
2020
EDELMAN
AWARD

Recognizing Distinction in the
Practice of Advanced Analytics,
Operations Research, and
Management Science



2020 EDELMAN PROGRAM NOTES

By Pinar Keskinocak, INFORMS President



It is my pleasure to welcome you to the 2020 Franz Edelman Award ceremony, as we celebrate this year's recipients of INFORMS' most prestigious award: The Franz Edelman Award for Achievement

in Advanced Analytics, Operations Research, and Management Science.

Today, we will recognize years of hard work and dedication by these finalist teams, representing the highest level of excellence in operations research (O.R.) and analytics. Thank you to all the finalists for your contributions and sharing the incredible impact of O.R. and analytics with the world.

The Franz Edelman Award annually recognizes organizations that achieve notable impact through the applications of O.R. and analytics. This year's finalists have made revolutionary contributions in cruise industry pricing and booking, railway planning and productivity, IT system sustainability, corporate decision-making, and retail inventory operations.

The 2020 Franz Edelman Award finalists are Carnival Corporation & plc, Deutsche Bahn, IBM, Intel, and Walmart.

More than 32 million people set sail on a cruise each year, and of those, nearly 50% will choose a ship from one of the six **Carnival & plc** brands. To optimize their revenue management efforts, Carnival created Yield Optimization and Demand Analytics (YODA), a cutting-edge program using advanced analytics and algorithms to provide dynamic price recommendations and inventory management. The program accommodates the needs of each of Carnival's brands across three continents, managing prices in six currencies.

As the largest European railway company, **Deutsche Bahn** must take into account a staggering number of factors in the scheduling of its more than 26,000 trains, which carry passengers and hundreds of tons of goods throughout Germany. To better execute their train scheduling, Deutsche Bahn created a decision support system that optimizes train rotations in every transport division, including cargo, and regional and long-distance passenger transport. The new system has realized a 10% increase in locomotive and railcar productivity and an 80% increase in time saved, as well as supports better planning and productivity.

To identify devices at risk from an outage, **IBM** Services (the Global Technology Services Unit within IBM) has developed a novel approach to indicate potential problems before they occur, significantly improving their customer experience. Using machine learning and advanced data analytics, IBM can identify contributing risk factors and prompt a fix before a failure occurs, leading to a 23% reduction of outages and more than \$1 billion in savings annually. In addition, IBM has been able to reduce the number of problematic systems encountered by their clients by as much as 85%.

Given the scale and increasing complexity of its products and manufacturing processes (particularly in regard to its semiconductor business), **Intel** utilized advanced analytics to create a set of capabilities that span from product feature design to supply chain planning. These new capabilities not only allow for significantly faster analysis of business scenarios, but have increased annual revenue by \$1.9 billion since implementation while decreasing cost by \$1.5 billion. Overall, this has realized a total benefit of \$21.2 billion while also contributing to Intel's environmental efforts to reduce water usage and prevent wastewater.

With product lines that range from retail to automotive, to perishable goods, and more,

Walmart faced significant challenges relating to price markdowns for this wide range of products across its numerous brick-and-mortar locations across the country. Walmart provided an innovative approach to its markdown process by developing a new machine learning-based system to help provide perfectly timed markdowns to optimize sales and clear excess inventory. The system also provides feedback to avoid overordering inventory in the future. Since implementation, the new technology has saved Walmart millions of dollars while better meeting customer needs.

On behalf of the INFORMS Board of Directors and the dedicated INFORMS staff, we thank you for joining us in celebrating this year's finalists. The impact of their contributions will extend into the future, fueling our efforts as we continue to spread the word of the many incredible ways that O.R. and analytics are saving lives, saving money, and solving problems.



THE LONG, WINDING JOURNEY TO PROTECT COMMUNITY WATERWAYS

**Reflections on Winning the
2019 Franz Edelman Award**

**By Angela Akridge, Louisville MSD
and Diana Qing Tao, Tetra Tech**

The average person doesn't give much thought to what happens "after they flush" or where all the dirty water goes after washing dishes, doing laundry or taking a shower. To them it's "out of sight, out of mind." But someone has to think about it – that's where the hard-working folks at the Louisville MSD come in by providing the essential wastewater, stormwater, and flood protection services to protect public health and safety for the residents and visitors of the Louisville Metropolitan Area in Kentucky.

But Louisville Metropolitan Sewer District (MSD) has taken it further than any other North American public utility. Winning the prestigious Franz Edelman Award was a hard-earned validation and a huge recognition for Louisville MSD and its long-time partner Tetra Tech, a full-service engineering consulting firm with the motto of leading by science. After all, this is a long winding journey of 20 years of close collaboration on an audacious concept, starting with a leap of faith.

In the 1990s, Tetra Tech engineers started to develop a nontraditional solution for underground sewer flow management, much like traffic control. It is based on sensor, weather forecasting, and operations research. The solution, Csoft, aims to mitigate a frequently occurring problem that plagues many older cities. More than 800 communities in the United States, including Louisville, combined sewer overflow where raw sewage is mixed with rainfall runoff and released to



the rivers and creeks when rainfall becomes large enough to inundate the wastewater system capacity.

Though the problem might seem simple, it is truly quite complicated. First, flows can take many different routes in highly complex and interconnected systems. Second, flows can vary in time and space during a rainfall event. The solution varies depending on how much water is in the pipe and the associated hydraulic behaviors. And third, in a very harsh sewer environment, failures and breakdowns can occur at any time. The solution must adapt to quickly changing conditions in the short term and changing climate in the long term while mitigating any risks of sewer flooding to protect public health.

