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Sector Report

GLOBAL AI REPORT

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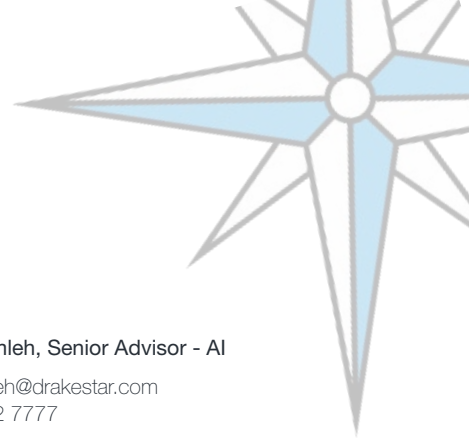
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Citations and sources are available upon request through <https://www.drakestar.com/contact>. Interviews were conducted by Drake Star Partners via email correspondence between June and September 2020.



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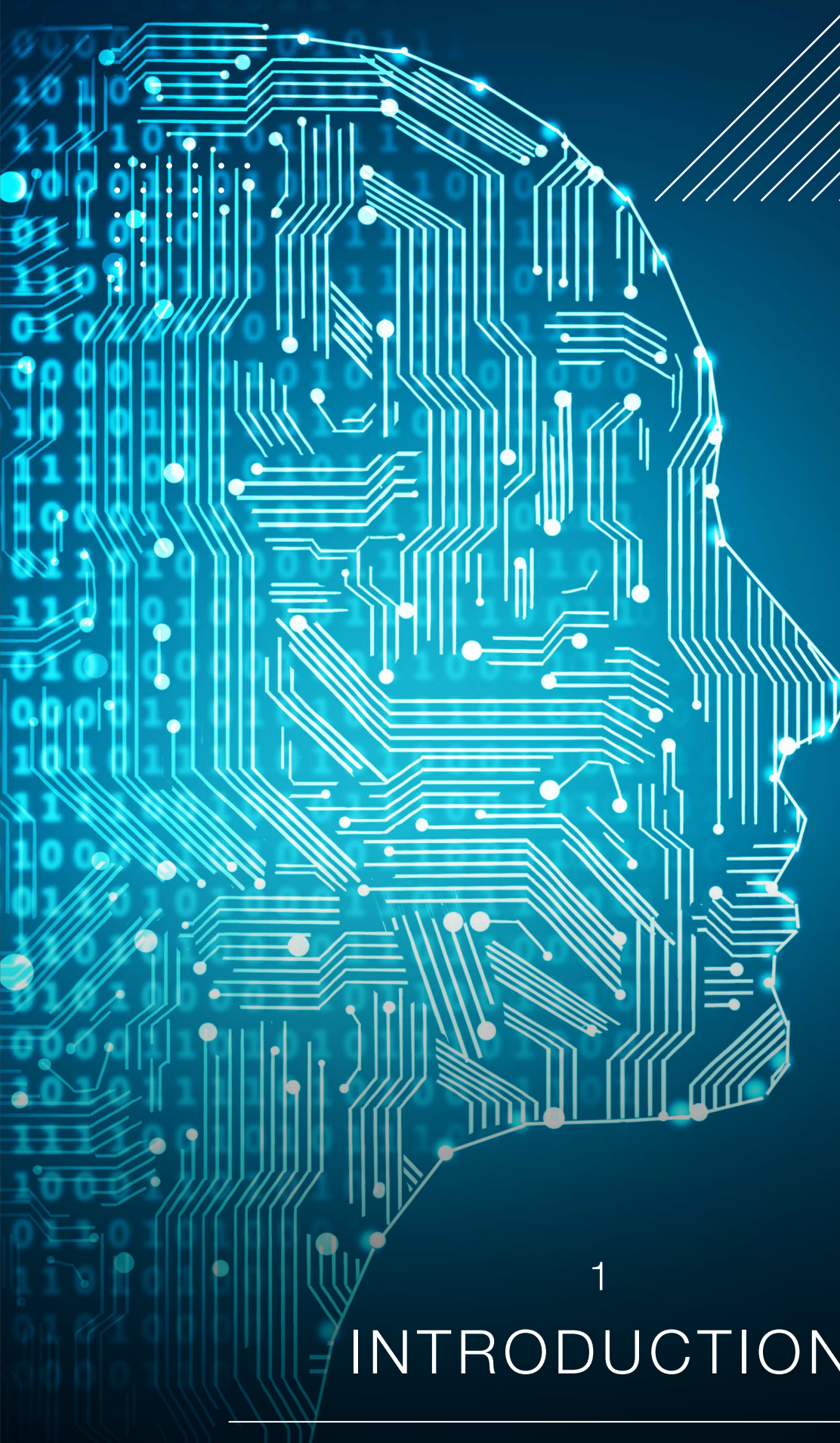


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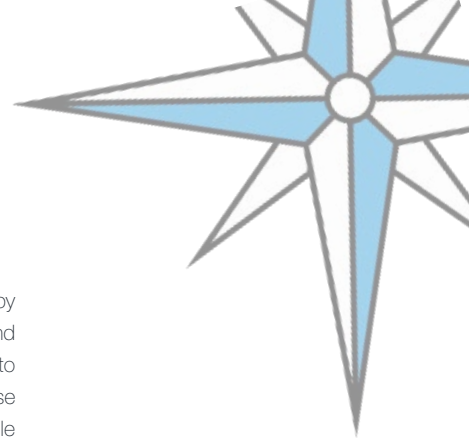


1

INTRODUCTION



MARKING DRAKE STAR'S GLOBAL AI REPORT















1. INTRODUCTION

We are pleased to publish our Drake Star Global Artificial Intelligence Sector Report. In this report, we begin by providing an update on the AI industry, exploring market sizing and forecasts, growth in key AI technologies and major market themes that we expect to dominate the sector going forward. Subsequently we look deeper into four key focus areas where AI has huge potential; Retail, Fintech, IT Services and Cybersecurity. In each of these we look to outline the key use cases for AI, include a market map highlighting the most important and notable companies in the space and provide our outlook on the expected impact of COVID-19. We also explore the impact of AI on Sports Technology and Visual Content, given Drake Star's expertise in these markets. Following this, we explore some additional topics covering the Global AI Index as well as M&A and fundraising activity. We conclude with our own predictions on the expected outlook in each of our key focus areas. Finally, we profile over 70 of the most innovative and disruptive companies in AI covering Retail Tech, Fintech, IT Services, Cybersecurity, Sports Technology and Visual Content. We will be exploring the impact of AI across other verticals in future updates of the Global AI Report.

To provide a more comprehensive overview of how sector dynamics are reshaping the industry, we have interviewed some of the leading executives, investors and entrepreneurs in AI. We would like to thank the below individuals and their teams for taking the time to contribute to this research.

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Q&A

WITH

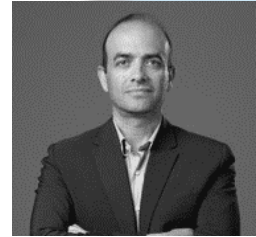


OMAR HATAMLEH

Drake Star Senior Advisor, Author & ex-CIO of NASA



Interviewed July 23rd, 2020



We interviewed Omar Hatamleh, ex-CIO of NASA and Drake Star Senior Advisor, to understand more about the future of AI

Please provide a brief overview of your background

Sure, so I have 23 years of experience in the field approximately, I've been at NASA for all that time and had several roles in science and engineering and later in management, but the last few years has basically been on innovation and Artificial Intelligence. We are concentrated on how the impact of AI is going to take place across all the sectors of the economy. I recently published a book called *BetweenBrains* and it talks about the impact of Artificial Intelligence on the future of jobs, the future of our society and industry, on ethics and on so many other aspects that we need to know about. This is an emerging field that is changing every year, becoming more advanced and more capable, and it's one of these things that you constantly need to keep adapting and modifying because otherwise it becomes obsolete after some time.

Why do you think interest in AI has grown so much in recent years?

That comes back to the fundamentals of what made AI. AI is nothing new, its been in existence since the 50s, and it came in, and came out, because all the supporting elements were not in place.

First, is the algorithmic element. Until now they actually used to be very basic and archaic and weren't producing good results. Now we have multi-layered algorithms that are very, very complex.

The second part is if you have complex algorithms, you need the computational power behind it to run it. One of the greatest advancements we have had in recent years is actually the emergence of GPUs. So with a conventional CPU you complete a calculation, and you move to the next one – it goes in series. With a GPU, created by the gaming industry, you can actually do up to several thousand calculations at the same time. Because we are now manufacturing these at scale, the price is becoming more affordable and so more people have access to this computational power. So now we have great algorithms and we have the computational power behind it to be able to solve these algorithms.

The third element is big data; now finally we have incredible vast amounts of data and without data, the previous foundational elements will not do any good. So what we do is we go through the data, we learn from it, we make assessments and that's what is being used as a feeding stock to make future intelligence useful and actually have an impact.

Do you think the general public are prepared for AI?

Even before we go there, let's go to education. Before for example, if you do a 5-year technical degree, that's it - most of the things you learn will stay with you for the rest of your career. Those fundamentals are always going to be there, but if you study a technical degree in 5 years, by the time you graduate, a lot of those aspects you learn will be obsolete – you then go into the workforce and you're not actually equipped to be able to do the job. So one of the first things we need to do is actually build a bridge between academic institutions and industry to make sure that the curriculum and what is being learnt is being constantly updated so that by the time you graduate you are up to speed with what's going on.

People ask me which emerging technology will be the one that will have the most impact and by far AI will be the one – it has implications on every single thing we do in our lives from medical, from economics, from finance, from design – you can give me any topic and I can tell you exactly how much success we are going to have with Artificial Intelligence. But even more creative fields for example, painting, poetry, music – which we thought will never have any technology like AI, now is using Artificial Intelligence. AI is still very much taking baby steps – imagine when it becomes more mature and more advanced.

Where do you see AI going in the next 5-10 years?

Well, if I have to classify AI, it's three types basically – right now we are considered by the experts to be in Weak or Narrow Artificial Intelligence. Then we are going to reach General Artificial Intelligence in the next few years. Then the part that becomes really interesting is when we reach Super Artificial Intelligence, which people estimate will be in 20 to 25 years. That's when things become incredible - computational systems will be able to adapt and modify and change themselves and that is where people are concerned about whether we are going to lose control. Are the boundary conditions we are feeding the Narrow Artificial Intelligence we are using now going to remain with us as we continue maturing the technology? Are they going to be completely irrelevant in terms of biases? What is going to happen with implementation? I think is going to be a gradual approach.



Q&A

WITH



OMAR HATAMLEH

Drake Star Senior Advisor, Author & ex-CIO of NASA



Interviewed July 23rd, 2020

But sometimes as humans, we tend to think in a linear fashion – it's how we evolved. Right now, we are living in an exponential world so everything is moving exponentially – we shouldn't just judge what is going to happen over the next 5 to 10 years based on what we have right now. Right now AI is in its infancy, it's very basic but the potential it has over the next 15 to 20 years I think is going to be something unimaginable, something we have never seen before.

Are there any technologies that won't eventually be touched by AI?

That's one of the things we are really looking at. What are going to be the jobs where it will be difficult for AI to be implemented? To be honest it's getting more and more difficult to find. Almost every job is going to be impacted so in order to remain relevant and contribute as a professional you need to be able to learn constantly, get out of your comfort zone and be able to switch your career, discipline or knowledge. You should constantly be doing this otherwise you will become stagnant and lose relevance. So these are the skills and attributes that people need to develop because I think it's going to be a challenge to define

areas where AI isn't going to be impactful going forward.

Are there any interesting uses of AI that NASA is exploring?

In astronomy a lot of the analysis has been done manually until recently - AI can do a great job in analysing signals and clearing the noise. But we can also use it in long term space exploration in terms of psychology. When people engage in long-term space travel there is a psychological impact and a lag in communications, the further away you get from Earth, the longer it takes to get the signal back and forth. So we need to depend on AI systems to do a lot of the medical applications, navigation and so on – I can think of a whole array of use cases for AI in space technology.



Also available in video format:
<http://bit.ly/global-ai-report>



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2

AI MARKET OVERVIEW



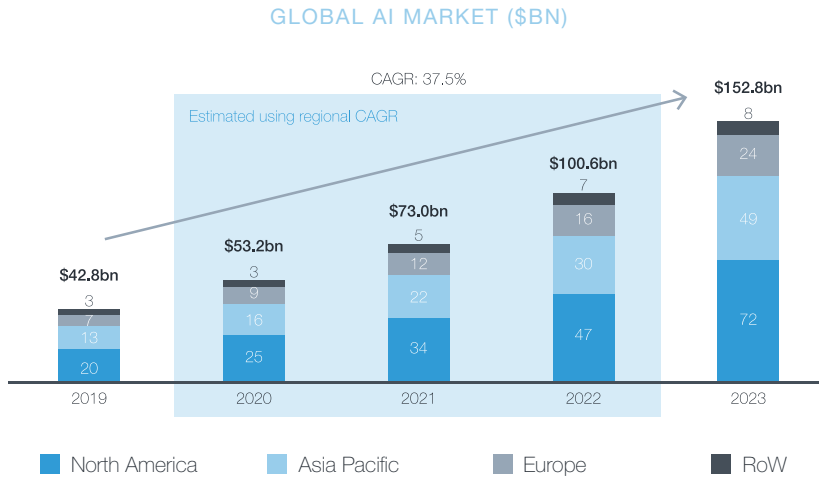
SIZING THE OPPORTUNITY



2. AI MARKET OVERVIEW

THE GLOBAL AI INDUSTRY

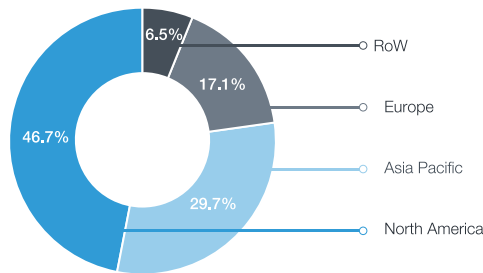
Adoption of Artificial Intelligence has increased significantly in recent years as consumers and businesses alike are getting increasingly comfortable with using AI. According to Deloitte research, 37% of organisations have now deployed AI, showing a 270% increase from four years ago. As a result, Artificial Intelligence is continuing to see rapid growth with global market size reaching \$152.8bn by 2023, a 37.5% CAGR from 2019.



Note: 2020-2022 market size by region estimated using CAGR rates – this ignores heterogeneity between years

Source: n.a., Analytics Insight Predicts Artificial Intelligence Market At US\$53.2 Billion In 2020, North America To Lead, Analytics Insight, May 7 2020

GEOGRAPHIC BREAKDOWN

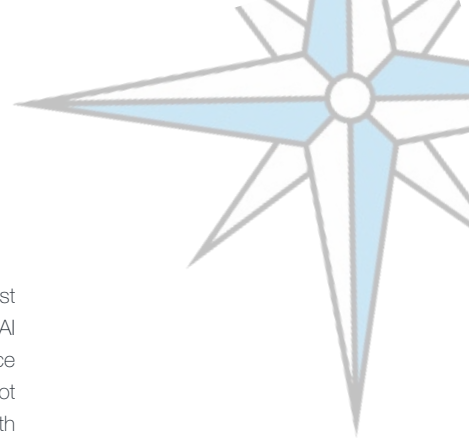


Source: As above, geographical breakdown as of 2019

■ **North America** has a dominant share in the AI market (46.7% in 2019). Currently at approximately \$25bn (as of the end of 2020) the US contribution will increase to \$72bn by 2023 (37.7% CAGR). This is in line with the broader trend and shows no significant loss or gain geographically.

■ **Asia Pacific**, with a market share of 26.7% in 2019, is anticipated to make up some ground on North America, increasing its market share marginally to 32%, registering the highest CAGR of 40.2%. This can be attributed to rapid improvements in information storage capacity, computing power and parallel processing, all of which have contributed to the swift uptake of Artificial Intelligence technology in industries ranging from automotive to healthcare.

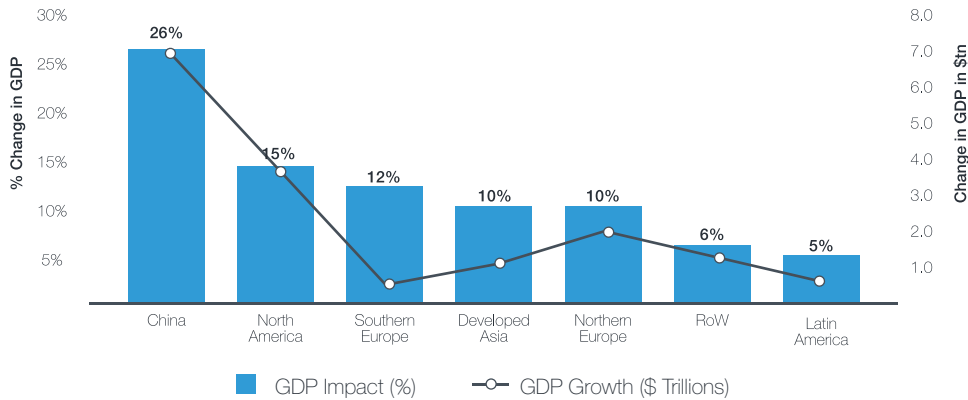
■ **Europe** and **ROW** follow behind in terms of market size with a smaller share overall. Despite this, both regions are still predicted to grow rapidly with CAGRs of 34.4% and 30.4% respectively.



ECONOMIC IMPACT OF AI

According to PwC, AI could add an estimated \$15.7tn to the global economy by 2030, making it the biggest commercial opportunity in today's fast-changing economy. According to the study, the economic impact of AI will be largely driven by productivity gains from automating processes and augmenting the traditional labour force as well as by generating additional consumer demand resulting from personalised products and services. Not surprisingly, China leads the way with a \$7tn impact to GDP (representing 26% GDP impact), followed by North America with \$4tn (representing 15% GDP impact).

PROJECTED AI CONTRIBUTION PER REGION TO GDP BY 2030



Source: Anand Roa and Gerard Verweij, *Sizing the Prize*, PwC, 2018

AI BY INDUSTRY & USE CASE

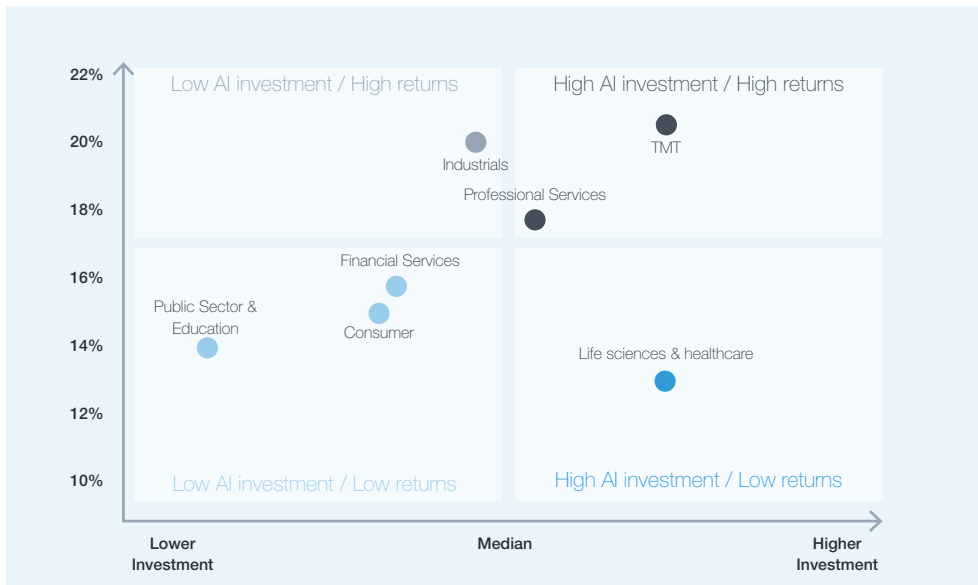
To obtain a view on which industries are leading the way in integrating Artificial Intelligence into their processes, we have drawn information from the State of AI in the Enterprise report from Deloitte. The survey covers 1,900 executives from companies considered early adopters of AI across key industries in seven economically developed nations.

Deloitte found that 82% of participants have achieved some financial return from their investments in AI with the median annualised return reaching 17%. Whilst investment in AI has been universally positive where deployed, returns are largely heterogeneous; industries such as TMT have returned over 20% where others, such as education, have seen a significantly lower return. Whilst these figures are self-reported we expect that ROI in TMT, industrials and professional services is more easily quantifiable with shorter payback periods; operational and customer service improvements are easier to measure than results in education or healthcare.





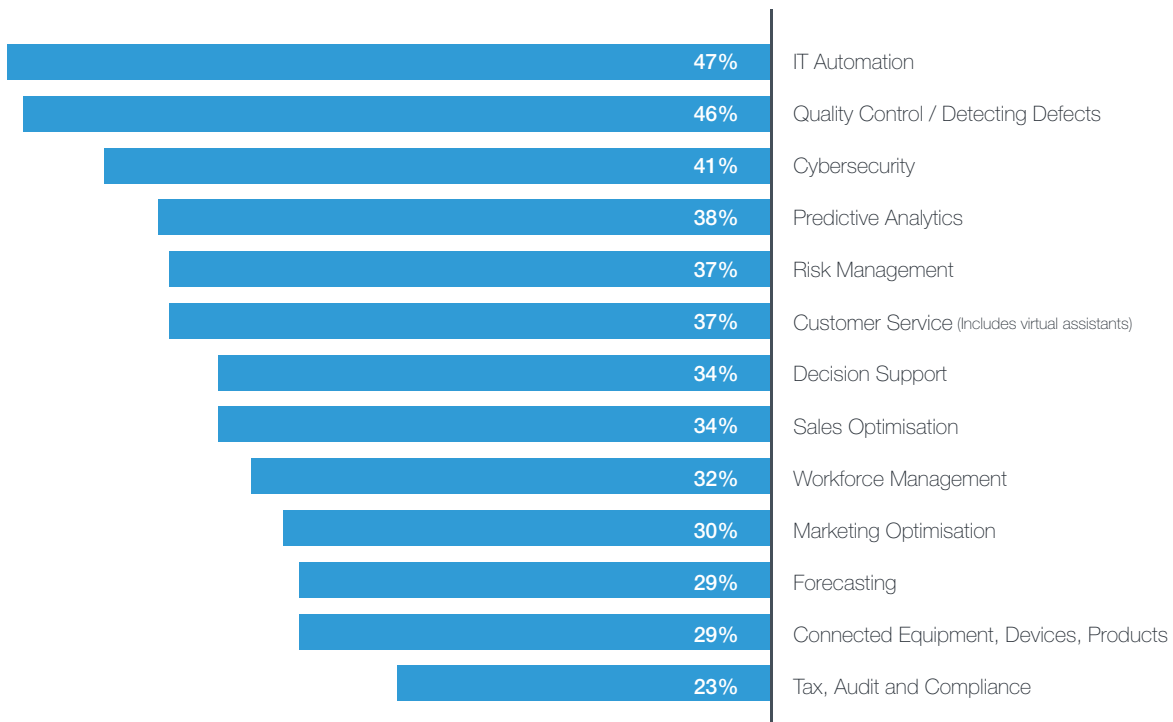
RELATIVE LEVELS OF AI INVESTMENT AND RETURNS BY INDUSTRY



Source: Loucks, Davenport and Schatsky, *State of AI in the Enterprise, 2nd Edition, Deloitte, 2018*

According to the survey, commercial focus has been mainly on IT Automation, Quality Control and Cybersecurity (below). Here, AI has the potential to have an immediate and measurable impact on operational efficiency and operational risk. As the technology matures and model accuracy under dynamic real-world situations improves we expect more sophisticated use cases – AI will become integrated throughout the enterprise and enable change across multiple business units. AI-as-a-Service, which we explore in more detail in the next section, will play a pivotal role in democratising the application of AI across the economy.

AI'S TOP 3 USE CASES ARE IN IT



Source: Loucks, Davenport and Schatsky, *State of AI in the Enterprise, 2nd Edition, Deloitte, 2018*



THE RISKS OF AI AT A CORPORATE LEVEL

Whilst AI has enormous potential, there are still concerns from company executives around its development, deployment and application. According to Deloitte, cybersecurity heads the list of AI-related concerns with over 50% of respondents ranking it within their top 3. These largely stem from the threat of adversarial inputs (data constructed to deceive the model) which are hard to identify and can cause incorrect, unreliable, or fraudulent outcomes that could have major impacts on customers.

	Ranked 1	Ranked 2	Ranked 3	Ranked top three
Cybersecurity vulnerabilities of AI	23%	15%	13%	51%
Making the wrong strategic decisions based on AI	16%	13%	14%	43%
Legal responsibility for decisions/actions made by AI systems	11%	15%	13%	39%
Failure of AI system in a mission critical, life or death context	13%	14%	12%	39%
Regulatory noncompliance risk	12%	15%	10%	37%
Erosion of customer trust from AI failures	11%	11%	11%	33%
Ethical risks of AI	10%	12%	10%	32%

Source: Loucks, Davenport and Schatsky, State of AI in the Enterprise, 2nd Edition, Deloitte, 2018

AI AT A COUNTRY LEVEL

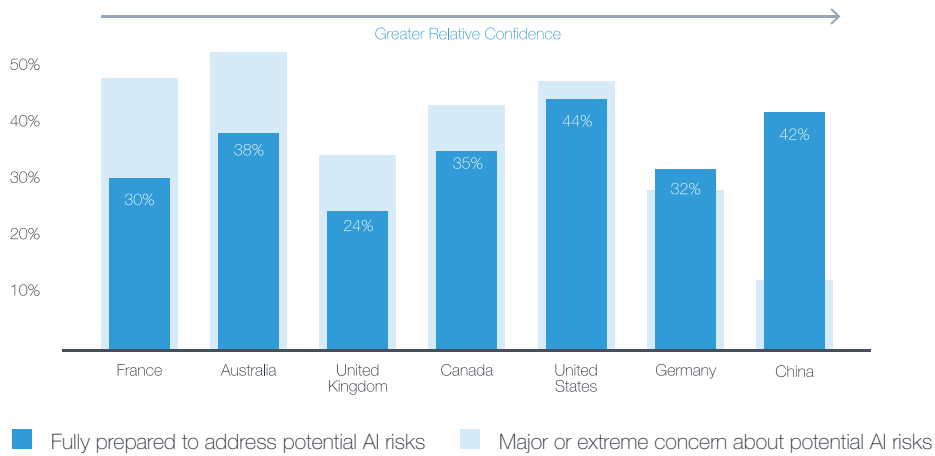
We must also consider AI on a macro scale. Data from the Deloitte study shows that for the most part, the concerns of organisations far outweigh their confidence in being able to address them. This is something that will need to be addressed on a national and international basis in order to accelerate the adoption of AI technologies worldwide.

Despite this, China and Germany stand out as having the greatest relative confidence in AI at an enterprise level. Largely this comes down to government policy; the Chinese government have declared their ambition for China to become the world's leading innovator by 2030 and has announced plans to invest tens of billions of dollars in AI research and development; Beijing recently announced a \$2.1bn AI-centric technology park, and Tianjin plans to set up a \$16bn AI fund. Similarly, Germany's greater relative confidence in AI at an executive level can be in part attributed to its highly focused 'AI Made in Germany Strategy', which incorporates \$3bn worth of investment until 2025. Further, specific actions have been taken at a government level to manage ethical concerns, such as information manipulation and job cuts from AI-driven automation. Clearly a focus on AI at a country-wide level is necessary to provide company executives and entrepreneurs with confidence that we are ready for the widespread adoption of Artificial Intelligence.





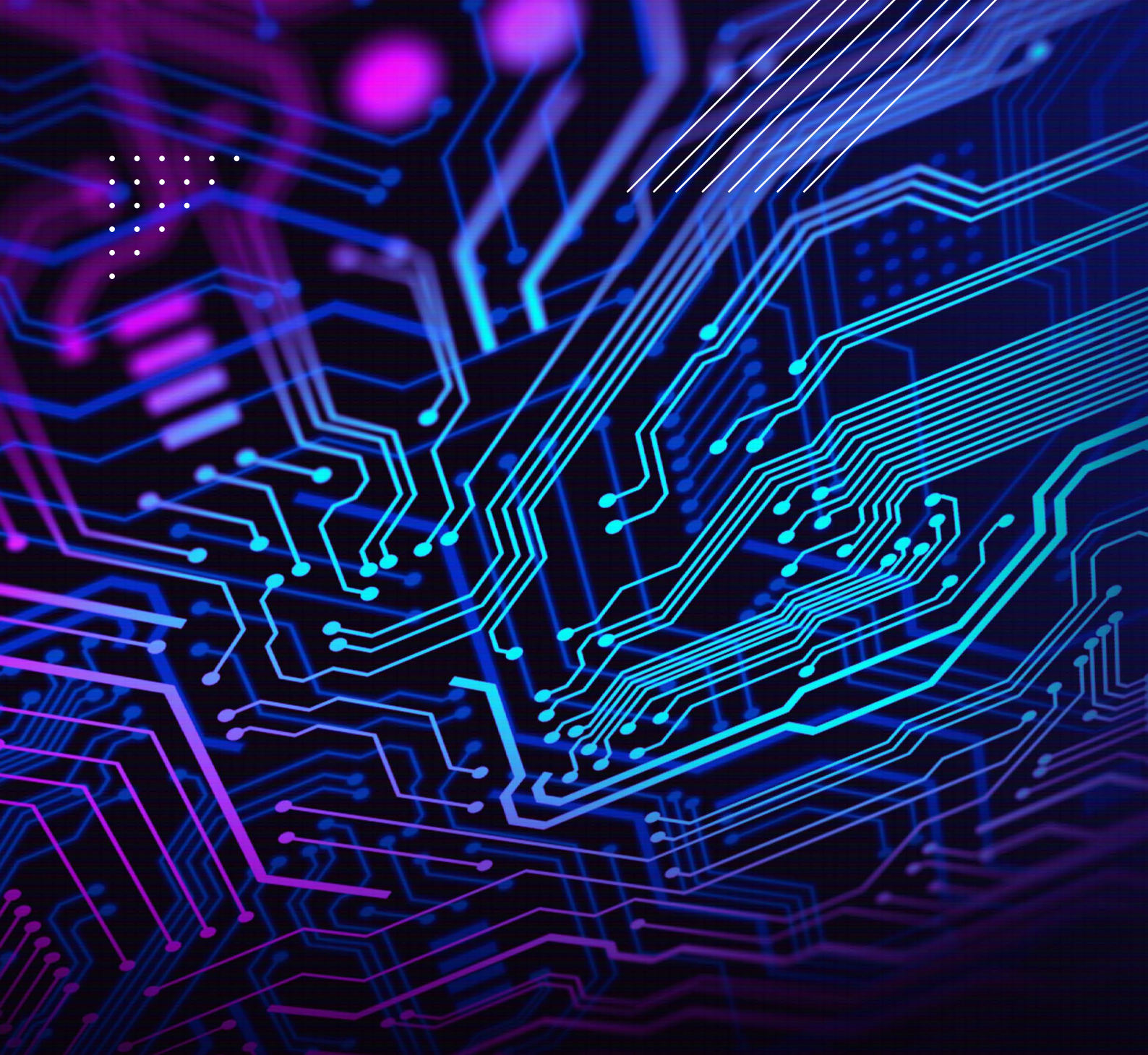
CHINA IS MOST PREPARED TO ADDRESS POTENTIAL AI RISKS



Source: Loucks, Davenport and Schatsky, *State of AI in the Enterprise, 2nd Edition*, Deloitte, 2018

Overall, the use of AI technology in industry is growing at an accelerating rate, impacting almost all sectors of the economy. North America is a clear leader in terms of market size with APAC falling not far behind – Europe and RoW have some catching up to do. Whilst at a macro-level market growth and adoption has been strong, interviews with company executives highlight that there is heterogeneity in investment and returns across sectors. Applications of AI in perhaps less-quantifiable domains are yet to be fully explored and there are still question marks around AI at a country and corporate level. Understanding how the industry will evolve over the next 5-10 years will be key for investors, entrepreneurs and executives to best manage the transition towards the widespread adoption of AI. In the next section, we explore 5 market themes in more detail which we believe will dominate the industry in 2020 and beyond.





3



KEY MARKET THEMES

TOPICS THAT WILL DOMINATE THE CONVERSATION



3. KEY MARKET THEMES

AI is a constantly evolving discipline – advancements in research, technology, and understanding are ever progressing and will continue to disrupt the wider economy for years to come. Most use cases of AI have yet to be fully explored and of those that are operational, many are still in developmental phases. With this in mind, Drake Star Partners have identified 5 key market themes that we expect to dominate the conversation around AI and its use in the wider economy.

#1. AI AT THE EDGE

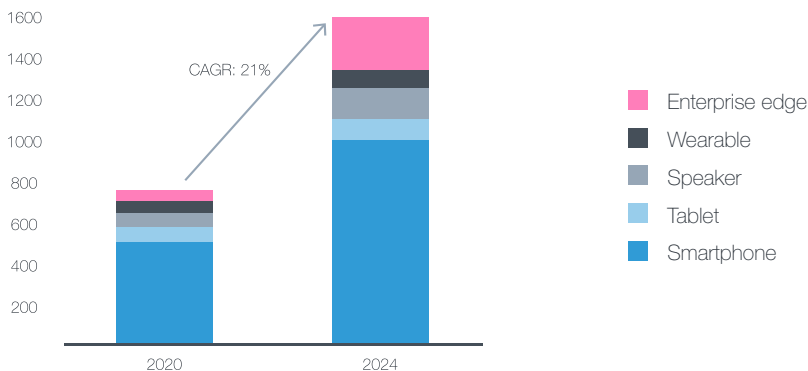
Artificial Intelligence has traditionally been deployed in the cloud – AI algorithms require massive computing power to crunch enormous amounts of data. Current use cases now require AI decisions to be made locally on a device – at the edge of the network. Industrial IoT, autonomous vehicles and video security are all important use cases of AI – they have the potential to be truly transformational to our economy and society. These use cases require decisions to be made in real-time; autonomous cars must make decisions instantaneously and industrial sensors must alert power plant workers of an imminent explosion as it happens. Traditional cloud-based methods have a degree of latency; a short delay as data is sent to the cloud, computed, and sent back to the device. AI computed on the device has zero latency and is therefore much better equipped for the use cases mentioned.

But these aren't the only reasons for the proliferation of AI at the edge; one of the key drivers behind this is data privacy and data security. Consumers are increasingly conscious of their data privacy and where their personal data is stored. Cloud computing, by its very nature, uses distributed data centers that could be located anywhere across the world; AI at the edge allows for computation and data storage on the device. For similar reasons, security is less of an issue with edge devices as data isn't being transferred across multiple networks.

When discussing AI at the edge, it is also important to make the distinction between training and inference in an AI model. Algorithm training requires significant amounts of data and considerable computing power – in order to teach a security camera what an intruder looks like you must feed it thousands or even millions of images. Inference on the other hand is the component that applies the new data to the pre-existing model – it is effectively a huge number of mathematical operations meaning it is possible to perform locally on a CPU or GPU. AI at the edge is typically used in inference whilst training is more likely to use cloud-based networks.

In terms of outlook, AI at the edge will become an increasingly important part of the ecosystem, particularly given the expected adoption of autonomous vehicles and IoT. IDC forecasts estimate that AI chip manufacturing will grow at a CAGR of 21% through to 2024 with enterprise edge use cases leading the accelerated growth.

FORECASTED SHIPMENTS OF EDGE AI CHIPS WORLDWIDE BY DEVICE (IN MILLIONS)



Source: Lee, Loucks, Stewart, Jarvis and Schatsky, Technology, Media & Telecommunications Predictions 2020, Deloitte, December 2019





#2. THE RISE OF AI-AS-A-SERVICE

AI-as-a-Service is an increasingly discussed topic in AI; the combination of a SaaS-type delivery model and AI has the potential to offer powerful Artificial Intelligence capabilities to even the most IT-challenged businesses at an affordable price. Just as SaaS has dominated the past decade in enterprise software, we expect AI-as-a-Service to become an essential part of the AI landscape, bringing off-the-shelf solutions to a range of different industries. Combined with the ever-increasing quantity and improving quality of data that comes with technological advancements such as 5G and IoT, we expect this delivery model to help democratise AI.

AI-as-a-Service is already widely used in several disciplines, offering the following capabilities:



PREDICTIVE ANALYTICS



COMPUTER VISION



COMPUTER SPEECH / NATURAL LANGUAGE PROCESSING



CHATBOTS / CUSTOMER SERVICE

AI-as-a-Service can be an easy way for companies to access AI technology at a fraction of the cost of deploying in-house. Computational requirements are handled by a fully-scalable cloud and front-end applications make programs accessible to non-AI experts. On the whole, AI-as-a-Service is dominated by large corporate players such as Google, Amazon and IBM. Despite the attention of big tech, there are still opportunities for challengers in the space and those offering niche or high-performance products with great UX have an opportunity to capture market share. Element AI, a Canadian-based AI-first software provider, is one such company – they provide the tools for enterprises to operationalise AI, particularly in insurance, retail and logistics. Co-founded by world-renowned AI computer scientist Yoshua Bengio and co-founded and led by CEO Jean-François Gagné, Element AI OS supports the entire AI production lifecycle allowing users to create production-ready models from a central repository of AI building blocks.

ELEMENT AI

-  2016
-  334
-  VC Backed, \$257m raised to date
-  AI-as-a-Service
-  B2B



MONTREAL

BUSINESS DESCRIPTION

Developer of emerging technology solutions designed to reinvent how humans and machines work smarter together. Founded in Montreal, the company aims to democratise and operationalise AI to create valuable business impact across the enterprise. The company has developed a suite of products, services and tools to enable clients to unlock insights and solve their unique business challenges with Artificial Intelligence.

KEY PERSONNEL

JF Gagné– Co-Founder & CEO
 Yoshua Bengio– Co-Founder & Lead Fellow
 Anne Martel – Co-Founder & Chief Administrative Officer

KEY INVESTORS

We expect more challengers to enter the market in coming years as SMEs and larger corporates alike recognise the growing need to develop an AI capability at a reasonable cost. Despite this, clear differentiation in results will be evident. AI-as-a-Service could potentially operate as black-box systems to protect IP rights; this means the AI can only be evaluated based on its inputs and outputs – customers will not be able to understand the algorithm itself. Therefore differentiation in AI-as-a-Service is relatively straight-forward; higher performance products under real-world conditions will win over a longer period.

AI-as-a-Service is clearly a high growth industry; Mordor Intelligence estimates it will be worth \$22bn by 2025 and grow at a CAGR of 45%. Potential headwinds in this space will be around the performance of lab-trained models on real-world data – applying a generic model to specific proprietary datasets could reduce model performance. A further challenge over the next 5 years will be the lack of talent in AI – improving understanding of the operationalisation of AI will greatly enhance trust in AI systems and uptake from a broader consumer base.





We interviewed Jean-François Gagné, CEO of Element AI, to understand more about their approach

Please provide an overview of Element AI

So, Element AI will be celebrating 4 years in October and since the inception of the business we have been really focused on bringing all the advances in Artificial Intelligence into the hands of business users making decisions for their organisation. What is fascinating is that as powerful as the algorithms that have been emerging in the labs are, the industry has really had a hard time implementing them into the day-to-day business lives of people. When they have done so it was through extraordinary effort, lots of fine-tuning and very often ended up being quite fragile. Element AI has been on a mission to build the infrastructure around putting the algorithms into production (as well as bringing new algorithms to the market) for people in enterprises that do not have a lot of data, and whose business context is changing all the time.

The pandemic has made this especially important; your forecasts that were good suddenly need to change, but your historical data is no longer as valid. How do you deal with that – and how do you collaborate with this new Artificial Intelligence technology? All of our products are designed in a way where you don't rely as much on data scientists and programmers to actually be able to train and use AI. They are explainable and therefore represent a big advantage for business users because not only can they provide better feedback, but they can also better understand why a certain recommendation has come about.

That is essentially what we are about and we have a suite of products and a platform to do it, mostly serving the Fortune 1000 at the moment with about 315 employees. We also have our own research lab internally so we can bring new technology to the market really fast. We have offices in Asia, Europe, North America, here in Montreal and a presence in Toronto as well.

The operationalisation of AI is one of it's greatest challenges – how are Element AI looking to tackle model performance when applied to real-world situations?

What we are starting to realise is that a lot of the data that organisations have collected, as much as it is a good point of reference, is not always the most useful in terms of driving future performance. This technology requires a new way of thinking. Of course data is important, of course getting access to feeds (either external or created internally) will make a difference to performance, but it's really the interaction with business users and the input they can provide to the models that equate to huge increases in performance. Getting the exchange right between the machine and the people is really key, and that's how we are designing our products and algorithms. The algorithms need to be equipped to interact and capture this feedback.

All in all, this is a new way of operating your business, and as much as this comes with a lot of good things it also comes with a lot of change to manage. We have been perfecting the art of bringing our clients from traditional ways of using systems and evolving towards a more collaborative and interactive model.

What is your view on the regulatory landscape?

First, there's a lot of different conversations that are happening, and need to happen, and they're often all saying one thing: "Hey here is lots of regulation because people are afraid of AI and AI should be kept under guard" and then everything is portrayed as falling into the same bucket. Really, we have got an environment where all consumers are using products and services that may leverage AI technology. Now, in this consumer context, there is regulation that is needed in order to ensure that there is a proper level of service and people and their privacy are treated respectfully – there is some work to be done there.

When it comes to B2B, this is a separate area. Standards are necessary here so businesses can build on top of them, to not waste energy repeating things over and over. Each area of this field is emerging and new and requires the right dose of regulation and standards. I am not too worried about what is happening and I don't think we are going to get into a place where this is too regulated anytime soon. But it may feel like a lot of regulation and standards coming if you bundle the consumer and B2B situations together and treat it as one.

Has the COVID-19 pandemic impacted this in any way?

Not really. I think society is now reflecting on lots of aspects, not necessarily new conversations, but conversations that we are now paying more attention to. Whether it's the Black Lives Matter conversation, which we have seen in Montreal, or sexual harassment situations being addressed in some companies, people are really emphasising the wanted change in all these areas.

More than ever, people's biases, algorithmic biases, and dataset biases are something that are top of mind and this is something that is just a good thing. In the end this is going to bring a lot of benefit, because I'll tell you, every energy you put into making your systems or your decisions explainable, this always turns into a few things; you will better assess the quality of these decisions, and you are going to be able to assess weaknesses. When you know the weaknesses, guess what, people come up with creative ways to improve on them. So, ultimately this translates into performance - we have seen this in the industry.



Q&A

WITH



JEAN-FRANÇOIS GAGNÉ

CEO, Element AI

ELEMENT AI

Interviewed July 20th, 2020



Sometimes people are not making the investment in explainability in these areas from the get-go when people actually should – so I think in all of this there's going to be a lot of positives coming out of what is happening.

Montreal has a thriving AI ecosystem – what has contributed to this success?

This is not something that happened overnight. Really, the Montreal ecosystem has been in the making for over 20 years. There has been a lot of research going on; it started in the universities and then as the technology picked up speed, Canada broadly, but Montreal and Toronto more specifically, kept the investment up during what people referred to as the 'AI Winter'. As computing progressed, as data storage has progressed, network speed has been increasing, at some point a lot of the techniques that were developed here in Montreal ended up becoming the viable solution for extracting knowledge, extracting value, and creating amazing prediction tools. At a certain point, that momentum started to not only pick up speed but grow exponentially.

In the last 5 years, it's incredible what has happened. I mean Element AI is just one of the stories, there has been a lot of investment from all fronts, foreign organisations, local organisations, local governments and there has been a convergence of momentum from all these axes that has lifted the ecosystem to something that is quite unique now. We have got amazing know-how, a great pool of talent that keeps growing, Montreal is an amazing place from a cost-of-living perspective and is an international city; all the right ingredients that really turns the place into one of the big hubs when it comes to doing something in this field - whether its advanced research or commercialisation.

Being located here has been a great advantage, especially as we were here early on and managed to get a lot of friends who were a long time working on the technology on board. It ended up giving us quite a big advantage from the start.

What do you see as being the major headwinds for AI across the next 5-10 years?

I will speak for the B2B space, which is mostly where I am living in the day-to-day. I think that the biggest challenge here is that the infrastructure required for organisations to be successful at using AI is not in place. As much as we are accumulating more data, what we are seeing now consistently is it's not just any data that you can use, it's carefully curated data that has a lot of value. Sure, if you have a lot of data it will help, but a little bit of very carefully curated data will be significantly more useful than a lot of bad data. It sounds very obvious but it's easy to get cast into that trap. This is one of the big headwinds of the technology, the algorithms are getting more mature and they work but being able to feed them with the proper sources and having the right infrastructure for them to be able to operate at scale is going to be quite a tough

adoption journey.

The other one is a more recent one. More and more the latest advances in the field have come from a huge, huge amount of computing being thrown at algorithms and the cost of training an AI model is skyrocketing, growing much faster than Moore's Law. If this is the only way we get better performance from AI, and remember there is still a long way to go before they are fully useful, this may actually slow down the adoption of the technology. These are two things to watch for. I think there are always tons of potential solutions you can apply to these, but I would say these are the two highlights in terms of potential headwinds in the next 5 years for sure.



Also available in video format:

<http://bit.ly/global-ai-report>





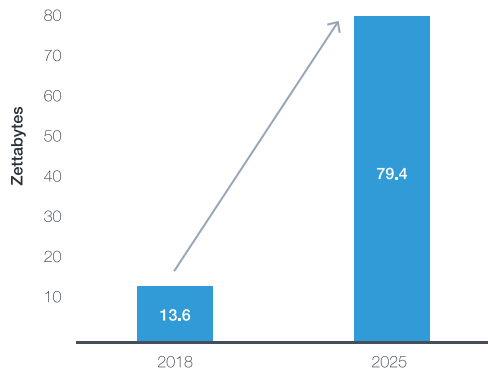
#3. 5G AS A CATALYST

5G is the 5th generation technology standard for cellular networks and is considered a major leap forward in connectivity. 5G utilises a higher frequency than previous technology, allowing it to transfer data much more quickly – up to 10x faster than 4G.

Among many use cases, 5G will be transformational in the development of the Internet of Things – 5G connections can support up to 10x more devices and provide seamless connectivity. According to IDC, there will be 41.6bn connected IoT devices in use by 2025 all requiring reliable access to the cloud.

This connectivity presents a great opportunity for AI – with faster speeds and better connectivity comes more devices and more data. IDC estimates that by 2025, IoT connected devices will create 79.4 Zettabytes worth of data per annum, a 484% increase on 2018. With 5G able to support a million concurrent edge devices per square kilometer, data will flood data lakes across a wide variety of use cases including autonomous driving, video analytics and industrial automation. More data from these devices will translate into ever-improving AI systems and therefore improved safety, accuracy, and outcomes for consumers.

DATA VOLUME OF IOT CONNECTED DEVICES WORLDWIDE (ZETTABYTES)



Source: n.a., *The Growth in Connected IoT Devices Is Expected to Generate 79.4ZB of Data in 2025, According to a New IDC Forecast*, IDC, June 2019

5G will clearly play a transformation role across many aspects of the economy with AI being no exception. Despite this, the enormous potential that enhanced connectivity could have on data supply further raises questions around data management and storage. With more data comes additional processing requirements and increased costs in data labelling and cleaning. AI-first software companies need to work hard to improve data handling processes to ensure that the increased data supply can be utilised profitably.