By 1999, the first proof of concept pilot project of the solution was implemented to control a storage tunnel with some initial success. Through the network of professionals working in the area of sewer management, Louisville MSD learned about the application of technology called “Real Time Control” (RTC) that employs model-based optimization for informed decision making.

In 2000, feasibility studies identified significant benefits of overflow reduction for Louisville at low cost compared to traditional solutions. Louisville MSD then took the risk to implement a solution that is still considered “bleeding edge,” when no one had attempted such sophisticated levels of full system optimization using RTC ever before in the wastewater industry. The design of the Phase 1 projects initiated in 2003 and the RTC system was commissioned in 2006. In the first year, over 600 million gallons of overflow was captured and treated, the equivalent of almost 1,000 Olympic-size swimming pools of sewage water that didn’t go into our rivers.

RTC is now an integral part of Louisville MSD’s plan to continue to reduce overflows and mitigate flooding. Louisville MSD is still constructing some of the largest infrastructure projects, and the knowledge we’ve gained over the last few years has allowed us to continuously adapt our implementation strategy.

Tetra Tech’s Csoft solution has a proven track record of benefits and withstands the test of time and changing rainfalls. In addition to Louisville MSD, the solution has also been implemented in other cities around the world, supporting their efforts to reduce overflows and protect community waterways, for a savings of nearly a billion dollars to date.

Both Louisville MSD and Tetra Tech are proud of the work that directly impacts the 755,000 Louisville Metro residents and the more than 24 million annual visitors in their quality of life in this community.

Louisville MSD’s chief engineer, now Chief Strategy Officer for Business Transformation and Regulatory Compliance, Angela Akridge and the president of Tetra Tech, Leslie Shoemaker supported joining the Franz Edelman Competition. Countless other MSD and Tetra Tech team members provided additional support. The communication departments from both MSD and Tetra Tech put together wonderful videos and animations in a matter of weeks. INFORMS provided clear instructions and great coaching, and Carrie Beam patiently worked with the Louisville MSD team to refine the story telling and add the human touch that was needed to demonstrate impact.

In addition, everyone at Louisville MSD, all of the unsung heroes, deserve special recognition. They work diligently everyday to provide the essential public services and making Louisville a world-class destination city – full of economic growth and outdoor recreation opportunities for those who call Louisville home – today and for decades to come.

“There has to be this pioneer, the individual who has the courage, the ambition to overcome the obstacles that always develop when one tries to do something worthwhile, especially when it is new and different.” – Alfred P. Sloan

OPERATIONS RESEARCH: BILLIONS AND BILLIONS OF BENEFITS!

By Jeffrey M. Alden,
General Motors Analytics Research

Over 302 billion U.S. dollars of impact! That's impressive! How were they estimated? How broad is the impact? Is there more?

Since 1974, the Edelman finalists publish their project accomplishments in the *INFORMS Journal on Applied Analytics* (formerly *Interfaces*). While reviewing the 284 articles, their cumulative monetary impact was estimated under the following guidelines:

- Be objective and make conservative assumptions.
- Include reported impact plus at most two more years of anticipated impact.
- Include only one year of enormous impact (10s of billions) to downplay the huge size and budget of some organizations.
- Ignore relative impact even though saving \$10 million for a small company may be more impressive than saving \$100 million for a large company.

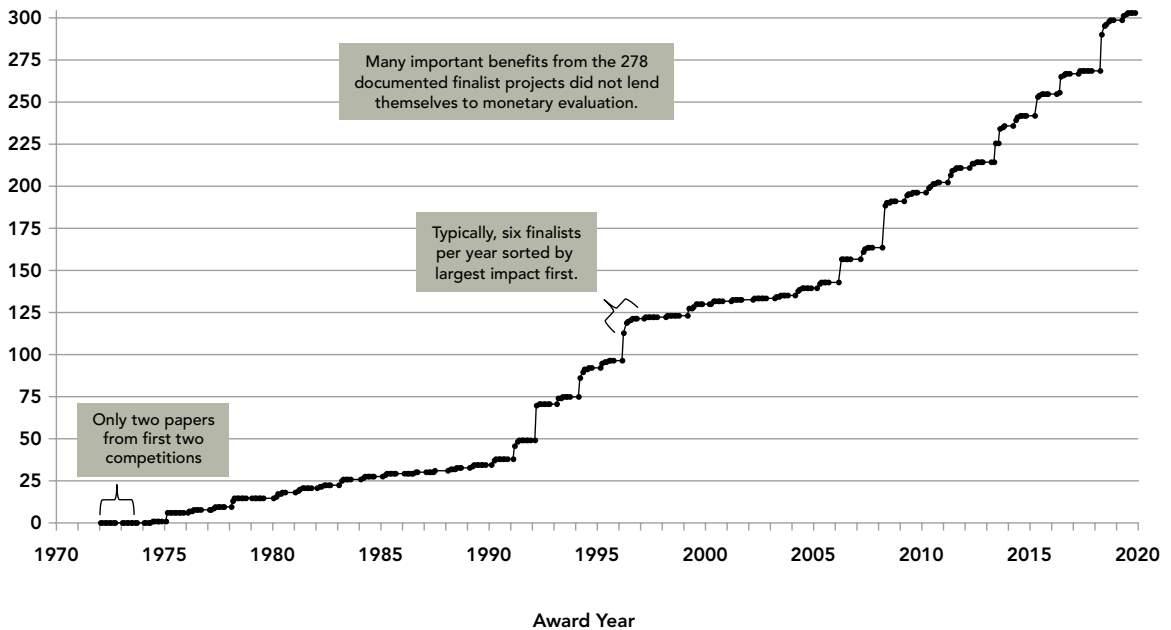
These conservative guidelines exclude important yet difficult-to-quantify reported benefits like better: legal dispute resolution, cancer treatments, airline safety, epidemic disease control, organizational structure, on-time railways, space shuttle heat shielding and water quality. For example, there are more than 20 finalist papers with significant life and health benefits. Most are difficult to quantify, however, a CDC project on (future) U.S. epidemics expects annual savings of 6,000 lives valued at \$12B¹ and one U.S. Army project estimates 4,500

avoided casualties by reducing requirements for helicopter and ground-convoy movements². Nearly all finalist papers report non-monetary benefits and frequently tout them as most important and longer lasting by establishing, for example, ongoing practices and organizational changes that improve health, safety, cooperation, decision making, timeliness, and job satisfaction. Great! Clearly, reported monetary benefits understate the full impact of the Edelman finalist projects.

Another important indication of the influence of operations research (O.R.) is the impressive breadth of applications. The Edelman finalists represent 143 different application areas including aviation (safety, traffic), banking, canal operations, communications (broadband, broadcasting, radio spectrum), consumer products, crowd control, delivery (express, truck), defense (Air Force, Army), education, financial (contract bidding, credit card, fraud, investment, pension, settlement), fire protection, forestry, healthcare (blood collection, cancer, diagnosis, disease control, elderly, hospital, medical displays, pharmaceutical, surgery), hotel management, energy production and distribution (coal, gas, electric, nuclear, oil, wind), land use, manufacturing (electronics, food, paper, seeds, steel, tires, vehicles), marketing, mining, printing, sanitation, security (airport, police), senior housing, social networks, sports, tax collection, transportation (airline, highway, railway, rental, outer space, school bus), treasure hunting, waste management, water (flood, flow, resources, quality), and weapons dismantlement. The list goes on and on! In fact, 733 organizations³ from business, government, and academia are recognized and honored as supporting or benefiting from finalist projects.

Benefits over \$302 Billion from Edelman Finalist Projects 1972 through 2019

(Conservatively quantified benefits, realized plus at most two years anticipated, in 2020 U.S. dollars)



Finally, this is just the “tip of the iceberg” because the Edelman competition only captures those O.R. professionals choosing to compete! Just think, the 1,353 Edelman finalist authors¹ represent only 10% of the current INFORMS membership. Undoubtedly, there is a vast number of projects with significant impact that did not compete due to confidentiality, lack of internal support to compete (e.g., no one thought of it, too busy, no management support, inadequate documentation), or the team was simply unaware of the competition.

The impact is immense! O.R. professionals should be proud of their profession – you can say “hundreds of billions” when asked about the value of O.R.!

² “Bayesian Networks for Combat Equipment Diagnostics,” *Interfaces*, Vol. 47, No. 1.

³ Some organizations and contestants have competed multiple times and are counted more than once.

⁴ Interesting how the average number of authors per paper has grown from 1.8 over first 10 award years (1974–1982) to 8.2 over last 10 award years (2010–2019). Linear regression gives 0.17 annual growth in average authors per paper with $R^2 = 0.80$.

¹ For CDC: 6000 lives/year \approx 314M U.S. population * 5% epidemic penetration * 10% die under current practices * (1-80% fatality reduction under improved practices) * 1 epidemic per 200 years. Value of quality year of life in U.S. is \$2M / average life \approx \$50K/year (a standard value) * 78 years life expectancy * 50% average life lived. Total expected annual impact is \$12B = 6,000 * \$2M. See “Advancing Public Health and Medical Preparedness with Operations Research,” *Interfaces*, Vol. 43, No. 1 (note Figure 6). Numbers are reasonable values offered by the author.

**FRANZ
EDELMAN
AWARD**



RECOGNIZING AND REWARDING REAL ACHIEVEMENT IN O.R. AND ANALYTICS

The Franz Edelman Award Competition is administered by the Practice Section of INFORMS.

For more than 48 years, the international Franz Edelman Award Competition has shined a spotlight on the most outstanding real-world applications of operations research (O.R.) and analytics that are transforming our approach to some of the world's most complex problems.

Every year, organizations from around the world, both large and small, profit and nonprofit, business and governmental, private and public, compete for the Edelman Award. The common theme shared by all selected finalists is having realized substantial

benefits, from life-saving medical advancements to millions in cost savings and efficiency gains, from the practical application of advanced methods of operations research and analytics.

Rich with insightful research, the abstracts from Edelman finalist papers are shared online through the *INFORMS Journal on Applied Analytics*, formerly *Interfaces*, and full-text versions of some of these papers are available in an online archive. In addition, video of past competition presentations can be found in the INFORMS Video Learning Center, and serve as valuable tools for teaching, marketing, or publicizing O.R. practice successes.

The history of the Edelman Award predates that of INFORMS. In 1972, The Institute of Management Sciences (TIMS), together with its College on the Practice of Management Science (CPMS), created the competition. In 1986, the award was renamed in honor of one of the earliest industry practitioners of O.R. in North America, Franz Edelman. When TIMS merged with the Operations Research Society of America to create INFORMS in 1995, the Edelman Award became the flagship event in a growing awards program.