#4. OPPORTUNITIES FOR SUSTAINABLE PROGRESS

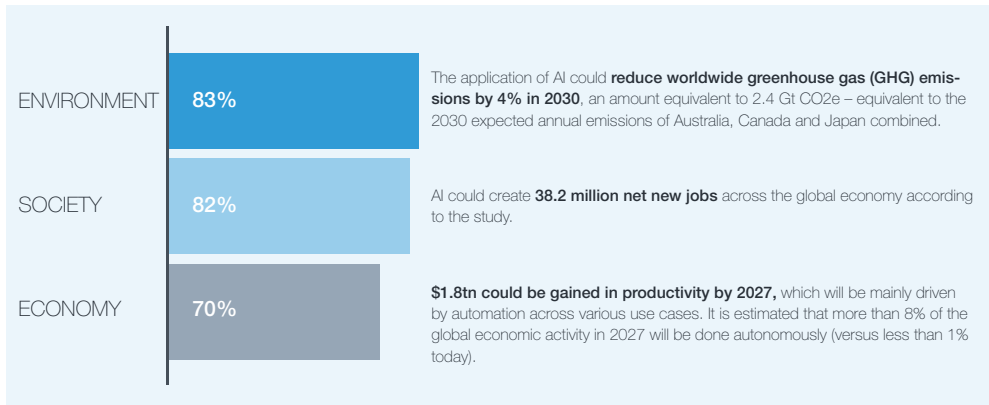
Artificial Intelligence has created profound disrupting and enabling impacts on business, governments, and society and as a result is influencing larger trends in global sustainability. Overall, AI is helping the next generation of companies to develop new products and systems that are simultaneously productive for the economy and nature. AI is making government more transparent and efficient, healthcare more effective and accessible, cities more livable, and the planet we share more sustainable.

In a new study led by the KTH Royal Institute of Technology, 134 out of 169 individual targets in the United Nation's Sustainable Development Goals could benefit from AI.





PERCENTAGE OF THE UNITED NATIONS ENVIRONMENTAL, SOCIETAL AND ECONOMIC TARGETS ENABLED BY AI



Source: Vinuesa et al, *The role of Artificial Intelligence in achieving the Sustainable Development Goals*, Nature Communications, January 2020

AI for the environment

According to a 2018 report by Intel, 74% of 200 decision makers in environmental sustainability agreed that AI would help solve environmental problems. The use cases in AI for the environment are numerous and have the potential to solve some of the world’s most pressing environmental challenges - some of which have been identified in the chart below by the World Economic Forum and PwC.

Climate Change	Biodiversity	Healthy Oceans	Water Security	Clean Air	Weather and Disaster Resilience
<ul style="list-style-type: none"> Clean Power Smart Transportation Sustainable production and consumption Sustainable land-use Smart cities and homes 	<ul style="list-style-type: none"> Habitat protection and restoration Sustainable trade Pollution control Invasive species and disease control Realising natural capital 	<ul style="list-style-type: none"> Fishing sustainably Preventing pollution Protecting habitats Protecting species Impacts from climate change (including acidification) 	<ul style="list-style-type: none"> Water supply Catchment control Water efficiency Adequate sanitation Drought planning 	<ul style="list-style-type: none"> Filtering and capture Monitoring and prevention Early warning Clean fuels Real-time, integrated, adaptive urban management 	<ul style="list-style-type: none"> Prediction and forecasting Early warning systems Resilient infrastructure Financial instruments Resilience planning

Source: Herweijer et al, *Harnessing Artificial Intelligence for the Earth*, PwC, January 2018

Startups are rapidly entering this space; generating profits by doing business for good. FarmGrow is leveraging satellite imagery (optical and radar) and AI to track the global performance of agricultural production and its risks such as deforestation and forest fires. The Satelligence platform supports farmers by providing daily actionable insights that directly impact the success of their agriculture.







-  2016
-  22
-  VC Backed \$0.7m raised to date
-  Sustainability
-  B2B



UTRECHT

KEY PERSONNEL

Niels Wielgaard – CEO, Strategy & Direction
 Arjen Vrieling – Director
 Rens Masselink – Head of Operations

KEY INVESTORS

ROBECO

BUSINESS DESCRIPTION

Using satellite imagery (optical and radar) and Artificial Intelligence, Satelligence provides daily actionable insights detecting the global performance of agricultural production and its risks such as deforestation and forest fires. The technologies of Satelligence support FarmGrow implementers to better manage appropriate levels of shade on cocoa farms, provide information that is used by coaches to better target their field visits and monitor and prevent forest encroachment.

AI has enormous potential to accelerate the world’s sustainable business practices, but the extent to which it is effective will depend largely on how widely it is used in other areas. It is only once AI becomes further democratised across the board that its application to sustainability will become more common. Collaboration between governments, startups and non-profits will play an important role in shaping this new ecosystem.

#5. A FOCUS ON EXPLAINABILITY, BIAS AND TRUST

As AI becomes more widely adopted across the economy, public opinion is shifting towards a sharper focus on the ethics behind the creation and use of such powerful technologies. 2019 saw the expansion of early principles for AI ethics and risk management from supra-national governing bodies and corporates alike:

- **The European Commission** published a set of seven guidelines for developing lawful, ethical and robust AI.
- In October 2019, **Element AI**, partnered with the Mozilla Foundation to create data trusts through a new data collection model which provides greater control over data to individual users.
- **Big tech companies** such as Microsoft and Google have also taken steps toward making their AI development conformant to ethical standards.

As part of this, the concept of ‘explainability’ is becoming increasingly demanded by the public. As explained previously in this section, some AI algorithms (particularly those using deep neural networks) operate as black-box systems, whereby it is near impossible to audit the decision-making process for individual model outputs. Developing models that can be audited will become increasingly important over the coming years to build public trust in AI – particularly in B2C use cases such as underwriting in financial services. This largely comes down to expectations of implicit bias in AI models – a concept that will prove fundamental to a broad adoption of AI.

Implicit bias

Implicit bias occurs when a model’s output is systemically prejudiced due to erroneous assumptions in the machine learning process. Whilst to some extent AI can reduce bias by minimising the role of subjective interpretation of data, AI models can also embed human and societal biases at scale. Left unchecked, feeding biased data to self-learning systems can lead to unintended and even dangerous outcomes.

In 2016, an attempt by Microsoft to converse with millennials using the “Tay” chat bot created a racist machine that switched from tweeting that “humans are super cool” to praising Hitler and spewing out misogynistic remarks. Similarly, the Correctional Offender Management Profiling for Alternative Sanctions (COMPAS) system, which uses machine learning to make recommendations for criminal sentencing created a biased model through incomplete training data. The training model included race as an input parameter but excluded more extensive and impactful data points such as past arrests, thus creating an implicit bias when applied to real-world data.

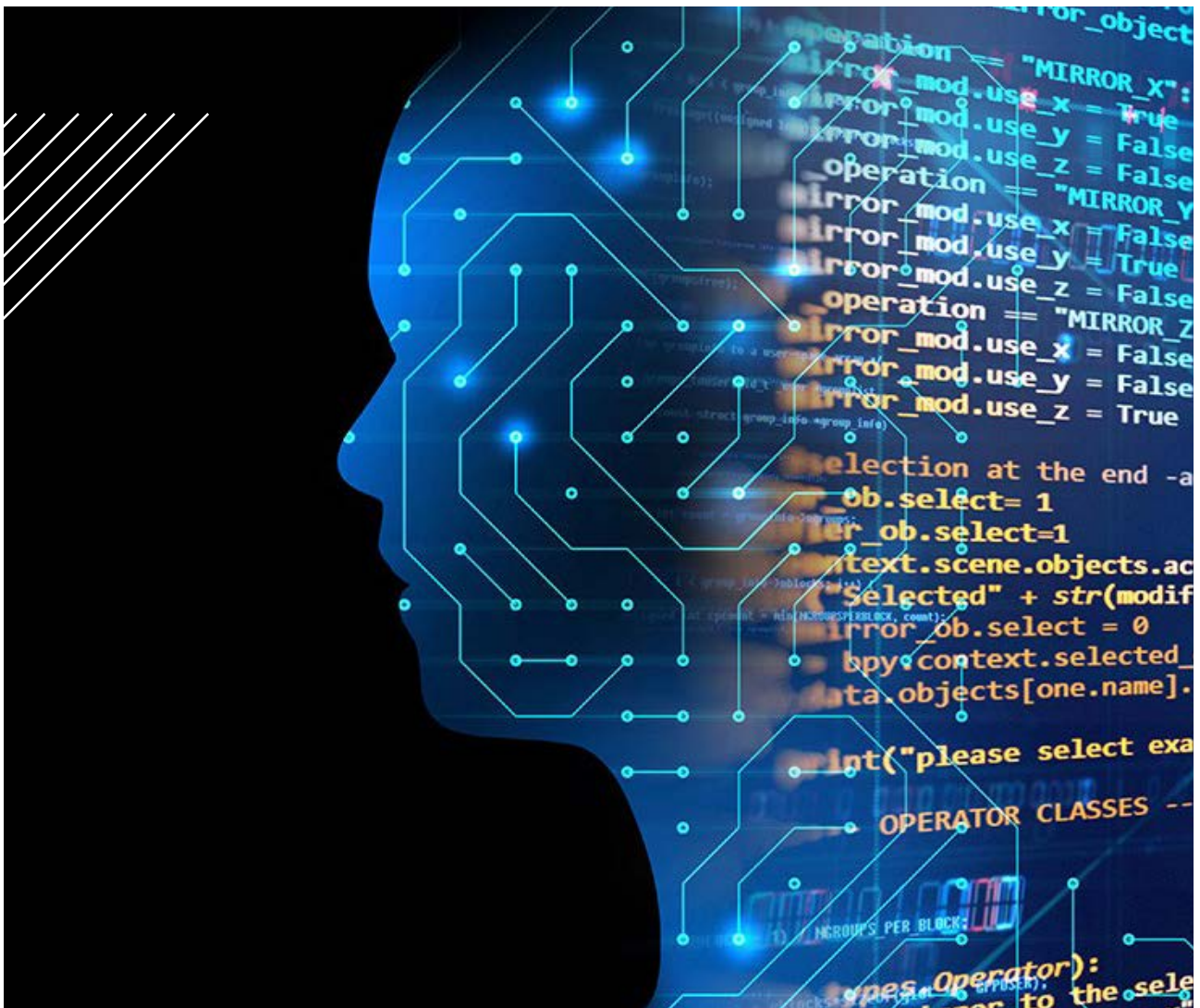




A recent article by MIT Sloan, explains key considerations and guidance around bias when developing AI models:

- **Awareness:** Project leads should first and foremost be reflective and proactive in understanding implicit bias within AI models
- **Removing biased assumptions:** Once potential biases are identified, companies should block them by eliminating problematic data or removing specific components of the input data set. External support can help challenge past and current policies
- **Expanding the dataset:** Expansion of the training data set in terms of variables can help counterweight potentially problematic data. Alternative data points including social media data, satellite imaging, granular transaction data and wearables data can help remove bias from AI models
- **Continuous re-training:** Whilst it is tempting to assume that, once trained, a machine-learning model will continue to perform well, project leads must consider the changing dynamics of the operating environment and update or re-train models accordingly

Whilst technology in general is inherently value-neutral, the implementation and use of technology can be problematic (used for good and bad). Governments and corporations play a vital role in the foundation of ethics in AI and introducing appropriate regulation that simultaneously encourages innovation whilst eliminating misuse. As with many emerging technologies, regulators can struggle to keep up with the rate of innovation and therefore it is imperative that tech leaders and startups ensure best practice around ethics and bias when developing AI technologies.



Q&A

WITH



JEFF GREEN

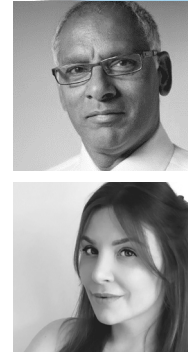
Co-Founder

STEPH HAMILL

Co-Founder & CEO



Interviewed September 7th, 2020



We interviewed Jeff Green and Steph Hamill from MettaNoon to understand more about Sensory AI

Please provide a brief overview of yourselves and MettaNoon

Jeff: Sure. My background is first, as a Sales Director at multiple software companies, then I worked in Private Equity, both Private Equity and PE-owned businesses and now I have an IT Services business and I'm a sustainable finance and social impact angel investor.

Steph: I am CEO and Co-Founder of MettaNoon. I'm also a Royal Society of Arts Fellow and lecturer. A creative who became a consultant, my role within MettaNoon centres on the intersection of what we consider a whole new category; human-centered Sensory AI. We blend applied neuroscience, human behavioural economics, creative solutions and conceptual thinking with AI.

Could you tell us about Sensory AI and MettaNoon?

Jeff: Sensory AI is the technology layer that we have developed to deliver a more creative experience and provide more insight on the human side of AI. MettaNoon has three core businesses; an AI advisory business, an investment innovation arm and our own sensory AI products.

Why is Sensory AI important and how will it impact the adoption of Artificial Intelligence?

Steph: At MettaNoon, we seek non-linear transformation opportunities to creatively apply Sensory AI to digital and physical spaces. This amplifies the multi-sensorial human experience in everything that we interact with.

This will humanise the digital space. It will give people a more balanced platform and could also mean a democratisation of education, wealth and opportunity. So, we feel strongly that Sensory AI has the potential to do good and we believe that Sensory AI can lead AI for good.

How are you at MettaNoon approaching this?

Steph: We ask our partners and our clients to dream big and then we ask them to dream bigger. It's all about curiosity and imagination - we see ourselves as the rocket fuel for our partners. Nothing's impossible anymore, especially with AI - we can explore, we can innovate, we can create together. Saying that, we know that it's great to have a dream, but you need a plan and the best route to making the impossible possible is by putting together a robust roadmap. It may not mean that you go from A to B automatically, you may drop off at two and five and Z be-

forehand. But we set a plan to make it happen and make it a reality. And then we test it, we break it, we put it back together and make it stronger.

Our Positive Methodology combines Sensory AI with the best strategic design thinking, always being human-centered and having a growth mindset. Positive stands for; Perspective, Orientate, Sketch, Invest, Transduce, Iterate, Validate, and Evaluate.

Are you optimistic about AI from an ESG point of view?

Jeff: I'm very optimistic about ESG and AI, and particularly what we can do with Sensory AI, because it provides an opportunity for everyone to play on a level playing field. That's the key. With education being an example, decision support being an example, AI can help us provide authentic, diverse human solutions.

Could you give some examples of the work you are doing?

Steph: At the moment, we have three live proof of concepts and products that we are partnering on with our clients. For example, we're working with Google AI to sketch out and create an enhanced pet experience. Pet linguistics is the best way to put it. Obviously incredibly nuanced and a niche space but has a mass market.

We've also partnered with a very disruptive European PropTech start-up. We are accelerating their strategic perspective, orientating their digital market product and adding a Sensory AI layer around human behavioural economics, neuroscience (so for example, galvanic skin testing and heart rate monitoring). This informs the behaviour of the product, so that the AI ultimately always stays human, sensory and user-centric. This way we can validate the augmentation with biometric data.

And we also have EQAI. This is something very close to my heart, and powerful. We've been speaking with a couple of very impressive partners who want to develop it with us and adopt it, fast. We are developing ways to protect and aid the vulnerable in difficult situations. Whether they need human support, whether they have any needs around gambling or concerns in the Financial Services space, EQAI is about serving the vulnerable by picking up on unique cues, using Sensory AI to support them and their needs by delivering user self-awareness interactions and empowering people to make their best choices.



Also available in video format:

<http://bit.ly/global-ai-report>



4

AI IN FOCUS

EXPLORING THE IMPACT OF COVID-19





4. AI IN FOCUS

The impact of COVID-19 has been devastating across the globe, both societally but also economically. Stories of the pandemic winners and losers have been echoed around the world. Our view, one that is shared by many, is that COVID-19 will have a different kind of impact to previous economic crises – we expect large sociological impacts in the short, medium and long-term and importantly, we expect them to persist. Clearly, the so-called ‘new normal’ requires a new framework for analysis – a full review of each sector and its outlook through the duration of this crisis and its place in the world over the next 6 -12 months and beyond.

Due to the breadth of AI and its many use cases, we have decided to focus broadly on 4 key areas in this report; Retail Tech, Fintech, IT Services and Cybersecurity. Our selection of these specific verticals results from both our expertise as a firm as well as the verticals where we feel there is potentially enormous change as a result of COVID.



RETAIL TECH



FINTECH



IT SERVICES



CYBERSECURITY

We aim to present a closer look at the above verticals and identify the most interesting and notable use cases for AI, important and exciting companies in the space, M&A and financing activity and comments from our sector experts at Drake Star. To complement this we also present our view of the outlook for each specific use case given the COVID-19 pandemic through our COVID Impact Analysis framework.

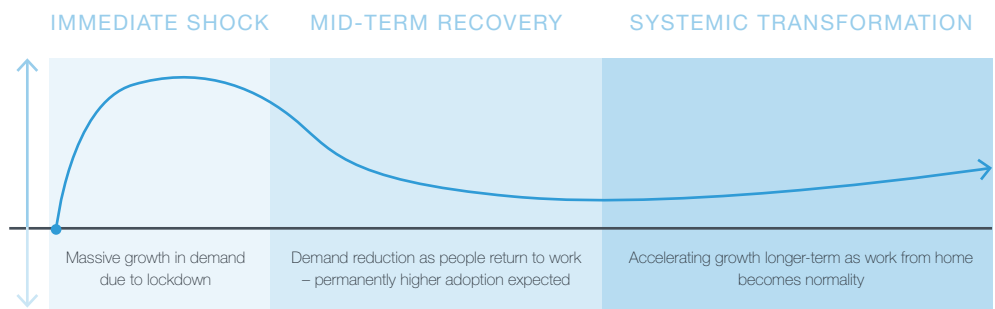
COVID IMPACT ANALYSIS – THE METHODOLOGY

In conducting this research, we look to investigate and analyse the impact of COVID-19 on the growth trajectories of specific AI use cases. In doing so we have collated internal research, leveraged our global network of experts and heard directly from companies and entrepreneurs in each of the focus sectors in order to identify the impact of the pandemic over different time horizons. Note that our time horizons do not have estimated dates – we feel the uncertainty of the current situation and economic recovery is too high to specify timing. Our definitions of the time horizons used in the analysis are below:

Immediate Shock: Defined as the period from the onset of the virus until the return to relative normality – the end of any form of lockdown, reopening of businesses and return to pre-crisis trading conditions.

Mid-term Recovery: Defined as the post-lockdown period in which the economic recovery is in full-swing – we consider this to be the period prior to a return to pre-crisis GDP.

Systemic Transformation: Defined as the longer-lasting societal change as a result of the crisis – this is the new outlook on the sector as if there were no change from our base period – i.e. no economic shock or financing complications.



The chart demonstrates the expected deviation of growth rates relative to pre-crisis growth in each AI use case – in some verticals growth will already be high, our analysis looks to show the direct change as a result of COVID.

4.1

RETAIL TECH & SUPPLY CHAIN

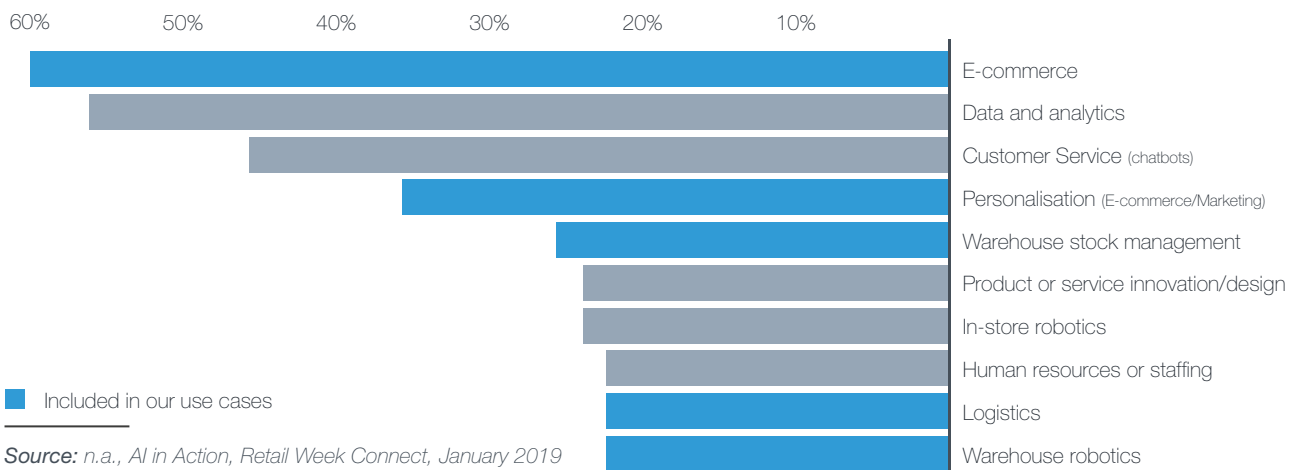
Technology has transformed the retail industry in ways unimaginable just a decade ago, disrupting business models and redefining value chains for some of the world's most established retailers. While e-commerce has been the primary growth driver in retail during this period, the COVID-19 pandemic has now driven almost every consumer to buy online – regardless of age, demographic or gender. Brick-and-mortar retailers that in recent years have tried to drive foot traffic by offering differentiated experiences are now forced to minimise foot traffic or meet customers outside of their stores. The changes of the last decade - and in the last 6 months - demonstrate how quickly the retail industry is evolving, with the 2010s showcasing the meteoric rise of online marketplaces and the shift to mobile globally. These changes require both brick-and-mortar and online retailers to become more nimble and adapt more quickly by taking into account as many data points as possible about their customers, their products, and the multitude of external factors that drive customers to those products (e.g. weather, sporting events, seasonality, health/wellness).



THE RISE OF AI IN RETAIL

Heightened customer expectations and increased market competition have forced retailers to adopt technology to enhance the customer experience and increase efficiency. We consider AI to be the next frontier in retail technology – the widespread adoption of AI across the retail ecosystem is inevitable and necessary for survival and growth in the industry.

AREAS OF INVESTMENT IN AI BY UK RETAILERS IN 2019 (% OF RESPONDENTS)



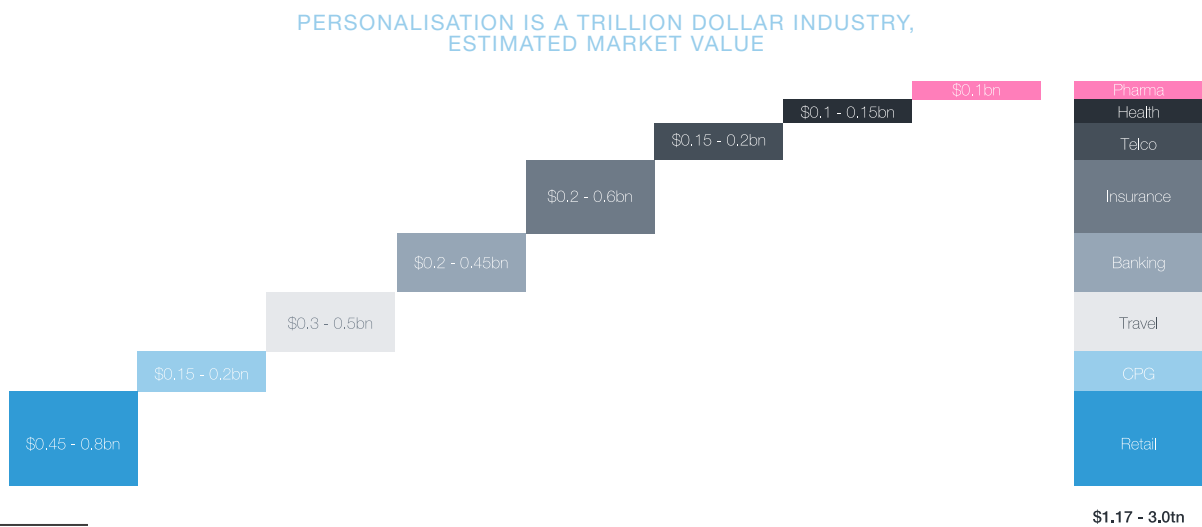
Source: n.a., AI in Action, Retail Week Connect, January 2019



Specific use cases of AI in retail cover a variety of disciplines, from stock management to autonomous logistics to front-end e-commerce. Our focus here will be on specific use cases where we believe AI has the greatest potential and where the greatest opportunities exist for retailers, investors and entrepreneurs in 2020 and beyond.

#1. PERSONALISATION

Personalisation is changing how retailers reach, interact with, and sell to customers. Consumers expect retailers to "know them" more than ever before. Simply put, personalisation tailors products, content and pricing to a customer's unique wants and preferences. Personalisation leverages demographic data, location data, metadata, internet browser data, device data, purchase history data and even on-screen response times. Importantly, customers and retailers are willing to pay for this capability, with McKinsey estimating personalisation in retail as a \$450-800bn industry making it the largest 'personalisation' use case in their report.



Source: Bughin et al, *Notes from the AI Frontier*, McKinsey Global Institute, September 2018

Despite the clear demand from customers and retailers, there is still a long way to go. According to a survey by Evergage, only 12% of brands feel their personalisation strategies are highly effective.

AI-based personalisation can provide an efficient and cost-effective solution. Whilst non-AI solutions are often complex and manual, AI reduces much of the previous data ingestion and analysis time requirement. AI also enables personalisation beyond the online use case. Nosto, for example, is connecting online and in-store data to create seamless omnichannel shopping experiences for consumers, utilising AI to successfully deliver personalised content and promotions. We expect the rapid adoption of personalisation technologies in the mid-term as firms look to optimise their e-commerce strategy.

2011

128

VC Backed, \$36.3m raised to date

Personalisation

B2B

HELSENKI

BUSINESS DESCRIPTION

Nosto is a world-leading e-commerce personalisation platform with a simple premise – that every shopping experience can, and should be, personal. Through its Commerce Experience Platform, Nosto consolidates an individual's behavioural data points into a single repository. Using machine learning, the platform then builds real-time predictive profiles to deliver highly personalised experiences at every interaction with every customer.

KEY PERSONNEL

Juha Valvanne – Co-Founder & Global Head of Corporate Development
 Antti Pöyhönen – Co-Founder & CTO
 Jani Luostarinen – Co-Founder & Head of Engineering

KEY INVESTORS

idinvest PARTNERS **KREOS** CAPITAL
OpenOcean wellingtonpartners



#2. PRODUCT ATTRIBUTE EXPANSION

In a world dominated by major online marketplaces and retailers such as Amazon and Walmart, customers are becoming increasingly demanding of accurate and detail-rich product content. As discussed in more detail previously, modern consumers have increasingly specific needs and, therefore, search online based on increasingly specific product attributes. Further to increasing requirements, consumers are also becoming more unforgiving - inaccurate or out-of-date product information will certainly lead to an abandoned purchase and could lead to a reduction in brand loyalty or reputation for both the retailer and the manufacturer.

Here, product attribute expansion refers to the creation and upkeep of product details (title, description, images, videos, etc.) and product attribute tagging. Attribute expansion software and algorithms can assist in the optimisation of SEO and search, reduction of inaccuracies or missing content, and enablement of real-time recommendations of similar alternative items.

Retailers must balance product content quality with the size of their product catalogs to optimise both sales and profitability. Manual processes, while ensuring accuracy, incur high costs and are highly inefficient. AI can provide a scalable solution to this problem by utilising image recognition technology and deep learning in order to extract relevant attributes and contextualise the information. Impira's AI platform, for example, not only aggregates data from disparate systems, but it also increases efficiency by automating workflows for users and identifying inaccurate information or data gaps in product content.

 <hr/> <ul style="list-style-type: none">  2017  40  VC Backed, \$32.3m raised to date  Product Attribute Expansion  B2B 	 <p>SAN FRANCISCO</p> <p>BUSINESS DESCRIPTION</p> <p>Impira uses AI to turn unstructured data, such as documents, videos, images, audio, and webpages, into a structured format. Powered by AI and using technologies such as OCR and computer vision, Impira's no-code solution helps businesses streamline previously labour-intensive workflows by automatically tagging images and extracting text from documents.</p>	<p>KEY PERSONNEL</p> <p>Ankur Goyal – Co-Founder & CEO Richard Stebbing – Co-Founder & Head of Tech</p> <p>KEY INVESTORS</p> <p>COATUE GENERAL CATALYST HUMAN CAPITAL Lightspeed</p>
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#3. SUPPLY CHAIN OPTIMISATION

The COVID-19 pandemic has revealed the fragility of modern supply chains and the importance of minimising risk and maintaining efficiency. Global shortages caused by a reliance on Chinese manufacturers have placed a new-found emphasis on supply chain management. The emphasis now will be on building stronger and smarter supply with increased resilience to shocks as well as improved visibility over demand forecasting and contingency planning.

Here, supply chain optimisation refers to AI that optimises or automates retail supply chains. We consider both software and hardware-based solutions that utilise AI to either help manage risk or optimise efficiency in retail supply chains.

Evidently, the COVID-19 pandemic has had a devastating impact on supply chains, both in getting manufactured goods out of China (and other key geographies) and getting product to the end user. We expect supply chain visibility, reporting and forecasting to become paramount to retailers as consumers and businesses alike respond to changing economic and behavioural conditions. As a result, AI-based solutions are likely to replace highly inefficient and manual processes by utilising large and unstructured datasets to develop insights that are computationally unachievable by humans.



Q&A

WITH



BO ZHOU

Co-Founder & President, Futurmaster

FutuMaster

Interviewed July 24th, 2020



We interviewed Bo Zhou, Co-Founder of Futurmaster, to understand more about AI in Supply Chain Management

Please provide a brief overview of FuturMaster

Providing AI-augmented supply chain planning and trade promotions management solutions, FuturMaster helps clients achieve service excellence and growth in revenue and profit. More than 600 customers, representing over 10,000 users across 90 countries, trust FuturMaster to optimise their end-to-end supply chain planning (demand, supply and S&OP) and improve their business performance.

With over 25 years of expertise, FuturMaster solutions have been deployed by global leaders in multiple industries, including L'Oréal, Heineken, Lactalis, Mars Royal Canin and Sanofi. FuturMaster has offices in France, the UK, Singapore, China and distributors in Australia, Brazil and in the DACH region in Europe. The company has been recognised by Gartner as one of the top players of its Magic Quadrant for Sales & Operations Planning and Supply Chain Planning System of Records.

How important is AI to the future success of FuturMaster?

AI is at the core of our augmented supply chain planning solutions and is absolutely key in FuturMaster's product strategy. On the demand planning side, demand sensing powered by machine learning and deep learning enables us to increase substantially the short-term forecast accuracy by leveraging increasingly available data. On the supply planning side, combining operations research and optimisation with machine learning and deep learning enables us to provide feasible supply plans for the extended supply chain much faster, from clients of clients to suppliers of suppliers, and allows for hundreds of simulations of identified risks and possible evolutions.

We strongly believe that data, smart algorithms and AI will enable our clients to survive and gain a competitive advantage in the current volatile and uncertain world.

How are you using AI to solve problems for your customers?

On the demand planning side, AI is used to solve multiple problems.

Our clients are increasingly adopting our technology to improve forecast accuracy by leveraging multiple streams of sales data (sell in, sell through and sell out), as well as external data such as weather data or school holidays. The automatic cleansing technology also reduces the planners' workload while improving forecast accuracy.

As far as trade promotions are concerned, our solutions use AI in order to drastically improve our customers' ability to predict the uplift of promotions, by leveraging historical sales data related to previous promotions. This includes products' attributes, the retail attributes or the timing and mechanism of promotions.

FuturMaster's solutions also leverage AI and clustering algorithms in order to optimise new product launches by generating sales patterns, predicting the volume of new product launches based on product and channel attributes, and dynamically adjusting the forecast.

On the supply planning side, our clients apply our optimisation algorithm combined with AI to optimise the way the demand will be fulfilled. Our solutions enable our clients to find and select the supply plan which maximises their service level while reducing their total cost-to-serve. Even for a small local operation, the possible supply plans exceed millions of combinations taking into account the stock on hand, the production capacity (both equipment and labour), and the availability of raw materials, components and packaging materials in order to decide production and transfer plans. For a large and global operation, the complexity is such that the possible combinations exceed easily number of atoms in the universe. Therefore, only optimisation algorithms combined with AI will enable them to find and select the best-fit combinations.

What is your outlook on the future of AI in supply chain optimisation? How has COVID-19 impacted demand for such a technology in SCM?

The COVID-19 crisis has increased the awareness of all stakeholders in companies, especially C-levels, about how critical their supply chain is to the survival and success of their enterprise. As a consequence, the demand for supply chain planning technology has increased rapidly. AI-powered supply chain planning is the technology which enables enterprises to fully leverage available data, so that they can further improve their service level and reduce their cost-to-serve and working capital. Optimising companies' supply chain plans is no longer a nice-to-have but a must in such a volatile and uncertain world.



Q&A

WITH



BO ZHOU

Co-Founder & President, FuturMaster

FutuMaster

Interviewed July 24th, 2020



Congratulations on your recent fundraise from Cathay Capital – what are some of the key takeaways you got from the process? How did COVID-19 impact the fundraising process?

Our recent fundraise with Cathay Capital aims at accelerating our product development, international expansion, and strengthening our successful transition to SaaS solutions. We are grateful to the Drake Star team led by Christophe Morvan for guiding us through the entire investment process. One of the major takeaways is to identify the right partner that can bring more than money. As a Franco-Chinese investor, Cathay

Capital is a perfect match for our European and Chinese footprint and their network will accelerate our expansion.

Do you have any recommendations or advice to other AI companies in your space related to raising growth capital?

AI companies need to demonstrate the value they bring to their clients, and investment will follow. We are just at the beginning of the transformation of our economy by AI-driven technologies.

TRANSACTION HIGHLIGHTS

DRAKE STAR PARTNERS
Acted as exclusive financial adviser to
FutuMaster
PRIVATE PLACEMENT
CATHAYCAPITAL
凯辉基金
Enterprise Software

- Minority growth equity funding to accelerate the transition towards SaaS and support international expansion
- Expert focus on delivering AI-augmented supply chain solutions to global leaders in multiple industries
- International process featuring financial and strategic investors
- Entire due diligence, documentation and signing done virtually



*"It is a great satisfaction for **Drake Star Partners** to have assisted Bo and his team on this primary transaction. Convinced from the outset of FuturMaster's **strong value proposition**, we believe that Cathay Capital is the right partner for the company to fulfill its business plan. **Agility and responsiveness have been key success factors to execute due diligence** and close the transaction during the recent quarantine period"*

Christophe Morvan
Managing Partner (Paris)

Drake Star Partners is the marketing name for the global investment bank Drake Star Partners Limited and its subsidiaries and affiliates. In the USA, all securities are transacted through Drake Star Securities LLC. In the USA, Drake Star Securities LLC is regulated by [FINRA](#) and is a member of [SIPC](#). © 2016 Drake Star Partners. This report is published solely for informational purposes and is not to be construed as an offer to sell or the solicitation of an offer to buy any security. The information herein is based on sources we believe to be reliable but is not guaranteed by us and we assume no liability for its use. Any opinions expressed herein are statements of our judgment on this date and are subject to change without notice.

Citations and sources are available upon request through <https://www.drakestar.com/contact>. Interviews were conducted by Drake Star Partners via email correspondence between June and September 2020.



Further, the COVID-19 pandemic has had an enormous impact on the end of the supply chain - getting products in customer's hands has been equally challenged. Smart store companies such as Standard Cognition are delivering fully touch-free and cashier-less physical retail. In a world where infection control, hygiene and employee safety are of utmost importance, retailers providing a convenient yet safe in-store and checkout experience will prosper.

- 2017
- 120
- VC Backed, \$97.3m raised to date
- Smart Stores
- B2B/B2C

SAN FRANCISCO

BUSINESS DESCRIPTION

Standard Cognition is an autonomous checkout technology for brick and mortar retailers. The company's technology uses AI and computer vision to allow customers to shop and pay without having to queue at a traditional checkout, ultimately reducing operating costs for retailers and improving the customer experience.

KEY PERSONNEL

Jordan Fisher – Co-Founder & CEO
 Michael Suswal – Co-Founder & COO
 TJ Lutz – Co-Founder

KEY INVESTORS

MAPPING AI IN RETAIL TECHNOLOGY

Artificial Intelligence in retail goes far beyond the specific use cases previously mentioned and alternative uses of AI have also caught investor attention in recent years. Below we present a broader landscape of AI in retail, highlighting strategically important, notable and high-potential companies across several use cases.

Personalisation

Product Attribute Expansion

Supply Chain Optimisation

Business Intelligence

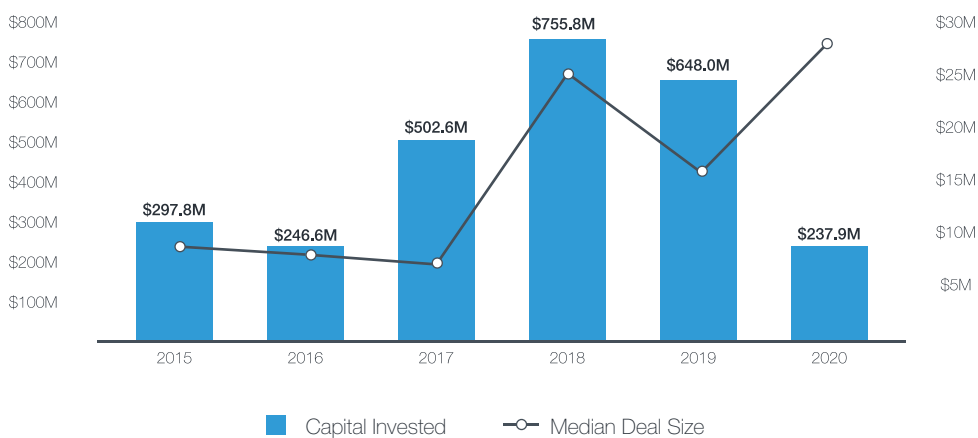
Smart Stores



AI IN RETAIL HAS ATTRACTED SIGNIFICANT VENTURE CAPITAL AND GROWTH EQUITY INTEREST

AI in retail remains a relatively immature space with the majority of financing activity coming from venture capital and growth equity. Nonetheless, 2019 saw landmark AI M&A transactions in McDonald's acquisition of Dynamic Yield, an AI-powered personalisation solution and Nike's purchase of Celec, an inventory optimisation software provider.

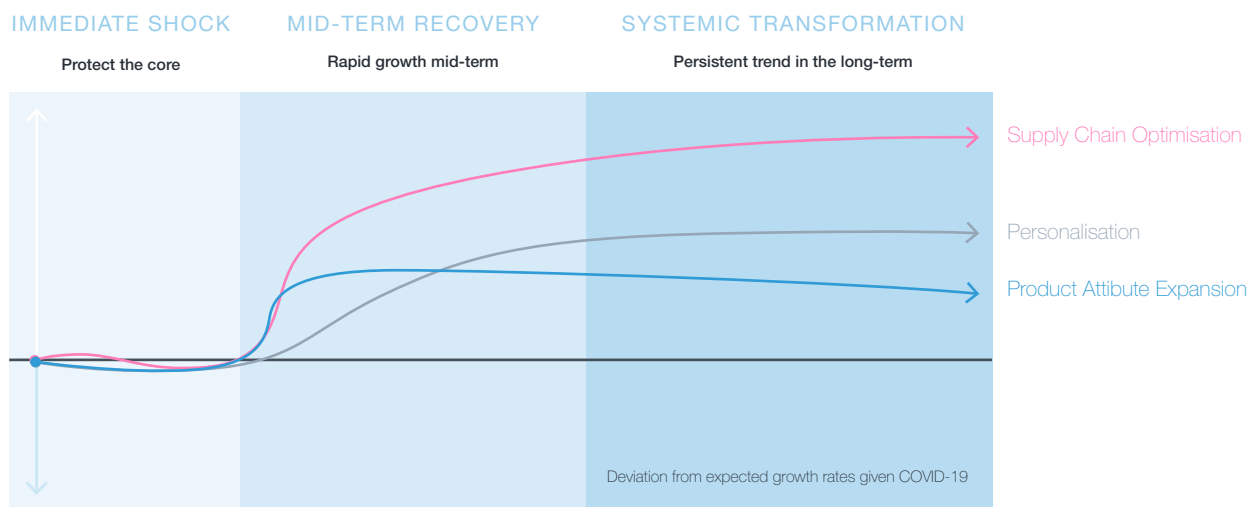
Disclosed capital raised from VC and Growth Equity has tripled since 2016, reaching \$648m in 2019, demonstrating rising investor activity. Due to a lack of disclosure on all investments and difficulty in categorisation, we estimate that the actual figure is considerably higher. Unsurprisingly, disclosed median deal size has consistently increased from approximately \$8m in 2016 to \$28m in 2020 (H1), reflecting an increase in the maturity of the retail AI ecosystem.



Source: Pitchbook, June 2020, Venture Capital and Growth Equity only

MAPPING THE IMPACT OF COVID-19 ON AI IN RETAIL

In this research, we look to investigate and analyse the impact of COVID-19 on the growth trajectories of specific AI use cases. In doing so, we have collated internal research, leveraged our global network of experts and heard directly from companies and entrepreneurs in the space. Below is a summary of our perspectives and rationale on the changing market dynamics resulting from COVID.



GDP level indexed to 1st of January 2020



THE DRAKE STAR OUTLOOK

Personalisation

- **Immediate Shock:** Initial lag through the immediate shock as retailers focus on survival. Lower priority in the near-term so we expect a delayed gain after the immediate crisis ends
- **Mid-term Recovery:** Adoption in the mid-term as companies look to optimise their online/e-commerce strategy. COVID-induced behavioural change will accelerate wider e-commerce adoption and encourage traditional retailers to incorporate higher levels of personalisation into their offering
- **Systemic Transformation:** Persistent trend in the longer-term carried by the rising tide of accelerated e-commerce adoption

Product Attribute Expansion

- **Immediate Shock:** Similar initial lag through the immediate shock as retailers focus on survival
- **Mid-term Recovery:** Somewhat higher priority in the near-term as retailers look to enhance and optimise their product management. We expect old-economy firms to take up cost-effective AI-based solutions to catch up
- **Systemic Transformation:** Overall gains in the space as a result of COVID relative to previous growth, driven mainly by a wider behavioural shift towards e-commerce

Supply Chain Optimisation

- **Immediate Shock:** Shorter initial lag through the immediate shock as retailers focus on survival. Relatively steep incline as weakened supply chains require inventory optimisation and logistics automation in order to better serve demand
- **Mid-term Recovery:** Continued gain in the mid-term relative to pre-crisis due to renewed focus on managing supply chain risk
- **Systemic Transformation:** Strong behavioural impact long-term that will accelerate the use of e-commerce more broadly and hence the adoption of AI in the space. Transition to new supply chain models (decentralisation) and digitisation



Q&A

WITH



JUAN MEIJA

Partner, Drake Star Partners



An interview with Juan Meija – a Partner at Drake Star and a member of the Consumer and Retail Tech Team

What do you see as the major opportunity in retail tech for AI?

I believe the major opportunity is in personalisation as evidenced by the sheer number of startups pursuing this category. Personalisation enables online retailers and brands to increase average order values, improve conversion rates, and raise customer lifetime values by creating a more engaging customer experience. Various forms of personalisation have seen rapid adoption since the results are quantifiable, effectively enabling A/B testing at scale and measurement relative to a control sample. Some companies in this space are even willing to charge based on uplift – you only pay if the software makes you more money.

Another area where I see significant opportunity is within the supply chain. For example, retailers have typically relied on instinct and historical data to decide on inventory levels and allocations. With predictive analytics, which is highly suited to the application of AI, retailers can analyse the vast quantity of data on historical sales, lost sales and real-time consumer trends. As a result, retailers can make smarter recommendations to purchase the right products and get them to the right distribution centers, stores or directly to consumers. As with personalisation, the goal is to improve the customer experience – a store with next-day delivery (as a result of an optimised distributed logistics network) or with no-stock outs will see improvements both on the top and bottom lines.

What do you see as the major headwind in retail tech for AI?

In speaking with AI vendors that service retailers and brands, I consistently hear the major headwind they encounter is the lack of a budget for their solution, particularly if it's an IT budget.

Retail is an increasingly competitive space and many retailers and brands are facing declining revenues and margin compression; thus budgets are getting squeezed. Today, the prominent use cases for AI-powered solutions are typically still considered a nice-to-have vs. a need-to-have. Compound this with the perceived or actual complexity of implementing an AI solution when few internal resources have the requisite skills, and executive teams are reluctant to adopt these new technologies. To be successful, providers need to make the integration into existing technologies seamless and be able to demonstrate a clear short-term ROI.

How do you see M&A activity evolving?

Despite some high-profile acquisitions from major retailers and brands (McDonalds/Dynamic Yield and Nike/Celect), retail buyers are typically not going to pay the premium multiples that AI investors demand. Therefore, I believe point solution providers in the AI space are more likely to be acquired by larger tech companies seeking to enhance their product offerings and talent (acquihires). Technology acquirers can cross-sell to their existing customer bases and more efficiently leverage their sales and marketing budgets – whereas retailers may have dis-synergies if they no longer allow the AI company to service other retailers. For traditional software players, adding an AI solution enables them to differentiate their offering in the market, so it may be worth paying a premium for a target that can change the DNA of the entire company. JDA's acquisition of Blue Yonder did just that – within 1.5 years of the acquisition, JDA re-branded as Blue Yonder in order to reposition the company as an innovative, cloud-based and AI-powered player in supply chain management.





We interviewed Paul Clarke from Ocado to understand more about how they are using AI and other emerging technologies

Please provide a brief overview of Ocado

Sure. So, I've been on the last 14 years of our rollercoaster journey, I missed the first six. But I think it's fair to say that people find it quite difficult to keep up with who we are and what we're doing. We used to be the world's largest online-only grocery retailer. We aren't that anymore. Not because somebody else is bigger, but just simply because a year or so ago, we effectively divested our retail business into a joint venture with Marks and Spencer's which goes live on the first of September this year. So we now own 50% of the world's largest online-only grocery retailer. What that means is what's left really exposes what we've always been, which is a technology business and more recently a platform business. We've always built almost all the technology that powers our platforms ourselves, we're very self-sufficient and we have a disproportionately large engineering team in a division called Ocado Technology that I used to run. Having evolved a solution that worked for us, we then subsequently made our platform available to one of the other large retailers in the UK - Morrison's. We then set about building a new platform called the Ocado Smart Platform and we have subsequently signed deals with some of the largest and most innovative grocery retailers around the world. On the back of that, we're going to be building 40 huge automated warehouses over the next four years around the world for those B2B customers. I suppose if you take another layer of the onion below being a technology company and a platform company, what you actually find is really we are an innovation factory - we're very good at creating solutions to hard problems and then building the technology to deliver those solutions and operating them at scale. That's what we're now doing in the grocery area.