Born in Germany not long before Hitler came to power, Franz Edelman encountered much adversity at a young age. After fleeing the Nazi regime as a teenager in the late 1930s, Franz Edelman found himself in England, where his alien status resulted in internment and he was sent to Canada for an interlude of lumberjacking. After overcoming these obstacles, he received his

undergraduate education at McGill University, and later earned a PhD in applied mathematics from Brown University. He then joined the RCA Corporation as an engineer concentrating on computational topics. While his earlier efforts focused on physical science problem solving, he rapidly began to envision the extreme value of computer systems that could assist with management and business operations. By the early 1950s, this insight led him to establish RCA's legendary Operations Research Group, one of the first such groups in a North American corporation.

As he continued to advance the O.R. profession, Franz Edelman advocated that success in operations research requires excellence in information technology (IT) – computer software, computer hardware, and communications. His passion for IT ultimately led him to his new role as vice president of Business Systems and Analysis for RCA, responsible for IT as well as O.R. These ideals are still very much present in our current focus on “analytics” and “business intelligence,” where strong analysis combines with strong IT.

After 30 years of service to RCA, Franz Edelman retired and formed Edelman Associates, an O.R. consulting firm. Throughout his career, Franz's commitment to advancing O.R. and his positive influence on others enhanced his legacy as a leader in the field of O.R. practice. Shortly after his death, the Franz Edelman Award was named in his memory and today continues to advance the operations research practice to which he contributed so much.



THE FINEST STEP FORWARD: THE JOURNEY TO THE FRANZ EDELMAN AWARD

Every year, the recipient of the Franz Edelman Award for Achievement in Advanced Analytics, Operations Research, and the Management Sciences is selected from a pool of incredibly accomplished finalists, representing leading organizations from around the world. The finalist projects represent years of research, hard work and collaboration for their organization. For INFORMS too, the selection process begins long before the award is ever presented.

As fall approaches, INFORMS issues a call for entries, one to which nearly two dozen organizations will respond with a summary illustrating a practical operations research (O.R.) application in which the results had significant, verifiable, and quantifiable impact for the organization.

The Franz Edelman Award Committee is comprised of nearly three dozen O.R. practitioners and academics from leading O.R. programs, including Otis, Hewlett-Packard, Boeing, General Electric, General Motors, CANA Advisors, SAS, U.S. Census Bureau, UPS, and Carnegie Mellon University. By November, this committee will have narrowed the



applicant field to a group of semifinalists, and by the end of the year, six will be recognized as Edelman Award finalists.

Prior to being named finalists, each entry will be carefully reviewed by a team of verifiers, who work with the relevant stakeholders to validate the details of their award entry. The verifiers will thoroughly examine the O.R. work presented in the assigned entry summary, as well as its potential impact, and convey this information to the rest of the selection committee. The verifiers communicate directly with the entrant's O.R. team, the users of the work, and client management. Verification is a crucial step in the competition as it ensures that only the highest-quality O.R. will be represented in the Edelman Award Competition. All verifiers follow detailed written guidelines and sample verification reports, to ensure a thorough process that is identical for each award entry.

Once the Edelman Award Committee has announced the entries that will advance to the finals, each finalist will prepare a journal-quality paper and a 40-minute presentation that will be held during the Edelman Competition. A team of experienced coaches is assigned to each finalist



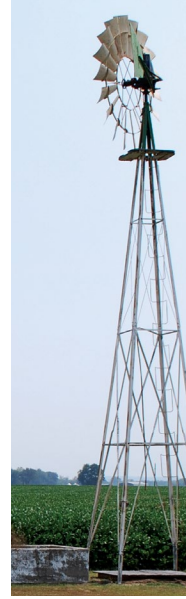
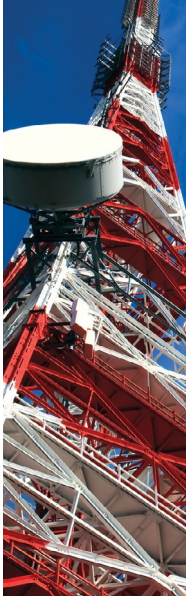
team to guide them throughout each step of the process, and help ensure that the team's paper and presentation will convey the significance and monumental impact of the work to the panel of judges.

As the final stage of the competition approaches, the finalist papers are presented to the judges, who will begin the long review process. Each judge studies the papers independently, and provides input to a group discussion. The finalists are each assigned a focal point judge who conveys valuable feedback from the judging committee to the finalist teams' coaches. This feedback helps each team identify areas with potential for clarification or improvement prior to the final presentation.

On the day of the competition, each team will conduct a 40-minute presentation, followed by a 10-minute period of questioning by the judges. As they assess each presentation, the judges will follow a strict set of guidelines, including the importance of the application, the novelty and portability of the technical solution, the quality and effectiveness of the implementation, and the total impact of the

project in both quantitative and qualitative terms. Once the final presentation is complete, the judges sequester themselves to carefully review all that they have heard and seen, until they unanimously agree on which finalist team best exemplifies the ideals and standards of the Franz Edelman Award and its legacy that represents more than 45 years of O.R. and analytics excellence.

Following the competition, the incredible achievements of all the finalists will be showcased in the January/February issue of the *INFORMS Journal on Applied Analytics* (formerly *Interfaces*), which is dedicated to improving the practical application of O.R. to decisions and policies in today's organizations and industries. In addition, the competition is recorded and all presentations are made available via streaming video shortly after the end of the competition. During the INFORMS Annual Meeting in the fall, which attracts more than 7,000 analytics professionals and academics from around the world, the first-place team will conduct a keynote address, while the other finalists will again be invited to reprise their work during a meeting session.



EDELMAN FIRST-PLACE AWARD RECIPIENTS

2019 **Louisville Metropolitan Sewer District**
“Analytics and Optimization Reduce Sewage Overflows to Protect Community Waterways in Kentucky”

2018 **Federal Communications Commission**
“Unlocking the Beachfront: Using Operations Research to Repurpose Wireless Spectrum”

2017 **Holiday Retirement**
“Revenue Management Provides Double Digit Revenue Lift for Holiday Retirement”

2016 **UPS**
“UPS On-Road Integrated Optimization and Navigation (ORION) Project”

2015 **Syngenta**
“Good Growth through Advanced Analytics”

2014 **U.S. Centers for Disease Control**
“Eradicating Polio Using Better Decision Models”

2013 **Delta Programme Commissioner**
“Economically Efficient Flood Standards to Protect the Netherlands Against Flooding”

2012 **TNT Express**
“Supply Chain-Wide Optimization at TNT Express”

2011 **MISO**
“MISO Applies Operations Research to Energy Ancillary Services Markets, Unlocking Billions in Savings”

2010 **Indeval**
“Mexican Financial Markets Benefit from Novel Application of Operations Research”

2009 **Hewlett-Packard**
“HP Transforms Product Portfolio Management with Operations Research”

2008 **Netherlands Railways**
“The New Dutch Timetable: The O.R. Revolution”

2007 **Memorial Sloan-Kettering Cancer Center**
“Operations Research Advances Cancer Therapeutics”



EDELMAN FIRST-PLACE AWARD RECIPIENTS (Cont.)

2006 **Warner Robins Air Logistics Center**

“Warner Robins Air Logistics Center
Streamlines Aircraft Repair and Overhaul”

2005 **General Motors**

“Increasing Production Throughput
at General Motors”

2004 **Motorola, Inc.**

“Reinventing the Supplier Negotiation Process
at Motorola”

2003 **Canadian Pacific Railway**

“Perfecting the Scheduled Railroad: Mode
Driven Operating Plan Development”

2002 **Continental Airlines**

“A New Era for Crew Recovery
at Continental Airlines”

2001 **Merrill Lynch, Inc.**

“Pricing Analysis for Merrill Lynch
Integrated Choice”

2000 **Jeppesen Sanderson, Inc.**

“Flexible Planning and Technology
Management at Jeppesen Sanderson, Inc.”

1999 **IBM**

“Extended Enterprise Supply Chain
Management at IBM Personal Systems
Group and Other Divisions”

1998 **Bosques Arauco, S.A.**

“Use of O.R. in the Chilean Forest Industries”

1997 **Société Nationale des Chemins de Fer
Français & Sabre Decision Technologies**

“Schedule Optimization at SNCF: From
Conception to Day of Departure”

1996 **South African National Defense Force**

“Guns or Butter: Decision Support for
Determining the Size and Shape of the South
African National Defense Force”

1995 **Harris Corporation/Semiconductor
Sector IMPReSS**

“IMPReSS: An Automated Production
Planning and Delivery-Quotation System at
Harris Corporation—Semiconductor Sector”

1994 **Tata Iron & Steel Company, Ltd.**

“Strategic and Operational Management with
Optimization at Tata Steel”



EDELMAN FIRST-PLACE AWARD RECIPIENTS (Cont.)

1993 **AT&T**

“AT&T’s Telemarketing Site Selection System Offers Customer Support”

1992 **New Haven Health Department**

“Let the Needles Do the Talking!
Evaluating the New Haven
Needle Exchange”

1991 **American Airlines**

“Yield Management at American Airlines”

1990 **Health Care Financing Administration**

“Diagnosis Related Groups: Understanding
Hospital Performance”

1989 **ABB Electric, Inc.**

“A Choice-Modeling Market Information System That Enabled ABB Electric to Expand Its Market Share”

1988 **City of San Francisco
Police Department**

“A Break from Tradition for the San Francisco Police: Patrol Officer Scheduling Using an Optimization-Based Decision Support System”

1987 **Syntex Laboratories, Inc.**

“Sales Force Sizing & Deployment Using a Decision Calculus Model at Syntex Laboratories”

1986 **Southland Corporation (CITGO Petroleum Corporation Subsidiary)**

“The Successful Deployment of Management Science throughout CITGO Petroleum Corp.”

1985 **Weyerhaeuser Company**

“Weyerhaeuser Decision Simulator Improves Timber Profits”

1984 **Blue Bell, Inc. (dual)**

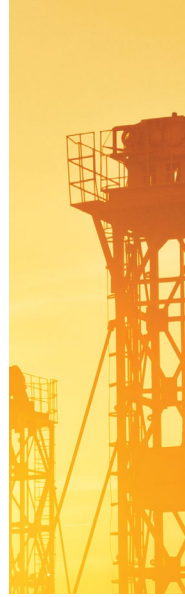
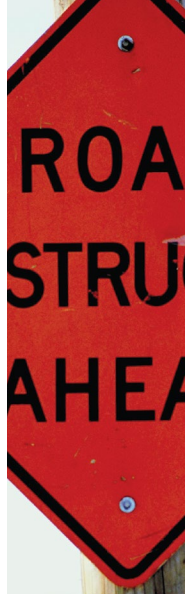
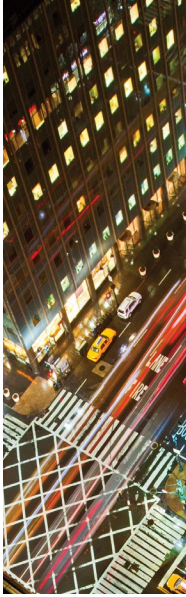
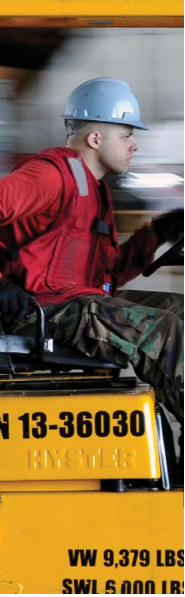
“Blue Bell Trims its Inventory”

1984 **The Netherlands Rijkswaterstaat & the RAND Corporation (dual)**

“Planning the Netherlands’ Water Resources”

1983 **Air Products and Chemicals, Inc.**

“Improving the Distribution of Industrial Gases with an On-Line Computerized Routing and Scheduling Optimizer”



EDELMAN FIRST-PLACE AWARD RECIPIENTS (Cont.)