But I suppose another way to look at our businesses, or a way I like to look at it, is we've been on an 18-year shopping trip for innovation assets in the form of data, IP, know-how, technology and competencies. It turns out those innovation assets we've been shopping for, using online grocery as the vehicle, don't know very much about grocery because they don't need to - groceries are just atoms. So, another way to look at what we do is we're very good at moving atoms around in highly automated, smart ways. The division that I now run, which is called the Office of the CTO or OCTO, is really about taking all of those technologies and competencies and other innovation assets, and going off and looking at how to disrupt other sectors with that same theme of moving atoms around smartly, just not food atoms. So I'm not involved in the grocery side of the business anymore. The tagline for the division I run is 'changing the way the world stores, sorts, assembles, moves and sells atoms' which is quite broad! We're also involved in the food chain that feeds the innovation into the core platforms and the general future-proofing of the business, alongside a lot of stuff that we do with governments, universities, schools and other organisations. So I'll stop there. But hopefully that gives you an idea of the unusual nature of Ocado under the surface.

How does Ocado use AI to solve problems for its customers?

So, AI and machine learning is one of a group of kind of disruptive technologies that we cook with, so to speak. The other ones being things like robotics, digital twins, synthetic environments and living labs. I suppose the business that we're in is building smart machines, and then operating those at scale, particularly within our huge automated warehouses. Those smart machines obviously rely on AI and machine learning to make them smart. But AI is also used in applications right the way across our kind of e-commerce fulfilment and logistics platform.

One way I suppose to characterise the applications is to say they're all about helping to manage scale and complexity to drive optimisation, increase efficiency and remove friction. The nature certainly of grocery, including online grocery, is that with an average item price of £2, there's about 60p to go from onboarding the groceries from suppliers, picking, packing, and then delivering them to our customers kitchen tables in one hour slots. That means that the only way you can do that profitably, as we have done for many years now, is to use a huge amount of technology and automation but also a huge amount of optimisation, whether it be what we achieve by modelling everything with simulation or digital twins, or the use of AI. So now for some examples of those applications taken from different areas of the business. One of the things we have to do is forecast, you know, how many of the 55,000 products that we range we're going to sell, and the way we do that is by having a whole ensemble of different forecasting engines and they compete with one another to be the best at for each individual product. So, for example, the one that's best for forecasting strawberries at the moment is trying to beat the one that's forecasting raspberry's so it can do strawberries and raspberries. At different times of the year, different models from this ensemble will be better but now about 60%, at the last count, of those engines, which used to all be rule and algorithm-based, are now machine learning-based. They help the whole process of predicting what future demand for our products will be and that's absolutely key as part of achieving the extremely low levels of wastage that we operate at. We're constantly looking for that sweet spot that maximises availability and freshness for our customers, whilst minimising stock cover and waste. Most supermarkets are probably at the kind of 3% or 4% wastage level, we are at about 0.75%. And that's the economic wastage, that's not the wastage to landfill. Because we purge products when they're half of their life typically, it means they still have life on them and therefore we can make them available to humans, whether that be charities, food banks, our staff shop and so forth. So our actual food wastage is 0.015%, a fraction of what happens in normal stores and a lot of that is to do with the smartness of those forecasting engines.

We use AI machine learning for fraud detection because machine learning models can be fed with many more signals that allow us to make smarter decisions about fraudulent orders than could be done using



humans. We use natural language processing and AI for allowing our customers to shop with voice, so we were one of the very first applications for transactional shopping of grocery on the Alexa platform. There are many applications of machine learning within our warehouses, one that perhaps I'll just touch on is managing swarms of 3000 robots in each of these warehouses. As I said earlier, we're building 40 of them around the world over the next four years on top of the ones that we already have live both in the UK and elsewhere. That's a lot of robots. If you're going to look after those in real-time, and keep those swarms of robots healthy, it's kind of akin to trying to do remote medicine for humans, where you're using maybe wearables and sensors in the home and patient records. Well, in this case, the patients are the robots. We need to keep them healthy. So we have a predictive maintenance system that takes all the data from those robots, feeds it up into the cloud and there we use machine learning to look at the onset of problems before they become problems and then we also feed this data into our digital twin to do optimisation. That's another really exciting application of machine learning is when you start attaching machine learning models, to simulations or digital twins, and use them to achieve optimisations that frankly, humans simply couldn't come up with because of complexity. So that's a few examples from across our platform.

What do think will be the impact of the pandemic on AI and data privacy?

So, there were a couple of questions that came up or were asked towards the start of the pandemic. The first was, where are all the smart machines? Where are all the smart machines that could help us clean hospitals more safely, distribute critical supplies, like PPE, more effectively, adapt manufacturing lines with configurable robotics to be able to create what we needed or to distribute food to the vulnerable? And can we have more smart machines now? And the answer was no, because smart machines take time to mature, whether it be in synthetic environments or living labs and that's something that we need to address in terms of resilience. And, indeed, there are a lot of conversations going on about how we make sure that some of the tools that we didn't build in the previous peacetime for the battle that we're still fighting now, we will have up our sleeve for the future exogenous shocks - like future pandemics, or indeed things like climate change. I think one of the other questions that got asked was "Well, where's all the data that we need?", especially the real-time data and the crowdsourced data, whether that be from citizens, from sensors or from other sources. Data has played a hugely important part in driving insights but also feeding the models that have helped to try and tackle this virus and understand the implications of the levers that are going to be pulled to try and control R and to try and reduce the infection rates.

So I think coming back to your question, I think one of the most important outcomes (I'll come back to what you were saying about privacy and ethics and so forth) has really been about understanding the need for the data infrastructure that we need to build, in order to put oursel-

ves in a better situation in terms of being able to open up datasets that were frankly not available to us, whether it be data trusts or data marts or data passports for controlling how data is shared with whom and for what purposes. Data standards, data ontologies - this is all the kind of data infrastructure that's needed. And it's needed for AI and machine learning and it's needed for building digital twins. One of the things that I'm very passionate about is the concept of building a national digital twin, which is probably a subject for another day. But it's also needed for, doing all sorts of other moon shots that are now being talked about in this country, which all need data as a fuel. So, I think that the most important learning is around the need for investment in data infrastructure as a horizontal to power many verticals.

I think in terms of ethics and privacy, if anything, the current pandemic has highlighted the importance of that, particularly around how do you make people comfortable with the idea of sharing their sort of personal medical data for the purposes of combating a virus such as this one. We need to achieve a level of trust that allows people to be comfortable with doing that, because it's going to be very important as a model for other challenges that we face which are all going to require us to have better data to understand how our world works, including ultimately at a planetary level when we try and tackle climate change, as we must. That's why these digital twins at a planetary scale are going to be so important and then as I mentioned earlier, in terms of something we're doing, the complexity of solving those problems means you are absolutely going to have to use AI and machine learning in conjunction with those models in order to try and optimise the systems of systems of systems or systems that are going to be required to solve that problem. I hope that one of the enduring outcomes of this terrible pandemic will be a greater appreciation of the importance of data, the importance of models, the importance of smart machines, and that we invest now, heavily, in building those capabilities for the future.

What do you think are the major headwinds to the adoption of AI more generally?

Well, we've been through a number of AI winters, and I think it's one of those technologies, like many other disruptive technologies, that's unfortunately highly misunderstood, often overhyped and over promised but we shouldn't let that in any way undermine just how important it's going to be, for us, particularly, as I say, given the scale of some of the problems that we face. So, I think, trying to communicate to people effectively what AI and machine learning really can do, what it can't do, and also the implications it will have on things like education is going to be important.

My personal view is there is a need for fundamental educational reform in the light of technologies like AI, like robotics, like quantum computing, in order to prepare the next generation for a much smarter and more automated world that they'll inhabit. That means moving from a largely knowledge-based education system, that's all about learning the tags

Q&A

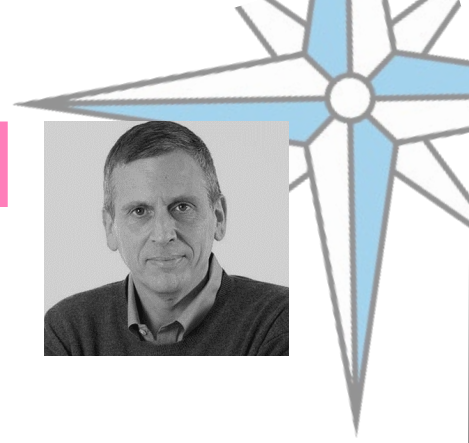
WITH



PAUL CLARKE CBE
CTO, Ocado



Interviewed August 24th, 2020



on mark schemes and being able to regurgitate those, to really much more focus on the meta-skills that will endure and which won't be disrupted by those technologies. And that's going to be crucial, not only to create the talent to be able to deliver these technologies, but also on a much wider scale, to create a fair and equitable smart society in which people can benefit from those technologies, rather than dealing with the unintended consequences of them. So, I think that the only insurance policy against that highly unpredictable future that we face in terms of the second and third order effects of these kinds of technologies, which are frankly impossible to predict, is education.

And so that's where, once again, you can't look at this in isolation, you really have to look at this within a much wider ecosystem, of which, education is another part in order to prepare for that future. So therefore I think one of the biggest headwinds we face is that at a planetary scale, at a national scale, at a company scale, as far as I see it, there is not enough big long-term disruptive thinking going on. People do tend to think quite short term, we don't build truly big compelling visions and my big fear in the current pandemic is that although it has encouraged some bigger thinking because of the scale of the problem we have to solve now, there will be a return to short-term thinking.

My fear is that, as is often the case of human nature, when the sun starts shining again, as I would put it, planetary oxytocin is going to kick in, it will numb the pain, we will start to forget that level of pain that we've lived through, and short term thinking will return. I think it's absolutely critical that we jam open those windows of opportunity and make sure that doesn't happen. We need to use this pandemic, as a gym in order to develop new muscles, for dealing with things like climate change and hopefully make our countries and indeed our planet, a better place and a more sustainable place and a more resilient place to live.

Clearly, if you can stack three crates of animals in the wrong order in a wet market and bring down a whole planet, at least in terms of the dominant species, there is a hell of a lot to fix and it is at a planetary scale. So, we need to get on and do that.



Also available in video format:
<http://bit.ly/global-ai-report>





Fintech refers to the integration of technology into the provision of financial services in order to improve quality and delivery for consumers and businesses. This includes a host of different applications and use cases, including but not limited to payment providers, banking software, insurance broking, underwriting, trading, communicating with customers and managing portfolios. Financial Services is an industry that is facing significant disruption, with challenger banks, big tech players and startups all contributing to rapid innovation in the industry. The broad application of fintech across the entire financial services sector provides a large opportunity for incumbent corporates and new players. In 2018, it was estimated that the global fintech market reached \$127.7bn but by 2022 would be worth over \$300bn, growing at an impressive 24.8% compound annual growth rate.

The rise of fintech in the last 10 years has been similar to the digitalisation of other industries; smaller organisations are more nimble and initially less constrained by regulation than incumbent players and hence could quickly gain market share and disrupt existing business models. Increasingly regulation has become challenging in the fintech space. In some instances, regulatory problems are a function of technology whilst in others, they are a reflection of the tech industry's impatience to disrupt finance. More recently, we have seen consolidation in the market as larger financial institutions look to acquire or form JVs with disruptors. We are also witnessing the introduction of big tech into the fintech world – Google plans to introduce consumer bank accounts in 2020 and in 2019 Apple debuted a credit card in partnership with Goldman Sachs. Amazon is also making major headway in financial services, investing heavily in payment infrastructure as well as financial products and services without becoming a bank or insurer. With products and services such as Amazon Pay, Amazon Cash and Amazon Lending, they now cover a wide spectrum of financial services including payments, deposits, lending and insurance. Whilst this is the case, technology corporates are expected to leave the majority of the financial legwork to the banks to avoid regulatory headaches, in part protecting their proprietary business.

Our expectations for the next decade in fintech centre around these themes with the integration of fintech as part of the basic functionality of other non-finance products being a major development. We further expect data sharing across providers to become more widespread and enable the development of challengers in the fintech ecosystem as well as the proliferation of AI in fintech.

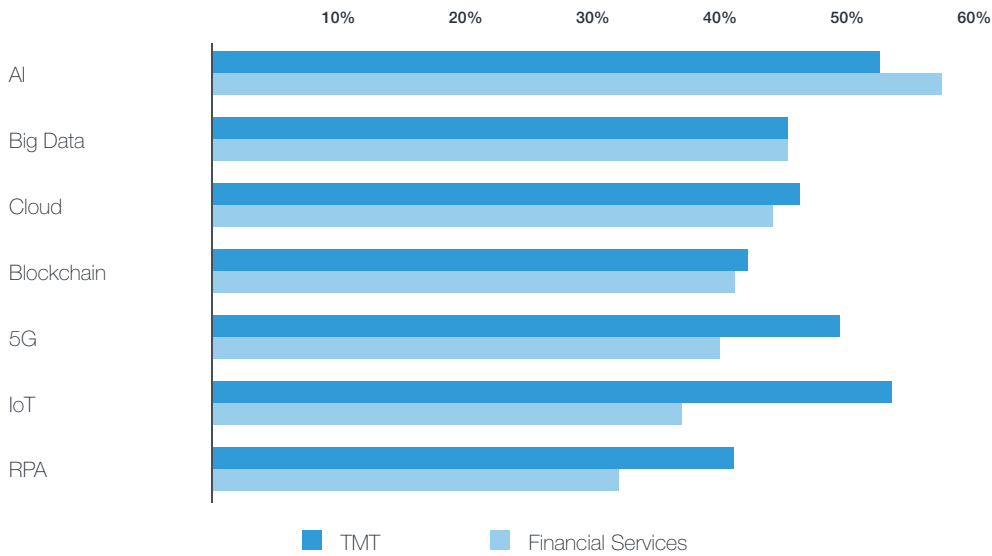
AI IN FINTECH

As with almost all parts of the economy, AI is expected to have an enormous impact on financial services. According to PwC's Global Fintech Report 2019, 56% of financial services executives felt that AI would be a transformational technology in the space within the next 2 years.



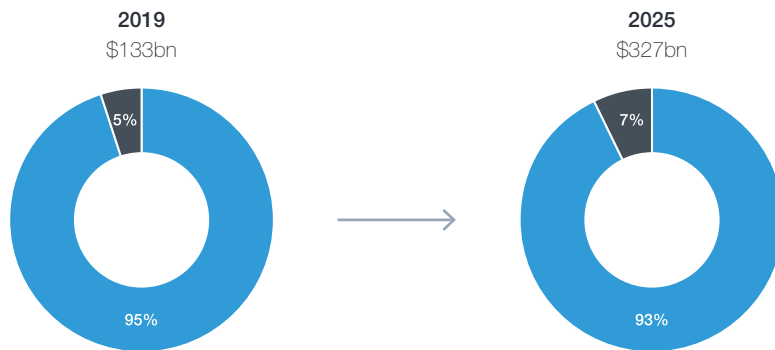


TECHNOLOGY THAT LEADERS THINK WILL DRIVE CHANGE IN THE NEXT 2 YEARS



Source: n.a., Global Fintech Report, PwC, October 2019

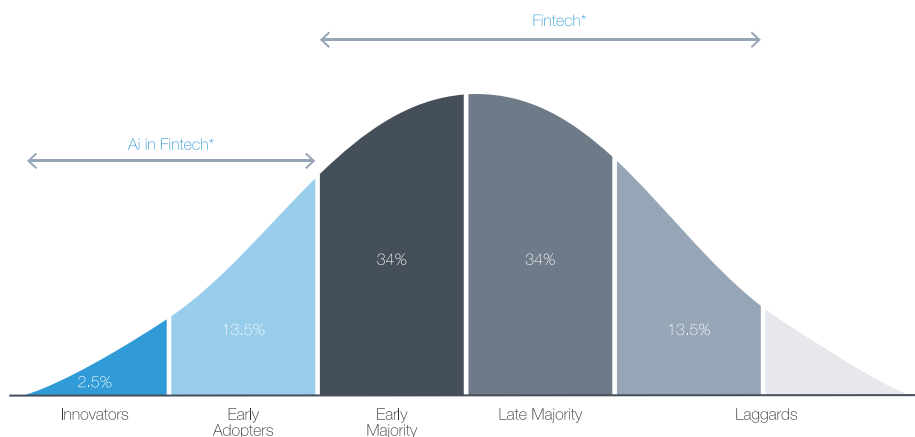
Other estimates validate PwC's research - the AI in fintech market is expected to reach \$22.6bn by 2025, growing at a CAGR of 27.5% (Mordor Intelligence) from \$6.7bn in 2019. As a proportion of the overall fintech market, AI remains relatively small but is expected to capture a growing market share rising from 5% in 2019 to 7% in 2025.



Source: n.a., AI In Fintech Market - Growth, Trends, Forecasts (2020 - 2025), Mordor Intelligence, 2020

Despite the relatively low estimated market share (in percentage terms) of AI in fintech, the opportunity is still very large – the fintech opportunity is just bigger. Fintech has grown into the mainstream, particularly in the Western world with significant opportunities in emerging markets – AI on the other hand is still largely in developmental phases with much less widespread adoption from financial institutions. Ultimately this narrows the breadth of opportunity in the short term for AI, but we expect this to change dramatically over the coming decade.





Source: Drake Star Partners, *Illustrative only

In this chapter we outline several select use cases for AI in fintech and our expectations around their development both in the immediate term and over a longer period. Due to the breadth of applications of AI technology across the fintech ecosystem, we look to identify use cases that can be applied horizontally across multiple sub-segments. Our analysis will explain how AI can have a marked impact on businesses and consumers as well as highlight some key players operating in the space.

#1. PERSONALISATION AND CUSTOMER SERVICE

Personalisation is a topic that comes up consistently when considering the potential of AI – customers will come to expect high levels of personalisation in all commercial engagements. We see many similarities in financial services as we do in the role of personalisation in retail; consumers expect tailored product recommendations, pricing and insights closely aligned to their unique situation, preferences and financial goals. In particular, financial services customers now demand insights and recommendations on their spending behaviour, assistance with their wider financial goals and highly targeted financial products such as loans, saving accounts and investment vehicles. BCG estimates that for every \$100bn of assets, a bank can gain as much as \$300m in additional revenue through personalising customer interactions. Despite the size of the opportunity, data from The Digital Banking Report shows that only 6% of financial institutions are currently introducing advanced personalisation into their customer journey.

Companies can more profitably leverage information from customer personalisation with the application of AI and machine learning techniques. Financial institutions that can deliver personalisation at a reasonable cost and glean insights to better understand the customer through AI, stand to gain deeper connections with their customers and enhanced loyalty.

With the enormous amount of data at their disposal, financial institutions are well-positioned to integrate AI-based workflows into their customer journey. Granular transaction data, demographics and credit information can all be leveraged with the help of AI to offer personalised recommendations and insights.

Crayon, a Singapore-based business intelligence platform, has developed Maya.ai to capitalise on the growing need for personalisation in financial services. Maya.ai utilises a large dataset consisting of over 6.5m merchants to create a graph-based entity-affinity model – this model is then mapped to customer behaviour data to reveal a universe of choices and recommendations. AI then analyses the universe of potential choices and recommendations, incorporating factors such as time, location, weather and transaction history to best determine the right recommendation for the right customer. The company claims this can have impactful results; a leading global bank based in Singapore saw its offer utilisation rate increase by 4.58% and annual incremental spend increase by \$18m in just 9 months.







-  2012
-  163
-  VC Backed, \$14.2m raised to date
-  Personalisation / Chatbots
-  B2B



SINGAPORE

KEY PERSONNEL

Suresh Shankar – Co-Founder & CEO
 Vijaya Kumar Ivaturi – Co-Founder & CTO
 Srikant Sastri – Co-Founder

KEY INVESTORS






BUSINESS DESCRIPTION

Crayon Data is a big data company that provides personalisation solutions through its Maya.ai product to the financial services and retail sector. Maya.ai personalises offer management for fintechs, providing taste-led offer recommendations to improve customer loyalty whilst simultaneously engaging brands and merchants.

An alternative application of AI in customer service comes in the form of chatbots. As one of the core technologies in AI, natural language processing can now be deployed confidently to enhance customer engagement, communication and service. Integrating chatbots into the customer service workflow can help redirect or triage support traffic to improve customer support efficiency and reduce overall customer service spend. According to a study conducted by Juniper Research, chatbots can save at least 4 minutes of a customer service agent's time – they are particularly suited to simple problem-solving tasks such as responding to FAQs and handling account services requests.

Chatbots and other forms of conversational AI can further help refresh digital banking applications by offering payment services and account information from within messenger applications. One such application is Cleo, an AI-powered digital assistant that helps customers effectively manage their money. Offered both as a stand-alone app and within the Facebook Messenger application, Cleo connects to your bank account and analyses spending behaviour in order to provide recommendations on how to reach your financial goals. Cleo monetises its product through a freemium subscription model offering additional features such as Cashback and Salary Advance.



-  2016
-  86
-  VC Backed, \$37.2m raised to date
-  Personalisation / Chatbots
-  B2C



LONDON

KEY PERSONNEL

Barnaby Hussey-Yeo – Founder & CEO
 Thish Nadesan – COO

KEY INVESTORS






BUSINESS DESCRIPTION

Cleo is an AI-based personal finance platform designed to change everyone's relationship with money. The company's platform enables users to track and analyse their spending across multiple accounts and cards by chatting with Cleo, a virtual assistant accessible via the app or on Facebook Messenger.

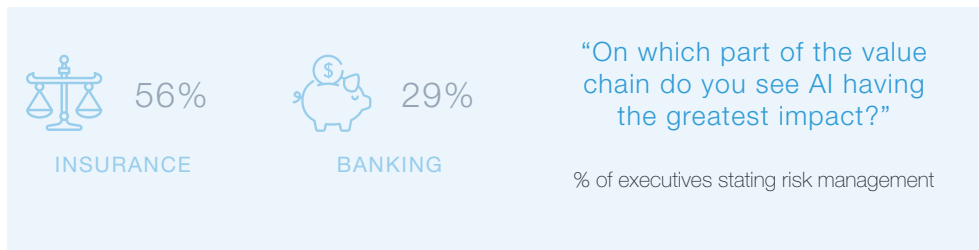
Personalisation is a trend that we are seeing more broadly across the entire economy – customers expect businesses to know them better than ever before. Fintech is no exception and AI has an important role to play in operationalising personalisation for customers.





#2. UNDERWRITING WITH ARTIFICIAL INTELLIGENCE

Underwriting, or the process of undertaking financial risk, is a central component of financial services, whether in insurance, lending or banking. Across all sub-sectors, the principles in underwriting remain the same; financial institutions assess the degree of risk in the contract which determines the price - be it in the form of an interest rate, premium or underwriting spread. A common goal across underwriting is to improve the accuracy of risk assessment – firms that can more accurately predict those customers who will meet the terms of the contract (e.g. repaying the entire loan on time in full) will see lower default rates and be more profitable on average. Owing to a unique ability to deliver self-learning probabilistic predictions, AI is incredibly well-placed to improve underwriting accuracy across the ecosystem. What is interesting to note however, is the difference in attitudes towards the use of AI in underwriting in banking and insurance. Executives see a more important role of AI in insurance pricing relative to credit underwriting.



Source: Bigham et al, *AI and risk management*, Deloitte, n.a.

Underwriting in Banking

Credit underwriting is the contractual process of lending money, most often from a bank to either a consumer (e.g. personal loans or mortgages) or a business (e.g. credit facilities and term loans). Given the amount of credit in the financial system, evidenced by US household debt reaching a record \$14.3tn in Q1 2020 (Reuters), marginal improvements in default rates can create enormous value for financial institutions.

At its core, credit lending is a big data problem; the value of a loan is tied to the creditworthiness of the borrower – the more data on the borrowers, the more accurately their risk can be priced. AI is used to analyse data and identify patterns that can be used to evaluate individual loan decisions. Instead of ‘bucketing’ borrowers by credit score, AI can draw in disparate data sources to optimise the loan approval process – machine learning models can then utilise these outcomes to further reduce default rates.

From a regulatory standpoint however, this can be problematic – AI models must be able to provide a definite and auditable explanation for every loan decision. Model explainability, or the ability to understand how an AI system reaches a certain conclusion is essential to the development of this use case.

Fiddler AI aims to address this problem by providing transparent AI-driven underwriting models. Their platform allows risk managers to analyse decisions and ensure underwriting practices are delivered fairly and efficiently. Further to this, the very nature of explainable AI allows for personalised recommendations to borrowers on how to improve their loan outcomes and creditworthiness – all while reducing bad debt for lenders through improving underwriting accuracy.







-  2018
-  28
-  VC Backed, \$13.2m raised to date
-  Credit Underwriting
-  B2B



PALO ALTO

KEY PERSONNEL

Krishna Gade – Co-Founder & CEO
 Amit Paka – Co-Founder & CPO
 Manoj Cheenath – Co-Founder & Chief Architect

KEY INVESTORS

BUSINESS DESCRIPTION

Fiddler Labs provides an explainable AI platform that enables financial institutions to deliver trustworthy, transparent and auditable insights across various use cases. The company's platform allows financial institutions to optimise credit underwriting, detect fraud and reduce customer churn whilst ensuring the highest degree of trust and transparency in the process.

We expect this use case to grow rapidly over the next decade, especially as regulators are likely to encourage more data sharing between providers – further enabling the use of AI in analysing larger datasets to get a better understanding of a customer's risk profile. PSD2, a relatively obscure European legislation first proposed in 2007 and more recently amended in 2013 will help accelerate this growth. The directive entered into force in January 2018, but a perhaps more important milestone was reached in September 2019 – the requirement for financial institutions to share data with third parties (often fintechs) if permissioned. As a result, banking customers going forward will be able to leverage their historical data when applying for loans or mortgages with providers other than their bank. Scienaptic, a US-based fintech platform utilise data from a variety of sources including transaction history, social media, location data and more to optimise underwriting. Led by Pankaj Kulshreshtha, former CEO of Analytics at Genpact, the company has already announced \$151m in loss savings for a major credit card provider using its platform.



-  2014
-  95
-  Angel Backed, \$9.9m raised to date
-  Credit Underwriting
-  B2B



NEW YORK

KEY PERSONNEL

Pankaj Kulshreshtha – Founder & CEO
 Pankaj Jain – President

KEY INVESTORS



BUSINESS DESCRIPTION

Scienaptic aims to redefine the legacy approach to credit underwriting. The company's platform, Ether, offers a suite of AI underwriting tools to better identify qualified prospects, flag risks and offer a more complete risk assessment. Using fully compliant, explainable AI, the company claims to increase approval rates by 15-40% whilst simultaneously reducing losses by 10-25%.

Underwriting in Insurance








In Insurance, the role of AI in underwriting is more mature but operates in a similar fashion. Similarly to lending, insurance premiums are dependent on risk, or the perception of risk. Insurance contracts are broadly categorised into several groups; Property & Casualty, Health Insurance, Life Insurance & Reinsurance. Insurers are able to utilise alternative data in their underwriting models particularly for 'invisible' consumers that lack historical data. Alternative data can be anything from IoT sensor data, satellite data and even photographs – AI can be used to draw insights from these sources and provide more accurate product pricing for customers.

Cape Analytics provides such an underwriting solution in the P&C space, utilising aerial images of properties to better evaluate risk, valuation and probability of default without the requirement for a physical inspection. Utilising computer vision, the company's algorithms can tag property attributes to identify a range of loss-predictive signals – for example, their Roof Condition Rating system can identify missing tiles and discolouration in real-time.





The platform can be deployed via API and can be used to provide online quoting allowing insurance brokers to combine personalised property-specific data with other sources to better price risk.

 <hr/> <ul style="list-style-type: none">  2014  57  VC Backed, \$43.9m raised to date  Insurance Underwriting  B2B 	 <p style="text-align: center;">MOUNTAIN VIEW</p> <p>BUSINESS DESCRIPTION</p> <p>Cape Analytics uses deep learning and geospatial imagery to provide instant property intelligence for buildings in the United States. The company enables insurers and other property stakeholders to access valuable property attributes at the time of underwriting, offering more personalised and more accurate online quotations on home insurance in real-time.</p>	<p>KEY PERSONNEL</p> <p>Ryan Kottenstette – Co-Founder & CEO Suat Gedikli – Co-Founder & CTO Amy Minnick – Chief Business Officer</p> <p>KEY INVESTORS</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="790 526 941 571"></div> <div data-bbox="949 526 1117 571"></div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div data-bbox="790 593 941 638"></div> <div data-bbox="949 593 1117 638"></div> </div>
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#3. PREVENTING FINANCIAL CRIME

Financial crime is any illegal act committed against property, involving the unlawful conversion of ownership to one's own personal use. Crimes range in severity and cost from basic theft to large-scale operations coordinated by groups of organised criminals. Financial crime is a major problem with unsustainable costs; EY estimates put the annual cost at \$1.4tn - \$3.tn. Financial institutions and their compliance teams play an important role in preventing financial crime, with a clear motivation being the large penalties for failing to uphold their duties. AI has the potential to fundamentally improve the efficiency and efficacy of a financial institution's compliance efforts; simultaneously reducing the manpower required to prevent and investigate financial crime as well as providing more accurate and timely insights into potential threats. Whilst there is a wide scope of potential financial crime, we would like to focus on two of the most notable; Anti-Money Laundering and Payments Fraud.

Identity Theft & Payment Fraud

Fraud is criminal deception intended to result in financial gain – payment fraud is anything that relates to a transaction or payment. With advances in payment security, it is surprising to note the consistent increase in cyber-crime reports year on year reaching over 3m in 2019. AI can provide a highly effective weapon in the fight against payment fraud – particularly around reducing false positives and identifying cases of fraud early.

AI-powered anomaly detection is one of the most successful techniques employed in combating payment fraud and requires relatively simple machine learning capabilities. Models are trained on large datasets of transactions and learn a baseline sense of normality for each customer. When abnormal transactions occur, the model can flag the behaviour to fraud teams who can investigate further. As more data is created, models continue to improve in their accuracy and understanding of normal and abnormal transactions. Traditional parameter-based transaction monitoring systems were the precursor to these AI-powered solutions. AI provides an opportunity for a major upgrade to traditional systems whilst simultaneously reducing compliance costs – through reducing false-positive rates.

A false-positive occurs when a legitimate transaction is flagged as suspicious and the transaction is declined. Evidence suggests that this can be hugely damaging to retailers and financial institutions; Kount, a fraud prevention software company reported a loss of \$2bn for merchants in the US as a result. For financial institutions this can have adverse impacts on customer relationships and adversely impact reputation when legitimate transactions are declined.

The opportunity then for AI really lies in the reduction of the false-positive rate. Teradata claims its AI-powered fraud products helped reduce Danske Bank's false positives by 60% and increased real fraud detection by 50%.

Payment fraud solutions are not only offered to financial institutions – merchant and e-commerce websites can





further benefit from AI-powered fraud prevention solutions. Ravelin provides machine learning products that help merchants increase payment acceptance rates and reduce chargebacks – hoping to answer the 1.8% loss in business revenue from online payment fraud.



-  2014
-  76
-  VC Backed, \$39.2m raised to date
-  Fraud
-  B2B



LONDON

KEY PERSONNEL

Martin Sweeney – Co-Founder & CEO
 Nick Lally – Co-Founder & COO
 Leonard Austin – Co-Founder & CTO
 Mairtin O’Riada – Co-Founder & CIO

KEY INVESTORS







BUSINESS DESCRIPTION

Ravelin provides fraud detection services through a real-time platform that combines machine learning with a merchant’s own risk profile. The company provides unique insights and highly accurate fraud detection ultimately making online commerce a safe place to do business.



Anti-Money Laundering

A further application for AI in financial services is in Anti-Money Laundering (AML) and Know Your Customer (KYC) compliance. According to EY, money laundering activity is estimated to be between 2-5% of global GDP and despite significant focus from financial institutions and government organisations, only 10% of suspicious transaction reports lead to investigation.

Different from payment fraud, AML technology looks to prevent financial crime on a much larger scale. Part of this is through exploring ultimate beneficial ownership; understanding the complex web of relationships between shareholders, owners and corporations. Given an enhanced global focus on tax fraud and customer due diligence following the Panama Papers scandal, we expect significant attention on this in terms of AI in the coming years. Across the world, a stringent regulatory backdrop in financial services is having a marked impact on compliance spending; Accenture estimates put AML compliance costs on average at \$60m per annum per bank, with larger firms spending considerably more (up to \$500m). The fourth AML Directive in the EU and FINRA rules in the US are adding increasing pressure to deliver cost-effective solutions to manage financial crime. Alongside additional regulatory pressure, legacy systems are not working effectively or efficiently - according to IBM these systems can see false-positive rates above 90%.

AI can be utilised to analyse large data sets and identify patterns that would otherwise not be picked up by rule-based monitoring or human analysis. In 2018, HSBC announced it was working with London-based AI company Quantexa to combat money laundering and financial crime. Quantexa’s platform enables AML and compliance teams to utilise AI to better allocate resources and manage major threats as they emerge in real-time.



-  2016
-  242
-  VC Backed, \$89.4m raised to date
-  Fraud
-  B2B





LONDON

KEY PERSONNEL

Vishal Marria – Founder & CEO
 Jamie Hutton – CTO
 Avri Chana – CFO

KEY INVESTORS




BUSINESS DESCRIPTION

Quantexa has developed an entity resolution and network analytics technology that uncovers hidden customer connections and behaviours using big data and AI. This enables clients to solve major challenges in financial crime across anti-money laundering, KYC checks and fraud as well as optimise credit risk assessment and develop improved customer intelligence.

Q&A

WITH



TAMER OZMEN

Former MD of Microsoft Services UK



Microsoft

Interviewed July 27th, 2020



We interviewed Tamer to find out more about his time at Microsoft and his thoughts on the future of AI in Financial Services

Please provide a brief overview of your background

Of course, I was with Microsoft from 2010 until 2019, totaling 9 years across several roles. My first 5 years were as CEO of Microsoft Turkey, based in Istanbul, followed by 4 years as the Managing Director of Microsoft Services in the UK. The role at Microsoft Turkey was centered around establishing the Microsoft brand in the country and building out enterprise and SME revenue across core products. Additionally we introduced various consumer products into the Turkish market such as the Xbox and the Microsoft Surface. In 2015 I moved into a UK-based role as MD of Microsoft Services – ultimately this was all about digital transformation and supporting the implementation and adoption of new technologies in UK FTSE 500 enterprises.

During your time at Microsoft you worked with AI in Financial Services – could you explain more about the role of AI in this industry and how this evolved over your time at Microsoft?

Sure – so the banking industry has really only started to go through major digital transformation in the last 2-3 years. Initially this was focused around cloud migration projects - moving enterprise on-premise applications to the cloud. We saw many initiatives around hybrid cloud foundation and various other infrastructure and efficiency projects during this period. Many banks and insurance companies have started to embark on large workforce management technology investments and data initiatives.

At the same time, many of these financial institutions started to analyse and better understand their proprietary data and in recent years data has become one of their most important assets. At Microsoft, we utilised and mobilised this data using AI to improve efficiency across the organisation; addressing regulatory and compliance requests, improving understanding of customer behaviour and optimising customer acquisition and retention initiatives.

Specifically, we delivered projects in various parts of the organisation including AI-based NBA (Next Best Action) projects, AI-based pricing forecasts using Monte Carlo algorithms and unsupervised learning initiatives using k-nearest neighbours algorithms.

What do you see as being the major headwinds for AI in financial services and insurance going forward?

Data, data, data. These institutions are still very much at the beginning of their digital transformation journey in moving from legacy systems to the cloud. Agile, microservices-based applications will drive the future,

but we are still a long way from this in the financial services space. Going forward, low-code initiatives will reduce the programming time and ultimately provide the scalability and efficiency for the implementation of AI across the enterprise.

How important is educating company executives on AI as a part of delivering AI-based digital transformation?

Absolutely – this is a hugely important part of digital transformation and will be massively important for the adoption of AI. Sharing best practice within the industry relating to AI and the implementation of the technology in enterprise will help accelerate adoption. Further, understanding how other industries use and apply AI can also lead to new ideas and initiatives within one's own industry.

What is your view on the current regulatory landscape in AI? Has the pandemic impacted this at all?

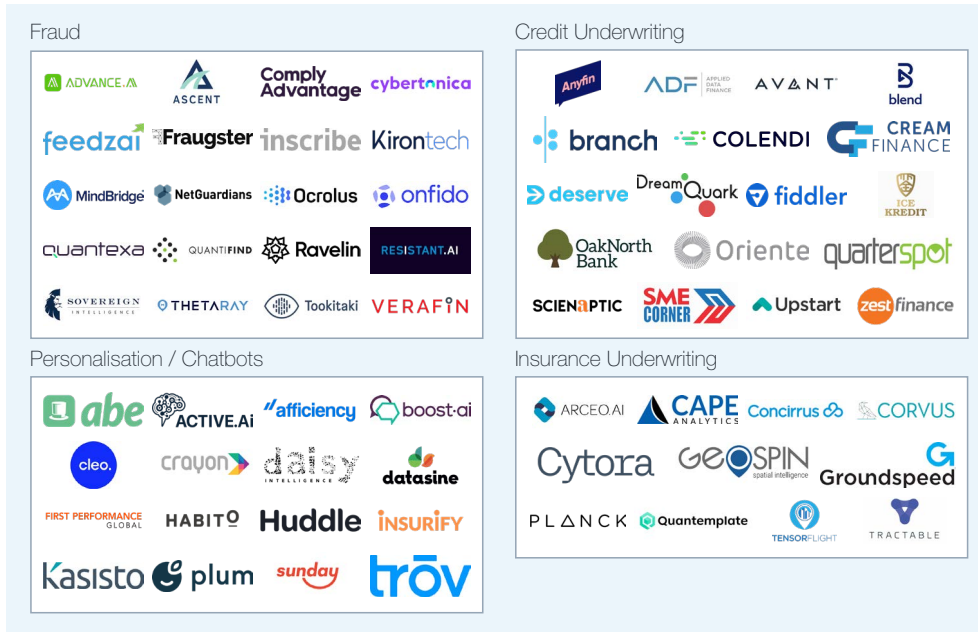
AI ethics is a very important issue and most companies and governments are trying their best to figure out the best way to manage it at scale – this is proving challenging given the pace of innovation. In my view, the COVID-19 pandemic will accelerate the development of standards in AI as we reflect on the way we interact with technology following the crisis.





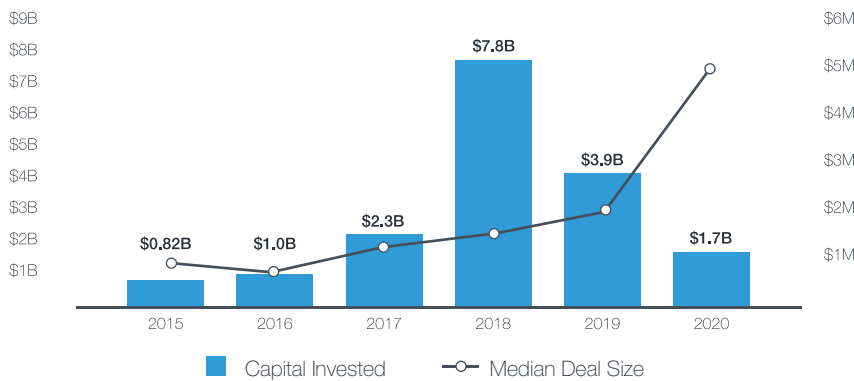
MAPPING AI IN FINTECH

Below we present our Drake Star AI in fintech market map, highlighting strategically important, notable and high potential companies across the discussed use cases. In the below map we focus only on the venture and growth stage firms– we appreciate that most incumbents are likely to be developing capabilities in-house but we focus on providing insight for investors on the most exciting startups in AI in fintech as of 2020.



AI IN FINTECH IS STILL DOMINATED BY VC ACTIVITY

In line with similar trends seen in other sectors around GE and VC activity in the AI space, we see significant growth in both capital invested and median deal size. We are also seeing increasing maturity in the space, reflecting the wider adoption of AI technology into financial services. On the M&A side, the acquisition of Kensho by S&P Global stands out. Kensho is an AI-first technology provider with solutions for preventing and investigating financial crime – showcasing an inorganic strategy from an incumbent player to develop an AI capability.



Source: Pitchbook, July 2020, Venture Capital and Growth Equity only

MAPPING THE IMPACT OF COVID-19

In this research we look to analyse the impact of COVID-19 on the growth trajectories of specific AI use cases – in doing this we have collated internal research, leveraged our global network of experts and heard directly from companies and entrepreneurs in the space. We hope to provide some insight and rationale into changing market dynamics as a result of COVID.



IMMEDIATE SHOCK

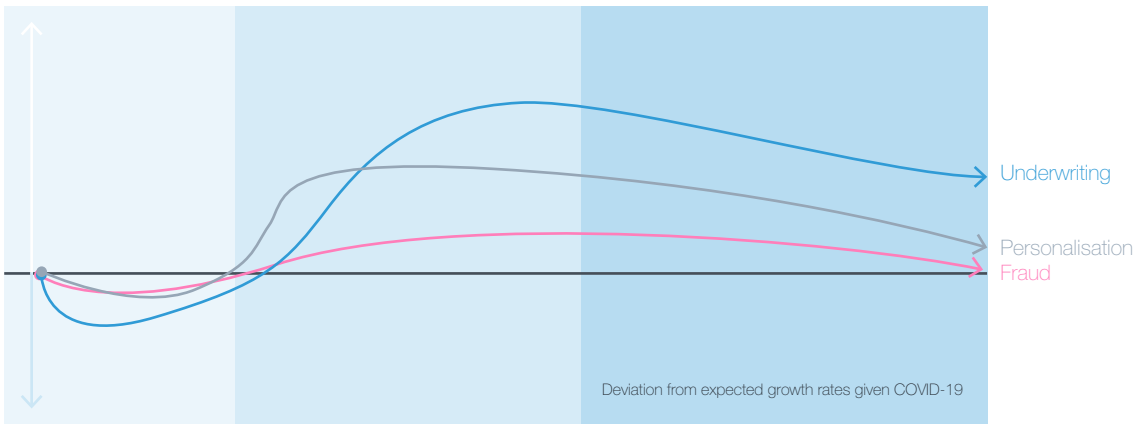
Minimal immediate negative shock due to uncertainty

MID-TERM RECOVERY

Strong uptick mid-term as AI powers growth across the entire value chain in banking, investing and lending

SYSTEMIC TRANSFORMATION

Rapid acceleration of digitalisation and permanent change in mindset will accelerate the adoption of AI in the longer term



GDP level indexed to 1st of January 2020

THE DRAKE STAR OUTLOOK

Personalisation

- **Immediate Shock:** Short term we expect a marginally negative impact as financial institutions focus on navigating the uncertainty caused by the pandemic – as the implications of the shock have become clearer, we expect financial institutions to continue or even accelerate the implementation of personalisation technology.
- **Mid-term Recovery:** In the mid-term we expect a strong uptick in activity underpinned by a rapid requirement for digitalisation particularly in terms of reaching and engaging customers. Our conversations with industry leaders suggest there is strong demand coming out of the initial shock as banks and insurers look to find more efficient ways of targeting and retaining customers.
- **Systemic Transformation:** Long term we expect a rapid acceleration in digital transformation efforts – AI companies in this space will play a significant part in the this. Whilst we expected this growth previously, we expect the pandemic will accelerate this change substantially leading to outperformance over the longer term.

Underwriting

- **Immediate Shock:** Short term we expect a marginally negative impact of AI in personalisation as financial institutions focus on navigating the uncertainty caused by the pandemic.
- **Mid-term Recovery:** AI use cases in underwriting both credit and insurance are expected to gain significantly during the mid-term recovery as financial institutions seek efficiency gains given low interest rates.
- **Systemic Transformation:** Long term we expect a permanent improvement in outlook for underwriting – AI companies in this space will benefit in the longer term given an accelerated rate of digital transformation in the industry as a result of COVID.

Fraud

- **Immediate Shock:** Short term we expect a marginally negative impact of AI in fraud as financial institutions focus on navigating the uncertainty caused by the pandemic. AI-based fraud solutions are more mature in terms of adoption so we expect a more muted impact generally.
- **Mid-term Recovery:** Muted gains in the mid-term as widespread digitalisation across the financial services ecosystem is accelerated – given fraud is a more mature space we expect this to be more limited.
- **Systemic Transformation:** Marginal uptick in activity long term as a consequence of accelerated digital transformation.

Q&A

WITH



JULIAN OSTERTAG

Managing Partner, Drake Star Partners

ANTONIA GEORGIEVA

Partner, Drake Star Partners

D R A K E  **S T A R**
PARTNERS



Where do you personally see the major opportunities for AI in fintech?

Julian: Fintech is very broad and AI will have very different impacts across the entire ecosystem. But a consistent feature across each sub-sector is the insufficient use of data; customer data, market data, transaction data. AI provides a unique opportunity for financial institutions to leverage this data – with important applications across AML, fraud, wealth management, insurance, alpha generation and more. Ultimately, AI can open opportunities that were previously unfeasible from an economic point of view; lending to SMEs, for example, requires intelligent solutions that can assess risk in a cost-effective way. Larger banks do not necessarily want to engage in this risk/return trade-off – but through utilising AI and integrating alternative data sets, fintech can open the credit markets to these smaller organisations. For me, AI can totally revolutionise the way SMEs and consumers interact with the financial markets – effectively democratising capital and insurance.

Antonia: For me, AI has a great potential to incrementally and tangibly improve efficiency and productivity or facilitate the creation of new products and services. Many use cases fall under 'process automation', and while initially the focus has been on middle/back-office applications, AI is increasingly deployed for new revenue generation in client-facing applications for customer acquisition, personalisation and customer service. Investment management is another area where AI is expected to become a key driver, specifically in alpha generation. The growing use of AI to generate investment ideas, optimise investment portfolios, customise and personalise investment advice and manage risks can confer substantial benefits for asset and wealth managers and their institutional and retail clients in the form of improved investment outcomes.

What strategies do you expect incumbent financial institutions to adopt in terms of AI?

Antonia: Similar to the adoption of other emerging technologies, financial services incumbents will follow a familiar pattern; build, partner, or buy. According to a 2019 survey, 33% of respondents are currently developing AI capabilities in house. Considering the major hurdles to AI implementation, however, such as access to data and talent, a transition towards 'partner' and 'buy' strategies could be expected, particularly in 'value-neutral' aspects of the value chain.

Julian: I agree with Antonia - larger incumbents need to adopt AI across the entire value chain from targeting customers to onboarding customers to product pricing to customer retention & experience – but they need to do so in a way that makes sense economically. In my view, most incumbents will increasingly choose to develop partnerships and not build AI (with some exceptions) thus increasing dependence on third-party software providers. Only the top financial institutions will have

the resources for in-house developments and current legacy banking systems are typically dated and reliant on 24hr batch data. For a partnership model to work, third-party providers must offer a high degree of flexibility that integrates effectively with these legacy banking systems.

What do you see as being the headwinds to the adoption of AI in financial services?

Antonia: For me, the quality of and access to data and availability of data science talent are major hurdles to implementing AI in fintech. AI relies on vast amounts of different types of data and as such data management, data privacy, data governance, data quality and data accessibility are increasingly important for fintechs to manage. Alongside data, issues such as privacy, cybersecurity, concentration risk, built-in biases and discrimination, transparency, explainability and accountability, and systemic risk in financial markets will be of critical importance. In that respect, regulation will be key in shaping the implementation of AI in a sustainable and responsible manner.

Julian: In my view, legacy banking systems, data availability and regulation in particular are significant headwinds in the adoption of AI in financial services. Legacy banking technology that cannot, on the whole, deliver real-time data on customers will prove problematic for incumbents trying to fully integrate AI into their workflows. On the regulation side, regulators will need to make sure that the level of regulation is appropriate to protect consumer privacy yet enable innovation in the space to continue at the pace we are currently seeing.