1982 **Arizona Department of Transportation**
“A Statewide Pavement Management System”

1981 **ANR Freight System**
“From Freight Flow and Cost Patterns to Greater Profitability and Better Service for a Motor Carrier”

1980 **Kelly-Springfield Tire Company**
“Coordinating Decisions for Increased Profits”

1979 **The Greater New York Blood Program**
“The Long Island Blood Distribution System as a Prototype for Regional Blood Management”

1978 **Cahill May Roberts, Ltd.**
“A Planning System for Facilities and Resources in Distribution Networks”

1977 **Syncrude Canada, Ltd.**
“Simulation of Tar Sands Mining Operations”

1976 **American Telephone & Telegraph**
“The Use of Management Science in Making a Corporate Policy Decision—Charging for Directory Assistance Service”

1975 **Xerox Corporation**
“Management Science’s Impact on Service Strategy”

1974 **Canadian National Energy Board**
“Management Science in Energy Policy: The Trans Canada-Great Lakes Transmission Case”

1973 **The Babcock & Wilcox Company**
“Planning Nuclear Equipment Manufacturing”

1972 **The Pillsbury Corporation**

THE 2020 SELECTION COMMITTEE & VERIFIERS

We wish to thank the following individuals for their dedication and service as Selection Committee members and as verifiers for this year's Edelman Award.

Each of the semifinalists is assigned a verifier who works behind the scenes, often with an associate verifier, to validate the claims made by their entry. A verifier's primary role is to understand an applicant's O.R. work and its impact in detail, and then convey this to the rest of the committee, both orally and in a written report. Verification is a crucial element of the competition because it ensures that only the highest-quality O.R. and analytics work with verified impact makes it to the Edelman Award finals.



- Layek Abdel-Malek, *NJ Institute of Technology, v*
- Susan Albin, *Rutgers University*
- Jeffrey M. Alden, *General Motors, v*
- Sharon Arroyo, *Boeing, v*
- Carrie Beam, *University of Arkansas, v*
- Rob Benson, *Spinnaker Management Group, v*
- Sudip Bhattacharjee, *University of Connecticut, v*
- Ann Bixby, *Aspen Technology, v*
- Aaron Burciaga, CAP, *ECS Technology, v*
- Manoj Chari, *OTIS Elevator Company, v*
- Walt DeGrange, CAP, *Canal LLC, v*
- Pooja Dewan, *OTIS Elevator Company*
- Ken Fordyce, *Arkieva*
- Yoshi Ikura, *SAITECH, v*
- Ananth Iyer, *Purdue University, v*
- Shailendra Jain, *Hewlett Packard, Retired, v*
- Burcu Keskin, *University of Alabama, v*
- Don Kleinmuntz, *Kleinmuntz Associates, v*
- Russell P. Labe, CAP, *RPL Analytics Consulting, v*
- Irvin Lustig, CAP, *Princeton Consulting, v*
- R. John Milne, *Clarkson University*
- Polly Mitchell-Guthrie, *Kinaxis, v*
- Sven Müller, *European University Viadrina*
- Patricia Neri, *Bayer*
- Ranganath Nuggehalli, CAP, *UPS, v*
- Ionnis (Yanni) Papadakis, *Verizon*
- Olga Raskina, *Bristol Myers Squibb, v*
- Cynthia Rudin, *Duke University, v*
- Harrison Schramm, CAP, *Group W*
- Dashi Singham, *Naval Post Graduate School*
- Michael Trick, *Carnegie Mellon University in Qatar*
- Rajesh Tyagi, *GE Global Research*
- Andres Weintraub, *University of Chile*

"v" Indicates Verifiers



THE 2020 COACHES & JUDGES

We wish to thank the following individuals for their dedication and service as coaches and judges for this year's Edelman Award.

The role of the coach is to ensure each team's paper and presentation conveys the work in a manner that may be well understood by a general operations research audience. Often a coach is paired with an associate coach who lends another perspective to the process.

The judges must work together, evaluating the evidence to determine which finalist is most deserving of the Franz Edelman Award for Achievement in Advanced Analytics, Operations Research, and Management Science. The award is for implemented work that has had significant, verified, and preferably quantified impact.