How do you see M&A activity in fintech evolving over the next 12 months?

Julian: AI is very much at an early stage and the M&A space reflects that with relatively low but increasing volumes. We expect this to accelerate significantly over the next 5-10 years and valuation multiples to be high – reflective of the growth potential in the space. More broadly in fintech, we are seeing a decrease in M&A volume but with robust valuations. In our discussions with our network we hear a similar story – investors are more selective but willing to pay for the right opportunity.

Antonia: Fintech M&A activity in 2020 has been impacted by COVID-19 to a greater degree compared to financing activity, with both fintech M&A volume and number of transactions in Q2 at levels not seen since 2013 or 2014. Over the next 12 months, however, the economic headwinds will likely accelerate the separation of winners and losers and will lead to further consolidation, which is a continuation of a broader, multi-year trend. Longer term, the rate of innovation in financial services, intensified competition and the associated pressure on margins, as well as the need for scale, will continue to drive consolidation.



4.3 IT SERVICES

IT Services refers to the application of business and technical expertise to enable organisations in the creation, management and optimisation of or access to information and business processes (Gartner). These services (either provided internally or outsourced) are an integral requirement in almost every organisation across the globe, covering a broad spectrum including managed cloud services, disaster recovery, network security and optimisation, help desks, process automation and more.

IT Services remains a major constituent of global IT spending, constituting over \$1tn of the total \$3.9tn in 2020 according to Gartner. Expected market growth is lower than some of the other sectors we have looked at in this research with growth estimated at 3-5% year on year. Despite this key market drivers (discussed in more detail below), particularly around digital transformation, changing working behaviours and emerging tech are continuing to deliver pockets of high growth within the wider IT Services industry.

KEY MARKET DRIVERS



Accelerated digital transformation

- Digitalisation continues to be a primary focus for organisations across the globe
- In 2019, 40% of all technology spending went towards digital transformation with companies spending a total of more than \$2tn (Forbes)
- 70% of companies either have a digital transformation strategy in place or are working on one (Forbes)
- COVID-19 is widely expected to accelerate the rate of digital transformation across every sector



Changing working behaviours and enterprise mobility

- Enterprise mobility is gaining traction with remote working and BYOD (bring your own device) becoming mainstream operational practices (particularly in light of COVID)
- This is driving increasingly complex IT environments and accelerating the shift towards cloud services



Continued adoption of cloud infrastructure

- Cloud infrastructure continues to be a high growth area of the IT Services market, driven largely by the opportunity to transfer capital expenditure to operational expenditure and achieve cost efficiencies
- In 2020, 90% of companies are on the cloud and over 60% of workloads are running on a hosted cloud service (up from 45% in 2018) (451Research)
- By 2021, cloud data centres will process 94% of enterprise workloads (Cisco)



Optimisation with Artificial Intelligence

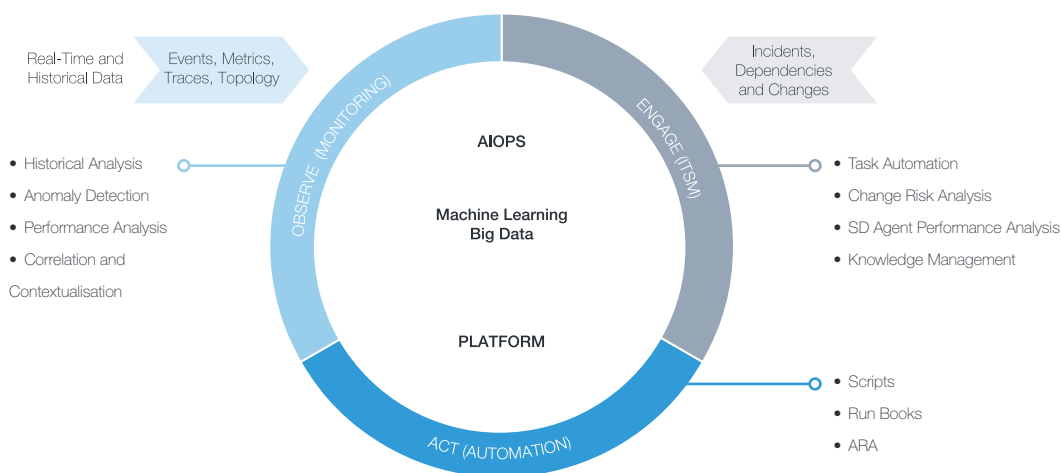
- Increasingly complex IT environments, driven by the introduction of IoT, APIs and mobile applications among others, are exceeding human scale – manual approaches that require human intervention are no longer sustainable especially given increasingly high customer/user expectations around performance and response times
- AIOps can provide solutions for managing this complexity efficiently

AI IN IT SERVICES

From discussions with CIOs and industry leaders, it is clear that in recent years much of the focus on applications of AI in IT Services have been centered around IT Operations, a subset of the broader IT Services industry. Gartner defines IT Operations as the people, management processes and software associated with IT Service Management to deliver the right services at the right quality in the most cost-effective way. ITOps teams are responsible for ensuring an optimal end-user experience, maximising uptime and continuously monitoring and fixing IT issues.

The application of AI in IT Operations (referred to as AIOps) has seen exponential growth in recent years and is playing an increasing role in the monitoring and management of modern and dynamic IT environments. As the scale and complexity of the modern enterprise continues to increase, ITOps can no longer be managed effectively using a manual approach. Increasing performance monitoring requirements and service ticket volumes are exponentially increasing the volume of data managed by IT departments. AIOps provides a cost-effective solution – utilising Artificial Intelligence to help IT departments monitor and analyse the IT environment, better manage and respond to incidents and automate corrective actions. Ultimately AIOps can optimise IT Operations teams by delivering continuous insights across an organisation’s IT architecture enabling professionals to focus on higher-value tasks and prioritise high-risk incidents to ensure an outstanding user experience. Gartner estimates the size of the AIOps platform market at between \$300-\$500m per year.

AIOps ENABLES CONTINUOUS INSIGHTS ACROSS IT OPERATIONS



Source: Gartner, September 2020

AIOps platforms broadly cover the use cases above; Monitoring & Analysis, IT Service Management (incident and change management) and Automation. Whilst not solely focused on ITOps we include Robotic Process Automation (RPA) as a use case given the potential of the space.





#1. MONITORING IT OPERATIONS

With the continuous monitoring of event logs, service requests and more, the volume of data created by the modern enterprise is immense and ever increasing. Availability and performance monitoring and event correlation can be challenging using traditional approaches given the scale of the task at hand.

Machine learning algorithms can be applied to enterprise data in order to better predict and identify anomalies, incidents and IT risks. Through understanding normal business operations, Artificial Intelligence can identify patterns in event data that can help ITOps teams predict and respond to errors before they become more serious incidents.

Estimates suggest adoption of this use case will increase rapidly, particularly in larger organisations; Gartner predicts that the use of AIOps to monitor applications and infrastructure will rise from 5% in 2018 to 30% in 2023 in large enterprises.

Monitoring the IT environment more effectively is clearly a key focus for IT department heads. According to AppDynamics, 74% of survey participants wanted to implement IT monitoring and analytics tools to proactively identify emerging high-impact problems and optimise the user experience. Despite this, it is clear there are some barriers to adoption with only 58% of respondents taking a proactive approach. AIOps providers that can make customer onboarding and model training as painless as possible will be able to more easily capture new customers and grow market share.

The diagram below explains how AI-enabled tools support each of the four different stages of monitoring.

THE FOUR KEY STAGES IN MONITORING IT OPERATIONS USING AI

1	2	3	4
Descriptive IT	Anomaly Detection and Diagnosis	Proactive Operations	Avoiding High-severity Outages
Visualisation and statistical analysis	Automated pattern discovery and event correlations	Predictive analytics	Root Cause Analysis

Source: Gartner, September 2020

One such company using AI to detect and monitor incidents is Zenoss. Zenoss uses root-cause analysis, real-time models and other AIOps tools to provide complete visibility for cloud, virtual and physical IT environments. The company's software assists in managing networks, servers, virtual devices, storage and cloud infrastructure, ensuring complete visibility and predictability over IT Operations.



-  2005
-  122
-  VC Backed, \$58.1m raised to date
-  Monitoring & ITSM
-  B2B



AUSTIN

BUSINESS DESCRIPTION

Zenoss has developed an IT monitoring platform that provides a complete solution for cloud, virtual and physical IT environments. The company's software assists in managing networks, servers, virtual devices, storage and cloud infrastructure, ensuring complete visibility and predictability over IT operations.

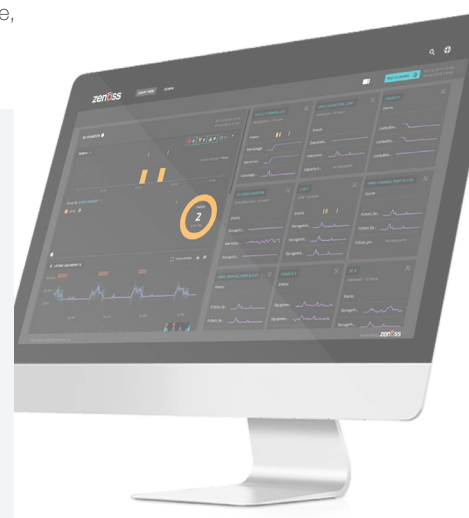
KEY PERSONNEL

Greg Stock – Chairman & CEO
 Matt Bates – CFO
 George Kanuck – CRO

KEY INVESTORS


GROTECH VENTURES


ORIX



Source: Zenoss



#2. IT SERVICE MANAGEMENT (ITSM)

Broadly ITSM in the context of ITOps refers to the teams responsible for engaging with and responding to incidents and dependencies within the IT environment. ITSM tools facilitate the tasks and workflows associated with the management and delivery of high-quality, minimum-downtime IT support. ITSM frameworks and software traditionally supported IT service desks and IT service delivery functions but are increasingly embedded in other parts of the organisation including HR ticket-handling. Given the potential of Artificial Intelligence in incident management, we focus specifically on this use case within the wider ITSM function.

Traditional approaches to incident management (namely through the ITIL model) are slowly becoming a thing of the past. The ITIL framework was built on the assumption that there is a single source of real-time information necessary for the effective management of IT operations. But given the pace of change in modern enterprises, standard ITIL practices can't keep up. ITSM requires the power of AI and machine learning to better process disparate data and resolve incidents more quickly.

ITSM Service Desks typically work in the following way;

- The end-user calls the service desk
- An agent creates the ticket and selects the appropriate support category for the ticket
- The ticket gets routed to the right support group
- The ticket gets resolved

The limitations of this traditional ITSM approach come when mistakes are made in this chain (typically the incorrect selection of a support category) - this increases ticket resolution times, slows productivity and makes for a poor customer experience.

With AI this process looks significantly different. Chatbots and virtual agents handle initial contact and ticket creation, and tickets are classified automatically. In addition, the virtual agent can provide suggestions, recommendations and low level support for more simple requests (for example password resets).

Talla is an example of an AIOps platform that is used in incident management. Talla's platform is designed to bring AI-powered service desks to HR, IT and other internal service teams. The company's platform manages and prioritises inquiries, automates answering FAQs and proactively educates their employees, all within native chat applications like Slack and Microsoft Teams.

 <hr/> <ul style="list-style-type: none">  2015  44  VC Backed, \$17.3m raised to date  Monitoring & ITSM  B2B 	 BOSTON	<p>KEY PERSONNEL</p> <p>Frank Speiser – Chairman & CEO Byron Galbraith – Co-Founder & CTO</p>
	<p>BUSINESS DESCRIPTION</p> <p>Developer of an ITSM platform designed to bring an AI-powered service desk to HR, IT, and other internal service teams. The company's platform manages and prioritises inquiries, automates answering FAQs, and proactively educates its employees, all within chat applications like Slack and Microsoft Teams, enabling clients to automate their service desk and streamline communications.</p>	<p>KEY INVESTORS</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">   </div> <div style="text-align: center;">   </div> </div>



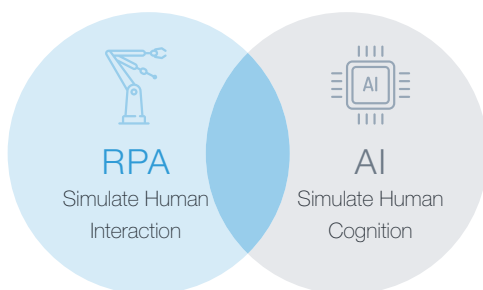


#3. ENRICHING BUSINESS PROCESS AUTOMATION (BPA)

The final part of the AIOps workflow is automation. Business Process Automation is broadly defined as the automation of complex business processes and functions, of which automation in ITOps is a particular application. Process automation, when applied effectively, fundamentally improves efficiency and reduces process errors whilst simultaneously releasing employees for more strategic, high value-add tasks. Given the increasing role Artificial Intelligence can play in process automation across the entire enterprise we have decided to widen the scope to cover RPA providers that operate in more than just IT Services.

Robotic Process Automation

The most widely known application of BPA is Robotic Process Automation (RPA). While BPA is a broad approach to optimising business processes, RPA is task-specific; it is software that automates a particular business process. More specifically it allows a user to configure one or more scripts (also referred to as “bots”) to activate specific keystrokes in an automated fashion. The result is that the bots can be used to mimic or emulate human interaction in specific tasks (transaction steps) within an overall business or IT process (Gartner).



Source: Drake Star Research

RPA bots perform the same process every time - they don't learn or self-correct as they iterate through repetitions and they can not find a more efficient process for a programmed task. Artificial Intelligence on the other hand does just that – algorithms can be trained to learn, reason and self-correct and aim to simulate human cognition. AI can be used to enhance RPA solutions, whether as a part of the process (for example using OCR to extract text from images) or to optimise the process (for example making decisions on whether human intervention is required).

Mimica is one such company using machine learning to enhance the deployment of RPA, claiming to reduce required man-hours by up to 70%. Their software learns from production data during a 2-3 week monitoring phase and builds a consolidated and accurate process map for the particular task. As a result, bots can automatically handle all exceptions on deployment (97% accuracy), reducing man-hours and hence cost for engineering teams. Engineering teams can also use Mimica to analyse hundreds of processes across the business and identify those with the highest expected ROI.

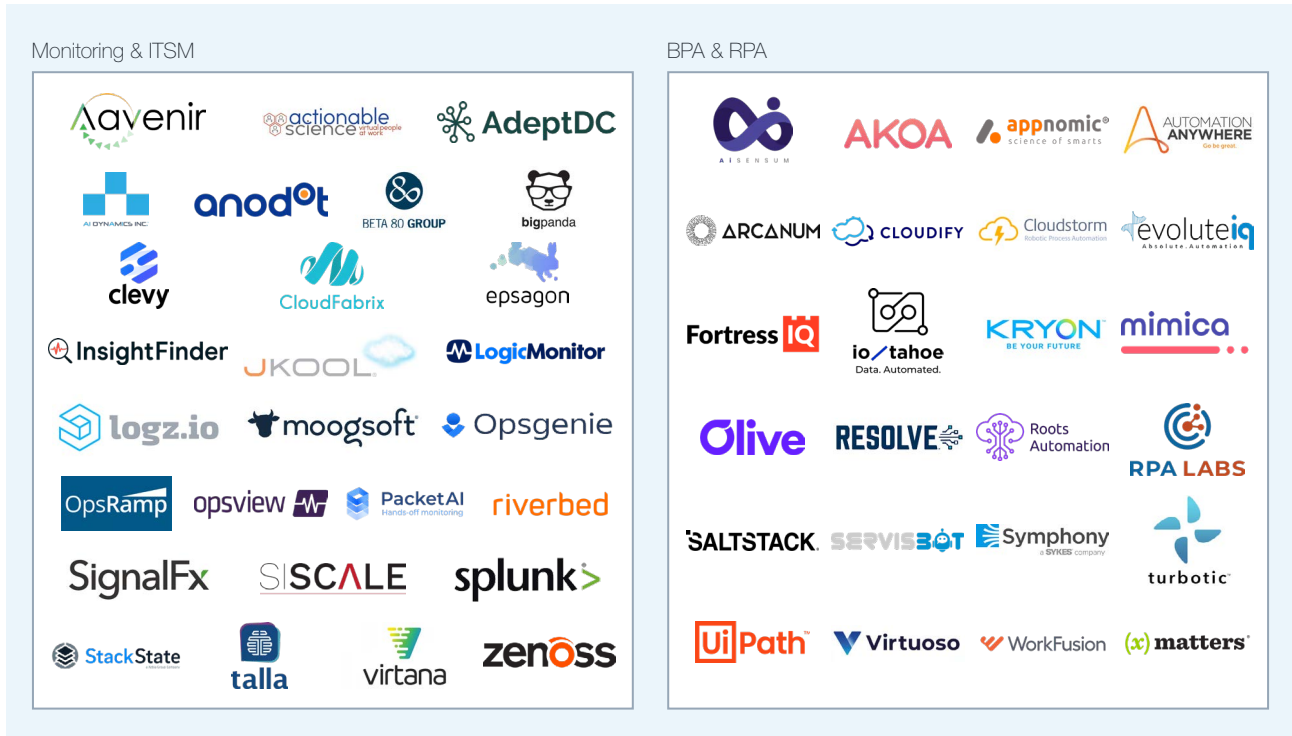
<ul style="list-style-type: none"> 2018 11 VC Backed, \$1.8m raised to date BPA & RPA B2B 	<p>LONDON</p> <p>BUSINESS DESCRIPTION</p> <p>Mimica is a machine learning automation platform designed to accelerate the deployment of RPA. The company's platform uses Artificial Intelligence to automate process intelligence and process mapping whilst reducing man-hours and process errors.</p>	<p>KEY PERSONNEL</p> <p>Tuhin Chakraborty – Co-Founder & CEO Raphael Holca-Lamarre – Co-Founder & CTO</p> <p>KEY INVESTORS</p>
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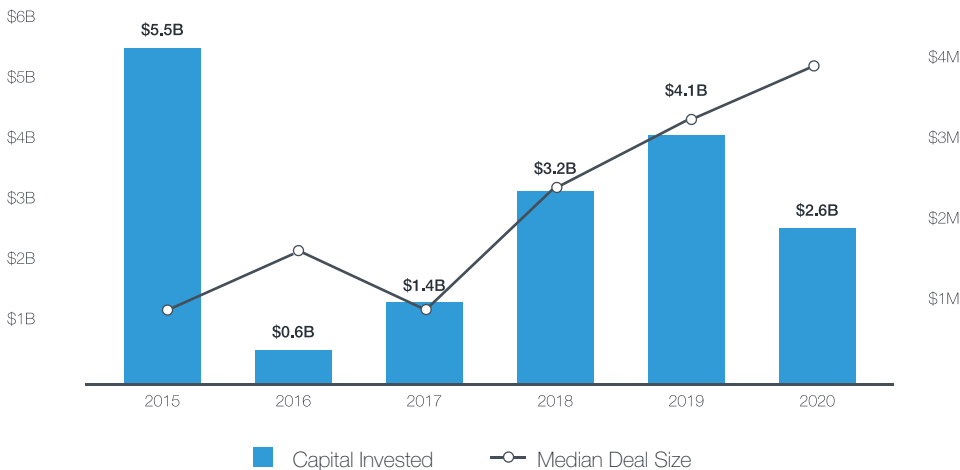
MAPPING AI IN IT SERVICES

Below we present our Drake Star AI in IT Services market map, highlighting strategically important and high-potential companies in the space. We appreciate, however, that players in this industry are increasingly developing end-to-end solutions that cover the entire AIOps cycle and therefore categorisation can be challenging. We have combined Monitoring and ITSM use cases given many platforms offer both as a complete AIOps solution.



M&A AND VC ACTIVITY REFLECTS THE INCREASING MATURITY OF THE IT SERVICES SPACE

In line with similar trends seen in other sectors around VC activity in the AI space, we see significant growth in both capital invested and median deal size. 2015 stands out with the highest capital invested driven by one major transaction – the acquisition of Publicis Sapient by Publicis Group for \$3.7bn. Since 2015, we have seen increasing maturity in the space, reflecting the wider adoption of AI technology into IT Services.



Source: Pitchbook, July 2020, Venture Capital, Growth Equity and M&A



MAPPING THE IMPACT OF COVID-19

In this research we look to analyse the impact of COVID-19 on the growth trajectories of specific AI use cases – in doing this we have collated internal research, leveraged our global network of experts and heard directly from companies and entrepreneurs in the space. We hope to provide some insight and rationale into changing market dynamics as a result of COVID.

IMMEDIATE SHOCK

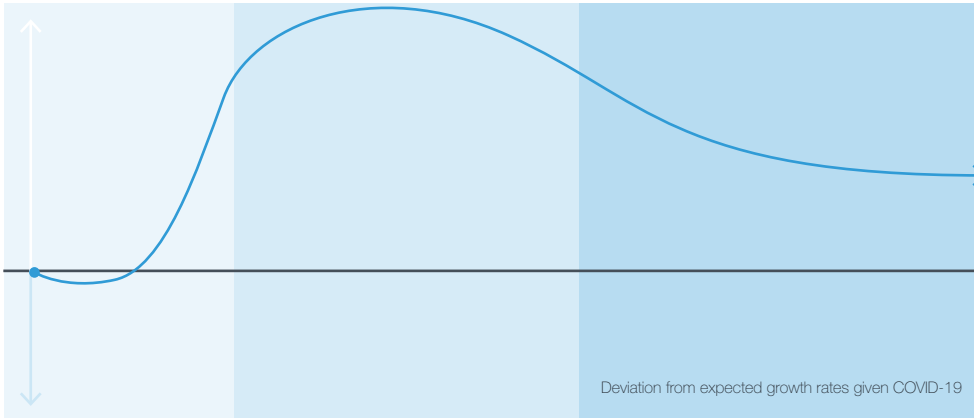
Initial shock with rapid uptick in demand towards the end of the period

MID-TERM RECOVERY

More rapid growth given the accelerated rollout of digital transformation programmes

SYSTEMIC TRANSFORMATION

Systemic impact on the sector given changing consumer behaviours



GDP level indexed to 1st of January 2020

THE DRAKE STAR OUTLOOK

AI in IT Services

- **Immediate Shock:** Pause in activity during April and May due to underlying uncertainty around the economic impact of COVID-19. Our conversations with companies in the space indicated a significant uptick in demand broadly in IT Services as businesses look to accelerate digital transformation programmes.
- **Mid-term Recovery:** Continued accelerated growth relative to pre-COVID with the accelerated rollout of transformation programmes.
- **Systemic Transformation:** Diminishing impact of COVID over a 3-5 year period as the rate of digital transformation slows – we still expect a positive systemic impact relative to pre-COVID given structural changes in working behaviours and digital transformation likely to drive increasing complexity in IT infrastructure.



Q&A

WITH



GABY SILVESTRIS

Partner, Drake Star Partners



What do you see as the major opportunity in IT Services for AI?

Their ability to provide AI-driven solutions that bring alignment amongst business objectives, strategic goals, operating and engagement models, technology platforms and innovation. Now more than ever, stakeholders seek to unlock business value, make better informed agile decisions and improve customer experience, employee engagement and profitability. Applying AI to businesses is not just about achieving basic efficiencies and streamlining laborious task. The landscape of AI applied to businesses can be complex and usually converges with other technologies. Designing and implementing successful AI strategies and technology transformation programmes need not only to align with a business's operating models, objectives, and behaviours but often with other technologies as well. IT Services' specialists play and will continue to play an increasingly vital role in this regard.

What do you see as the major headwind in IT Services for AI?

Adaptability. As the adoption of AI and digital transformation continue to change the landscape of all industries, it is also important for IT Services businesses to adapt and evolve their own organisations. AI is not only changing how IT Services businesses interact and deliver solutions to clients, it is also changing the way IT Services businesses adopt AI in their own organisations and their own internal way of working. Embracing the power of AI to augment their internal capabilities, improve workflows, team engagement and operations is key for the reinvention of IT Services companies. For example, by leveraging AI and machine learning in software coding, developers can spend more time innovating and designing new technology solutions to address complex business challenges.

How do you see M&A activity evolving in this space?

Digitalisation, technology, and AI-driven solutions continue to be crucially embedded in the new ways of working and engagement. I believe M&A appetite will remain strong for technology and technology-enabled businesses that are led by high quality management teams and are well positioned in growth markets with resilient business models. As we all know, there is significant drive to increase revenue optimisation and operational efficiencies whilst facilitating better decision-making processes. I particularly expect strong global demand for businesses that are focused on AI-powered solutions applied to business improvement, ERP systems, big data and analytics, digital and cloud transformation programmes as well as cyber & information security.

What are some of the key valuation drivers in IT Services?

Investors and strategic buyers look at an array of financial and operational value drivers and KPIs to formulate their valuations and determine

the attractiveness of an asset in the IT Services space. For example, clearly differentiated value propositions aligned to market growth, talented management teams, scalable and robust operating models, financial performance, quality of earnings, attractiveness of customer base, strength of client relationships, repeat business and stickiness of revenue along with revenue visibility and pipeline management are just some of the key valuation drivers.

What has been the impact of COVID-19 on AI-powered IT Services?

The Coronavirus pandemic is transforming all industries and I believe it has accelerated the revolution and adoption of digital and AI transformation. In many cases, COVID-19 forced companies to transform their operations and the way they conduct business almost overnight. We are facing a "new normal" way to live, to connect, to experience, and also to do business. AI-powered IT Services solutions and AI-enabled platforms will help companies adapt quicker to this "new normal" and give them a competitive market advantage. It will also enrich digital transformation programmes and bring alignment between business strategy, operating and engagement models and technology stacks. For instance, it could simulate live work environments, manage resources and workflows more effectively, foresee and overcome supply chain challenges, detect and analyse client behavioural patterns, and deliver 'hyper-personalised' products to customers.



4.4

CYBERSECURITY

Digital technologies have become essential for our everyday lives – we shop online, we work online and we bank online. As we become increasingly reliant on the digital space and cyber infrastructure, businesses and consumers alike are increasingly vulnerable to cyberattacks and cybercrime. According to Maryland’s Clark School of Engineering, a cyberattack occurs every 39 seconds and affects 1 in 3 Americans each year. Cybersecurity technology aims to provide some defense against this threat – protecting systems, networks and programs from breaches to ultimately prevent the theft of IP or customer data and to prevent fraud.

The size and expected growth of the global cybersecurity market highlights the seriousness of this threat and the potential cost of firms both reputationally and financially. Market estimates imply a current market size of \$173bn in 2020, growing to \$270bn by 2026 – representing growth of 86%. Increased spending on cybersecurity is reflective of the expected damage related to cybercrime, which is projected to hit \$6tn annually by 2021.

KEY MARKET DRIVERS



Expanding threat of cyberattacks

- Malicious cyber activity is on the rise, as criminals use ever-more sophisticated strategies to infiltrate systems and networks
- There were over 11.7bn records and over 11 terabytes of data leaked or stolen in publicly disclosed security incidents in the three years from 2016 to 2018, according to IBM



Increasing regulation of cyber risk

- Governments worldwide are increasingly concerned that cyberattacks could hit crucial economic sectors
- Many are issuing new laws to ensure organisations improve their cybersecurity controls. In the EU, new data protection regulation, including privacy provisions, came into force in May 2018
- Such mandatory standards will almost certainly lead to higher demand for new cybersecurity products and services



Explosion of connected devices

- The rapid expansion of internet-enabled economic activity and the number of connected devices and systems increase the likelihood of widespread malicious cyber activity
- People in far corners of the globe are gaining online access, as the world becomes more digitised and interconnected



Growing risk awareness

- Recent high-profile cases of malicious cyber activity and media coverage of data breaches have made companies and other organisations increasingly aware of the risks cyber adversaries pose to their businesses.



AI IN CYBERSECURITY

AI technology is playing an increasingly important role in cybersecurity, providing cybersecurity professionals with additional firepower to monitor, detect and mitigate potential threats. IBM estimates report that the average cost of a breach for organisations that fully deploy security automation is \$2.88m - a \$1.55m lower than organisations without automation.

AI as a technology is ideally suited to cybersecurity use cases given its ability to adapt to a constantly changing world – all in real-time. AI-powered cybersecurity providers can understand the context behind a potentially malicious activity and respond in a proportionate way – therefore preventing business impact whilst isolating the potential threat. Use cases of AI in cybersecurity are numerous however we isolate three as being important going forward.

#1. NETWORK THREAT ANALYSIS

Fundamentally, the objective of cyber criminals is one and the same; gain unauthorised access to a system or network and cause widespread business disruption or steal information. These attacks are systematic, calculated and increasingly sophisticated and can be delivered through a variety of methods including malware, phishing, ransomware, SQL injection and more.

Broadly, network threat analysis can be defined as the process for systematically monitoring potential cyber threats to a network or system. As firms increasingly adopt digital tools and processes into their operations, they are effectively increasing the number of digital touchpoints in their internal networks. With increasing digitalisation, businesses run more of their processes via this network; internal IM communications, email communications, business transactions, third-party applications, internal software and website content are all exposed to cyber threats.

Whilst there are huge advantages to digital transformation, this simultaneously increases potential risk exposure. As a result, security teams must be fully equipped to handle the increasing scale and sophistication of these attacks – but this can be problematic. An increasing number of possible entry points to a network means security analysts face an increasing number of potential threats – making defending a company's cyberspace increasingly costly.

AI presents an opportunity to both improve the accuracy and effectiveness of the analysis and do so in a highly cost-efficient way. AI effectively monitors all incoming and outgoing network traffic to identify suspicious activities, classify threat types and deploy appropriate countermeasures all in real-time. Ultimately this helps security teams monitor traffic at scale providing an appropriate classification system that enables analysts to cut through the noise and respond to cyber threats before they cause lasting damage to the organisation.

Further to this, unsupervised AI in particular can help deal with a common issue in cybersecurity – the 'unknown unknowns'. As Andrew Tsonchev (Director of Technology at Darktrace) explains in his interview, a major threat to larger corporates is malware that has not been seen previously – traditional systems (including machine learning applications) are largely unable to identify these threats. This is where unsupervised AI can have a greater impact – the algorithms understand what a normal operating environment looks like and therefore can identify actions or behaviours which could indicate a potential threat. Darktrace, founded in 2013, is a pioneer in the cybersecurity space with its Enterprise Immune System technology helping to protect over 3,500 organisations worldwide.



Q&A

WITH



ANDREW TSONCHEV

Director of Technology, Darktrace



Interviewed August 5th, 2020



We interviewed Andrew Tsonchev from Darktrace to understand more about how they use AI in cybersecurity

Please provide a brief overview of Darktrace

So Darktrace is about seven years old, we are a UK company that was founded originally out of the University of Cambridge. We're now very much a global company, and we've been very lucky to have seven years of pretty unprecedented growth within the industry where we are now one of the fastest growing tech companies in Europe, and that's been based off applications of machine learning and AI to various aspects of the cybersecurity challenge. So when we started Darktrace, we were very focused on how can we use AI and machine learning to detect cyber threats that traditional security tools miss, especially nation state attacks, unknown attacks, novel attacks, the sort of difficult part of the problem. We developed our approach with that goal in mind and since then we have expanded the set of problems that we are bringing machine learning to bear on within the security space. So initially it was detection, and then we've focused on response. How can you use machine learning to automate the response to security incidents inside companies when they happen? What can AI do to help provide immediate defensive capability that allows companies to fight back against cyber attacks, not just detect them? And then most recently we've turned our attention to investigation. How can we use machine learning and AI to improve and streamline the way that security operations are run inside companies. When you think about a SOC inside an organisation, the part of the business that's tasked with monitoring and responding to security incidents, they spend a large amount of their time investigating and analysing security events to help them understand if they're under attack, what the nature of that attack is and so the final part of the problem that we've been using machine learning to address is how do we automate that investigation work. So we're now at the point where we have systematically applied various forms of AI and machine learning, and we can talk more in-depth about what kinds exactly and how it works, but various forms of machine learning and AI to detect, respond and investigate. So the three main components of running security and defending organisations.

How does Darktrace use AI to solve problems for its customers?

So the first thing, let's start with detection. So the traditional approach to detection, in the cybersecurity space, has been for the longest time focused on looking for 'known bad' in various ways. So you approach the problem as, here are all the possible threats that we want to be in a position to defend against and so we need to continually check to make sure that none of these threats are occurring inside the business or the domain we're trying to protect. So to use technology to do that, the most obvious way is to have some kind of technical signature or indicator of the different types of threats. Now that could be an antivirus signature from a particular kind of malware that's been seen before.

Essentially all of the threats are predefined, and you go and you look for them. It's limited because it can't look for things that it hasn't seen before or you haven't told them to look for as a technology solution. So the promise of AI in detection, is it allows for a technology system to embrace novelty and that's crucial for security because security threats tend, by their nature, to be unusual, unexpected things.

So really, you need to be looking for those unknown things, the 'unknown unknowns' as people like to say. And so the way AI helps with that is through various families of unsupervised machine learning. The analogy we use to explain the way this works is with the human immune system. So the immune system deals with and responds to the threats that get past the perimeter of the body, the skin or the various other forms of defenses that we have to keep out bad stuff. When a pathogen or virus gets in, yes, there is a part of the immune system that responds to things you've previously been infected with. But there's another part of the immune system that detects and responds to novel pathogens, novel viruses, and the way it does that is by understanding 'self'. So the human immune system has a sense in which it understands and can recognise the normal operating environment of the body. You want it to be able to spot the things that look foreign - unusual intrusions into that environment. So what we have built at Darktrace is an architecture that replicates that approach with unsupervised machine learning for a business. So what you do is you take in as much data as you can, about what employees are doing, what devices are doing, what applications are running in the environment, what third party SaaS applications are in use, email, all of this and you train machine learning systems to build what we refer to as 'patterns of life'. Once you've trained these models of behaviour, then you use those to understand what 'self' is for the organisation and to conversely identify not 'self'. Instead of looking for the cause of a threat, it's looking for the symptoms, the sign that something has changed in the environment, the impact of a security incident. So there's a coupling between the degree of risk that's being posed to the business and the degree to which it causes a real change in the operating pattern of that business.

Response is very interesting because once you find something in the environment you want to contain it. So the idea is this, you need to deal with the security incident, and that would typically involve some form of investigation, but you need to buy the security team time to do that investigation safely. But until you know if it's a threat, you can't just take systems offline, because if it's not a threat, you've just impacted business productivity. And so the trick here is to use AI to do decision-making. So you want to assign an opportunity cost to various things you could do and then take a course of action that will minimise the risk for the business. When you do this correctly, it's very surgical. So you don't interfere with, say an employee doing a day-to-day task; you let them access email, go to websites that they normally do - but you step in to prevent them doing all the strange stuff, the stuff that would spread laterally and cause a big impact on the business.

Q&A

WITH



ANDREW TSONCHEV

Director of Technology, Darktrace



So once you found the potential threat and you've contained it intelligently to open up a window of opportunity to investigate it, then we want to use machine learning to help the security team with that investigation. So the final way in which we've used AI to help security is to replicate the exploratory investigation process that security personnel do with AI. We've trained a system on many, many, many threat investigations that our hundred or so internal security experts have run for our customers at Darktrace and we've used that training to build supervised machine learning algorithms that contain all of that knowledge. So we are doing all the initial triage and analysis work and creating a report for the security team that looks like the sort of thing that would be the result of 8 or 10 hours work from a junior analyst. So ultimately, we're helping security teams to be a lot leaner, a lot more efficient and helping them to scale their operations to a far greater degree than they can do using traditional tools.

How do you see cybersecurity being impacted by COVID-19?

Yes, it's obviously a million-dollar question right now. I can say that, like in most areas of life, security has been revolutionised in the last few months as the impact of this pandemic has played out. There's a few aspects of that. The most important one is that it's simply accelerated digital transformation. Companies have been forced to pull forward and execute far more rapidly than they were intending - often projects that they have been intending for a while, but not on the speed and the scale that they have had to do it. So there's been a massive shift to remote working obviously, and there's been a massive shift to a reliance on third-party cloud services. Now that's had a profound impact on the way security teams protect their companies. The remote working one has been a challenge because it's a different set of risks. You're taking devices that often were protected on a corporate network and you've moved them into an unprotected environment - that's a challenge. The other piece, the shift to cloud services essentially means that you've torn apart that playbook overnight of how the business operates. If you don't know what should and shouldn't happen in a business, then you're blindfolded, and you don't know how to look for security threats - if you are working within that traditional paradigm of looking for 'known bad'. So it's been the case that companies have had to realise that if they want to keep the lights on, they need to have a security strategy and a technology type that allows them to evolve with the change and continuously identify potential incidents without them personally, individually, knowing what would constitute an incident. That can be quite a mindset change for lots of organisations. The good thing is that they're being forced to do the work now, so that ultimately we will emerge safer from this than we were before because it's making companies invest more heavily than they would otherwise have done.

The other challenging piece has been the way attackers have adapted and responded to the opportunity presented by the pandemic and the shift in technology.

So, email is the most obvious example of this. Typically the predominant

form of a malicious email tech involves some kind of financial fraud - that dropped off a cliff within the first couple of weeks of going into lockdown. It was replaced by a huge surge in spoofing attacks and impersonation attacks around things like COVID response, the CDC disease control, these sorts of things. So they are very clearly following the opportunity in a sense. The other piece is that because of the shift to remote working and the shift to remote collaboration tools, attacks have moved as well. So attackers are doing a lot more SaaS-based attacks, attacking Microsoft 365, these sorts of platforms, and they're attacking the exposed perimeter of the business. We saw a lot of server-side attacks, crypto mining campaigns, ransomware campaigns, all exploiting server-side devices or internet facing devices over the last few months. So we've really doubled down on the way we protect SaaS applications and have invested heavily over the last few months in a lot of R&D and accelerated a lot of work on enhancing our capabilities to protect those aspects of the business. So that was our own piece of the digital transformation journey - we had to really quickly adapt our technology to make sure that we were not blindsided and there were no blind spots in coverage for our customers during this crisis.

What is going to be the major headwind for AI in Cybersecurity?

That's a great question. In AI more generally, the two biggest challenges we face are public attitudes towards privacy and data collection and potentially adversarial poisoning of AI training data. Now, the first of those is a really interesting topic, and I don't want to go too deeply into it. I think what's important to say is that what technology companies and AI companies like ours should be doing is trying to design our systems with the smallest possible amount of compromise. So designing in a way that's privacy-preserving, designing in a way that minimises the amount of data that needs to be held.


On the adversarial stuff. There's two parts; there's poisoning of training data, and then there's malicious AI itself. A lot of companies rely on historic training datasets. That means that you can poison the dataset so that all the machine learning you then run on top of it is tricked. So it learns bad stuff as good. We've managed to sidestep that at Darktrace because we don't really rely on historical training data - we try to train in-situ for every customer. But the biggest challenge and the one we're most concerned about is adversarial AI in the form of the bad guys using AI to attack us. Today, if you want to do a sophisticated attack campaign, the target has to be worth it. That means that SMEs are spared the most sophisticated attacks - but if you can scale your attacks so that you can replicate that level of sophistication for SME attacks then you have a real problem. We must make sure that companies are actually using the data that lives in the business to defend against this - you just have to use it and train machine learning with it in the right way.









Also available in video format:

<http://bit.ly/global-ai-report>





-  2013
-  1,330
-  VC Backed, \$338.4m raised to date
-  Network Threat Analysis
-  B2B





CAMBRIDGE


KEY PERSONNEL


Poppy Gustafsson – CEO
 Nicole Eagan – CSO & AI Officer
 Andrew Tsonchev – Director of Technology

KEY INVESTORS









BUSINESS DESCRIPTION

Darktrace is a leading AI company and the creator of autonomous response technology. Its self-learning AI is modelled on the human immune system and used by over 3,500 organisations to protect against threats to the cloud, email, IoT, networks and industrial systems.

#2. PHISHING DEFENCE & EMAIL MONITORING

A phishing attack comes as a seemingly legitimate message that tries to convince you to either click a link, download a document, install software or enter some personal and potentially compromising information. Unlike other cyber attacks, phishing is an example of social engineering; using various techniques to convince a user to hand over their personal information. Phishing techniques include link manipulation, filter evasion and website forgery with the overall goal being access to personal information including email, bank accounts and usernames and passwords which are used for financial gain or, in some cases, as a part of a more serious attack at a later stage.

A spear-phishing attack is a more targeted attempt and is typically enacted to fewer individuals with a higher probability of success. Attackers will typically gather information about the target via online search and through social media profiles to increase the quality of the con and hence the probability of success.

Phishing attacks are carried out on consumers as well as enterprises and are particularly effective during times of uncertainty or change. Phishing attacks made up 27% of all attempted COVID-19 related scams globally. Phishing attacks can be particularly dangerous for corporations. Data from Check Point Research shows that 64% of organisation have experienced a phishing attack in the last year and according to Verizon, 32% of all data breaches in 2018 involved phishing activity. According to the FBI's Internet Crime Report 2019, business email compromise saw disclosed losses of over \$1.7bn, with the actual figure expected to be much higher.


So how can AI help prevent phishing attacks? Generally, industry-standard email monitoring and protection systems have relied on preventing malicious and potentially harmful email from getting into the inbox. Given varying levels of understanding and knowledge relating to cybersecurity, this has historically tended to be the best option for defending an organisation. As the sophistication of email attacks has increased, it is estimated that 25% of phishing emails bypass traditional email gateways meaning this is no longer completely effective on its own. This is where AI can prove useful – preventing phishing attacks from inside the mailbox.






AI can be used to learn communication habits and normal user behaviour in order to detect anomalies based on time of day, domain names, signatures, content and links. Utilising a similar methodology to network threat analysis, AI can be used to detect unknown threats – threats that signature-based detection capabilities cannot.


IronScales is one such company that is leveraging AI technology to protect enterprises from the full spectrum of phishing attacks. Their platform can help detect and defend against spear-phishing attacks, where attacks do not use malicious URLs or attachments and so are often missed by traditional cybersecurity platforms. Using natural language processing, their IronSights solution creates a digital fingerprint for every sender – once this is established, any deviation from the norm can be easily detected.







-  2013
-  54
-  VC Backed, \$33.0m raised to date
-  Phishing Defense & Email Monitoring
-  B2B



RAMAT GAN



BUSINESS DESCRIPTION



Developer of an automated platform to address the challenges of email phishing. The company's platform uses a combination of machine learning and human intelligence to offer phishing simulation training, threat protection and incident response, enabling organisations to better protect themselves from the threat of phishing.

KEY PERSONNEL

Eyal Benishti – Founder & CEO
Erez Fingerman – COO
Lior Tenzer – CFO

KEY INVESTORS

#3. MALWARE-DETECTION

To understand how AI can be applied to anti-virus software, it's first important to understand how traditional anti-virus software works. Traditional anti-virus uses digital signatures and pattern recognition to compare a suspect file to previous instances. This works well to a point and only on previously seen malware. Advanced threats such as the WannaCry ransomworm and Petya are too complicated for legacy AV systems because the payload is well disguised as non-malicious software.

AI anti-virus works slightly differently and uses a combination of methods to identify and destroy potentially harmful files. Machine learning models can be used to detect and block malware, effectively building upon the information provided in signature-based detection. Utilising methods that go beyond traditional file and date signatures, AI can look at patterns including the structure of files, how a payload is delivered, which files they act upon and more to build up a more contextual picture of the file in question. This can be particularly important at the edge or for endpoint devices where there is less frequent or poor connection to the cloud. 'Agents', or pre-trained algorithms, can work directly on the device without having to connect to the internet.

Avira is one cybersecurity company that has been integrating AI into its software for over a decade and developing solutions that work on-premise. One of their products, NightVision Virtual Appliance, is an in-house on-premise AI-powered malware detection solution that allows customers to apply machine learning capabilities to a network without having to connect to a cloud security service. Ultimately this enhances data privacy, availability and cost efficiency for enterprise users whilst allowing them to gain the full power of AI-enhanced malware detection. Drake Star Partner's advised Avira on their recent sale to Investcorp.



-  1986
-  461
-  PE Backed, \$180m raised to date
-  Malware Detection
-  B2B/B2C



TETTANG

BUSINESS DESCRIPTION

Avira is a leading European cybersecurity software company serving the OEM and consumer end markets. Over its 30+ year history, the company has developed particular strengths in anti-malware, threat intelligence and IoT solutions as well as AI in cybersecurity. Avira recently announced its majority sale to Investcorp Technology Partners for \$180m. Drake Star acted as exclusive financial advisor to Avira on this transaction.

KEY PERSONNEL

Travis Witteveen – CEO
Matthias Ollig – CTO

KEY INVESTORS

INVESTCORP





We interviewed Matthias from Avira to find out more about AI in cybersecurity

Please provide a brief overview of Avira

Avira is a multinational cybersecurity software solutions firm serving the OEM and consumer end markets. Avira provides a consumer-focused portfolio of security and privacy solutions for Windows and Mac computers, Android and iOS smartphones, home networks and smart devices (IoT). Over its 30+ year history, the company has developed particular strengths in anti-malware, threat intelligence and IoT solutions. Its software provides next generation security for users' online identity, finances, and private data, protecting against viruses, malware, ransomware and other threats. All of Avira's features are available as licensed SDKs and APIs. Working together, Avira and its partners protect more than 500 million devices globally and consistently achieve best-in-class results from independent security tests. Avira is a privately held company headquartered near Lake Constance, Germany, with additional offices in the EU, the United States and Asia.

How are you using AI to solve problems for your customers?

Avira is using AI and machine learning to solve a multitude of cybersecurity challenges. Two examples from the more traditional anti-malware front are detecting zero-day malware strains (malware not seen before) and secondly, leveraging deep neural networks to identify new phishing attacks (attackers trying to steal one's digital identity). Avira also leverages AI for web content classification, i.e. classifying web pages into categories like news, gambling, and violent content. The Internet of Things is another area where Avira successfully deploys AI to secure smart homes by identifying anomalous traffic that indicates consumer IoT device attacks.

By no means does Avira consider AI and Machine Learning to be the silver bullet, but AI allows us to leverage all our threat telemetry to make the web a safer place. What is putting Avira in a unique position is the visibility we have. All of Avira's freemium customers and technology partners act as sensors that give us visibility about what is happening on devices and in networks. This vast amount of data is what is powering our machine learning engines. Avira believes that AI is a transformative technology, and we have heavily invested in this area. In 2020 we added a dedicated AI lab for explorative research thinking about the challenges that AI and cybersecurity will pose 5-20 years from now.

How important is AI to the future success of Avira?

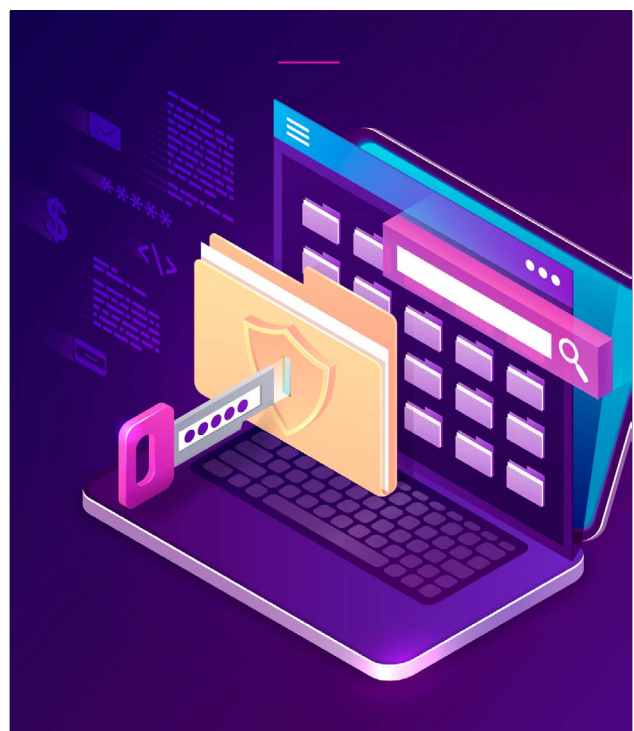
The issue that all cybersecurity vendors face is the exponential growth of threats online. Finding anomalies in these vast amounts of interactions is like finding a needle in a haystack. It cannot be done anymore

by humans alone, so we invest heavily in AI and automation. Avira considers AI to be a fundamental building block for all our products going forward.

What is your outlook on the future of AI in cybersecurity?

The bad guys are also looking at all of these technology trends. Of course, AI is being used by threat actors as well. Cybersecurity vendors, and society in general, now have to deal with fake identities: fake profiles on social media, fake photos, fake videos and more. Those identities are being used by threat actors to manipulate consumers, steal data, blackmail consumers, or even influence elections globally. Threat actors use so-called Generative Adversarial Networks to create fake profiles, which is a technique that has AI at its core. Now, AI can quickly generate hundreds, thousands, or even millions of these profiles, and they get more sophisticated every month. The challenge is that humans cannot keep up with detecting these profiles at scale; we need to deploy good AI to fight the bad AI!

At Avira, we also believe that AI environments will become more symbiotic; they will have humans in the loop. AI will find the anomaly, the needle in the haystack, and humans will go and investigate these anomalies. Without a doubt, the number of AI applications in cybersecurity will rise, and AI skills and the data needed to train the AI models will become an even more vital differentiator going forward.





Deep Instinct is another company utilising AI in malware detection and is a true innovator in its field. With its founders coming out of the Israeli Defense Force's notorious signal intelligence unit, the company is one of the first to use deep learning techniques in malware detection, training a Deep Neural Network algorithm on hundreds of millions of both malicious and legitimate files.



-  2015
-  167
-  VC Backed, \$98.2m raised to date
-  Malware Detection
-  B2B



NEW YORK

KEY PERSONNEL

Guy Caspi – Co-Founder & CEO
Eli David – Co-Founder & Chief Scientist
Nadav Maman – Co-Founder & CTO

KEY INVESTORS

COATUE  Tech Ventures

 LG Technology Ventures  SAMSUNG VENTURE INVESTMENT

BUSINESS DESCRIPTION

Deep Instinct operates a cybersecurity that provides protection against evasive unknown malware in real-time. The company's platform provides protection against zero-day threats and APT attacks by identifying malware using AI, resulting in comprehensive protection on any device and operating system.

MAPPING AI IN CYBERSECURITY

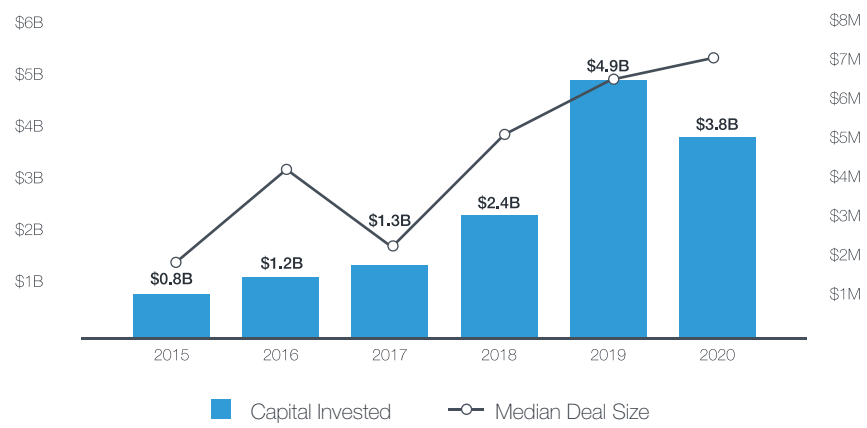
Below we present our Drake Star AI in Cybersecurity market map, highlighting strategically important and high potential companies across the discussed use cases. We have also chosen to include other select startups in the space that do not directly fit into our discussed use cases.

<p>Network Threat Analysis</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">    </div>	<p>Other</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">    </div>
<p>Malware Detection</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;">     </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">    </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">     </div>	<p>Phishing Defense & Email Monitoring</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;">    </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">    </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 10px;">    </div>



M&A AND VC ACTIVITY REFLECTS THE INCREASING MATURITY OF THE SPACE

AI in cybersecurity is becoming an increasingly mature space, with total capital invested and median deal size increasing substantially in recent years. 2020 activity remains strong, despite the COVID pandemic, with total deal volume across M&A and fundraising reaching \$4bn. M&A activity is dominated by strategic players, with major transactions including F5 Network's acquisition of Shape Security for over \$1bn in January this year, Broadcom's acquisition of Symantec and Thoma Bravo's take-private of Sophos Security. Given the number of undisclosed transactions in the space we expect total capital invested to be considerably higher than shown below.

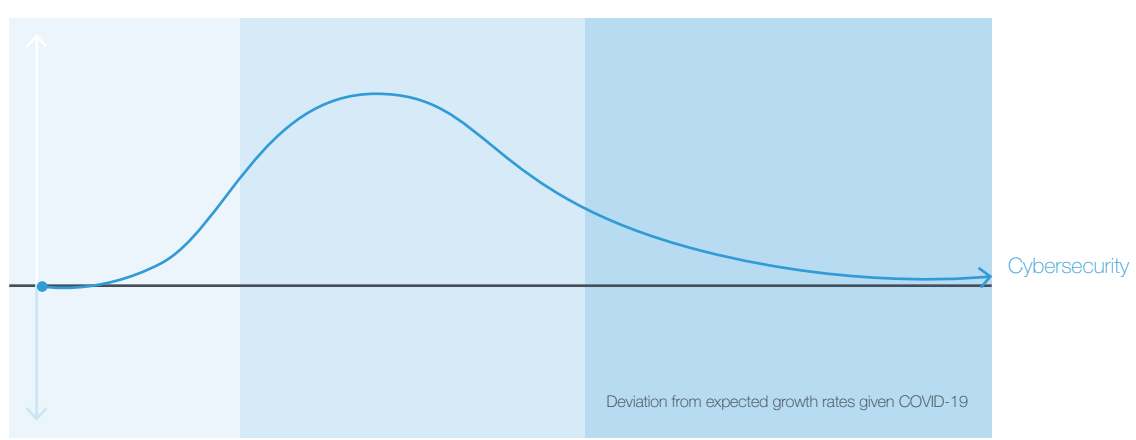


Source: Pitchbook, August 2020, VC, Growth Equity and M&A

MAPPING THE IMPACT OF COVID-19

In this research we look to analyse the impact of COVID-19 on the growth trajectories of specific AI use cases – in doing this we have collated internal research, leveraged our global network of experts and heard directly from companies and entrepreneurs in the space. We hope to provide some insight and rationale into changing market dynamics as a result of COVID. Given the similarity in end-user of the mentioned use cases, we expect the impact of COVID-19 to be consistent – as a result we present a view on the broader trend in cybersecurity below.

- IMMEDIATE SHOCK**
Some uptick in demand given crisis
- MID-TERM RECOVERY**
More rapid growth given a renewed focus on the importance of cybersecurity
- SYSTEMIC TRANSFORMATION**
Long term regression to previous growth trend



GDP level indexed to 1st of January 2020



THE DRAKE STAR OUTLOOK




Cybersecurity

- **Immediate Shock:** Slow uptake to AI-powered cybersecurity solutions as more traditional vendors capture immediate demand from COVID – accelerating towards the end of the period as security teams review their defense architecture in light of the pandemic.
- **Mid-term Recovery:** Renewed focus on cybersecurity at an executive level and enhanced awareness of the threats posed by zero-day attacks and 'unknown unknowns' will increase demand over the mid-term. Growth will be somewhat muted due to the economic consequences of the pandemic.
- **Systemic Transformation:** Long term we expect a limited impact on cybersecurity – AI companies in this space are highly likely to continue on their previous growth trajectory.

THE IMPACT OF COVID-19 ON THE CYBERSECURITY THREAT

Over the past 6 months, the COVID-19 pandemic has forced businesses and consumers alike to embrace change; remote working and social distancing being the major ones. With the attention on the health crisis, the threat posed by cybercriminals has undoubtedly increased, with criminals ultimately aiming to exploit the widespread uncertainty caused by the crisis.

Increased security risk from remote working and delays in cyber-attack detection and response due to reduced communication have contributed to the rapid increase in the cyber threat. Below we highlight some eye-opening statistics on the incidence of cyber attacks during the COVID-19 pandemic.

-  667% increase in spear-fishing attacks from Feb 2020 to May 2020
-  50.1% of companies name "cyberattacks and data fraud due to a sustained shift in working patterns" as the greatest COVID-related risk
-  71% of security professionals report increased security threats or attacks since the COVID-19 outbreak

Source: Forbes, World Economic Forum, Tech Republic



Q&A

WITH



RALF PHILIPP HOFMANN

Managing Partner, Drake Star Partners



An interview with Ralf Philipp Hofmann – a Managing Partner at Drake Star and lead advisor on Avira's recent sale to Investcorp

What is the M&A market like for cybersecurity businesses at the moment?

The M&A market for cybersecurity software companies remains very active and dynamic - the industry is continuously consolidating. This is driven by the attractiveness of innovative players with an enormous growth trajectory and established players generating very high margins. Strategic buyers look at economies of scale. PEs have been very active in the space and continue to execute numerous transactions, such as the taking private of Sophos by Thoma Bravo or the acquisition of Avira by Investcorp.

How do you expect M&A to be impacted by the COVID pandemic?

We have seen an enormous number of transactions being closed over the last months, involving both strategic buyers and sponsors. Cybersecurity companies have proven to be particularly robust in this environment. Both strategic players and financial investors have enormous funds available and I expect that cybersecurity M&A will continue to be very active.

What impact did the pandemic have on the Avira/Investcorp process?

At the beginning of the lockdown there was obviously a lot of uncertainty in the market. However, it became apparent very quickly that Avira was going to be very successful even in this uncertain environment. Selecting Investcorp with their track record and experience in cybersecurity proved to be the right decision.

What are the key lessons learned from this transaction?

In an uncertain market environment a company's quality and business model is even more important. Teaming up with a highly experienced investor with a long industry track record who is not easily deterred from pursuing its long-term strategy makes a real difference.

TRANSACTION HIGHLIGHTS

- Leading European cybersecurity software company sold to Investcorp Technology Partners for \$180m
- Represents the first institutional investment in Avira since it was founded in 1986
- Investcorp have established a market leading position of investing in technology companies with a specific focus on IT Security

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Citations and sources are available upon request through <https://www.drakestar.com/contact>. Interviews were conducted by Drake Star Partners via email correspondence between June and September 2020.

5

OTHER VERTICALS



IMPACT OF AI IN OTHER SELECT VERTICALS

A decorative graphic in the bottom right corner consisting of several white parallel lines that are slightly curved and angled upwards.

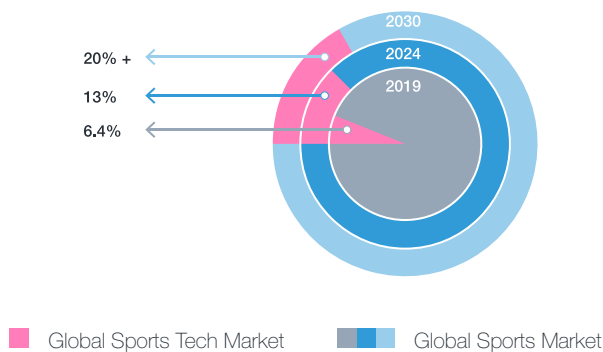
5.1 SPORTS TECH

Following the release of our inaugural Sports Technology report in April, we have chosen to explore the impact of AI on the Sports Tech industry. Whilst the sports industry has historically been relatively slow in its uptake of technology, AI remains disruptive in the space with enormous potential. Before considering the impact of AI on sports it is first important to understand the market and key growth drivers in sports technology today.

THE GLOBAL SPORTS TECHNOLOGY MARKET

The convergence of content and data, amongst other factors, has given rise to a boom in sports tech investment and as a result, the sports tech universe is rapidly growing within the wider sports industry. In 2019, the global sports tech market was forecasted to be worth \$11.0bn, representing 6.4% of the global sports market (\$172bn), and is forecast to grow at 23.1% CAGR to reach \$31.1bn by 2024.

SPORTS TECH VS. GLOBAL SPORTS MARKET

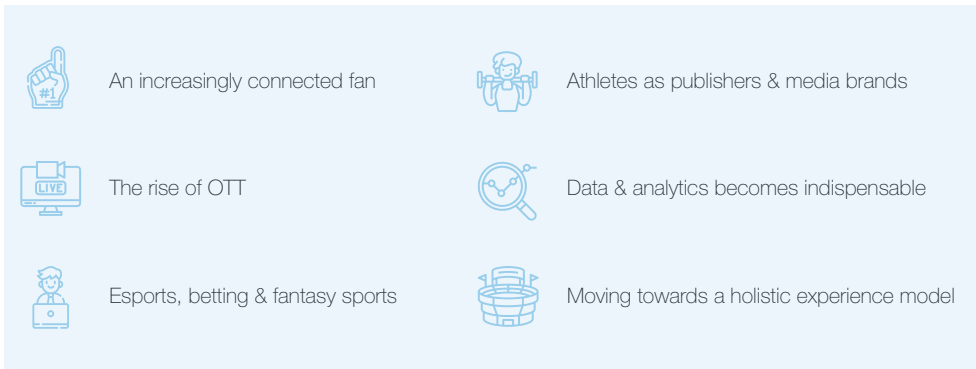


Source: Proprietary Drake Star analysis.

Whilst estimates around the size of the AI market within sport technology are limited, we expect AI technologies to represent a growing proportion of the wider sports tech market. Given its position within the sports tech ecosystem, we expect wider market themes that are shaping the sports tech ecosystem to hold true in the AI space. Below, we present Drake Star's view on the most important market themes relevant to the wider adoption of AI in sport technology. More explanation and analysis around these drivers can be found in the [Global Sports Technology Report](#).



KEY MARKET THEMES IN SPORTS TECHNOLOGY

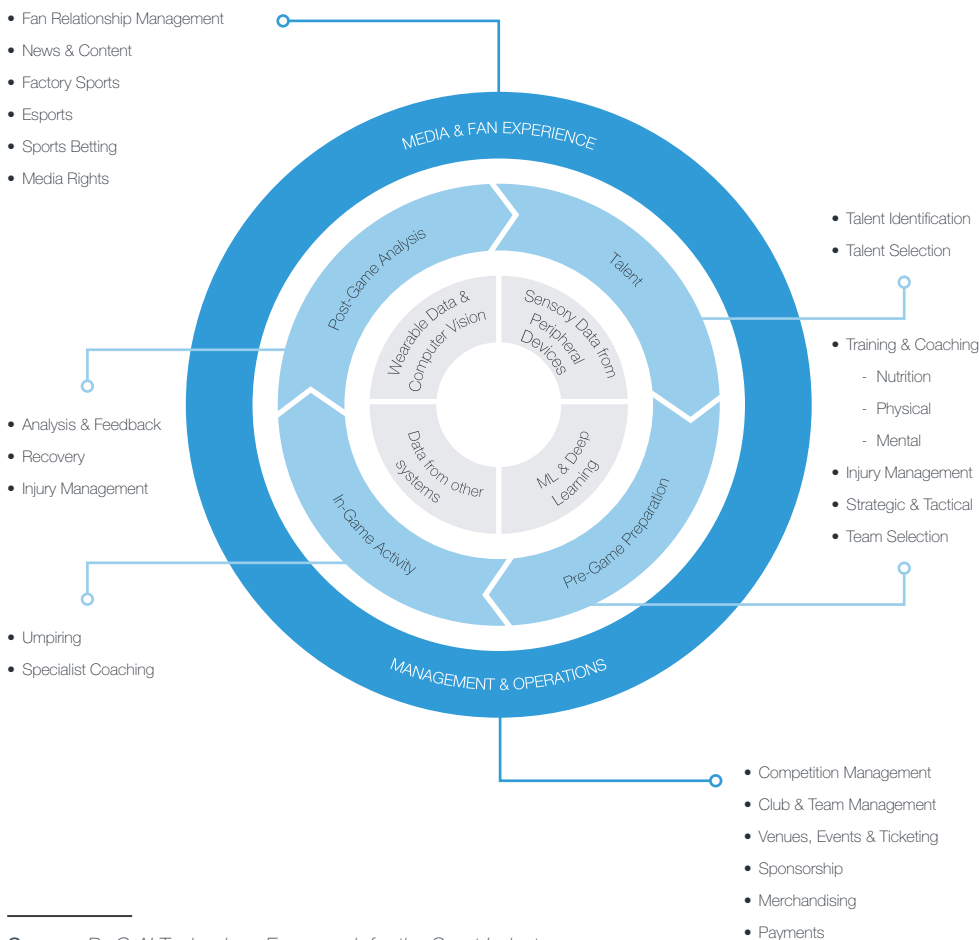


AI in Sports Technology

AI is seeing increasing adoption in sports technology across all major stakeholder groups and is set to continue on this trend over the next decade. Fundamentally, AI requires an abundance of data, something the world of sports offers in vast quantities. Companies that can take this data and make it useable (particularly relevant for unstructured data such as video footage) can leverage AI to deliver actionable insights and improvement opportunities for players, clubs, leagues and media rights owners.

Recent PwC research highlights some of the key use cases for AI in the sports industry. We have chosen to focus on three specific use cases where we believe AI has the greatest potential and where the greatest opportunities exist for stakeholders in 2020 and beyond.

AI USE CASES IN SPORTS TECHNOLOGY



Source: PwC AI Technology Framework for the Sport Industry





#1. COACHING & ATHLETE PERFORMANCE

Athlete performance & injury prevention

In the sports industry today, teams and players are increasingly leveraging every possible advantage to improve performance, monitor fitness and prevent injuries. Data aggregation and monitoring technologies have become highly sophisticated, with players recorded and analysed by cameras, sensors and wearables to understand every aspect of their game. Advancements in wireless technologies, real-time visualisation and RFID tagging, all underpinned by the aggregation and analysis of big data, mean the most granular details of player performance can be monitored in real-time or near real-time. Performance monitoring also extends off the field to pre-game preparation and post-game recovery, from nutrition and sleep monitoring to injury rehabilitation and prevention.

AI underpins this shift in focus and can be leveraged to create automated health assessments and more precise recommendations around injury prevention. Pattern recognition utilising data captured in training and matches can help physios and doctors to understand an individuals injury risk as well as identify illness. Steps can then be taken to reduce this risk by adjusting and personalising the intensity and type of training completed by each player.

Zone7 is an AI-powered sports technology company focused on reducing injury risk. The company's technology uses data collected from wearable devices and medical profiles to create personalised profiles to predict injuries and recommend optimal training drills and intensity levels.

 <hr/> <ul style="list-style-type: none">  2017  21  VC Backed, \$2.5m raised to date  Coaching & Athlete Performance  B2B 	 <p>PALO ALTO</p> <p>BUSINESS DESCRIPTION</p> <p>Zone7 helps athletes, coaches and medical professionals bridge the gap between maximum performance and injury prevention. The company's platform uses AI-driven pattern recognition to predict injuries and simulate how changes in training will impact performance and injury probability.</p>	<p>KEY PERSONNEL</p> <p>Tal Brown – Co-Founder & CEO Eyal Eliakim – Co-Founder & CTO</p> <p>KEY INVESTORS</p> <p>AMICUS PLG RESOLUTE VENTURES upwest</p>
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Coaching and match analysis

Combining individual tracking with detailed event data can provide a more complete picture of the sequencing of events in game, leading to improved insights on team performance and tactics. Performance visualisation software has enabled coaches and management to get an enriched understanding of patterns of play, tactics and individual decision-making, both live and post-game.

AI is particularly useful in turning unstructured data (mostly video footage) into structured data, providing coaches and performance teams with previously unavailable data points and insights. Stats Perform is a leader in AI-assisted performance improvement and computer vision in sports more broadly, providing solutions in team performance, betting and broadcasting. The company works with over 500 professional teams around the world and has a leading match analysis product, Edge Analysis, that helps football analysts build an improved understanding of the opposition through AI-powered insights.







-  1981
-  1,120
-  PE Backed
-  Data & Sponsorship
-  B2B



CHICAGO

KEY PERSONNEL

Carl Mergel – CEO
Ashley Milton – CFO
Mike Perez – COO

KEY INVESTORS



BUSINESS DESCRIPTION


Stats Perform is a leading provider of sports data, technology, and content designed to meet the evolving needs of media, broadcasters, leagues & teams, fantasy providers and players, as well as major B2B and B2C brands. The company's sports data, technology, and content include sports data collection, processing, distribution, web applications, broadcast enhancements, hosting, wireless applications, online statistics, scouting reports and research tools.

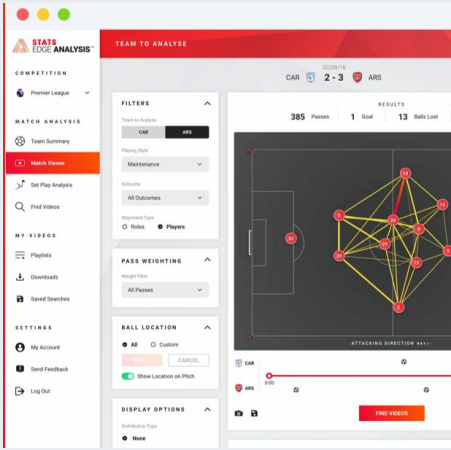
Case Study

Croatia National Team & Edge Analysis

Edge Analysis was used in the 2018 FIFA World Cup by Croatia's National Team, for a tactical analysis of France's star players. This enabled the Croatian Team's analysts to present information on their opponents in an extremely quick turnaround from the semi-final to the final. This provided the Croatian National Team with invaluable insight on how the French team played direct, counter-attacking football

Over the last decade the number of analysts working for sports teams has increased exponentially with now almost every team having an analyst (compared to only 1-2 analysts at the top-level clubs in 2010).








Source: Statsperform

Sportradar is an equally competitive player in the space, providing solutions to leagues and federations, rights holders and betting providers with select use cases focused on preventing match-fixing, leveraging content for OTT platforms and enabling rights holders to better understand their data.



-  2001
-  1,547
-  PE Backed, \$98.5m raised to date
-  Data & Sponsorship
-  B2B






ST. GALLEN

KEY PERSONNEL

Carsten Koerl – Co-Founder & CEO
Petter Fornæss – Co-Founder & MD
Technology

KEY INVESTORS



BUSINESS DESCRIPTION

Sportradar is a global leader in understanding and leveraging the power of sports data and digital content for media companies, bookmakers, sports federations and state authorities around the world. Partnering with over 1,000 companies in more than 80 countries, the company has positioned itself at the intersection of the sports, media and betting industries, and was acquired by CPPIB and TCV in July 2018 for €2.1bn.



#2. FAN ENGAGEMENT

Today, the fan ecosystem has become highly globalised, hyper-digitalised and fully connected. Advances in technology and a general shift in the media consumption landscape has empowered sports fans and raised expectations. Fans now require an omnichannel experience that satisfies their need for more – more information, more stats and more footage – accessible at any time on any device or platform.

AI can help sports teams, leagues and media rights holders to help meet this need through delivering live and on-demand content in a cost-efficient way. AI technologies, particularly computer vision algorithms, can streamline the production workflow and provide high-quality broadcasting solutions. Algorithms deployed at the edge can track the field of play, insert advertising and identify highlights without the need for human intervention.

Ultimately, AI deployed in this way will increase the quality and quantity of content that clubs, leagues and players can provide to fans in mainstream sports. We also expect this to extend broadcasting opportunities to niche sports and youth sports, enabling media rights holders to more efficiently monetise highly engaged sports fans. Pixellot is one such company making headway in the field, providing AI-powered solutions for tier 2 broadcasting in clubs and schools among other use cases such as coaching and analytics.

 <hr/> <ul style="list-style-type: none">  2013  99  VC Backed, \$68.1m raised to date  Fan Engagement  B2B 	 <p>PETAH TIKVA</p> <p>BUSINESS DESCRIPTION</p> <p>Pixellot's automated sports production solutions are revolutionising traditional video capture, production and distribution, enabling organisations to affordably broadcast and monetise sporting events. The company's technology streamlines the production workflow by deploying an unmanned multi-camera system in a single fixed rig, covering the entire field of play. Utilising AI-powered auto-production algorithms, the platform can track the flow of play, identify highlights, create replays and insert advertisements.</p>	<p>KEY PERSONNEL</p> <p>Alon Werber – CEO Gal Oz – Co-Founder & CTO Peter Schon – CFO</p> <p>KEY INVESTORS</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">   </div> <div style="text-align: center;">   </div> </div>
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#3. DATA ANALYTICS AND SPONSORSHIP

Until recently, a significant gap existed between the requirements of brands in terms of audience engagement and measurement, and what digital assets rights-holders offered in sponsorship packages. Brands are no longer interested in solely raising awareness; they are increasingly seeking to create deeper engagements with fans, largely through the application of data and analytics. As a result, we are seeing the evolution of sports sponsorships into those of partnerships between brands and right-holders. Artificial Intelligence is contributing to this evolution by better enabling the measurement of ROI of broadcasting campaigns in real-time.

IdenTV are leveraging AI to help clients improve analytics and measurement of their broadcast marketing efforts. The company's technology uses automated content recognition (ACR) to understand brand recognition and placement, generate dynamic advertising triggers and employ play-out verification and royalty tracking.







-  2013
-  21
-  Accelerator/
Incubator Backed
-  Data & Sponsorship
-  B2B



SAN FRANCISCO

KEY PERSONNEL

Mohammad Shihadah – Co-Founder & CEO
Amro Shihadah – Co-Founder & COO

KEY INVESTORS



BUSINESS DESCRIPTION

IdenTV is a leading video analytics technology company with use cases including content recognition, content indexing, in-video search, video security and more. The company's media solution provides real-time video search and content management tools for broadcasters to enable effective video content monetisation.

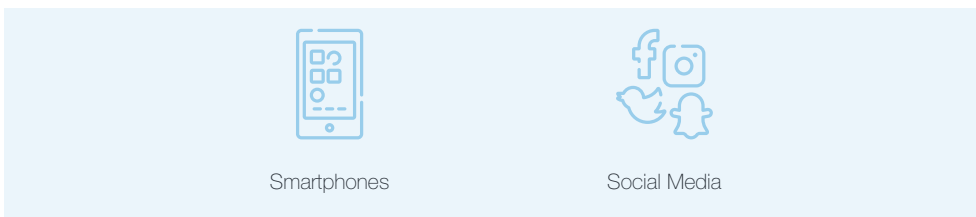
Given the abundance of data in sports, the potential of AI to empower athletes, coaches, teams, leagues and fans is extraordinary. As computer vision algorithms improve, the availability of highly accurate datasets with not seen before datapoints will enable the ecosystem to gain from enhanced insights across the entire value chain. At an athlete and team level, the availability of data will incrementally improve individual and team performance and provide insights that have been until now unavailable. On the other side, AI serves to ultimately improve the fan experience through enabling engagement with niche and amateur sport as well as enhancing content and automating content production. What remains to be seen is the pace of adoption of these technologies over the coming years.



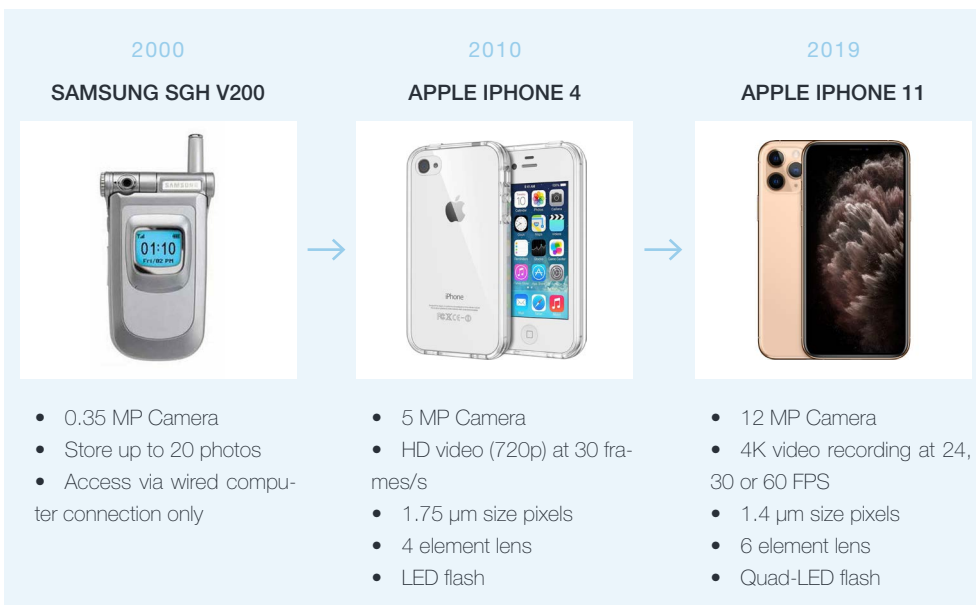
5.2 VISUAL CONTENT

Visual content is rapidly becoming an increasingly important medium for businesses in almost every industry across marketing, branding and communications. Largely this is driven by consumer behaviour over the last 15 years – we are creating more and more visual content and hence expect content from brands and retailers to be delivered in the same way. Fundamentally, the explosion of visual content over the last 15-20 years comes down to two main drivers: the development of the smartphone and the rise of visual-content focused social media.

KEY DRIVERS BEHIND THE VISUAL CONTENT EXPLOSION



Relative to digital cameras, smartphones provide a vastly improved user experience, simplifying the content creation process and providing a generally more convenient solution. As the quality of the cameras in smartphones have improved (see below), more and more people have been able to edit and share content and as such visual content has become a hugely important medium for consumers.



Source: Company website



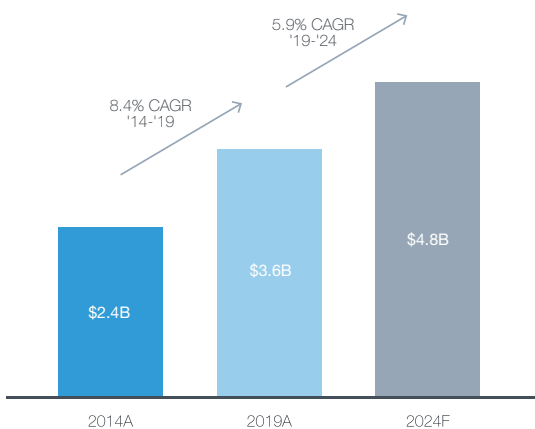
Alongside an enhanced capability for visual content creation, social media has enabled the rapid adoption of imagery and short-form videos for entertainment, marketing and branding purposes. Visual content-focused social media platforms, in particular Instagram and Snapchat, are enormously popular, with Instagram reaching over 1bn users in 2018. Given the rapid growth of these platforms and the high levels of engagement shown by individuals, these platforms have become an important focus for marketing and communications teams in order to better reach and engage with customers.

Given Drake Star's experience in the space, most recently advising on the landmark sale of Freepik to EQT, we have chosen to explore the impact of AI on Visual Content. Broadly, we define visual content for the purposes of market sizing as being comprised of 5 segments; stock images, stock video, micro-stock imagery and other adjacent parallels including templates and PSDs (Photoshop Design Files). Whilst the visual media space is often considered a somewhat creative industry, we expect AI to increasingly penetrate the market and become a key part of the ecosystem – particularly in helping brands create, manage, publish and analyse visual content.

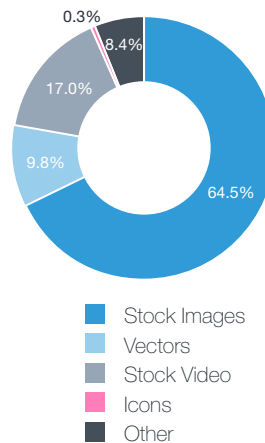
THE GLOBAL VISUAL CONTENT INDUSTRY

We estimate that the global visual market was worth \$3.6bn in 2019, with revenues split between Stock Images (65%), Stock Videos (17%), Vectors (10%), Icons (0.3%) and other (8%). The market is forecasted to experience growth, increasing to \$4.8bn by 2024 at an estimated 5-6% CAGR.

VISUAL CONTENT MARKET SIZE (\$BN)



SECTOR BREAKDOWN 2019



Source: Drake Star Analysis

Whilst estimates around the size of the AI market within visual content are nascent, we expect AI technologies to represent a small but growing proportion of the wider market.

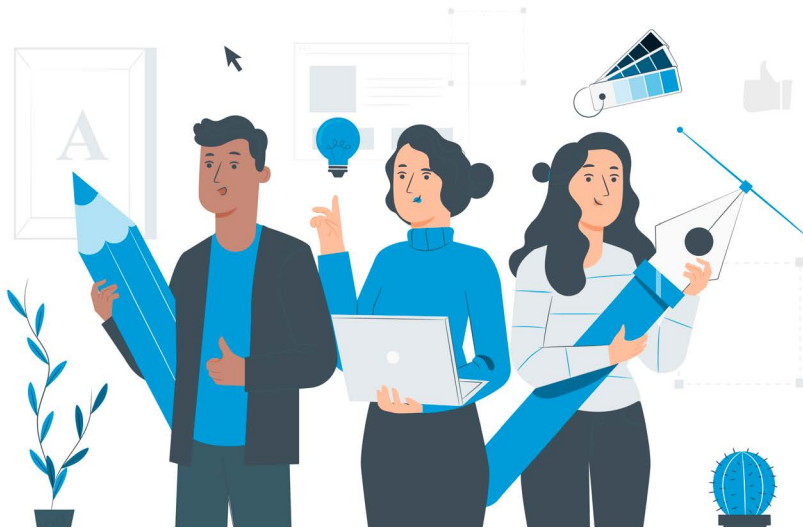
AI IN VISUAL CONTENT

The visual sector is already experimenting with AI technology providing some insight into the potential for a radically different future for the industry. AI is often not associated with creative industries yet in recent years it has been embraced by the visual sector as an effective tool to augment the creative process, reducing time spent on low-value-add yet resource-intensive tasks to free up professionals to focus on creativity and innovation. According to research by Adobe, 74% of creatives say they spent more than 50% of their time on non-creative tasks.

Our selected use cases focus on some of the major applications of AI in the visual content space. Initially we focus on how AI can optimise content management and enable more efficient and more effective content creation. We also look at visual content analytics with AI enabling brands and retailers to better understand changing customer behaviour, improve market segmentation and understand brand engagement and sentiment. Our final use case is less developed but one that will likely increase in importance over the next decade – AI-assisted design, photography and stock imagery. Whilst this is currently being explored by the major players in the space



(such as Adobe), we expect this use case to grow in importance as a part of the broader visual sector.



Source: Stories by Freepik

#1. VISUAL CONTENT CREATION & MANAGEMENT

In an increasingly mobile-first and social media driven world, the focus for audience engagement has shifted significantly towards visual content. Creating a highly compelling visual content strategy is a major challenge for brands yet key to engage, convert and retain customers. Given the importance of visual content as a marketing strategy today, imagery that accurately reflects a company's brand is essential yet sometimes difficult to find.

AI technology can help brands cut through the noise, utilising computer vision to tag images and videos in a fraction of the time capable through manual processes. Integrating AI into content management systems enables improved search accuracy and findability, automated content generation and improved personalisation.

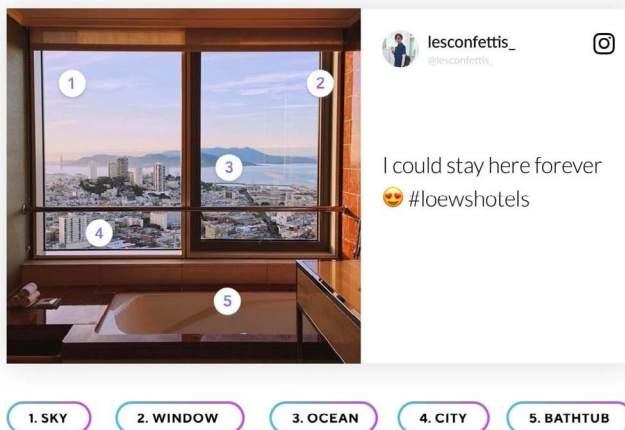
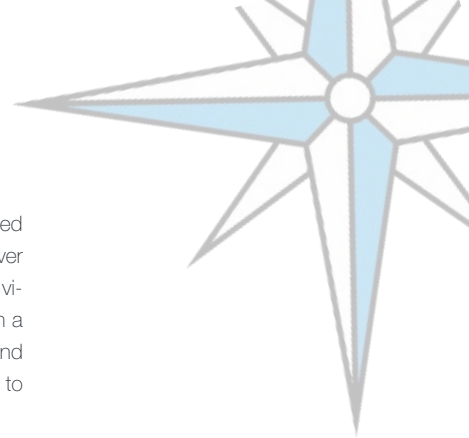






Image Tagging and Visual Search can enable content teams to identify relevant content faster and cost-effectively

Source: Tint





AI can also be particularly useful in leveraging user-generated content (UGC). UGC is content that is generated by customers and is widely considered the 'truest' form of content with a strong sense of social proof. However it is not easy to find – AI can help marketing teams find high-quality, authentic and on-brand UGC. Utilising visual search and predictive analytics, AI can identify and curate user-generated content for marketing teams in a highly cost-efficient way, without marketers having to scroll through Instagram or other social media sites to find high-quality content. Tint is one such platform – enabling the entire UGC production process from collection to rights management to publication.

 <hr/> <ul style="list-style-type: none">  2013  37  PE Backed, \$0.4m raised to date  Visual Content Creation & Management  B2B 	 <p>SAN ANTONIO</p> <p>BUSINESS DESCRIPTION</p> <p>Developer of a user-generated content (UGC) marketing platform designed to offer engaging content for brands and marketing teams. The company's platform manages the full production cycle from content curation to rights management, providing a seamless and efficient way for brands to find high-quality UGC.</p>	<p>KEY PERSONNEL</p> <p>Sameer Kamat – CEO Stuart Thompson – Global Director</p> <p>KEY INVESTORS</p>    
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AI can also be used by e-commerce sites, visual content platforms and content marketplaces. Visual content platforms can utilise AI to both improve search functionality via image tagging as well as deliver enhanced content recommendations based on an understanding of previous customer behaviours and similar products or imagery. Canva for example, has a rapidly growing machine learning division, with an initial focus on improving customer personalisation through enhanced recommendations and search functionality.


#2. CONTENT ANALYTICS






With the rapid growth of visual content in marketing and brand communications, understanding, identifying and quantifying changing cultural trends and attitudes towards brands is becoming increasingly complex. Brands that fail to analyse and consider visual content in forming their marketing and content strategies are missing important information about how customers engage with their products and services. With the rise of influencer marketing this is becoming increasingly apparent, brands need to fully understand their exposure and reach on social media.


Given the unstructured nature of visual content as a data type, AI can automate visual content discovery and analysis, helping marketing teams understand how their brand is presented online. Further, analysis can be conducted on competitors to help marketing teams identify niches and optimise positioning towards important target demographics or specific personas. Codec is one such company, providing a technology platform that understands 3rd party content across text, imagery and video and can identify audiences based on common interests or personas as opposed to demographics. This enables content marketing teams to more accurately target their audience with content that is highly relevant to them. Their platform also enables brands to understand how different content impacts sentiment and engagement across social media platforms and the traditional web. The company works with high profile clients such as Unilever, Diageo and Nespresso and claims extraordinary results, doubling revenue for Eve, a rapidly growing DTC mattress company, in just 30 days.







-  2015
-  157
-  Accelerator/Incubator Backed, \$1.8m raised to date
-  Content Analytics
-  B2B



LONDON



KEY PERSONNEL


Martin Adams – Co-Founder & CEO
Tom Blah – COO

BUSINESS DESCRIPTION

Developer of a content marketing intelligence platform. Using AI, Codex develops advanced audience insights based on millions of digital engagements in real-time. This provides brands with a unique view of their audience - their personalities, the people and brands that influence them and the visuals that define them.

KEY INVESTORS



#3. AI-ASSISTED DESIGN & PHOTOGRAPHY

AI can be used to augment the creative process; suggesting alternative designs, standardising imagery based on brand guidelines and enhancing photo and video editing tools, all to improve quality whilst optimising resources. Adobe have made great headway in this space through its Adobe Sensei product suite, with smart crop, content-aware fill and enhanced search functionality.

Case Study

Creating 7 million unique product packaging designs using AI

Nutella have experimented with AI-assisted design in their marketing campaigns, using AI to power it's 2017 'Nutella Unica' campaign whereby an algorithm developed 7 million entirely unique packaging designs for 7 million individual jars.

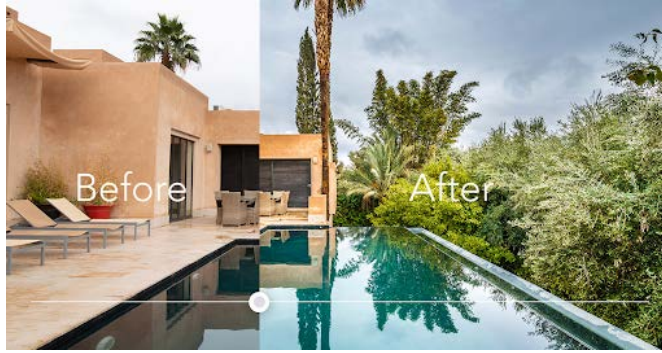




Source: EmbalagemMarca












Whilst there have been developments in the corporate space, the startup ecosystem in AI for design is still relatively small – we expect new challengers to emerge focusing on both the creation of visual content and the augmentation of the creative process. Meero is one of the major players in the space providing a platform for brands to discover and commission high-quality photography and video. With the help of AI, the platform can process millions of photos per second, providing automatic image enhancement to the standard of a professional retoucher and reducing post-production time to just 24 hours. Further, their deep learning algorithm can extract valuable visual attributes from photographs to improve search functionality within the Meero database.





Meero's AI-powered image enhancement software can reduce post-production to just 24 hours

Source: Meero

 <hr/> <ul style="list-style-type: none">  2016  1,128  VC Backed, \$282.8m raised to date  AI-Assisted Design & Photography  B2B/B2C 	 <p>PARIS</p> <p>BUSINESS DESCRIPTION</p> <p>Meero operates an on-demand photography platform designed to help photographers grow their business and skills. Meero uses AI and machine learning to reduce post-production times on the platform to just 24 hours, providing an outstanding level of service at scale.</p>	<p>KEY PERSONNEL</p> <p>Thomas Rebaud – Founder & CEO Chris Bourdeu – CFO</p> <p>KEY INVESTORS</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="817 943 916 1061">   </div> <div data-bbox="959 943 1110 1061">   </div> </div>
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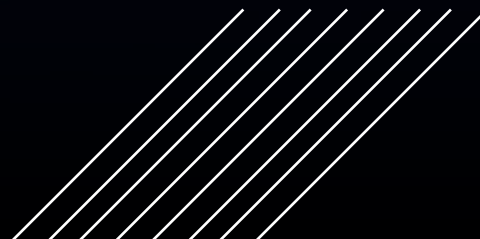


6



GLOBAL AI INDEX

A RACE TO THE TOP





6. THE GLOBAL AI INDEX

UNDERSTANDING AI ON A GLOBAL SCALE

Across the world, governments, corporates, researchers and the wider public are beginning to adapt to the rapid development of AI and further understand its role in society. Certain countries, notably the US and China, are already surging ahead in the race for AI supremacy whilst others are being quickly left behind. The Global AI Index, developed by Tortoise Media, provides a quantitative view on the major players in AI and how this dynamic will change over the coming decade. Initially this chapter will present an introduction to the index, and an interview with its creator, Alexandra Mousavizadeh, a Danish Economist and Partner at Tortoise Media. We will then briefly explore Israel in the context of AI development and its place in the global AI landscape. Finally, we will explore a case study around Montreal and the success it has had in developing a thriving AI ecosystem.

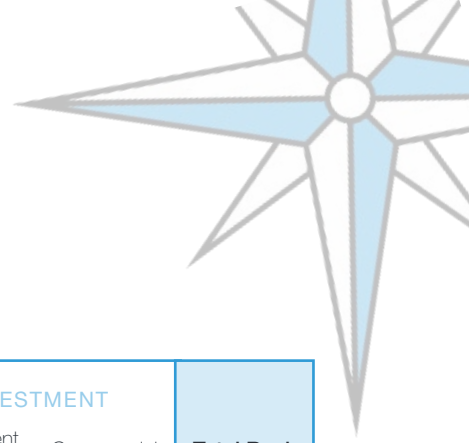
The Global AI Index ranks 54 countries on their AI capability and potential around three core pillars; investment, innovation and implementation. These are then further broken down into seven key indicators; talent; infrastructure; operating environment; research; development; government strategy; and commercial ventures. Each indicator is weighted for importance following consultation with a network of experts from academia, business, public policy and infrastructure.

Key findings

- Despite US and Chinese firms near equal representation in terms of venture capital, the AI Index finds that the US is an undisputed leader in the space, due largely to its superior research quality, talent and availability of truly private funding. As China ramps up investment in AI, however, experts believe that it will overtake the US in as little as 5 -10 years.
- Due to China's focus on the AI space in recent years, it has emerged as the fastest-growing country in AI. The Chinese government has taken a particular interest in facial recognition technology and its potential policy implications - in 2018, 85% of facial recognition patents filed globally were filed in China.
- China has stated that it plans to invest more than \$22bn into AI research and development over the next decade. Due to the current coronavirus epidemic, China may have to divert funds to continue fighting the outbreak, which could have implications on their investment in the near term.
- The UK currently sits in the highly-competitive third-place seat in the AI Index. Due to its academic reputation and vibrant AI talent base, the country leads Europe in the AI "space race," with over 120 AI companies. However, the UK has a remarkably slow patent application process, which may allow close competitors Canada, Germany, and France to take its spot in the coming years.
- Smaller countries – such as Israel, Ireland, New Zealand and Finland – have developed vibrant AI economies thanks to flexible visa requirements and positive government intervention.
- The Canadian government was the first to outline a national AI strategy in 2017 and have committed significant public money to develop research capabilities across Canada.