Coaches

- Layek Abdel-Malek, *New Jersey Institute of Technology*
- Jeffrey M. Alden, *General Motors*
- Sharon Arroyo, *Boeing*
- Aaron Burciaga, CAP, *ECS Technology*
- Manoj Chari, *OTIS Elevator Company*
- Ken Fordyce, *Arkieva*
- Yoshi Ikura, *SAITECH*
- Ananth Iyer, *Purdue University*
- Irvin Lustig, CAP, *Princeton Consultants*
- Sven Müller, *European University Viadrina*
- Patricia Neri, *Bayer*
- Harrison Schramm, CAP, *Group W*

Judges

- Pooja Dewan, Chair; *OTIS Elevator Company*
- Sudip Bhattacharjee, *University of Connecticut*
- Ann Bixby, *Aspen Technology*
- Carrie Beam, *University of Arkansas*
- Gul Ege, *SAS*
- Michael F. Gorman, *University of Dayton*
- Shailendra Jain, *Hewlett Packard, Retired*
- Olga Raskina, *Bristol Myers Squibb*
- Rajesh Tyagi, *GE Global Research*



THE EDELMAN LAUREATES

The authors of the Edelman finalist papers are deemed Franz Edelman Laureates.

Authors of finalist papers to be published in *INFORMS Journal on Applied Analytics* (formerly *Interfaces*), are recognized as Laureates and formally presented with the Franz Edelman Medal.

Laureates are recognized for their significant contributions to work that was selected to represent the best applications in the world of analytical support for decision making. Laureates are expected to serve as role models and exemplify that challenges can be met and innovative applications of analytics can help every organization.

The Laureate recognition is distinct and separate from membership in the Franz Edelman Academy.

THE EDELMAN ACADEMY

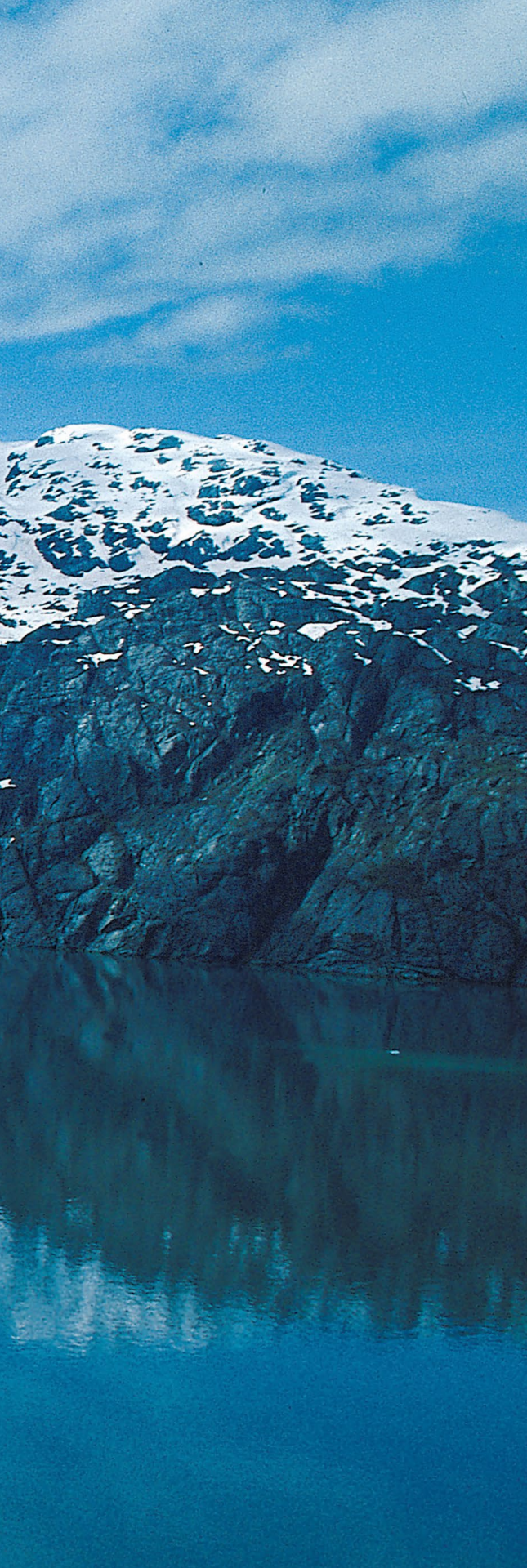
Each year, participating organizations are inducted as members of the Franz Edelman Academy.

The primary client organization, or beneficiary of the finalist work, is inducted into the Academy at the annual Edelman Gala.

In addition, organizations that played a major role in the work, and therefore deserve academy membership, may also be inducted. The most common example would be an organization that provided the professionals who did the majority of the analytical work.

The membership of the Franz Edelman Academy represents 48 years of extraordinary contributions to society through the innovative application of operations research and advanced analytics.





CARNIVAL CORPORATION & PLC

Joint Revenue and Inventory Optimization for Multiple Heterogeneous Brands in the World's Largest Cruise Company

More than 32 million people each year cruise on 278 ships, with 14 million guests from North America, 6.7 million from Europe, 4.2 million from Asia, and 1.5 million from Australasia. Of those guests, nearly 50% sail on Carnival Corporation & plc brands. As the world's largest leisure travel company, Carnival Corporation & plc provides guests around the world with extraordinary holiday experiences and exceptional value.

Carnival Corporation & plc is comprised of Carnival Cruise Line, Princess Cruises, Holland America Line, Seabourn, P&O Cruises (Australia), Costa Cruises, AIDA, P&O Cruises (U.K.), and Cunard Line, with operations in North America, Australia, Europe, and Asia, and together serve tens of millions of guests on cruises every year.

Carnival Corporation & plc undertook a cross-brand revenue management diagnostic that revealed opportunities to strengthen the use of operations research, innovation, and automation. A cutting-edge revenue management system was needed, however, existing solutions from the airline and hospitality industries were not compatible with the idiosyncrasies of the cruise domain. As such, the company partnered with Revenue Analytics to build a complete revenue and inventory system from scratch.