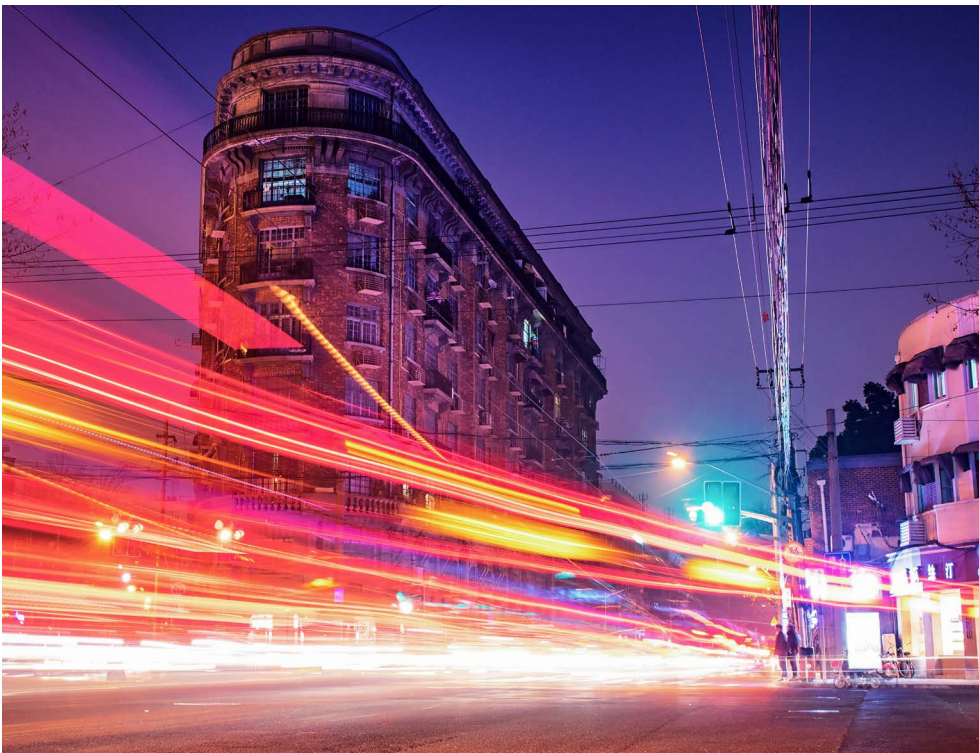
Thanks to Alexandra Mousavizadeh and her team at Tortoise Media for contributing to this section of the report.





Country	IMPLEMENTATION			INNOVATION		INVESTMENT		Total Rank
	Talent	Infrastructure	Operating Environment	Research	Development	Government Strategy	Commercial	
	1	1	6	1	2	13	1	1
	18	3	3	2	1	1	2	2
	5	8	1	3	11	7	4	3
	4	23	5	8	10	4	5	4
	9	12	7	4	12	5	9	5
	8	30	2	12	9	6	7	6
	2	4	39	16	15	30	6	7
	28	5	30	22	3	31	25	8
	26	16	17	6	7	12	8	9
	6	2	28	28	6	42	20	10
	11	32	8	18	4	39	12	11
	13	36	50	5	5	46	3	12

Source: Tortoise Media





We interviewed Alexandra from Tortoise Media to find out more about the Global AI Index

What was the motivation behind the Global AI index?

Artificial Intelligence is an engine of change, for better or for worse. Increasingly, our daily lives are impacted by technologies using machine learning, and businesses are using them to support more and more of their processes.

Our motivation for producing the Index here at Tortoise was to monitor and help explain this change on a global scale. As a news company focused on understanding what forces are driving geopolitical, environmental and social change we knew we needed to focus on Artificial Intelligence. At Tortoise Intelligence, our data and analytics team, the tool for doing this is the composite index.

Of the indicators chosen, which do you think are most relevant for the ranking?

Our overall approach was to represent the fact that:

- Artificial Intelligence is still the product of human intelligence; and therefore talent is a priority. Talented practitioners and developers who can innovate and implement new technologies are hugely important for AI development.
- Research into Artificial Intelligence is also a leading factor; making skilled researchers and the generation of new understandings and techniques is another priority. A leading indicator, and another that impacts the rankings significantly is the number of researchers in top-rated journals in a given country.
- Finally, money remains the primary catalyst for activity on Artificial Intelligence. Talent, and research, come at a premium to businesses and other institutions. So commercial funding as well as the total amount of investment into Artificial Intelligence companies are impactful indicators.

What data sources did use for The Global AI Index?

The vast majority of sources used for The Global AI Index are publicly available and open source; only one of which is proprietary. This was the Crunchbase API, which was drawn on for data in the 'Commercial Ventures' sub-pillar. A full list of the sources used in The Global AI Index is available in the indicator table. Some headline sources are Crunchbase, GLUE, IEEE, GitHub API, LinkedIn and SCOPUS.

What criteria did you use to weight each indicator for importance?

Throughout the course of our consultations with the advisory board, and the many ThinkIns held at Tortoise during the development of the Index, we put together a model for explaining the significance of each sub-pillar in terms of building capacity for Artificial Intelligence. As described, the leading factors were talent, research and investment; mostly expressing that financial and intellectual capital currently trump all other factors.

Our experts were consulted across the full range of indicators, and we reached a consensus on the importance. We recognised that this remains a subjectively constructed set of weightings, which is why we have conducted testing to demonstrate that the impact of the weightings is relatively insignificant compared to the impact of the actual values themselves.

What were the main challenges in creating such an Index?

1. Building up a network of people who are sufficiently knowledgeable to scrutinise and comment on the process.
2. Dealing with a vast number of data points that need to be normalised, and made comparable.
3. Checking the provenance and robustness of the data points.

What do we learn overall from the index?

I think we've learned more about the vast scale of activity on Artificial Intelligence and cut through some of the noise about how and why it is changing the world. We've been able to uncover a lot of information about collaboration between supposed rivals, informal learning of coding and machine learning skills, and the availability and competition for talent.

How do you intend to keep up with changes in AI?

We have planned a bi-annual refresh of the Index, drawing in new values for a range of our indicators to keep the rankings dynamic.

Our series of ThinkIns and events at Tortoise will also continue throughout the year. These represent fantastic opportunities to build upon our methodology and evolve the conversation into new areas.



Also available in video format:
<http://bit.ly/global-ai-report>



6.1 ISRAEL CASE STUDY

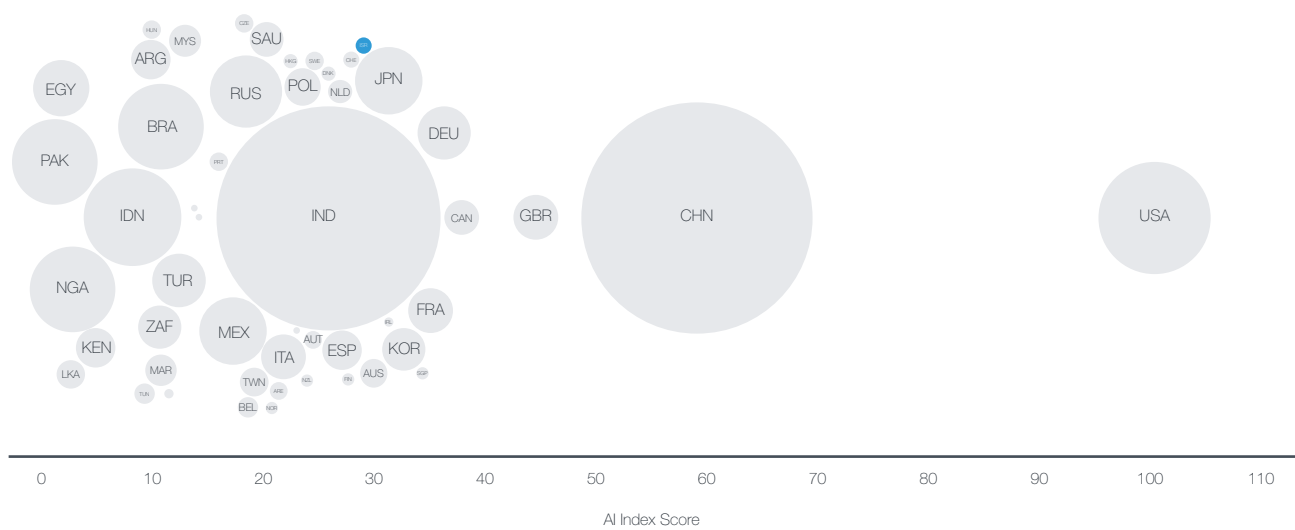
A MAJOR PLAYER IN AI

One country which stands out globally in AI is Israel – widely considered one of the greatest innovators in AI and emerging technology. Despite its stellar reputation, Israel actually scores comparatively lower than one might expect in Tortoise’s Global AI Index – we have spoken with Tortoise Intelligence to look into the data and understand more about their relative positioning on a global scale.

OVERALL RANKING

	IMPLEMENTATION			INNOVATION		INVESTMENT		Total Rank
	Talent	Infrastructure	Operating Environment	Research	Development	Government Strategy	Commercial	
Rank	13	36	50	5	5	46	3	12
Score	18.8	47.5	21.1	32.7	29.6	0	33.1	28.1

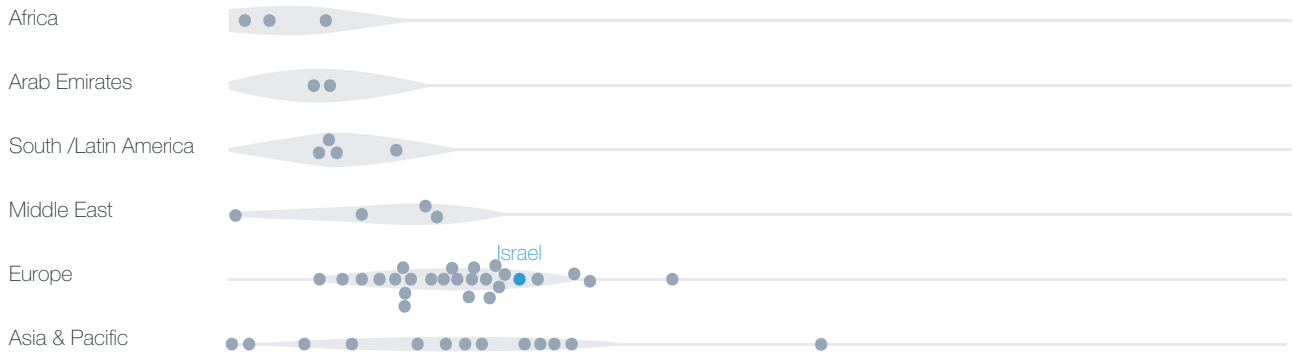
Israel punches well above its weight for size



Source: Tortoise Media



Scoring higher than most European countries



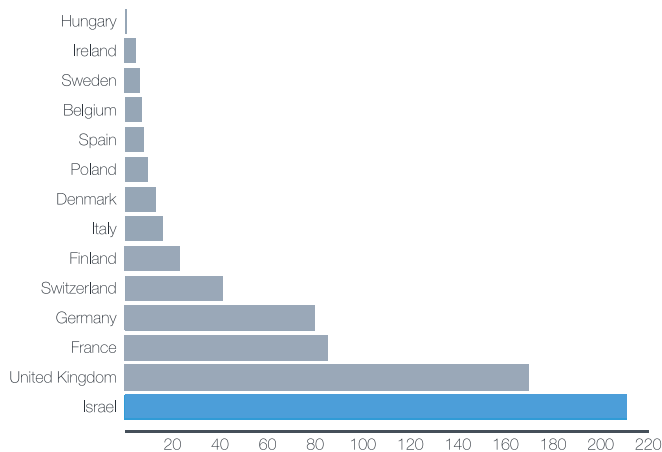
Source: Tortoise Media

Major gains are in private capital and R&D

Israel, widely known as the 'start-up nation', has a clear advantage in R&D and private capital. With the highest total funding to start-ups and sitting at joint 3rd in the number of AI-related patents filed, it is clear Israel has outstanding innovation capabilities.

FUNDING TO AI STARTUPS

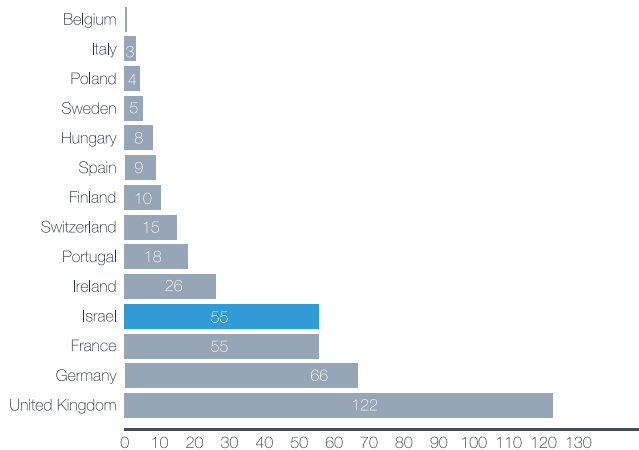
Total funding to all AI-related companies under three years old, \$m



Source: Tortoise Media

NUMBER OF AI-RELATED PATENTS FILED

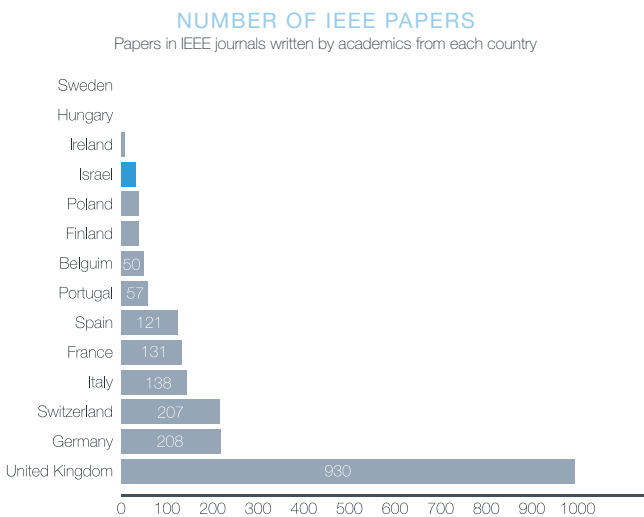
Patent filings by inventors involving AI



Source: Tortoise Media



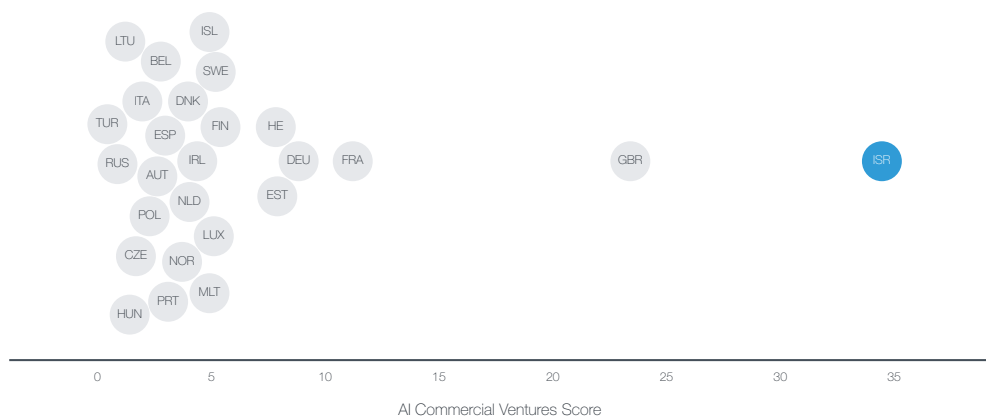
Interestingly while patents filed and AI start-up capital is very high – Israel differs from other AI leaders in its approach. Despite strong R&D, there are lower than expected numbers of university researchers and journal papers in the field coming from Israel. Largely we expect some of this superior R&D capability to be coming through the military – national conscription in Israel has allowed many young professionals to get a first-class education in AI and its application in cybersecurity and defense without a university degree (notably through the infamous Unit 8200). Ultimately we expect this has been a major driver in Israel increasing its advantage versus Europe on R&D.



Source: Tortoise Media

Commercial ventures score versus Europe

Alongside R&D, Israel has a clear advantage in its commercial ecosystem. With the total number of AI startups in Israel estimated at between 500 and 1000 (depending on your definition of Artificial Intelligence), Israel boasts one of the world's most exciting ventures scenes. With major success stories such as Mobileye (Sold to Intel for \$15.3bn), Lemonade (now worth \$3.3bn after an IPO in February) and SentintelOne (valued at \$1.1bn following a \$200m Series E in February 2020) and many more, it is clear Israel will remain a hotbed for venture activity and a target for venture capital and private equity alike. Below is a visual representation of Israel's lead in terms of commercial ventures as ranked per the Global AI Index.



Source: Tortoise Media

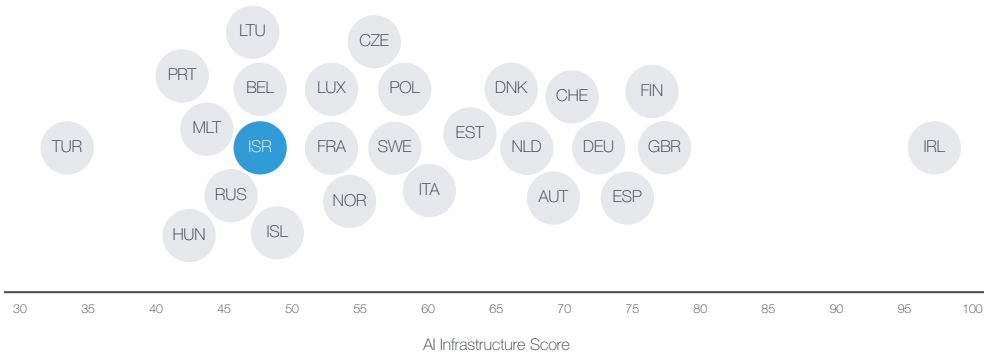
A poor operating environment & lack of government strategy is holding Israel back

Despite Israel's dominance in terms of commercial ventures and R&D, somewhat surprisingly it sits in 11th place in the Global AI Index. Largely this comes down to weaker scores in its operating environment, government strategy and infrastructure. Below we highlight Israel's scores in each of these three areas relative to other European countries.



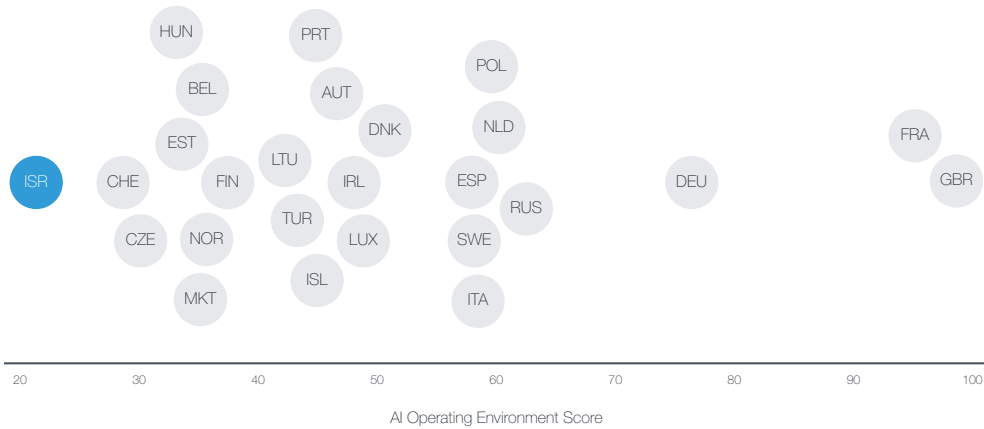


INFRASTRUCTURE



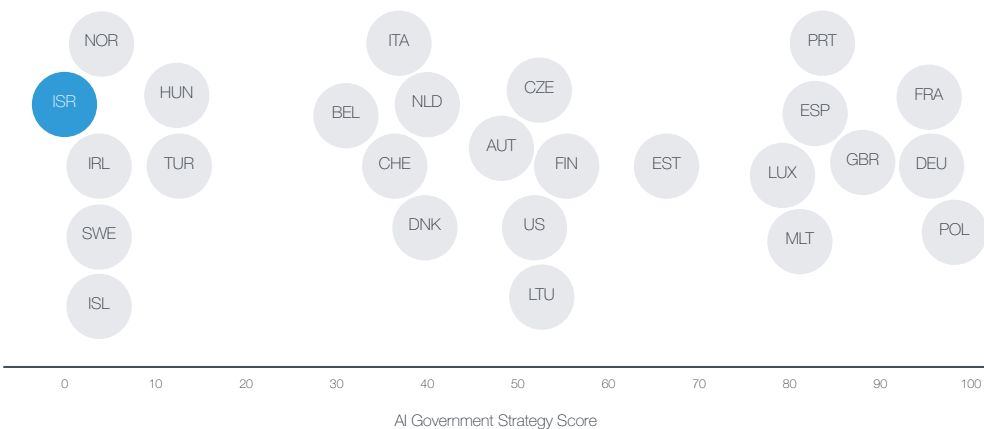
Source: Tortoise Media

OPERATING ENVIRONMENT



Source: Tortoise Media

GOVERNMENT STRATEGY



Source: Tortoise Media

Ultimately, we expect Israel as a country to rise through the rankings on all of these areas going forward, particularly in government strategy and infrastructure. Given the increasing adoption of AI, countries will be required to have a well-documented AI strategy and Israel is no exception. We expect great things to come out of Israel over the coming decade and with the right level of government support, Israel will surely become the world's leading AI ecosystem.

Thanks to Vintage Investment Partners for their insights on the venture capital space in Israel and contribution to this research. To find out more, please see the M&A and fundraising section for an interview with one of the partners at Vintage, Orly Glick.





MERAV WEINRYB
Managing Director at Qualcomm Ventures



Interviewed July 16th, 2020



We interviewed Merav from Qualcomm Ventures to understand more about their investment strategy in AI and 5G

Please provide a brief overview of Qualcomm Ventures

Qualcomm Ventures is the investment arm of Qualcomm Incorporated, one of the largest wireless telecommunications companies that sits at the forefront of 5G. As a corporate venture capital arm, we have a global footprint with a strong presence in established startup markets and have over 150 companies in our portfolio. We invest across emerging technologies where Qualcomm has demonstrated expertise – including areas such as 5G, IoT, AI, robotics, mixed reality, networking, mobile and automotive.

In addition to the financial support we provide to entrepreneurs, we leverage Qualcomm’s technology expertise and powerful network of industry partners to help our companies scale their businesses.

Which sectors are you most excited about coming out of this pandemic and why?

This unprecedented crisis is shining a spotlight on the critical importance of connectivity and 5G in particular. 5G will encourage more innovation and invention and create new industries.

For us the most promising new opportunities are in solutions that leverage 5G’s key benefits (ultra-low latency, higher bandwidth and reliability). Things like virtual gaming, remote education, telehealth, IIoT and AI to name a few, fall into this category of 5G use case applications. In addition, those solutions that help solve some of the problems we’re facing today in an innovative way to help people work, live and stay safe in this new environment, are ones that will continue to be important.

Will COVID-19 impact your investment strategy?

We continue to be strategic with our investments and focus on areas where Qualcomm has an expertise like IoT and mobile core. We also remain focused and disciplined on our overall strategy, which remains the same, and is to invest in areas that are important for our business which include 5G, AI, IoT, auto, mobile, networking and security.

5G is an important area for us in particular. In October of 2019, we launched a new, first-of-its-kind global 5G Ecosystem fund, to invest up to \$200m in start-ups developing innovative solutions across the entire 5G value chain. The focus for the fund is in disruptive innovation across the entire 5G ecosystem, in both enterprise and consumer domains. This includes devices, networking and communications, and applications and services.

We’ll continue to invest in promising startups that can benefit from Qualcomm solutions, in order to help accelerate the adoption of 5G beyond the smartphone and grow the wireless ecosystem – areas key to Qualcomm’s core business.

What specific features do you look for in an AI company when considering an investment?

We’re very interested in Artificial Intelligence (AI), given Qualcomm is well-positioned to provide superior on-device AI solutions and has the ability to enable AI on the edge of the network – i.e., inferencing taking place on the chip itself, rather than the cloud. We are particularly interested in new use cases of edge AI, which can leverage the AI processing capabilities which is part of our platform. The combination of 5G, edge computing and on-device AI will bring new opportunities for service innovation and will enable adjacent markets such as IoT, autonomous vehicles, mixed reality (XR) and robotics.

Qualcomm holds a number of 5G-related companies globally – how important do you see 5G being in the development of AI?

5G will play a central role in extending intelligence from the cloud to the edge, helping to move processing, content, and closer control to the edge to create “edge cloud”. 5G will allow AI to scale to help address the deluge of data from billions of smart connected devices – it will not be practical to send everything to the cloud. As such, we believe 5G will serve as the unifying connectivity fabric for the wireless edge, making it the key to unlocking on-device AI’s full potential. This will be a powerful catalyst for innovation that will transform virtually every industry.





6.2

MONTREAL CASE STUDY

CREATING AN AI ECOSYSTEM IN MONTREAL

Montreal has a growing and thriving AI community. Between academia, incubators & accelerators, investors, global technology corporates, startups and research organisations, Montreal is home to a unique AI ecosystem, with some of the greatest minds in AI globally.

Montreal-based AI companies have raised in excess of \$579m with \$279m raised in 2019 alone. But why is Montreal, a city of just over 1 million people, a world leader in Artificial Intelligence? Based on research by Montreal International, Drake Star Partners have identified six characteristics and initiatives in place in Montreal that have contributed to their success in developing a thriving startup ecosystem centered around Artificial Intelligence.



#1. PUBLIC INVESTMENT

Public investment and funding is highly important for innovation and technological advancement – investing in future capabilities pays dividends when managed correctly and distributed effectively. This has benefited Canada at a national, provincial and metropolitan level. Centrally-led government projects, such as the First Research Excellence Fund, provide significant research funding for Canadian universities and colleges - in 2016 this totaled \$900m of which over \$150m went to universities located in Montreal. Québec has received \$100m over five years for the creation of an AI cluster and \$40m for the Pan-Canadian Artificial Intelligence Strategy.

At a city level, funding is put towards research into AI and is supported by a high concentration of universities and research boards in Montreal. Partly for this reason, Montreal was selected by the Canadian government to be the headquarters for the SCALE AI supercluster with investable capital of \$260m in 2018. The aim is to create a supply chain-focused supercluster (investment and innovation vehicle), dedicated to helping Canadian companies build next-gen supply chains and boost industry performance. This centralised investment vehicle has provided an excellent opportunity for cross-sector collaboration and ensured Canada remains well positioned globally in its AI development.



SCALE AI

- 2017
- 14
- Accelerator/Incubator
- Accelerator
- B2B

MONTREAL

KEY PERSONNEL

Julien Billot — CEO
Clement Bourgogne — COO

KEY INVESTORS

BUSINESS DESCRIPTION

SCALE AI is an investment and innovation vehicle focused on the supply chain. The company offers funding for projects, AI training and education and an accelerator programme for startups across Canada.

#2. GLOBALLY-REOWNED UNIVERSITIES, RESEARCH & PROFESSORS

Closely related to gains from public funding is the academic and research community in Montreal. The city is home to 11 universities including leading institutions McGill University and the Université de Montréal. Both of which were granted \$84m and \$94m respectively from the \$900m Canada First Research Excellence Fund to pursue AI-related research.

Within the research community there is a significant focus on AI with over 300 researchers and 20 world-class AI professors. Montreal holds Canada's largest concentration of university researchers. One such professor is Yoshua Bengio, the winner of the 2018 Turing Award and the most cited computer scientist per day (Montreal International, Sept 2018), widely considered one of the 'Godfathers' of AI. Yoshua is heavily involved in both university-led research at the Université de Montréal and as Scientific Director at the Montreal Institute for Learning Algorithms (MILA). Mila is both a research and educational institution and is globally recognised for its significant contributions to the field of deep learning.

Mila

- 1993
- 303
- Education
- B2C

MONTREAL

KEY PERSONNEL

Yoshua Bengio — Scientific Director
Caterie Pisano — President & CEO

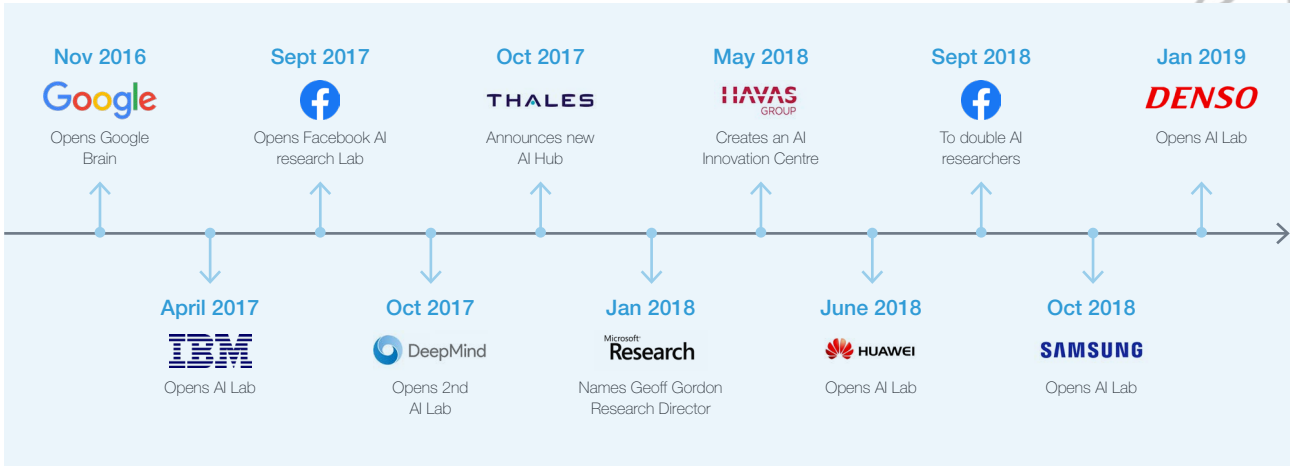
BUSINESS DESCRIPTION

Founded by Professor Yoshua Bengio of the Université de Montréal, Mila is a community of 450 researchers specialising in the field of deep learning. Mila has distinguished itself in the areas of language modelling, machine translation, object recognition and generative models. Since 2017, Mila is the result of a partnership between the Université de Montréal and McGill University, and is in close collaboration with École Polytechnique de Montréal and HEC Montréal.

#3. ATTRACTING MAJOR TECHNOLOGY PLAYERS

Montreal is also home to a significant number of research labs operated by major technology corporates. Google, Microsoft, Facebook, IBM, QuantumBlack and Samsung have all opened offices since 2016 in part due to the abundance of talent in Montreal. The chart below highlights key developments of major tech players in Montreal since 2016.

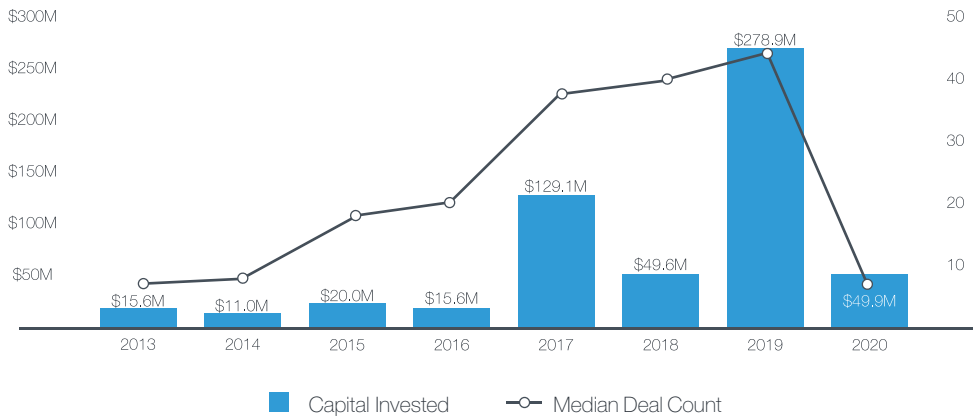




Source: Investissement Quebec

#4. GROWING FUNDRAISING AND STRONG ACCELERATOR/INCUBATOR ECOSYSTEM

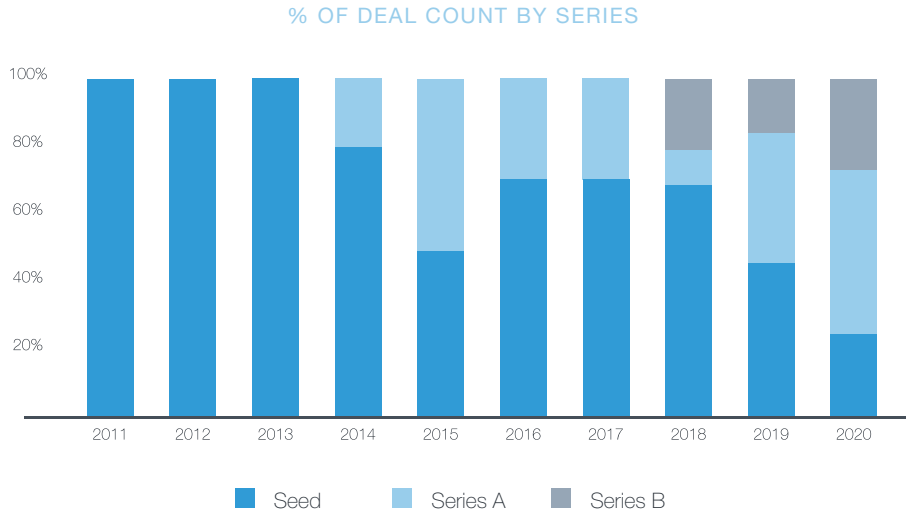
\$579m of investment has gone to Montreal based AI companies, with \$279m invested in 2019 alone - 2019 was dominated by Element AI's \$151m Series B.



Source: Pitchbook, June 2020

Interestingly the increased investment is likely linked to the maturity of the businesses in Montreal. AI companies in Montreal are relatively immature in terms of venture capital – 2019 was the first year where there were seed rounds contributed less than 50% of the total disclosed deals. We have also seen a growing proportion of Series B rounds and therefore expect the capital invested to continue rising – perhaps even at a faster rate than before. Due to a lack of disclosure on all investments and difficulty in categorisation, we estimate that these figures underestimate private investment in Montreal.





Source: Pitchbook, June 2020

Montreal is also home to 30+ incubators and accelerators including a specific TechStars AI incubator and the McGill Dobson Centre for Entrepreneurship. A thriving venture ecosystem attracts high quality talent and further encourages startup growth and venture capital fundraising.

#5. STRONG COMMUNITY & HIGH-QUALITY TALENT

Montreal is one of the most ethnically and culturally diverse cities in the world, with 80 languages spoken and 45% of the population being bilingual. It is also North America's first student-focused city, with over 11 universities and 6 engineering faculties. Over 10% of Montreal's population are students and population demographics are favourable towards technology; an average age of 40 being an important factor. This contributes towards a population focused on innovation and technology, all contributing to Montreal's rapidly developing startup community.

In 2018, an estimated 11,000 students graduated from AI and data-related degrees in Montreal; contributing to the estimated 93,000-strong labor force employed in AI & AI-related disciplines. Further, according to a survey by LinkedIn, there are 14,810 AI experts employed in Montreal (excluding CEOs and Founders) and of these 19% have a PhD and 48% have a Master's degree. The highly skilled pool of talent available in Montreal contributes hugely to the success of the ecosystem.

#6. ATTRACTIVE OPERATING COSTS & INCENTIVES

According to the fDi Benchmark 2018, running a business costs less in Montreal than any other major metropolitan area in North America – median salaries and benefit costs are low. Alongside this, fully refundable SR&ED tax credits from both the Canadian and Quebec Governments (15% & 14% respectively) as well as an attractive tax environment (ETR at 26% in 2019 - relative to 34.6% in New York) provide excellent conditions for startups to reinvest profits and increase R&D spending. Tax incentives are one of the levers that is likely to have an important impact on the AI ecosystem – schemes attract startups from across North America and encourage academics in Montreal to launch their own ventures.

Furthermore, the city also provides incentives to attract foreign researchers. A five-year personal income tax holiday is available to foreign employees engaged in R&D activities in Quebec, providing a 100% exemption from the Quebec provincial income tax for the first two years, then reducing by 25% for the remaining three.





THE MONTREAL STARTUP ECOSYSTEM



Incubators & Accelerators



Research Organisations



*Through a new partnership with Montreal International, Investissement Quebec and Ivanhoe Cambridge, Montreal will serve as a "major innovation and operational centre" for Behavox which is set to open a 400-person Montreal office

Montreal is certainly one of the leading AI research centers globally and has a growing venture ecosystem. The development and commercialisation of AI in Montreal is a testament to highly effective policies at both a national and provincial level. As highlighted by the Global AI Index, Canada continues to be a front-runner in the global AI arms race given its commitment to public funding and tax-related incentive schemes. Effective public policy contributes hugely to the collective growth of the community and has sown the seed for a period of economic prosperity as Montreal continues to grow into a global AI hotspot.



Q&A

WITH

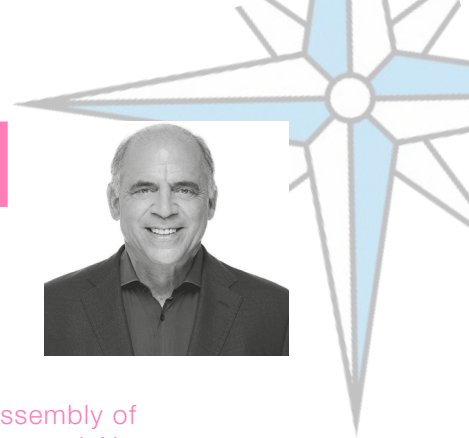


PIERRE FITZGIBBON

Minister of Economy and Innovation, gouvernement du Québec
(Government of Québec)

Québec 

Interviewed July 29th, 2020



We interviewed Minister Fitzgibbon, Member of the National Assembly of Québec, to understand more about their government policy around AI

Why have the governments of Canada & Québec taken a particular interest in AI?

Well, just to put it into context for those who may not be familiar, Québec is the second largest province of Canada and it's comprised primarily of an SME market. We've got 260,000 corporations in Québec, largely focused on entrepreneurship. So I think the government felt that, the ecosystem we have was conducive to promote and boost productivity. This was initiated by the previous government; I've just been in office for two years and we are continuing the same process. But basically, one of the characteristics of Québec is that although we have a lot of SMEs, we were probably under invested in productivity, namely robotisation, automation and the whole digital world of a corporation. So we all felt AI was clearly a tool to boost productivity. This was also anchored on the fact that we have a recognised talent pool, given we have 18 universities, we are multicultural - there's a whole set of attractiveness that the government felt, in Canada and in Québec, we could use to attract talent to complement what we have. So it's a combination but I would say primarily it was a drive to boost productivity, anchored on what we felt were condition precedents that existed on over which we wanted to build. I think so far it's been done with a fairly high level of success, although a lot is to be done yet to, what I call, bridge the AI fundamental research to the lives of corporates in Québec.

What would you say have been the most effective policies in fostering AI innovation?

I would say that it's putting the community of interests together. But first, I think thanks to the Canadian government for the Canada First Research Excellence Fund, which we did through the University of Montreal with IVADO, one of the fundamental research groups. This complemented by Dr Bengio, who was awarded a Turing Award, and by McGill University and University of Montreal that created MILA. So a lot of public funding has been allocated to these two concerns. They were also joined by what we call the Forum AI, which is an umbrella group, which makes sure that we have synergies amongst these fundamental research groups. We have now numerous fundamental researchers who got attracted by Dr. Bengio. We also have Hugo Larochelle, Joelle Pineau and other researchers, besides Yoshua. So I think this umbrella on the fundamental research is very important.

Given the fact that Québec is largely a start-up environment with a lot of entrepreneurs, that also fuels a lot of new entities. You mention Mr. Gagné from Element AI and there are numerous others. So I think we were able, and we are able to get the synergies between the start-ups, between the researchers and education, of course and we also have some corporate labs under the big names of the world, Google, Samsung, Airbus, Thales. They all have corporate labs [in Québec] and we were even able to create a geographical ecosystem - what I would call an innovation zone.

It's called Mile-Ex and it's an acronym for a part of the city of Montreal, which was almost defunct in terms of activity, and got rejuvenated by having Dr. Bengio there, some start-ups and corporate labs. So you can imagine if you're coming out from University and you end up in an ecosystem where you have access to these great researchers, you have access to the corporate labs of Google or Samsung it's very, very interesting and stimulating. I would say that's probably the condition precedent that allowed us to fuel this momentum, which we have as we speak.

How connected are the Québec government with AI research organisations, universities and startups?

Well, this is one of the things that surprised me the most. I wouldn't qualify myself as someone technology savvy, but I have been working with technology. I was involved in the wireless world and spent 7 years in the Telecom industry touring the world, although based in Asia. At the time, I would see corporations keeping a close guard of their technology. I'm amazed to see how open source and how openly these new technologies are developing. When I talk about Mile-Ex, which is a physical location, I've been there quite regularly because I find it stimulating, I'm amazed to see the Thales of the world, the Airbus, Samsung - the fact that they are opening up their technology or opening up their strategies as to what they want to do. I guess one could conclude in the end it's probably the only way to succeed, as new technologies probably only last three months. So if you are trying to be proprietary only and focus only on sole sourcing, and it's going to be difficult for you as a company to be effective. So I think we live in a different world. We live in a world of co-operation, I think we're embarking into a revived capitalism, which I would call 'sharing capitalism'. So AI is allowing that to happen and I'm happily surprised to see the young researchers and start-ups working with a large corporation on joint projects - I would say that that's probably the key ingredient to success. And I think now somehow, we are able to create that momentum and for me, my wish and my objective is to get this fundamental research down to the operating level of our SMEs. That's a challenge - but I think we've got the basis to do it.

How do you see COVID-19 impacting AI in Canada?

Yeah, I think as a Minister of Economy, my biggest challenge is how to restart the economy. We were on pause for three to four months, but I think that it's an easy statement to make to say that companies will have to reinvent themselves - some of them, interestingly enough, will have to change their whole model. One of the other elements to this that we've seen is that the pandemic has highlighted a number of weaknes-



Q&A

WITH



PIERRE FITZGIBBON

Minister of Economy and Innovation, gouvernement du Québec
(Government of Québec)



Interviewed July 29th, 2020



ses in the supply chain in Québec because we are so interdependent on the rest of the world.

So, I think on the first statement I made - I think we need to promote changes from within corporations to adjust to this new world – a key element to this is there is so much data available. I mean, AI is a sometimes-overused word, but I think to get a company to focus on which data is relevant to provide them comparative advantage to their competition is very important and is going to be more important now than ever. I mean, of course, if you go in the pharmaceutical health services industry, maybe there won't be that many changes or in construction or for engineers. But for other companies in the cultural environment, aerospace, other services, I think there would be numerous new changes in consumer behaviour. We require these companies to change their 'go to market strategy' - I think it's all about data. It's all about selecting the right data and then, with the proper assistance from consultants, figuring out how we are able to use this data to develop an edge versus the competition. So I think supply chain for sure will require more and more AI and I think that as a policymaker it becomes very important for me - very, very important. The whole strategy of how we allocate our

financial resources in the Economic ministry is going to be driven by innovation, innovation, innovation - in which the whole digital world/AI will become, I think even more important.

The Global AI index puts Canada in 4th place globally with its only weakness being the reliability and scale of infrastructure. Is this something policy is looking to address?

I think this is clearly a weakness that we need to correct, that so far has not been harmful, but that could become difficult very, very quickly. Actually COVID-19 has exacerbated this situation.

There's four elements that are linked to this point.

The first one, which is basic, is internet connection and I mean, you're from Québec so you understand that. But if you look at Canada, it's such a large country and people are dispersed all over the territory. So, to give you a perspective, when I came into office two years ago, one of my files was to connect the unconnected Quebecers that don't



Q&A

WITH



PIERRE FITZGIBBON

Minister of Economy and Innovation, gouvernement du Québec
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Québec 

Interviewed July 29th, 2020



have access to the internet. Well, I was surprised because in 2003, the Prime Minister then said he would connect Québec in two years and here I came 17 years later with 350,000 Quebecers not connected - not considering the probably 500,000 that are badly connected with downloads of below 10 megabits. So it is clearly an issue. That issue had been addressed before COVID, but it's obviously been amplified, and you can imagine 350,000 people not connected in Québec - I think it's about 1.2 million that are not connected in Canada.

So both the federal government and the Québec government are accelerating that at pace. We're working with the telcos but there have been issues with installing fibre and issues with technology. I think obviously right now with fixed wireless, even satellite, where we can probably reduce significantly the latency of communication, I'm pretty confident in our commitment to the Quebecers that in 2022, people would be connected. We may lag a little bit there but frankly, I think technology has now allowed this to happen. So, yes, this is an issue we need to address.

If you go on to a higher level, quantum computing, of course, is something that will also become a requirement. It's not yet obviously implemented but I'm glad to say that our government has allocated CAD\$100 million on a program with the Sherbrooke University to work with large corporations such as IBM, Teledyne, to work on quantum computing. We have some projects going on right now in a place called Bromont, where Teledyne has a huge facility, in which we are looking to put even more money. So quantum computing is something we think given the AI foundation, will allow us to be a player, realising that the rest of the world is doing that as well.

We also have in our budget CAD\$34.5m over five years to increase computing power. Canada has a group called Calcul Canada, and we have Calcul Québec, which we obviously need to power our servers. This is going to be short term, because if we don't [invest] at some point, all these researchers will lack capacity. So we are aware of that, whilst I think we are lagging, we are not impacting the research programs that are currently in effect. But clearly we are required to move fast on increasing the current computational power.

Lastly, I'm proud to say we have worked on the 5G network - we created a group called ENCQOR working in conjunction with Ontario. We've got companies like Ericsson, Thales and IBM working with us and we have four centres, two in Ontario and two in Québec. We have basically 5G antennas and are using an incubator called Centech, which is involved with ETS, one of the engineering universities in Québec. I'm pretty happy to see the progress there, I was there actually a couple of months ago to witness start-ups working with 5G.

So, I think these four elements are clearly core to our strategy, because you are correct, if we don't pay attention to this now, very quickly, you can lag in the total poll in terms of effectiveness of implementation, which is obviously the key for us.

Montreal has a thriving AI ecosystem – what do you think has been the most important driver in its success?

Well, I mean in Québec we are only 8.3 million people - to think that we can do everything ourselves is utopia in all economic matters. So I think the key is attractiveness and attractiveness comes from different drivers. I think Canada in general, Québec as well, we are multicultural. I mean, people are bilingual in Québec, we speak English we speak French. Our demography is such that now we have a basin of immigrants that are, I think, very happy to work in Québec and its socially rest. We have, as I said, good access to university and its fairly low cost (18 universities), multicultural and with fairly low [business] operating costs. Wages are higher, but then when you talk about the wages in technology, I think it's all the same everywhere in the world. It might be a little bit more expensive, but maybe less so than in the US for example.

I think also the government has been fairly efficient in providing incentives, whether it's tax credit, whether it's for research, whether it's a provincial tax holiday for a number of years for large corporations. I'm involved right now with three projects in AI, with American companies that are looking to create a second hub and to make their second headquarters, so to speak. Québec offers a lot of advantage there in terms of government effectiveness in terms of programs. I mean this AI world is so complex that I think we need access to different cultures; we need access to different resources. But I think that the primary driver is the attractiveness of Québec in terms of talent pool and so forth. Dr. Bengio has allowed other researchers to come and I think that many Americans are looking at Québec as fertile ground for investment.

So I would say it's all of the above, it's primarily an ecosystem which is open for business and open for outside people coming in. We have ample territory; we have low cost electricity. If you look at Québec energy you've got 99 percent as renewable hydro energy so it's low cost and it's green.

So I think Québec offers a lot of advantages and we are, as you know, nice people.



Also available in video format:
<http://bit.ly/global-ai-report>

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Telephone: **+44 20 7766 5900**



7

M&A AND FUNDRAISING

OUR VIEW ON GLOBAL AI INVESTMENT ACTIVITY



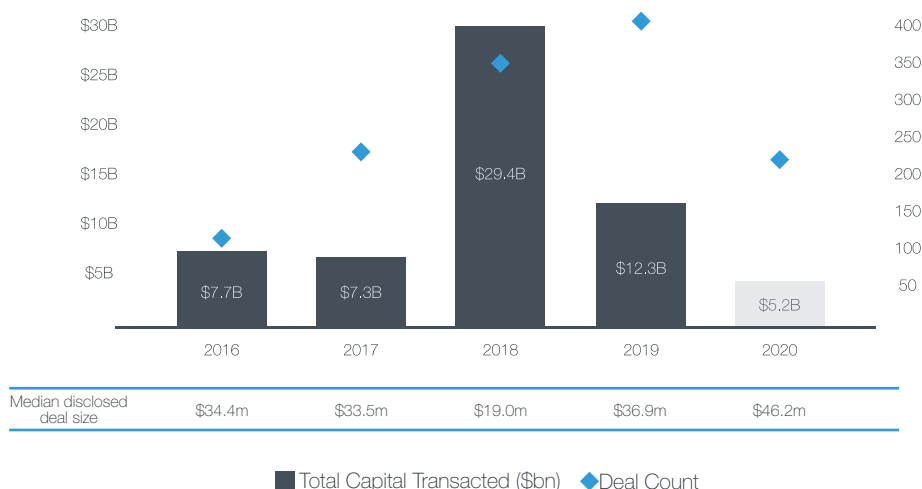


7. M&A AND FUNDRAISING

#1. GLOBAL AI M&A ACTIVITY

M&A activity in AI has experienced sizeable growth since 2016 reaching \$12.3bn in total disclosed transaction value in 2019 (2016-2019 CAGR of 16.9%). The high number of undisclosed transactions mean an entirely accurate view of total deal value is difficult to ascertain. That said, it is clear that the sector is still in its infancy. Although cumulative deal count has gradually trended upwards, the average disclosed deal size has fluctuated significantly in the last 4 years. 2018 M&A activity is largely distorted by the acquisition of Mobileye by Intel for \$15.3bn.

GLOBAL M&A ACTIVITY IN AI PER YEAR 2016 - 2020¹

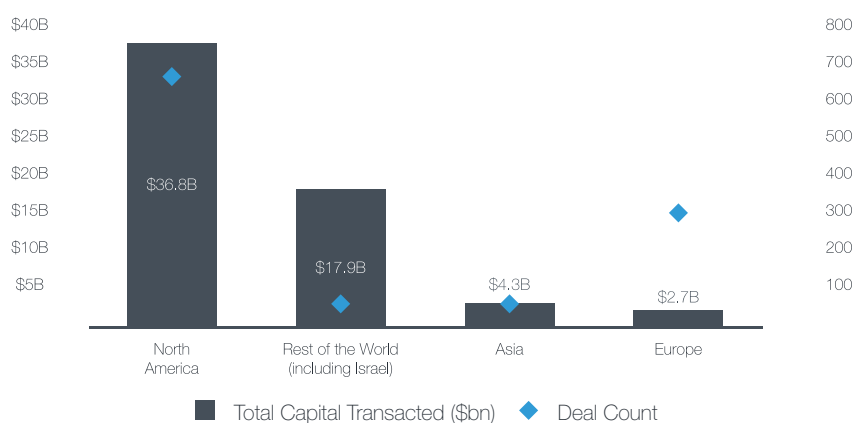


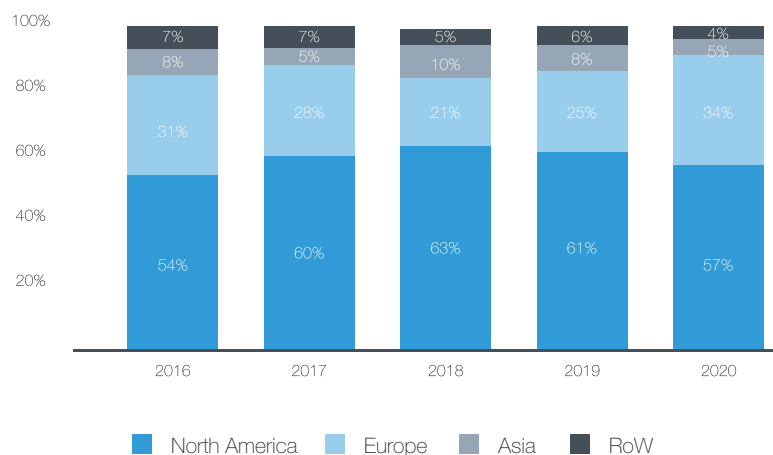
Source: Pitchbook, August 2020

North America is driving M&A activity in the sector, accounting for over 57% of deal volume (# of disclosed and undisclosed transactions) since 2016 and 58% of total capital invested. M&A activity distribution has remained relatively consistent since 2016, but there have been some changing dynamics – particularly growth in Europe and decline in Asia since 2018. The Rest of the World (ROW) M&A data is largely distorted by the Intel's acquisition of Mobileye for over \$15.3bn in 2017.

Although deal count is relatively high in Europe, total capital transacted is low - we expect this to be due to a relatively immature startup environment. We expect transaction sizes in Europe to increase rapidly as the ecosystem continues to mature.

GLOBAL M&A ACTIVITY IN AI PER REGION 2016 - 2020¹





Source: Pitchbook, August 2020

TOP 10 DISCLOSED STRATEGIC M&A TRANSACTIONS

Company	HQ	Sub-sector	Acquirer	Deal Size	Year	EV / Revenue	EV / EBITDA
MOBILEYE		Mobility	Intel	\$15.3bn	2018	N/A	N/A
CHANGE HEALTHCARE		Healthcare	McKesson	\$4.5bn	2016	N/A	N/A
Suzhou Qingfeng Investment		Financial Services	Jiangsu Shagang Company	\$3.4bn	2017	N/A	N/A
habana		Semiconductors	Intel	\$2.0bn	2019	N/A	N/A
flatiron.		Healthcare	F. Hoffman-La Roche	\$1.9bn	2018	N/A	N/A
CYLANCE		Cybersecurity	Blackberry	\$1.4bn	2019	N/A	N/A
SHPE		Cybersecurity	F5 Networks	\$1.0bn	2020	N/A	N/A
CTAL-Labs		Electronics	Facebook	\$1.0bn	2019	N/A	N/A
m*Modal		Healthcare	3M	\$1.0bn	2019	5.0 x	N/A
ARGO		Mobility	Ford	\$1.0bn	2017	N/A	N/A

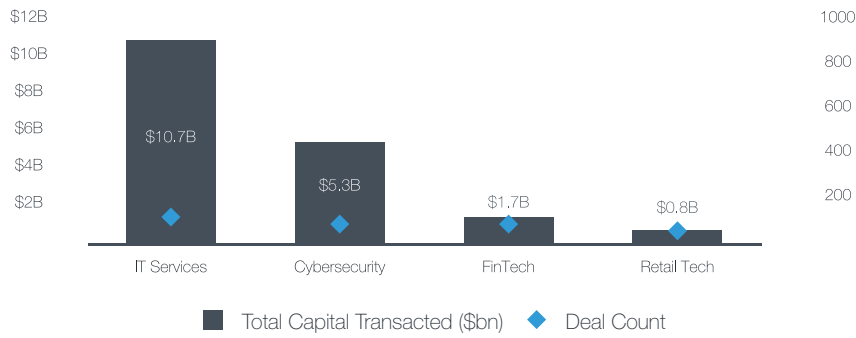
Source: Pitchbook

The table above shows the top ten disclosed M&A transactions profiled in our screening, ranked by deal size. Arguably the most insightful aspect of the M&A activity lies in the dynamics at play in the sub-sectors; below we compare the verticals discussed in the report.





M&A ACTIVITY BY SUB-SECTOR 2016-2020¹



Note: Categories are not mutually exclusive
Source: Pitchbook, August 2020

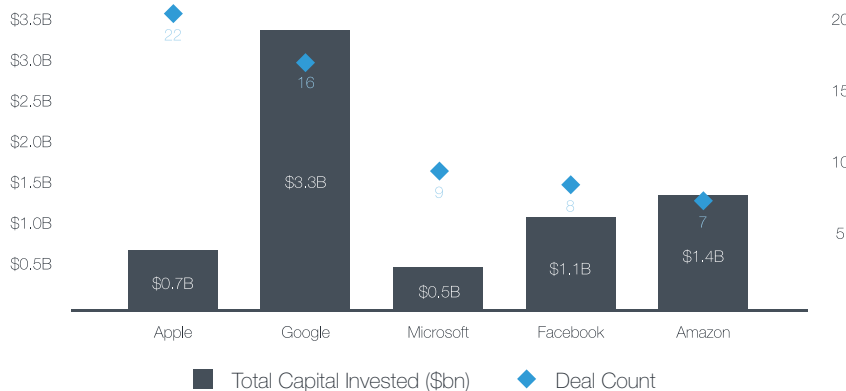
When looking at the four focus verticals in the report, it is not surprising that IT Services leads in terms of M&A. The highest amount of capital invested and deal count can be found in IT Services, we expect in part due to the maturity of the space. Despite this, other verticals are quick to catch up; Cybersecurity has the highest growth in terms of deal count with an astonishing CAGR of 135.1% between 2016-2019. Similarly, M&A in IT Services is also growing rapidly with a CAGR of 133.6%, Fintech 54.2%, and 53.3% for Retail Tech.

The AI acquisition landscape is dominated by a handful of tech giants looking to acquire talent and complementary technologies to improve their offering.

Apple was involved in 22 M&A transactions in AI in the last 10 years with a total disclosed amount totaling almost \$1bn. Followed by Google with 16, Microsoft with 9, Facebook with 8 and Amazon in last place with 7. Other big tech players have been significantly less acquisitive in their approach to AI adoption.

What is interesting is the acceleration of M&A in recent years. According to CB Insights, AI acquisitions saw a more than 6x uptick from 2013 to 2018, and up 38% year-over-year in 2019. Part of this increase can be attributed to a growing diversity in acquirers, as smaller AI startups become acquisition targets for traditional insurance, retail, and healthcare incumbents.

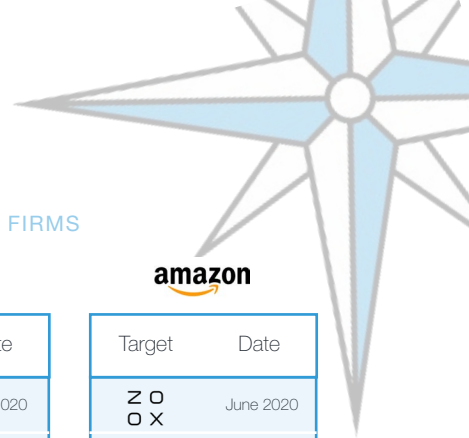
TOP 5 TECH GIANTS' M&A TRANSACTIONS SINCE 2010¹



Source: Pitchbook, August 2020

The table below showcases select acquisitions in AI made by Google, Apple, Microsoft, Facebook and Amazon. Apple has been relatively acquisitive in 2020 so far with acquisitions in computer vision and NLP to develop its Siri voice assistant and facial recognition technology.





SELECT RECENT ACQUISITIONS MADE BY THE TOP 5 BIG TECH FIRMS

Google		Apple		Microsoft		Facebook		Amazon	
Target	Date	Target	Date	Target	Date	Target	Date	Target	Date
NORTH	June 2020	Inductiv, Inc.	May 2020	CYBERX	June 2020	ATLAS ML	Feb 2020	ZOX	June 2020
Looker	Dec 2019	Voysis	April 2020	jClarity	Aug 2019	SCAPE	Jan 2020	CANVAS TECHNOLOGY	April 2019
Onward	Oct 2018	xnor.ai	Jan 2020	lobe	Sep 2018	CTRL-Labs	Sep 2019	dispatch	Nov 2017
SOCRATIC	Mar 2018	Spectral Edge	Nov 2019	bonsai	Jun 2018	GRØKSTYLE	Feb 2019	BODY LABS	Oct 2017
AIMATTER	Aug 2017	FAIRWELL	Aug 2019	semanticmachines	May 2018	Bloomsbury AI	July 2018	harvest.ai	March 2016

Source: Pitchbook, August 2020

In the year ahead, we expect big tech leaders to continue along the previous trend of acquiring complementary AI technologies and talent. More diversified players such as Google, Amazon and Facebook could potentially look to acquire more substantially in healthcare and other less-obvious verticals given the COVID pandemic and forced adoption of tele-health.

We have profiled below 5 notable M&A transactions in each sub-sector from 2016-2019. KKR's purchase of BMC Software in 2018 stands out as the largest acquisition at \$8.3bn.

FINTECH

Company	HQ	Acquirer	Deal Size	Year	EV / Revenue	EV / EBITDA
KENSHO		S&P	\$550m	2018	N/A	N/A
CYENCE		Guidewire	\$260m	2017	N/A	N/A
Quovo		Plaid	\$200m	2019	N/A	N/A
ITRS		TA Associates	\$141m	2017	5.4x	35.4x
claritymoney		Goldman Sachs	\$100m	2018	N/A	N/A

IT SERVICES

Company	HQ	Acquirer	Deal Size	Year	EV / Revenue	EV / EBITDA
bmc		KKR	\$8.3bn	2018	N/A	N/A
SignalFx		Splunk	\$961m	2019	N/A	N/A
thoughtonomy		Blue Prism	\$101m	2019	7.9x	N/A
Symphony		Sykes Enterprises	\$68m	2018	4.8x	N/A
cognigo		NetApp	\$56m	2019	N/A	N/A





CYBER

Company	HQ	Acquirer	Deal Size	Year	EV / Revenue	EV / EBITDA
CYLANCE		Blackberry	\$1.4bn	2019	N/A	N/A
SHPE		F5 Networks	\$1.0bn	2020	N/A	N/A
Recorded Future		Insight Partners	\$780m	2019	N/A	N/A
Twistlock		Palo Alto Networks	\$378m	2019	N/A	N/A
ENDGAME		Elasticsearch	\$234m	2019	N/A	N/A

RETAIL

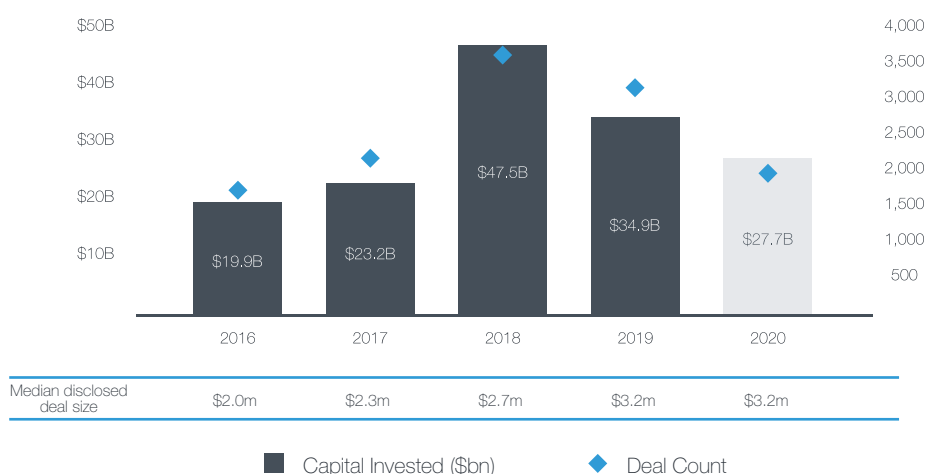
Company	HQ	Acquirer	Deal Size	Year	EV / Revenue	EV / EBITDA
dynamic yield		McDonalds	\$327m	2019	N/A	N/A
UNATA		Instacart	\$65m	2018	N/A	N/A
rubikloud		Kinaxis	\$60m	2020	N/A	N/A
select		Nike	N/A	2019	N/A	N/A
BlueYonder		JDA	N/A	2018	N/A	N/A

Source: Pitchbook, August 2020

#2. GLOBAL AI FUNDRAISING

Since the beginning of 2016, there have been 21,102 investments in AI and \$162.7bn invested. The AI fundraising ecosystem is still at an early stage, with most investments being in the venture capital space, albeit with an increasing number of growth equity investments. 2019 marked a high point for growth equity transactions with \$5.4bn raised over 31 deals in 2019. This was largely driven by Cruise raising \$1.1bn from General Motors and \$2.3bn from Softbank's Vision Fund, as well as Uber Advanced Technologies Group's \$1.0bn raise from Toyota, Denso and Softbank Vision Fund.

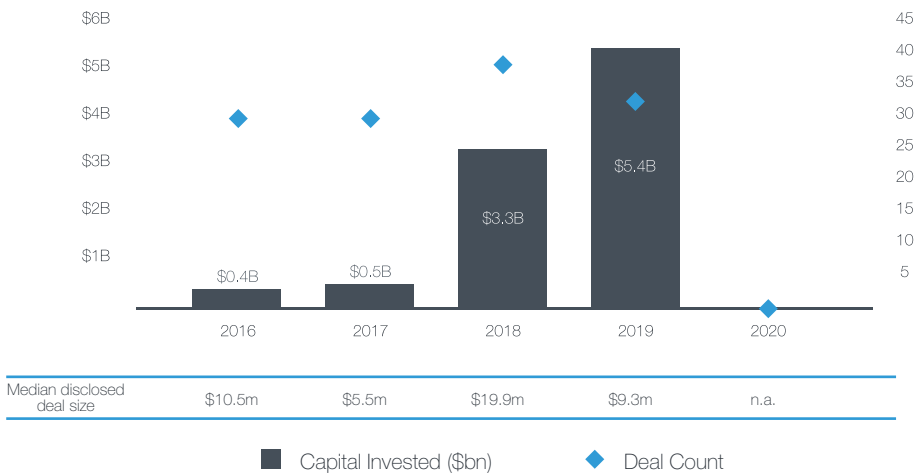
GLOBAL VC FUNDING IN AI PER YEAR 2016 - 2020¹



Source: Pitchbook, August 2020



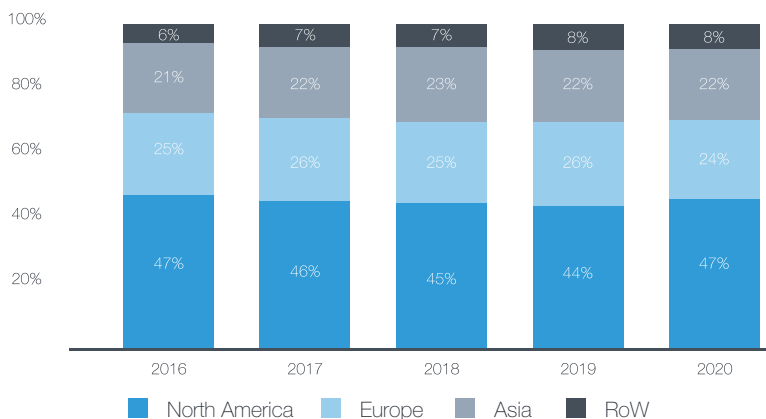
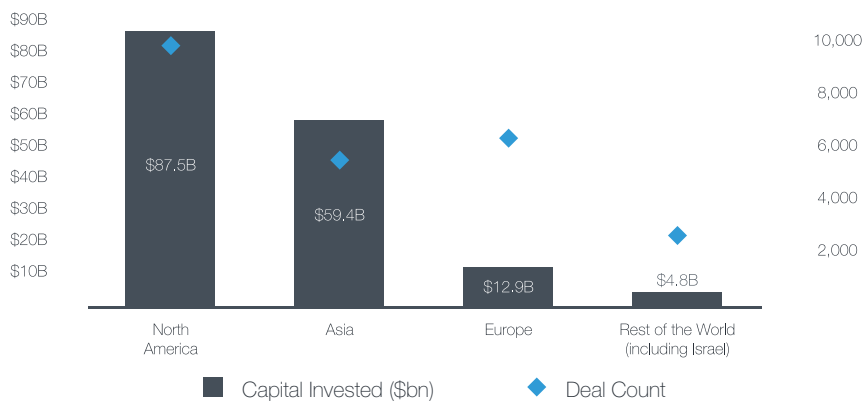
GLOBAL GROWTH EQUITY FUNDING IN AI PER YEAR 2016 - 2020¹



Source: Pitchbook, August 2020

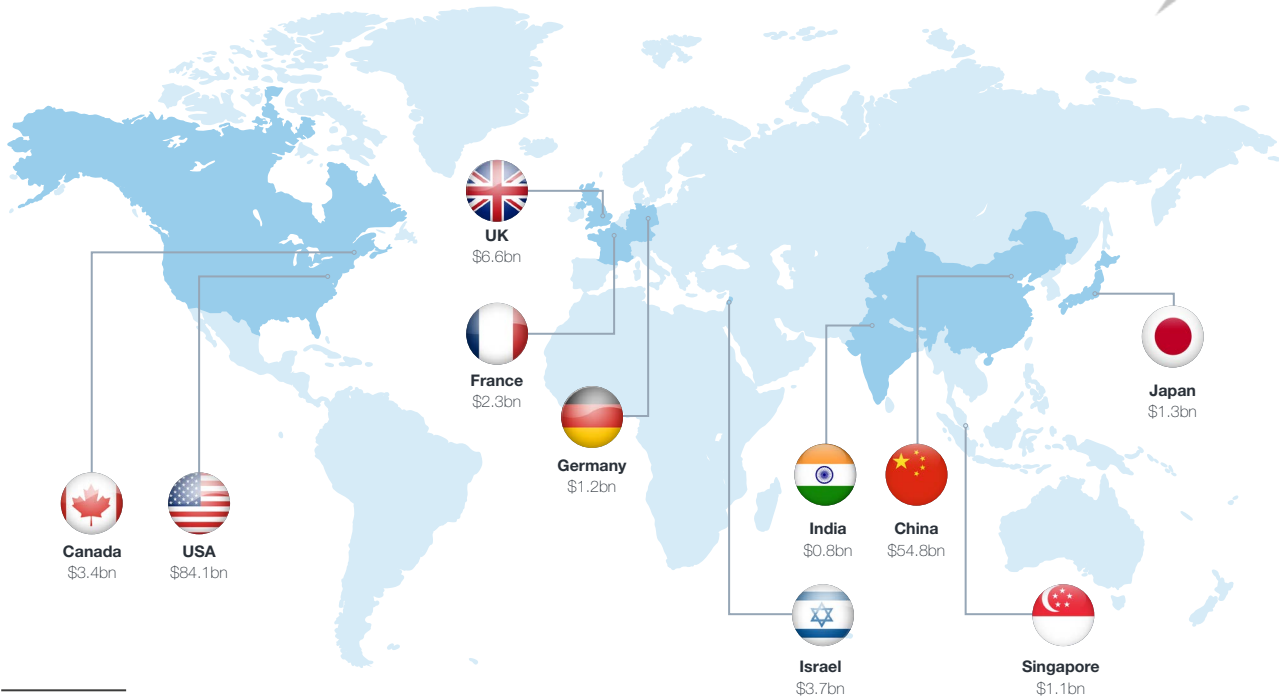
Fundraising distribution across regions has remained constant since 2016, and unsurprisingly North America has dominated, capturing over 44% of funding. When considering deal count distribution, Asia and Europe trail behind North America. Asia is far ahead of Europe when on total capital invested, distorted by a number of large fundraises in 2018, such as Weltmeister raising \$3.1bn from Alibaba and Bytedance raising \$3.0bn from a consortium led by Softbank. Europe has seen smaller deals, indicating that although the sector remains at an early-stage, funding is available – this further explains the historical lack of M&A in the space. In Europe, Babylon’s Series C round led by Saudi Arabia’s Public Investment Fund contributed significantly to the total, coming in at \$550m.

GLOBAL VC AND GE FUNDING IN AI PER REGION 2016 - 2020¹



Source: Pitchbook, August 2020

AI FUNDING IN TOP 10 COUNTRIES 2016-2019¹



Source: Pitchbook, August 2020

A country-level view of private capital in AI highlights the growing gap between the US, China and the rest of the world in AI development, as explored through in our chapter on the Global AI Index. The United States has raised \$84.1bn and China \$54.8bn, whilst other major players that all have individually raised less than \$7bn in funding over the last four years.

We have profiled the top funding rounds year to date since 2016 and 2019. **We estimate over \$20.3bn has been raised in the Fintech subsector since 2016, followed by IT Services (\$8.1bn), Cybersecurity (\$7.2bn) and Retail Tech (\$6.4bn).** Note, the investment categories are not mutually exclusive.

TOP 10 DISCLOSED FUNDRAISING TRANSACTIONS

	Name	Sub-sector	Country	Deal Amount	Post-money Valuation	Lead Investor(s)	Date
1	CRUISE	Mobility		\$3.4bn	-	General Motors, Softbank Vision Fund	July 2019
2	WELTMEISTER	Mobility		\$3.2bn	-	Alibaba Group	April 2018
3	ByteDance	Media		\$3.0bn	\$72.0bn	KKR	Oct 2018
4	快手 KUAISHOU TECHNOLOGY	Software		\$3.0bn	\$25.6bn	Tencent	Feb 2020
5	WAYMO	Mobility		\$3.0bn	\$27.8bn	Canada Pension Plan Investment Board	May 2020
6	ByteDance	Media		\$2.0bn	\$18.0bn	General Atlantic	Dec 2017
7	eagleview	Commercial Services		\$2.0bn	-	Barclays Investment Bank	Aug 2018
8	JD	FinTech		\$2.0bn	\$18.0bn	China Capital Management	April 2018
9	度小满金融 Du Xiaoman Financial	FinTech		\$1.9bn	-	The Carlyle Group	April 2018
10	Uber	Mobility		\$1.3bn	\$68.3bn	Softbank Investment Advisors	Dec 2018

Source: Pitchbook, August 2020



We have profiled below 5 select fundraises in each sub-sector from 2016-2019.

FINTECH

Name	Country	Deal Amount	Post-money Valuation	Lead Investor(s)	Date
QuarterSpot		\$598m	N/A	University Growth Fund	Jun 2018
VERAFIN		\$388m	N/A	BDC Capital, Spectrum Equity & 4 more	Sep 2019
Lemonade		\$300m	\$2.1bn	GV Ventures, General Catalyst & 12 more	Apr 2019
TRADESHIFT		\$240m	N/A	Gray Swan, IDC Ventures	Jan 2020
ADF <small>APPLIED DATA FINANCE</small>		\$163m	N/A	MAI Capital Management & 2 more	Jul 2018

IT SERVICES

Name	Country	Deal Amount	Post-money Valuation	Lead Investor(s)	Date
UiPath		\$568m	\$7.1bn	Accel, IVP, Sequoia Capital, Tencent & 7 more	Apr 2019
ALTERNATION ANYWHERE		\$290m	\$6.8bn	Goldman Sachs, Salesforce Ventures & Softbank	Nov 2019
TRICENTIS		\$165m	N/A	Fulcrum Equity Partners, Insight Partners & Wipro Ventures	Aug 2017
Qiniu		\$150m	N/A	Alibaba, Yunfeng Capital	Aug 2017
sumo logic		\$110m	\$1.19bn	Battery Ventures, IVP, Tiger Global, Wing VC & 2 more	May 2019

CYBER

Name	Country	Deal Amount	Post-money Valuation	Lead Investor(s)	Date
SentinelOne		\$200m	\$1.1bn	Accel, Qualcomm Ventures, Insight Partners & 7 more	Feb 2020
riskified		\$165m	\$1bn	General Atlantic, Pitango Venture Capital & 12 more	Nov 2019
NS8		\$123m	\$436m	AXA Venture Partners, Lightspeed	Jun 2020
SIGNIFYD		\$100m	\$450m	Premji Invest, Bain Capital Ventures & 7 more	May 2018
VECTRA <small>Security Risk Services</small>		\$100m	\$420m	TCV, Accel, Khosla, AME Cloud Ventures & 6 more	Jun 2019

RETAIL

Name	Country	Deal Amount	Post-money Valuation	Lead Investor(s)	Date
CONVOY		\$400m	\$2.75bn	Baile Gifford, G Squared, T. Rowe Price & 6 more	Nov 2019
BG BERKSHIRE GREY		\$263m	N/A	Canaan Partners, Khosla Ventures, NEA, Softbank	Jan 2020
Geek+		\$200m	N/A	China V Fund, Review Capital, Vertex Ventures China	Jun 2020
FAIRE		\$150m	\$1bn	Lightspeed, Khosla, Founders Fund & 3 more	Oct 2019
trax		\$125m	\$1bn	Boyu Capital, DC Thomson Ventures & 2 more	Jul 2018

Source: Pitchbook, August 2020



AI INVESTOR MARKET MAP

Financial Investors

The funding ecosystem in AI has developed in line with the AI sector as VCs and PEs look to establish themselves as prominent investors in the space. Below is our interpretation of the most active AI-focused investors globally.



Q&A

WITH



ORLY GLICK

Partner, Vintage Investment Partners

Vintage Investment Partners

Interviewed August 3rd, 2020



We interviewed Orly from Vintage Investment Partners to find out more about AI and investing in Israel

Please provide a brief overview of Vintage Investment Partners

Sure - so Vintage is a global investment firm and we basically have three strategies in three different geographies. We are active in the US, in Europe and in Israel and our three strategies are Fund of Funds, where we are investors in funds, Direct Co-Invest, where we invest alongside our funds in late stage startups and Secondary Funds, where we buy out LP positions or we invest directly in late stage startups on a secondary basis. The one thing that we have at Vintage which is unique is value-added services. Value-added services is a complimentary, widespread, business development effort in which we connect corporates to startups to create business opportunities. We speak to corporates every day, mostly to Fortune 1000 companies in different industries from the US, in Europe and in Asia. We understand their technological or strategic pain points and then we go back to our database, with all the knowledge that we have about 6500 companies in Israel, and we match startups to their pain points. The goal of this is to serve the whole ecosystem and essentially be helpful to the corporates in finding vendors, helpful to the startups in getting market access, finding potential clients, and helpful to the funds because we help their companies. We have done this in the past four years for about 450 corporates; we've set 1495 face to face meetings between corporates and startups, we've done 882 e-mail introductions and consequently helped orchestrate over 200 POs (Purchase Orders) and POCs (Proof of Concepts). So the whole idea is to basically do a win, win, win, win; provide opportunities to the corporates, helping startups, helping funds and helping ourselves as investors.

Which sectors are you most excited about coming out of this pandemic and why?

In our conversations with corporates, we have all seen what has happened in the past few months; everybody now knows that everybody's more online, people are shopping online much more. Speaking to corporates we also see a big need for digital transformation in general, especially in light of COVID. Everybody is now increasingly online so things like cloud migration and cloud security are fundamental requirements. On a commercial basis; more e-commerce solutions, supply chain solutions and things like user-generated content are now on the rise. Performance marketing, new advertising strategies are also going to be interesting going forward. We've also seen a huge increase in streaming and gaming activity, I believe gaming activity surged 200% because of COVID - people are more at home and are looking for more experiences and watching more streams than before. There's now 2.5 billion gamers that are playing worldwide as a result of the pandemic. So there's a lot of other industries that are going to have more revenue because of the situation simply because people are at home more. Obviously, other industries such as digital health will benefit as well - these are just some of the major areas we see opportunities.

How do you see AI evolving over the next 5-10 years?

So to explore this let's define AI in several subcategories. First, there are the chip makers - companies that are making sure that the infrastructure is there in terms of hardware. We've seen Intel buying Habana last year for example for approximately two billion dollars. So there will be some innovation in that space in the next few years. Then on top of that there are the AI-enablers - anything that enables AI - analytics in the cloud for example. Then the layer that is very interesting and I see it developing more and more is what we call the AI Operations (or AIOps) - supporting the algorithms, supporting the modeling, tools to assist training and deployment. This is something we see that is developing significantly now. On top of that are the easiest tools for enterprises to use - specific industry or specific vertical solutions. For example in AI for insurance, it's ready-made tools for insurance companies to use. We see more companies going into all of these areas although a lot of companies that you find in Israel are AIOps companies. The interesting thing that I do see is because of the dynamics of the availability of data scientists, there are some companies that provide tools to corporates that can help them use AI without a data scientist - making AI more available to enterprises on a business level. Ultimately this is one of the things that I hope will take off in the next five years. At the moment, it is essentially two different people - data scientists have their own domain and the businesses have the pain points. The connection between the two is going to be super important in the next few years.

Do you think Israel will become the world's most advanced AI destination?

I think to be honest we were a little late in the beginning, but I think that we're catching up significantly. I see the quality of the companies that are coming out of Israel and Israel is, if I have to generalise, the B2B enterprise software, deep tech nation. So definitely in terms of AI and deep technology, Israel is going to emerge as one of the strongest AI nations globally. There are some 6500 startups in Israel and if you go to the public databases and you search AI technologies from Israel, you'll probably find something like 555 companies or so. So there's a lot. But again there's a big difference between companies just using available tools out there and companies that are building their own AI engines or making AI available for enterprises to use. So it's going to develop variably in different layers but definitely we will have a large concentration of AI-based companies or companies that are using AI as a technology in Israel for sure.



Also available in video format:
<http://bit.ly/global-ai-report>

THE DRAKE STAR VIEW

2020 KEY MARKET TRENDS



AI AT THE EDGE



AI-AS-A-SERVICE



5G AS A CATALYST



OPPORTUNITIES FOR
SUSTAINABLE PROGRESS



RENEWED FOCUS ON
ETHICS

AI in Focus

Drake Star Predictions

#1

Retail Tech & Supply Chain

- Personalisation, product attribute expansion and supply chain optimisation will become dominant use cases for AI over the next decade
- Personalisation will see the widest adoption, largely given that results are directly quantifiable in terms of KPI uplift through A/B testing
- Brands and retailers will increasingly connect online and in-store data to create an optimised omnichannel customer experience
- COVID will have a positive systemic impact, particularly in optimising and managing risk in supply chains
- Tech acquirers will dominate the M&A landscape (as opposed to retail buyers) with product extensions and acquisitions

#2

Fintech

- AI will be applied across the entire value chain in both banking and insurance
- Incumbents will likely transition towards partnership or acquisition strategies, particularly in 'value-neutral' aspects of the value chain
- Availability of data (limited by legacy banking OS) and regulation will be key market headwinds
- Valuations will remain robust over the next 12-24 months, with M&A activity down in the short-term but consolidation in the mid-term reflecting margin pressure and economies of scale broadly across the fintech space

#3

IT Services

- COVID-19 has accelerated the revolution and adoption of digital and AI transformation
- There is an opportunity for AI-enabled IT Services organisations to bring alignment amongst business objectives, strategic goals, operating and engagement models, technology platforms and innovation
- Adaptability to a rapidly changing landscape and digitalisation will be the major market headwind in 2020 and beyond
- Strong global demand will persist for businesses that are focused on AI-powered solutions applied to business improvement, ERP systems, big data and analytics and digital and cloud transformation programmes

#4

Cybersecurity

- Growing risk awareness, increasing cyber regulation and expansion in the number of connected devices will continue to drive the cybersecurity market over the next 3-5 years
- Unsupervised algorithms will become more predominant in enterprise cybersecurity solutions to better defend against 'unknown unknowns'
- Renewed focus on providing solutions that can protect businesses in third-party applications and unsecured network given structural changes in the way businesses operate
- Expected continued market consolidation and high levels of PE activity

AI COMPANY PROFILES



Abnormal Security	Kryon
ActZero	Meero
AI.fi	Mimica
Anodot	Moogsoft
ArmorBlox	Nosto
Avira	Olive
Blend	Ometria
Blue Hexagon	PacketAI
Cape Analytics	PandaScore
Cleo AI	Pixellot
Codec	Planck
CommercelQ	Playermaker
ComplyAdvantage	Playsight
ContentStack	QOMPLX
Crayon Data	Quantexa
Cyberint technologies	Quantifind
Daisy Intelligence	Qubit
Darktrace	Ravelin
Deep Instinct	Resolve Systems
Egress	Satisfi
Engage3	Scienaptic
Epsagon	SecBI
Eversight	Sportradar
EvolutelQ	Stackstate
EyeErn	Standard Cognition
Feedzai	Stats Perform
Fiddler Labs	Syte
Flow Commerce	Talla
FortressIQ	Tessian
Grabango	Tint
Granify	Track160
GumGum	Verafin
Hudl	Virtana
Hunters	Wildmoka
IdenTV	WorkFusion
Impira	WSC Sports
Inky	Zenoss
Ironscales	Zippin
Kasisto	Zone7
Kinexon	



Source: Company Websites, Pitchbook, CapitalIQ, LinkedIn - August 2020



RETAIL TECH



SANTA CLARA

KEY PERSONNEL

Steve Gu – Co-Founder & CEO
Ying Zheng – Co-Founder & CTO

BUSINESS DESCRIPTION

AIFI is an AI technology company automating the world's stores using a combination of AI, edge computing and sensor fusion technology. The company provides real-time people tracking and product recognition to deliver auto-checkout solutions for supermarkets and retailers.

KEY INVESTORS



2016



62



VC Backed, \$15.0m raised to date



Smart Stores



B2B

CommercelQ



MOUNTAIN VIEW

KEY PERSONNEL

Guru Hariharan – Founder & CEO
Piyush Lumba – COO

BUSINESS DESCRIPTION

CommercelQ is an enterprise retail intelligence platform empowering retailers to achieve profitable growth through data-driven merchandising decisions. The company's platform automates actions across sales, marketing and operations by bringing machine learning to e-commerce.

KEY INVESTORS



2012



85



VC Backed, \$20.5m raised to date



Retail Intelligence



B2B



TORONTO

KEY PERSONNEL

Gary Saarevirta – Founder & CEO

BUSINESS DESCRIPTION

Daisy Intelligence offers AI-powered solutions for retail and insurance. The company's retail solutions focus on delivering an optimal product and pricing mix for retailers alongside providing accurate forecasting to improve operational efficiency. The company also provides insurance solutions focused on underwriting, claims automation and fraud detection.

KEY INVESTORS



- 2003
- 59
- VC Backed, \$12.3m raised to date
- Retail Intelligence
- B2B



DAVIS

KEY PERSONNEL

Ken Ouimet – Co-Founder & Chairman, Technology Committee
Tim Ouimet – Co-Founder & Board Member
Edris Bemanian – CEO

BUSINESS DESCRIPTION

Engage3 is a cloud-based SaaS platform that delivers real-time data and insights on products and pricing. The company's platform utilises AI to help retailers and manufacturers understand, protect and enhance their pricing through accurate competitor data and powerful analytics, ultimately optimising profitability.

KEY INVESTORS



- 2008
- 98
- VC Backed, \$34.2m raised to date
- Personalisation
- B2B



PALO ALTO

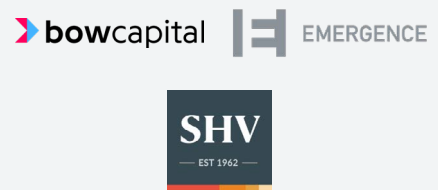
KEY PERSONNEL

Jamie Rapperport – Co-Founder & CEO
David Moran – Co-Founder & Chairman

BUSINESS DESCRIPTION

Eversight is a digital testing platform that offers insights on pricing and promotions both in-store and online. The company's platform uses predictive analytics, data science, machine learning and multi-tenant cloud architecture to provide digital A/B testing, enabling brands and retailers to improve promotion effectiveness.

KEY INVESTORS



- 2013
- 54
- VC Backed, \$27.7m raised to date
- Retail Intelligence
- B2B



HOBOKEN

KEY PERSONNEL

Rob Keve – Co-Founder & CEO
Michael Bryzek – Co-Founder, Chairman & CTO

BUSINESS DESCRIPTION

Flow Commerce is a cross-border e-commerce platform designed to facilitate and optimise international e-commerce sales. The company's platform uses AI and machine learning to remove the challenges facing cross-border commerce and address key requirements such as multi-currency pricing, cost-efficient shipping, international payment options and simple returns.

KEY INVESTORS



2015



83



VC Backed, \$55.7m raised to date



Supply Chain Optimisation



B2B



BERKELEY

KEY PERSONNEL

Will Glaser – Founder & CEO
Ed Scheuer – CFO
Ryan Smith – CTO

BUSINESS DESCRIPTION

Grabango is a leading developer of checkout-free technology. The company's technology uses computer vision and machine learning to maintain a virtual shopping basket for each person's store visit, enabling stores to eliminate queues and optimise the customer experience.

KEY INVESTORS



ABSTRACT VENTURES



Commerce Ventures



FOUNDERS FUND



2016



73



VC Backed, \$18.1m raised to date



Smart Stores



B2B



EDMONTON

KEY PERSONNEL

Jeff Lawrence – Founder & CEO
Mark Ly – VP Product & Technology

BUSINESS DESCRIPTION

Granify is an online platform that provides revenue maximisation tools to e-commerce retailers. The company's platform utilises predictive analytics and machine learning to identify the expected future value of buyers who are at risk of leaving the site and deploy appropriate messaging to deal with their specific objections.

KEY INVESTORS



2011



30



VC Backed, \$12.6m raised to date



Personalisation



B2B



SAN FRANCISCO

KEY PERSONNEL

Ankur Goyal – Co-Founder & CEO
Richard Stebbing – Co-Founder & Head of Tech

KEY INVESTORS

COATUE GENERAL CATALYST

HUMAN CAPITAL Lightspeed



2017



40



VC Backed, \$32.3m raised to date



Product Attribute Expansion



B2B

BUSINESS DESCRIPTION

Impira uses AI to turn unstructured data, such as documents, videos, images, audio, and webpages, into a structured format. Powered by AI and using technologies such as OCR and computer vision, Impira's no-code solution helps businesses streamline previously labour-intensive workflows by automatically tagging images and extracting text from documents.



HELSINKI

KEY PERSONNEL

Juha Valvanne – Co-Founder & Global Head of Corporate Development
Antti Pöyhönen – Co-Founder & CTO
Jani Luostarinen – Co-Founder & Head of Engineering

KEY INVESTORS

idinvest KREOS CAPITAL PARTNERS

OpenOcean wellingtonpartners



2011



128



VC Backed, \$36.3m raised to date



Personalisation



B2B

BUSINESS DESCRIPTION

Nosto is a world-leading e-commerce personalisation platform with a simple premise – that every shopping experience can, and should, be personal. Through its Commerce Experience Platform, Nosto consolidates an individual's behavioural data points into a single repository. Using machine learning, the platform then builds real-time predictive profiles to deliver highly personalised experiences at every interaction with every customer.



LONDON

KEY PERSONNEL

Ivan Mazour – Co-Founder & CEO
Alastair James – Co-Founder & CTO
James Wood – Co-Founder & Chief Experience Officer
Djalal Lougouev – Co-Founder & CPO

KEY INVESTORS

BEACON CAPITAL ForceOverMass

octopus ventures SONAEIM



2013



110



VC Backed, \$33.2m raised to date



Personalisation



B2B

BUSINESS DESCRIPTION

Ometria is an AI-powered customer marketing platform that offers personalised marketing solutions. The company's platform enables marketers to create personalised experiences across every customer touch point, utilising cross-channel customer intelligence to tailor each message to its recipient.

Qubit.



LONDON

KEY PERSONNEL

Graham Cooke – Founder & CEO
Christopher Bradbury - COO
Steve Harris - CFO

BUSINESS DESCRIPTION

Qubit is a website optimisation software designed to provide personalisation services at scale. The company's platform provides omnichannel personalisation, product recommendation and customer segmentation solutions to online retailers, ultimately building customer loyalty, improving marketing efficiency and increasing revenue.

KEY INVESTORS



2010



92



VC Backed, \$75.9m raised to date



Personalisation



B2B

[Sc]

STANDARD COGNITION



SAN FRANCISCO

KEY PERSONNEL

Jordan Fisher – Co-Founder & CEO
Michael Suswal – Co-Founder & COO
TJ Lutz – Co-Founder

BUSINESS DESCRIPTION

Standard Cognition is an autonomous checkout technology for brick and mortar retailers. The company's technology uses AI and computer vision to allow customers to shop and pay without having to queue at a traditional checkout, ultimately reducing operating costs for retailers and improving the customer experience.

KEY INVESTORS



2017



120



VC Backed, \$97.3m raised to date



Smart Stores



B2B/B2C

syte



TEL AVIV

KEY PERSONNEL

Ofer Fryman – Co-Founder & CEO
Idan Pinto – Co-Founder & COO
Lihl Pinto Fryman – Co-Founder & CRO

BUSINESS DESCRIPTION

Syte is a leading provider of visual search technology designed to transform the way people search and shop for fashion online. The company's technology utilises Artificial Intelligence to enhance product attributes and search functionality, enabling enterprises to deliver intuitive and personalised shopping experiences that increase revenue and brand loyalty.

KEY INVESTORS



2015



112



VC Backed, \$31.4m raised to date



Product Attribute Expansion



B2B

ZIPPIN



SAN FRANCISCO

KEY PERSONNEL

Krishna Motukuri – Co-Founder & CEO
Motilal Agrawal – Co-Founder & Chief Scientist

BUSINESS DESCRIPTION

Zippin is a leading provider of autonomous shopping technology for the retail industry. The company's technology uses deep learning-based computer vision and real-time sensor fusion to enable checkout-free shopping. Zippin's platform uses product and shopper tracking through overhead cameras as well as smart shelf sensors for the highest level of accuracy, even in crowded stores.

KEY INVESTORS



2018



28



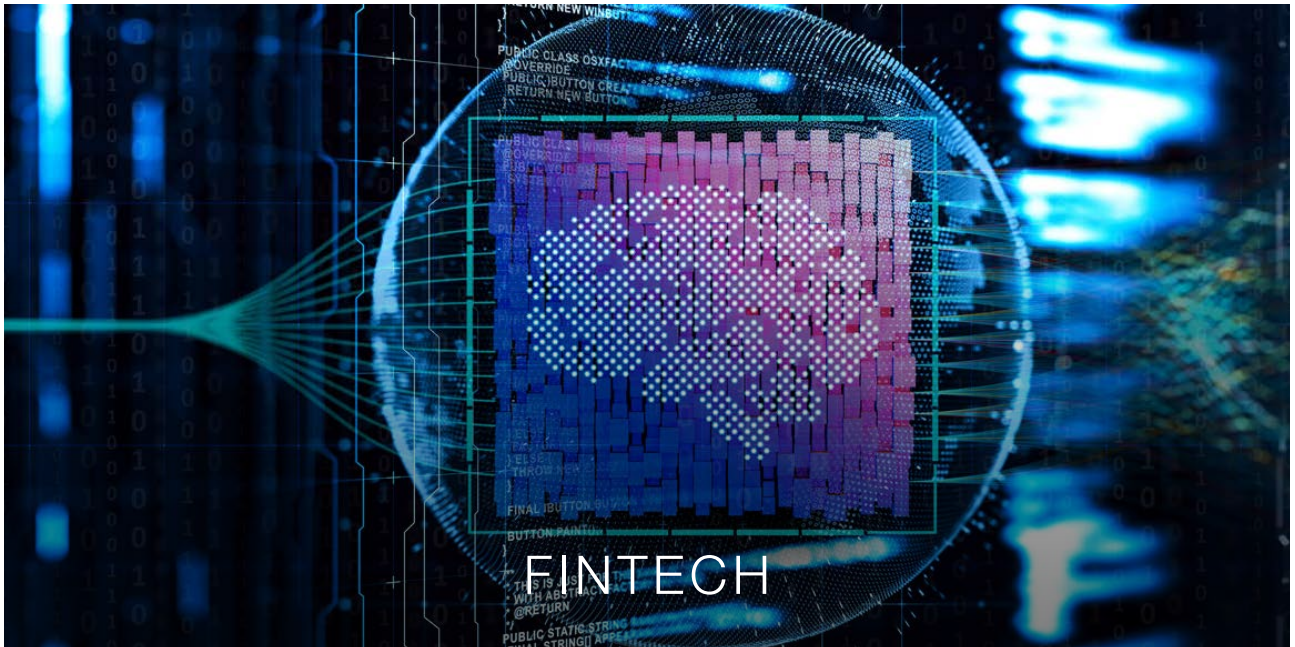
VC Backed, \$14.8m raised to date



Smart Stores



B2B



blend



SAN FRANCISCO

KEY PERSONNEL

Nima Ghamsari – Co-Founder & CEO
Erin Collard – Co-Founder & Board Member
Timothy Mayopoulos – President

BUSINESS DESCRIPTION

Blend is a digital lending platform that simplifies and improves the lending process. The company's machine learning-based platform uses verified source data to build a consumer's complete financial profile, automate third-party verification and manage the tasks needed to close a loan. This enables financial institutions to process lending faster, increase productivity and deliver exceptional customer experiences.

KEY INVESTORS



2012



518



VC Backed, \$389.1m raised to date



Credit Underwriting



B2B



MOUNTAIN VIEW

KEY PERSONNEL

Ryan Kottenstette – Co-Founder & CEO
Suat Gedikli – Co-Founder & CTO
Amy Minnick – Chief Business Officer



2014



57



VC Backed, \$43.9m raised to date



Insurance Underwriting

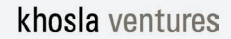


B2B

BUSINESS DESCRIPTION

Cape Analytics uses deep learning and geospatial imagery to provide instant property intelligence for buildings in the United States. The company enables insurers and other property stakeholders to access valuable property attributes at the time of underwriting, offering more personalised and more accurate online quotations on home insurance in real-time.

KEY INVESTORS



LONDON

KEY PERSONNEL

Barnaby Hussey-Yeo – Founder & CEO
Thish Nadesan – COO



2016



86



VC Backed, \$37.2m raised to date



Personalisation / Chatbots



B2C

BUSINESS DESCRIPTION

Cleo is an AI-based personal finance platform designed to change everyone's relationship with money. The company's platform enables users to track and analyse their spending across multiple accounts and cards by chatting with Cleo, a virtual assistant accessible via the app or in Facebook Messenger.

KEY INVESTORS



Comply Advantage



LONDON

KEY PERSONNEL

Charles Delingpole – Founder & CEO
Vatsa Narasimha – CFO & COO



2014



239



VC Backed, \$109m raised to date



Fraud



B2B

BUSINESS DESCRIPTION

Comply Advantage is a leading AI-driven financial crime risk data and detection platform designed to neutralise the risk of money laundering, corruption and other financial crime. The company's platform provides real-time insights into the risk of companies globally, automating compliance and risk processes and ultimately enabling firms to make intelligent risk decisions faster.

KEY INVESTORS





2012



163



VC Backed, \$14.2m raised to date



Personalisation / Chatbots



B2B



SINGAPORE

BUSINESS DESCRIPTION

Crayon Data is a big data company that provides personalisation solutions through its Maya.ai product to the financial services and retail sector. Maya.ai personalises offer management for fintechs, providing taste-led offer recommendations to improve customer loyalty whilst simultaneously engaging brands and merchants.

KEY PERSONNEL

Suresh Shankar – Co-Founder & CEO
Vijaya Kumar Ivaturi – Co-Founder & CTO
Srikant Sastri – Co-Founder

KEY INVESTORS



MITSUI & CO.



2009



454



VC Backed, \$82m raised to date



Fraud



B2B



SAN MATEO

BUSINESS DESCRIPTION

Feedzai has developed a platform that provides actionable intelligence in real time to make commerce safe. The company's platform applies machine learning to large data sets to detect anomalies and highlight potential cases of fraud associated with banking and shopping.

KEY PERSONNEL

Nuno Sebastiao – Co-Founder, CEO & Chairman
Pedro Bizarro – Co-Founder & Chief Science Officer
Paulo Marques – Co-Founder & CTO

KEY INVESTORS



2018



28



VC Backed, \$13.2m raised to date



Credit Underwriting



B2B



PALO ALTO

BUSINESS DESCRIPTION

Fiddler Labs provides an explainable AI platform that enables financial institutions to deliver trustworthy, transparent and auditable insights across various use cases. The company's platform allows financial institutions to optimise credit underwriting, detect fraud and reduce customer churn whilst ensuring the highest degree of trust and transparency in the process.

KEY PERSONNEL

Krishna Gade – Co-Founder & CEO
Amit Paka – Co-Founder & CPO
Manoj Cheenath – Co-Founder & Chief Architect

KEY INVESTORS



Kasisto



2013



88



VC Backed, \$33.5m raised to date



Personalisation / Chatbots



B2B



NEW YORK

BUSINESS DESCRIPTION

Kasisto is a virtual personal assistant technology designed to improve customer experiences in consumer mobile banking. The company's conversational AI-based platform, KAI, powers smart bots and virtual assistants on messaging, mobile, web and wearable devices, enabling companies to engage and transact with their customers through intelligent conversations.

KEY PERSONNEL

Zor Gorelov – Co-Founder & CEO
Ruth Brown – Co-Founder & COO
Sasha Caskey – Co-Founder & CTO

KEY INVESTORS



Commerce Ventures®



TWO SIGMA VENTURES

PLΔNCK



2016



55



VC Backed, \$28.0m raised to date



Insurance Underwriting



B2B



NEW YORK

BUSINESS DESCRIPTION

Planck is an AI-based platform that offers real-time data analytics and automated solutions to insurance providers. Utilising publicly available data, image processing and company reports, the platform can perform accurate risk assessments of businesses in real-time enabling insurers to offer personalised insurance policies at scale.

KEY PERSONNEL

Elad Tsur – Co-Founder & CEO
Amir Cohen – Co-Founder & CTO
David Schapiro – Co-Founder

KEY INVESTORS

8th EIGHT ROADS™



VIOLA FINTECH

Quantexa

Connecting Data | Empowering Decisions



2016



242



VC Backed, \$89.4m raised to date



Fraud



B2B



LONDON

BUSINESS DESCRIPTION

Quantexa has developed an entity resolution and network analytics technology that uncovers hidden customer connections and behaviours using big data and AI. This enables clients to solve major challenges in financial crime across anti-money laundering, KYC checks and fraud as well as optimise credit risk assessment and develop improved customer intelligence.

KEY PERSONNEL

Vishal Marria – Founder & CEO
Jamie Hutton – CTO
Avri Chana – CFO

KEY INVESTORS





2009



50



VC Backed, \$53.1m raised to date



Fraud



B2B



MENLO PARK

BUSINESS DESCRIPTION

Quantifind is a leading anti-money laundering and fraud detection software that uniquely discovers risk by combining internal financial institution data with public domain data. Utilising advanced AI, the company uses explanatory analytics to help financial crime analysts reduce false positives and optimise risk management.

KEY PERSONNEL

Ari Tuchman – Co-Founder & CEO
John Stockton – Co-Founder

KEY INVESTORS

AME CLOUD VENTURES

ANDREESSEN HOROWITZ



2014



76



VC Backed, \$39.2m raised to date



Fraud



B2B



LONDON

BUSINESS DESCRIPTION

Ravelin provides fraud detection services through a real-time platform that combines machine learning with a merchant's own risk profile. The company provides unique insights and highly accurate fraud detection ultimately making online commerce a safe place to do business.

KEY PERSONNEL

Martin Sweeney – Co-Founder & CEO
Nick Lally – Co-Founder & COO
Leonard Austin – Co-Founder & CTO
Mairtin O'Riada – Co-Founder & CIO

KEY INVESTORS



2014



95



Angel Backed, \$9.9m raised to date



Credit Underwriting



B2B



NEW YORK

BUSINESS DESCRIPTION

Scienaptic aims to redefine the legacy approach to credit underwriting. The company's platform, Ether, offers a suite of AI underwriting tools to better identify qualified prospects, flag risks and offer a more complete risk assessment. Using fully compliant, explainable AI, the company claims to increase approval rates by 15-40% whilst simultaneously reducing losses by 10-25%.

KEY PERSONNEL

Pankaj Kulshreshtha – Founder & CEO
Pankaj Jain – President

KEY INVESTORS



VERAFIN



ST. JOHN'S

KEY PERSONNEL

Jamie King – Co-Founder
President & CEO
Brendan Brothers – Co-Founder & Product Specialist
Raymond Pretty – Co-Founder & CTO

KEY INVESTORS



2003



529



PE Backed, \$449m raised to date



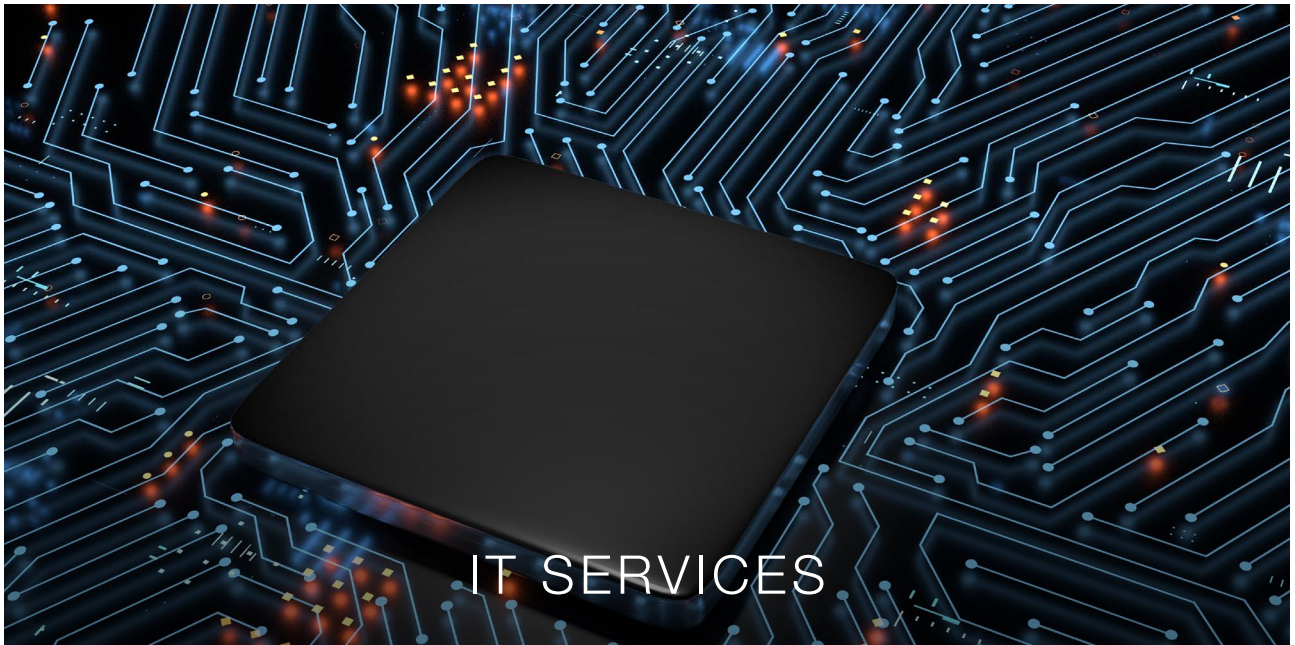
Fraud



B2B

BUSINESS DESCRIPTION

Verafin is the developer of a leading cloud-based fraud detection and anti-money laundering software designed to identify entities that may be involved in money laundering or terrorist financing activities. The company offers compliance automation tools such as big data intelligence, visual storytelling, collaborative investigations and AI-powered cross-institutional, multi-channel analysis to detect deposit, check, card and wire frauds and other financial crime.



IT SERVICES

anodot



REDWOOD CITY

KEY PERSONNEL

David Drai – Co-Founder & CEO
Ira Cohen – Co-Founder & Chief Data Scientist
Shay Lang – Co-Founder & VP R&D

KEY INVESTORS



2014



84



VC Backed, \$62.5m raised to date



Monitoring & ITSM



B2B

BUSINESS DESCRIPTION

Anodot has developed a cloud-based real-time analytics and automated anomaly detection system intended to turn outliers in time series data into valuable business insights. The company's platform uses automated machine learning algorithms to continuously analyse all business data and alert the businesses in real time whenever an incident occurs, enabling them to remedy urgent problems faster and capture opportunities sooner.



epsagon



2018



41



VC Backed, \$30.1m raised to date



Monitoring & ITSM



B2B



NEW YORK

BUSINESS DESCRIPTION

Developer of an automated performance tracking platform designed to offer complete monitoring for serverless applications. The company's platform predicts performance issues before they occur and offers full support for cloud resources by providing automated data correlation, payloads, and end-to-end observability within microservice environments, enabling enterprises to fix issues efficiently with less troubleshooting.

KEY PERSONNEL

Nitzan Shapira – Co-Founder & CEO
Ran Ribenzaft – Co-Founder & CTO

KEY INVESTORS



LONDON



2019



11



VC Backed, \$13.5m raised to date



BPA & RPA



B2B

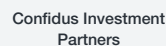
KEY PERSONNEL

Sameet Gupte – CEO

BUSINESS DESCRIPTION

Developer of an intelligent hyper-automation platform designed to help with process modernisation and implementation. The company's platform leverages the power of RPA, AI and ML technologies to effectively drive transformation programs across accounting, ITSM, HR and more.

KEY INVESTORS



SAN FRANCISCO



2017



78



VC Backed, \$46.0m raised to date



BPA & RPA



B2B

KEY PERSONNEL

Pankaj Chowdhry – Founder & CEO
Ryan Stroub – CFO

BUSINESS DESCRIPTION

FortressIQ is the creator of a cognitive automation platform that powers and accelerates digital transformation through imitation learning. Using an innovative type of AI that combines computer vision, natural language and sequence modeling, FortressIQ learns how a business functions through live activity analysis and can optimise automation as a result.

KEY INVESTORS



KRYON™



2008



166



VC Backed, \$68.0m raised to date



BPA & RPA



B2B



TEL AVIV

BUSINESS DESCRIPTION

Kryon is an RPA platform that offers continuous process optimisation. The company's platform uses patented AI technology that automates business processes quickly and efficiently resulting in immediate productivity gains, near-zero error rates, reduced costs and significant ROI.

KEY PERSONNEL

Harel Tayeb - CEO
Tomer Pinchas - CFO

KEY INVESTORS

AQUILINE
CAPITAL PARTNERS LLC

FORT ROSS
VENTURES

OAK
HC/FT

vertex
VENTURES

mimica



2018



11



VC Backed, \$1.8m raised to date



BPA & RPA



B2B



LONDON

BUSINESS DESCRIPTION

Mimica is a machine learning automation platform designed to accelerate the deployment of RPA. The company's platform uses Artificial Intelligence to automate process intelligence and process mapping whilst reducing man-hours and process errors.

KEY PERSONNEL

Tuhin Chakraborty – Co-Founder & CEO
Raphael Holca-Lamarre – Co-Founder & CTO

KEY INVESTORS

e1 Episode 1

e TI

moogsoft



2012



193



VC Backed, \$94.6m raised to date



Monitoring & ITSM



B2B



SAN FRANCISCO

BUSINESS DESCRIPTION

Moogsoft operates a next-generation incident management platform designed to help people and machines work together to find clarity in chaos. The company's platform automatically identifies performance issues and gives the immediate insight needed to manage problems proactively.

KEY PERSONNEL

Phil Tee – Co-Founder, CEO & Chairman
Amer Deeba – President & COO
Mike Silvey – Co-Founder & EVP

KEY INVESTORS

cisco
investments

DELL
Technologies
CAPITAL

Goldman
Sachs

wipro ventures

Olive



COLUMBUS

KEY PERSONNEL

Sean Lane – CEO
Lori Jones – CRO



2012



368



VC Backed, \$229.8m raised to date



BPA & RPA



B2B

BUSINESS DESCRIPTION

Developer of process automation software designed to build meaningful AI that empowers and scales humans. The company's software acts as a conduit between systems and data by automating repetitive, high-volume tasks and workflows to eliminate denials for no coverage as well as improve cash collection, enabling healthcare organisations to improve efficiency and patient care while reducing costly administrative errors.

KEY INVESTORS



khosla ventures



PacketAI

Hands-off monitoring



PARIS

KEY PERSONNEL

Hardik Thakkar – Co-Founder & CEO
Abdelhadi Azzouni – Co-Founder & CTO



2018



18



VC Backed, \$2.4m raised to date



Monitoring & ITSM



B2B

BUSINESS DESCRIPTION

PacketAI operates the world's first autonomous monitoring solution designed for the cloud. The company's platform uses AI and machine learning to predict IT infrastructure incidents, point to the exact root cause and provide automated remediation before customers are impacted, helping businesses to save time, cost and improve productivity.

KEY INVESTORS



RESOLVE



CAMPBELL

KEY PERSONNEL

Vijay Kurkal – CEO
Julie Albright – SVP Global Marketing
Robert Kelsall – VP Global Sales Engineering



2014



156



PE Backed, \$15.0m raised to date



BPA & RPA



B2B

BUSINESS DESCRIPTION

Resolve operates an IT process automation software. The company's technology accelerates incident response and resolution by providing engineers with human-guided automation, real-time incident collaboration and the ability to partially and fully automate processes in ITOps.

KEY INVESTORS





BOSTON

KEY PERSONNEL

Stephen Baker – CEO
Michel den Braver – CFO

BUSINESS DESCRIPTION

Developer of an AIOps platform designed to deliver a real-time, comprehensive map of the enterprise IT landscape. The company's platform empowers IT teams to deliver extraordinary customer experiences through autonomous, incident-free operations.

KEY INVESTORS



2015



49



VC Backed, \$17.5m raised to date



Monitoring & ITSM



B2B



BOSTON

KEY PERSONNEL

Frank Speiser – Chairman & CEO
Byron Galbraith – Co-Founder & CTO

BUSINESS DESCRIPTION

Developer of an ITSM platform designed to bring an AI-powered service desk to HR, IT, and other internal service teams. The company's platform manages and prioritises inquiries, automates answering FAQs, and proactively educates its employees, all within chat applications like Slack and Microsoft Teams, enabling clients to automate their service desk and streamline communications.

KEY INVESTORS



2015



44



VC Backed, \$17.3m raised to date



Monitoring & ITSM



B2B



SAN JOSE

KEY PERSONNEL

Ron Sege – Executive Chairman & CEO
Lisa Alger – COO
Marion Smith - CFO

BUSINESS DESCRIPTION

Virtana is a leading hybrid cloud optimisation platform for digital transformation. Its technology and services give innovative organisations the clarity they need to take control of their infrastructure, transform their cloud operations, and deliver a superior user experience.

KEY INVESTORS



2008



109



VC Backed, \$85.0m raised to date



Monitoring & ITSM



B2B



NEW YORK

KEY PERSONNEL

Alex Lyashok – President & CEO
Max Yankelevich – Co-Founder & Chief Strategy Officer
Andrew Volkov – Co-Founder & CTO

KEY INVESTORS



- 2010
- 315
- VC Backed, \$121.1m raised to date
- BPA & RPA
- B2B

BUSINESS DESCRIPTION

WorkFusion operates an intelligent automation platform that provides the tools needed to automate business processes, enabling enterprises to digitise their operation, increase productivity and improve service delivery.



AUSTIN

KEY PERSONNEL

Greg Stock – Chairman & CEO
Matt Bates – CFO
George Kanuck – CRO

KEY INVESTORS



- 2005
- 122
- VC Backed, \$58.1m raised to date
- Monitoring & ITSM
- B2B

BUSINESS DESCRIPTION

Zenoss has developed an IT monitoring platform that provides a complete solution for cloud, virtual and physical IT environments. The company's software assists in managing networks, servers, virtual devices, storage and cloud infrastructure, ensuring complete visibility and predictability over IT operations.



ABNORMAL SECURITY



SAN FRANCISCO

KEY PERSONNEL

Evan Reiser – Co-Founder & CEO
Sanjay Jeyakumar – Co-Founder & CTO



2018



72



VC Backed, \$24.0m raised to date



Phishing Defense & Email Monitoring



B2B

BUSINESS DESCRIPTION

Abnormal Security is a next-generation email security platform that uses behavioural anomaly detection to prevent business email compromise and social engineering attacks. The company's platform uses NLP, computer vision, text analytics and more to provide the highest standard of email security.

KEY INVESTORS

greylockpartners.



ActZero.ai



SEATTLE

KEY PERSONNEL

Sameer Bhalotra – Co-Founder & CEO
Ed Gardner – Co-Founder & Head of Product
John Nurczynski – Co-Founder & Director of Strategic Operations & Business Planning



2019



29



VC Backed, \$40.0m raised to date



Network Threat Analysis



B2B

BUSINESS DESCRIPTION

ActZero is an AI-driven cybersecurity company focused on managed detection and response. The company's platform utilises AI and machine learning to provide enterprises with better protection at a fraction of the cost of traditional approaches.

KEY INVESTORS





2017



48



VC Backed, \$16.5m raised to date



Phishing Defense & Email Monitoring



B2B



CUPERTINO

BUSINESS DESCRIPTION

Armorblox operates a cloud-native email security platform that protects against targeted attacks such as business email compromise, account takeover, and executive impersonation. The company's platform uses natural language processing and deep learning to identify and block conspicuous emails on all enterprise communications.

KEY PERSONNEL

Dhananjay Sampath – Co-Founder & CEO
Anand Raghavan – Co-Founder & CPO
Arjun Sambamoorthy – Co-Founder & Head of Engineering
Chetan Anand – Co-Founder & Architect

KEY INVESTORS



a_{capital}



1986



461



PE Backed, \$180m raised to date



Malware Detection



B2B/B2C



TETTANG

BUSINESS DESCRIPTION

Avira is a leading European cybersecurity software company serving the OEM and consumer end markets. Over its 30+ year history, the company has developed particular strengths in anti-malware, threat intelligence and IoT solutions as well as AI in cybersecurity. Avira recently announced its majority sale to Investcorp Technology Partners for \$180m. Drake Star acted as exclusive financial advisor to Avira on this transaction.

KEY PERSONNEL

Travis Witteveen – CEO
Matthias Ollig – CTO
Michael Silbermann – CFO

KEY INVESTORS

INVESTCORP

BLUHEXAGON



2017



34



VC Backed, \$62.9m raised to date



Malware Detection



B2B



SUNNYVALE

BUSINESS DESCRIPTION

Blue Hexagon is a next-gen enterprise automated network threat defense platform that prevents cyber threats in real-time. The company's platform uses neural networks to identify cyber threats in payloads and headers based on carefully curated global threat data.

KEY PERSONNEL

Nayeem Islam – Co-Founder & CEO
Saumitra Das – Co-Founder & CTO

KEY INVESTORS



Cyberint



PETAH TIKVA

KEY PERSONNEL

Itay Yanovski – Founder & SVP Strategy
Yochai Coem - CEO
Shai Yatzkan – CFO

BUSINESS DESCRIPTION

Cyberint operates a cybersecurity detection and response platform which leverages unique AI and ML algorithms to respond to ever-changing cyber threats in real time. The company also offers managed services that cover threat intelligence and attack surface monitoring to ensure optimal enterprise protection delivered by Cyberint's in-house cybersecurity experts.

KEY INVESTORS



2009



74



VC Backed, \$28.0m raised to date



Network Threat Analysis



B2B



DARKTRACE



CAMBRIDGE

KEY PERSONNEL

Poppy Gustafsson – CEO
Nicole Eagan – CSO & AI Officer
Andrew Tsonchev – Director of Technology

BUSINESS DESCRIPTION

Darktrace is a leading AI company and the creator of autonomous response technology. Its self-learning AI is modeled on the human immune system and used by over 3,500 organisations to protect against threats to the cloud, email, IoT, networks and industrial systems.

KEY INVESTORS



2013



1,330



VC Backed, \$338.4m raised to date



Network Threat Analysis



B2B

deepinstinct



NEW YORK

KEY PERSONNEL

Guy Caspi – Co-Founder & CEO
Eli David – Co-Founder & Chief Scientist
Nadav Maman – Co-Founder & CTO

BUSINESS DESCRIPTION

Deep Instinct operates a cybersecurity platform that provides protection against evasive unknown malware in real-time. The company's platform provides protection against zero-day threats and APT attacks by identifying malware using AI, resulting in comprehensive protection on any device and operating system.

KEY INVESTORS



2015



167



VC Backed, \$98.2m raised to date



Malware Detection



B2B



LONDON

KEY PERSONNEL

Tony Pepper – Co-Founder & CEO
Neil Larkins – Co-Founder & COO
John Goodyear – Co-Founder & CSO

BUSINESS DESCRIPTION

Developer of an intelligent email security platform that prevents, responds to and investigates potential security breaches. The company's platform uses contextual machine learning and powerful encryption to prevent human-activated data breaches and protect sensitive data.

KEY INVESTORS



2007



254



VC Backed, \$47.9m raised to date



Phishing Defense & Email Monitoring



B2B



TEL AVIV

KEY PERSONNEL

Uri May – Co-Founder & CEO
Tomer Kazaz – Co-Founder & CTO

BUSINESS DESCRIPTION

Developer of a cybersecurity platform that proactively hunts for cyber threats. The company's platform uses TTP-based detectors to spot potential attack signals and automatically investigates the suspicious activity. Threat hunting can be used to detect more sophisticated cyber attacks that other tools cannot detect using conventional methods.

KEY INVESTORS



2018



50



VC Backed, \$20.4m raised to date



Malware Detection



B2B



COLLEGE PARK

KEY PERSONNEL

Dave Baggett – Co-Founder & CEO
Simon Smith – Co-Founder & COO

BUSINESS DESCRIPTION

Developer of an AI-based anti-phishing platform intended to track and block unusual or suspicious threats. The company's platform uses novel computer vision and anomaly detection algorithms to identify and block spear-phishing attempts.

KEY INVESTORS



2008



55



VC Backed, \$29.4m raised to date



Phishing Defense & Email Monitoring



B2B



RAMAT GAN

KEY PERSONNEL

Eyal Benishti – Founder & CEO
Erez Fingerman – COO
Lior Tenzer – CFO

KEY INVESTORS



2013

54

VC Backed, \$33.0m raised to date

Phishing Defense & Email Monitoring

B2B

BUSINESS DESCRIPTION

Developer of an automated platform to address the challenges of email phishing. The company's platform uses a combination of machine learning and human intelligence to offer phishing simulation training, threat protection and incident response, enabling organisations to better protect themselves from the threat of phishing.

QOMPLX:



RESTON

KEY PERSONNEL

Jason Crabtree – Co-Founder & CEO
Andrew Sellers – Co-Founder & CTO

KEY INVESTORS



2014

171

VC Backed, \$78.6m raised to date

Network Threat Analysis

B2B

BUSINESS DESCRIPTION

Developer of Q:OS, an enterprise operating system designed to support the development and management of decision platforms in cybersecurity, insurance, and quantitative finance. The company's platform helps organisations to identify cyber risks, explore attack pathways and better understand the attack surface.



TEL AVIV

KEY PERSONNEL

Gilad Peleg – CEO
Doron Davidson – Co-Founder, CMO & VP Business Development

KEY INVESTORS



2014

19

VC Backed, \$9.5m raised to date

Network Threat Analysis

B2B

BUSINESS DESCRIPTION

Developer of an automated threat detection platform designed to provide end-to-end protection, particularly against attacks with an extended kill chain. The company's platform is a complete automated threat detection and response solution delivering highly effective, automated security.



LONDON

KEY PERSONNEL

Tim Sadler – Co-Founder & CEO
Ed Bishop – Co-Founder & CTO
Tom Adams – Co-Founder & Head of Client-Side Engineering

KEY INVESTORS



2013



150



VC Backed, \$56.3m raised to date



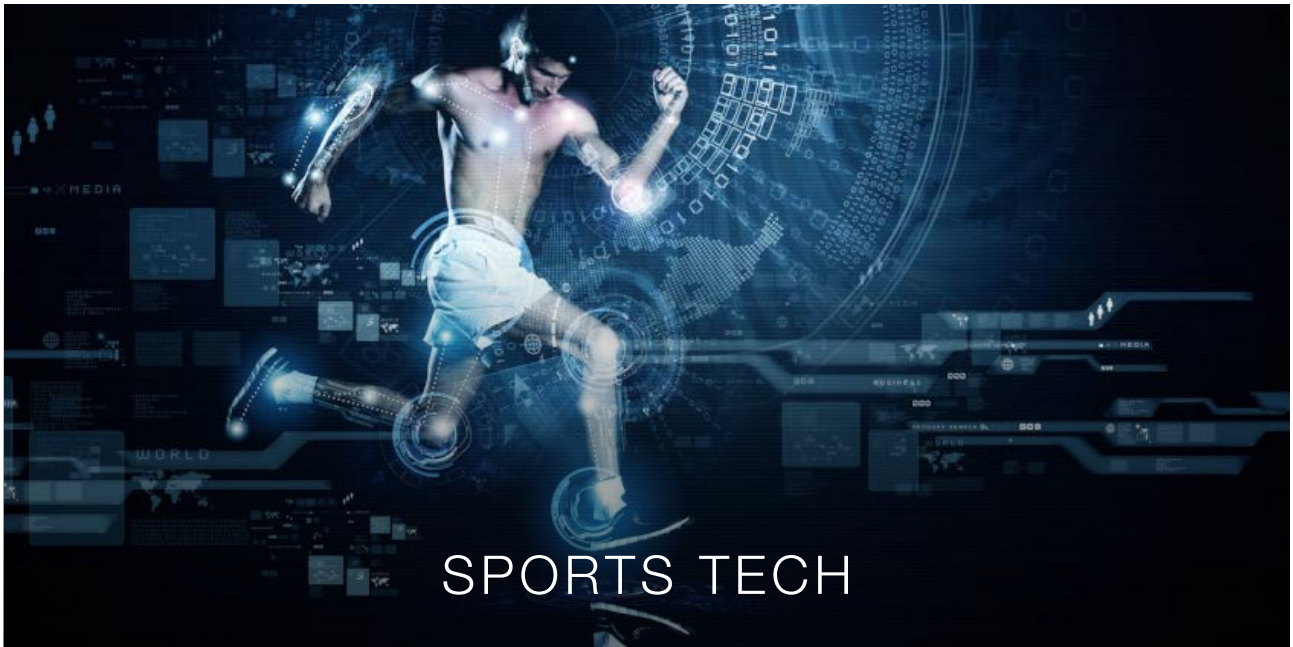
Phishing Defense & Email Monitoring



B2B

BUSINESS DESCRIPTION

Developer of a next-generation email security platform designed to prevent inadvertent data loss. The company's platform uses machine learning and Artificial Intelligence to eliminate advanced inbound and outbound threats on email.



LINCOLN

KEY PERSONNEL

David Graff – Co-Founder & CEO
Brian Kaiser – Co-Founder & CTO
John Wirtz – Co-Founder & CPO

KEY INVESTORS



2006



1,316



PE Backed, \$227.1m raised to date



Coaching & Athlete Performance



B2B

BUSINESS DESCRIPTION

Hudl is a leading performance analysis company revolutionising the way coaches and athletes train and compete. Hudl offers a complete suite of products that empowers more than 160,000 global sports teams at every level to gather insights with video and data analysis. Products and services include online tools, mobile and desktop apps, smart cameras, analytics, professional consultation and more.

identv™



2013



21



Accelerator/
Incubator Backed



Data & Sponsorship



B2B



SAN FRANCISCO

BUSINESS DESCRIPTION

IdeTV is a leading video analytics technology company with use cases including content recognition, content indexing, in-video search, video security and more. The company's media solution provides real-time video search and content management tools for broadcasters to enable effective video content monetisation.

KEY PERSONNEL

Mohammad Shihadah – Co-Founder & CEO

Amro Shihadah – Co-Founder & COO

KEY INVESTORS

newchip

KINEXON



2012



166



Accelerator/
Incubator Backed



Coaching & Athlete
Performance



B2B



MUNICH

BUSINESS DESCRIPTION

KINEXON provides state of the art sensor networks and edge computing solutions to manufacturing, logistics, sports and media organisations. Working with high profiles customers such as the Philadelphia 76ers and Paris Saint-Germain, the company utilises AI and computer vision to provide real-time sports tracking and analysis to teams, leagues, media organisations and rights holders.

KEY PERSONNEL

Alexander Huttenbrink – Co-Founder & Managing Director

Oliver Trinchera – Co-Founder & Managing Director

Maximilian Schmidt – Co-Founder & Managing Director

KEY INVESTORS



business
incubation
centre
Bavaria
managed by AZO

PandaScore



2015



48



VC Backed, \$4.3m
raised to date



Data & Sponsorship



B2B



PARIS

BUSINESS DESCRIPTION

PandaScore is a leading esports data and odds provider. Using AI, the company collects real-time data about competitive matches on video games such as League of Legends, Overwatch and Dota 2, then delivers it in real-time as odds and statistics through an API to the esports ecosystem. PandaScore works closely with worldwide bookmakers, media organisations, professional teams, and score apps.

KEY PERSONNEL

Flavien Guillocheau – CEO

Matt Ellsworth - COO

KEY INVESTORS



GFC



Pixelot



2013



99



VC Backed, \$68.1m raised to date



Fan Engagement



B2B



PETAH TIKVA

BUSINESS DESCRIPTION

Pixelot's automated sports production solutions are revolutionising traditional video capture, production and distribution, enabling organisations to affordably broadcast and monetise sporting events. The company's technology streamlines the production workflow by deploying an unmanned multi-camera system in a single fixed rig, covering the entire field of play. Utilising AI-powered auto-production algorithms, the platform can track the flow of play, identify highlights, create replays and insert advertisements.

KEY PERSONNEL

Alon Werber – CEO
Gal Oz – Co-Founder & CTO
Peter Schon – CFO

KEY INVESTORS

SHAMROCK
CAPITAL PARTNERS

ARKIN HOLDINGS



Asahi
Media Lab
Ventures



ALTSCHULER SHANAM

playermaker



2016



65



VC Backed, \$16.1m raised to date



Coaching & Athlete Performance



B2B



LONDON

BUSINESS DESCRIPTION

Playermaker is a sports performance and analytics company, using cutting-edge motion sensors and advanced AI algorithms to provide unparalleled insights on team and player performance. Utilising a smart motion sensor attached directly onto a player's boot, the platform measures technical, tactical, biomechanical and physical interactions on the pitch, enabling managers and coaches to better understand and improve individual and team play.

KEY PERSONNEL

Guy Aharon – Co-Founder & CEO
Eyal Postelnik – Co-Founder

KEY INVESTORS

Arsène Wenger



BENHAMOU GLOBAL VENTURES

playsight



2013



63



VC Backed, \$26.0m raised to date



Fan Engagement



B2B / B2C



PETAH TIKVA

BUSINESS DESCRIPTION

PlaySight connects the next generation of athletes with its immersive video, analytics and live streaming sports technology platform. The company makes courts, gyms, fields and rinks smart by installing high-performance AI software and connected camera technology, providing a variety of services including automatic production broadcasting, advanced coaching tools and a content platform to store, manage and share video, statistics, and analytics.

KEY PERSONNEL

Cehn Shachar – Co-Founder & CEO
Evgeni Khazanov – Co-Founder & CTO

KEY INVESTORS



SoftBank
Group



Verizon
Ventures





NEW YORK

KEY PERSONNEL

Don White – Co-Founder & CEO
Rungson Samroengraja – Co-Founder,
President & CFO
Randall Newman – Co-Founder & CTO

KEY INVESTORS



2014



27



VC Backed, \$7.7m raised to date



Fan Engagement



B2B

BUSINESS DESCRIPTION

Satisfi Labs is an AI-powered knowledge management platform that enables automated conversations with customers across multiple channels.

The company's Knowledge Engine takes in a client's brand, team and venue content to create an AI-ready platform enabling sports teams and leagues to provide an optimal fan experience at live events.



ST. GALLEN

KEY PERSONNEL

Carsten Koerl – Co-Founder & CEO
Petter Fornæss – Co-Founder & MD
Technology

KEY INVESTORS



2001



1,547



PE Backed, \$98.5m raised to date



Data & Sponsorship



B2B

BUSINESS DESCRIPTION

Sportradar is a global leader in understanding and leveraging the power of sports data and digital content for media companies, bookmakers, sports federations and state authorities around the world. Partnering with over 1,000 companies in more than 80 countries, the company has positioned itself at the intersection of the sports, media and betting industries, and was acquired by CPPIB and TCV in July 2018 for €2.1bn.



CHICAGO

KEY PERSONNEL

Carl Mergele – CEO
Ashley Milton – CFO
Mike Perez – COO

KEY INVESTORS



1981



1,120



PE Backed



Data & Sponsorship



B2B

BUSINESS DESCRIPTION

Stats Perform is a leading provider of sports data, technology, and content designed to meet the evolving needs of media, broadcasters, leagues & teams, fantasy providers and players, as well as major B2B and B2C brands. The company's sports data, technology, and content include sports data collection, processing, distribution, web applications, broadcast enhancements, hosting, wireless applications, online statistics, scouting reports and research tools.

TRACK160



2017



26



VC Backed, \$5.9m raised to date



Coaching & Athlete Performance



B2B



TEL AVIV

BUSINESS DESCRIPTION

Track160 is the developer of a team sports analytics and optical tracking platform designed to track and identify the players throughout a match. Using AI and deep learning techniques, the company's platform tracks player and ball movement, ball trajectory and speed without the use of sensors or human operators, enabling managers and coaches to quantify and better understand individual and team play.

KEY PERSONNEL

Miky Tamir – Co-Founder & Chairman
Amit Gilad – CFO

KEY INVESTORS



WILDMOKA



2013



43



VC Backed, \$7.8m raised to date



Fan Engagement



B2B



VALBONNE

BUSINESS DESCRIPTION

Wildmoka has developed a leading cloud-based platform for video production, hyper-distribution and content monetisation. Using next-gen technologies like speech-to-text, video recognition, and machine learning, the company enables customers to provide fans with highly personalised digital experiences across web, mobile and social media channels. Their current customers include high-profile names such as France Televisions, FOX Networks, Orange, beIN Sports and TF1.

KEY PERSONNEL

Cristian Livadiotti – Co-Founder & CEO
Thomas Menguy – Co-Founder, President & CTO

KEY INVESTORS



WSC Sports



2011



138



VC Backed, \$39.0m raised to date



Fan Engagement



B2B



GIVATAYIM

BUSINESS DESCRIPTION

WSC is the provider of an automation platform designed to optimise sports content production. The company's platform analyses live sports, identifies each and every event that occurs in the game, creates customised short-form video content and publishes to any digital destination, enabling sports organisations, coaching staff and sports associations to engage their fans and develop their brands.

KEY PERSONNEL

Daniel Shichman – Co-Founder & CEO
Hy Gal – Co-Founder & COO
Shmulik Yoffe – Co-Founder & CTO

KEY INVESTORS



NTT DOCOMO Ventures, Inc.



O.G. TECH VENTURES

Zone7



PALO ALTO

KEY PERSONNEL

Tal Brown – Co-Founder & CEO
Eyal Eliakim – Co-Founder & CTO

BUSINESS DESCRIPTION

Zone7 helps athletes, coaches and medical professionals bridge the gap between maximum performance and injury prevention. The company's platform uses AI-driven pattern recognition to predict injuries and simulate how changes in training will impact performance and injury probability.

KEY INVESTORS

AMICUS

PLG



upwest



2017



21



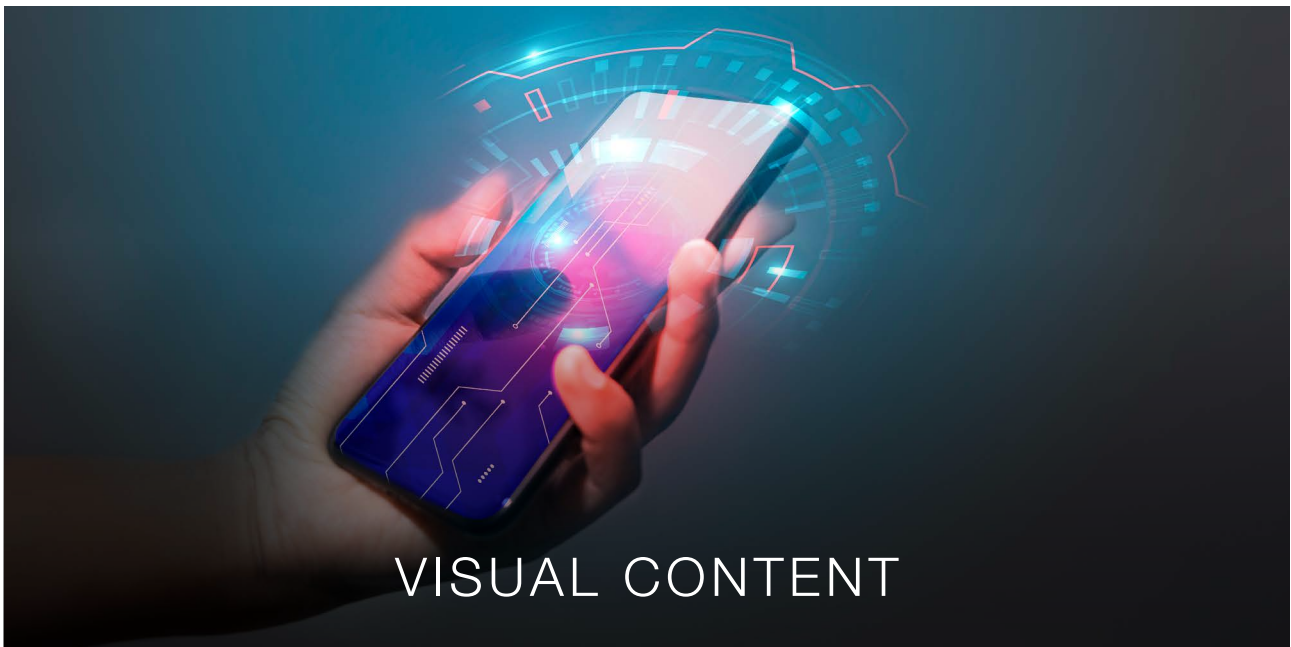
VC Backed, \$2.5m raised to date



Coaching & Athlete Performance



B2B



VISUAL CONTENT



LONDON

KEY PERSONNEL

Martin Adams – Co-Founder & CEO
Tom Blah – COO

BUSINESS DESCRIPTION

Developer of a content marketing intelligence platform. Using AI, Codec develops advanced audience insights based on millions of digital engagements in real-time. This provides brands with a unique view of their audience - their personalities, the people and brands that influence them and the visuals that define them.

KEY INVESTORS



ForceOverMass



2015



157



Accelerator/Incubator Backed, \$1.8m raised to date



Content Analytics



B2B



SAN FRANCISCO

KEY PERSONNEL

Neha Sampat – Co-Founder & CEO
Matthew Baier – Co-Founder, COO & CMO
Nishant Patel – Co-Founder & CTO

BUSINESS DESCRIPTION

ContentStack is a cloud-based content management system intended to power omnichannel content, digital experiences and personalised customer journeys. The company's system uses AI tools to manage, deploy and publish content across channels, enabling customers to reach their audience anywhere in a cost-effective way.

KEY INVESTORS



- 2018
- 164
- VC Backed, \$41.1m raised to date
- Visual Content Creation & Management
- B2B



BERLIN

KEY PERSONNEL

Florian Meissner – Co-Founder & CEO
Ramzi Rizk – Co-Founder & CTO
Gen Sadakane – Co-Founder & Creative Director
Lorenz Aschoff – Co-Founder & CPO

BUSINESS DESCRIPTION

EyeEm is an AI-powered marketplace for premium stock photography. With 24.5m photographers for hire and over 100m stock images, the company is the largest community of photographers and one of the largest photography marketplaces in the world. Utilising patented computer vision software, the company provides automatic content tagging and image analysis to select visuals that uniquely match a brand's aesthetic.

KEY INVESTORS



- 2011
- 191
- VC Backed, \$24.0m raised to date
- Visual Content Creation & Management
- B2B



SANTA MONICA

KEY PERSONNEL

Phil Schraeder – CEO
Patrick Gildea – CFO
Ken Weiner – CTO

BUSINESS DESCRIPTION

GumGum have developed an AI-based computer vision technology intended to unlock the value of visual content. The company's technology uses machine learning and deep learning to serve contextual advertising in line with content that users are already actively engaged with, increasing advert engagement and performance.

KEY INVESTORS



- 2007
- 266
- VC Backed, \$59.3m raised to date
- Content Analytics
- B2B



PARIS

KEY PERSONNEL

Thomas Rebaud – Founder & CEO
Chris Bourdeu – CFO

BUSINESS DESCRIPTION

Meero operates an on-demand photography platform designed to help photographers grow their business and skills. Meero uses AI and machine learning to reduce post-production times on the platform to just 24 hours, providing an outstanding level of service at scale.

KEY INVESTORS



2016



1,128



VC Backed, \$282.8m raised to date



AI-Assisted Design & Photography



B2B/B2C



SAN ANTONIO

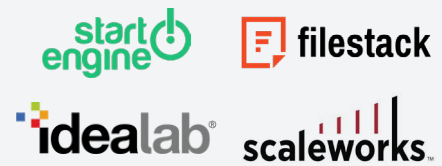
KEY PERSONNEL

Sameer Kamat – CEO
Stuart Thompson – Global Director

BUSINESS DESCRIPTION

Developer of a user-generated content (UGC) marketing platform designed to offer engaging content for brands and marketing teams. The company's platform manages the full production cycle from content curation to rights management, providing a seamless and efficient way for brands to find high-quality UGC.

KEY INVESTORS



2013



37



PE Backed, \$0.4m raised to date



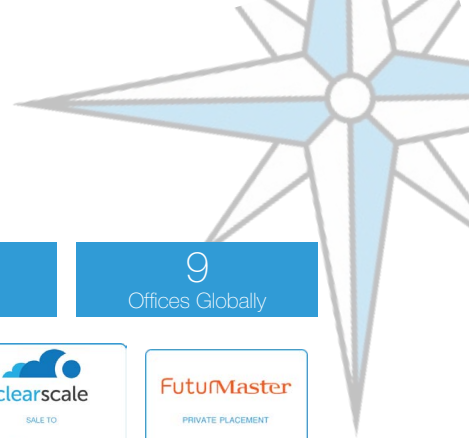
Visual Content Creation & Management



B2B

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A Global Leader in TMC, M&A and Corporate Finance



350+ Transactions	70% cross-border	9 Sector Verticals	25+ Partners	9 Offices Globally
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THE M&A ATLAS AWARDS WINNER Cross-Border Boutique Investment Bank of the Year 2019	THE M&A ATLAS AWARDS WINNER WINNER Cross-Border Deal of the Year 2019	THE M&A ATLAS AWARDS WINNER WINNER Media/Entertainment Deal of the Year (Mid-Market) 2019	THE M&A ATLAS AWARDS WINNER WINNER Corporate Deal of the Year 2019	THE M&A ADVISOR M&A AWARD WINNER M&A Deal of the Year 2019	THE M&A ATLAS AWARDS WINNER WINNER Cross Border M&A Deal of the Year 2018
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Citations and sources are available upon request through <https://www.drakestar.com/contact>. Interviews were conducted by Drake Star Partners via email correspondence between June and September 2020.



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P A R T N E R S