Business leaders, operations researchers, and software engineers came together from around the world to build YODA (Yield Optimization and Demand Analytics). Over four years, they built a system founded on advanced analytics to forecast demand, measure price sensitivity, and ultimately recommend pricing and inventory controls.

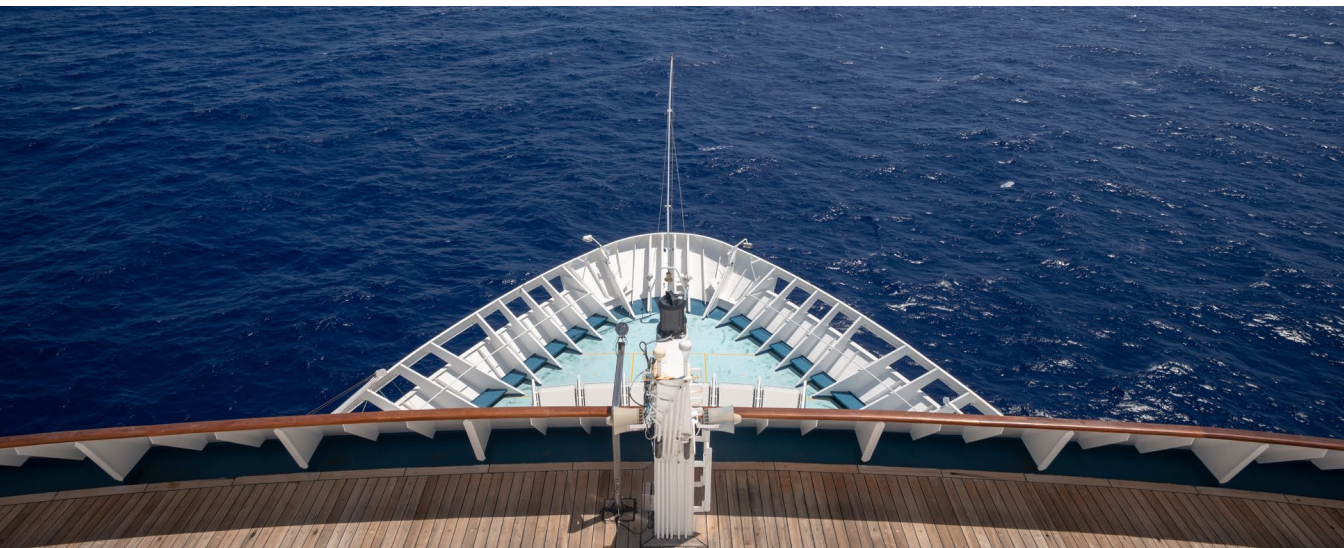
Prior to YODA, each of the Carnival brands was managing revenue and making decisions using its own tools and processes. Tools that existed across the brands varied significantly from simplified forecasting and cancellation predictions, to analysts making decisions in Excel tools by comparing to a similar cruise from history. These tools were capable of detecting large, sudden deviances from expected behavior, but were less adept at detecting slowly-developing patterns or handling quicker incremental adjustments needed to maximize revenue.

One of the initial barriers to overcome was that of geographical diversity; organizational structures and time zones are real barriers to working across

brands within the corporation. The YODA project was one cross-brand team, with defined roles and responsibilities for members based across Europe, Australia, and the U.S. In order to leverage the scale by combining efforts across brands, the team first needed alignment. Overall, the team identified 80 different categories and questions to resolve and align on an approach before designing and building a single system that could be consistently used by all brands, which were consolidated into a “Brand Alignment Matrix.” The process took almost three months, but once complete, set up the remainder of the project for success.

YODA is a system that leverages a unique quadratic programming optimization formulation (jointly optimizing both price and inventory allocations across multiple time periods). The inputs come from several machine learning algorithms to predict demand combined with an elasticity model derived from an exponential curve fit to represent the unique price-sensitivity behavior observed in the cruise industry. These models generate millions of price recommendations a day to price 65 ships.

Not only does Carnival generate 1.5% to 2.5% uplift in net ticket revenue as a result of YODA, according to pilot testing, but it also elevates the role of the pricing analyst in making strategic decisions, facilitating cross-brand coordination, and quickly reacting to a dynamic industry. As an additional measure of success, since initial deployment YODA has been adopted by an additional brand indicating it continues to be viewed very favorably internally. In addition to the revenue benefits, YODA has



driven renewed strategic conversations around the revenue management teams in each of the brands, by giving the science teams and analysts the ability to challenge long-standing principles of cruise revenue management using YODA outputs and associated models.

YODA has also set the new standard for cross-brand projects in Carnival Corporation. Not only did the project complete on time and under budget, it also fostered a level of collaboration never before seen between the Carnival brands.

ORGANIZATIONS

Carnival Corporation & plc

Carnival Corporation & plc is the world's largest leisure travel company, providing guests around the world with extraordinary holiday experiences and exceptional value. With operations in North America, Australia, Europe, and Asia, its portfolio features Carnival Cruise Line, Princess, Holland America Line, Seabourn, P&O Cruises (Australia), Costa, AIDA, P&O Cruises (U.K.), and Cunard.

Together, the corporation's cruise lines operate 105 ships with 254,007 lower berths visiting more than 700 ports around the world with 15 new ships scheduled to be delivered through 2025. Carnival Corporation & plc also operates Holland America Princess Alaska Tours, the leading tour company in Alaska and the Canadian Yukon.

Traded on both the New York and London Stock Exchanges, Carnival Corporation & plc is the only group in the world to be included in both the S&P 500 and the FTSE 100 indexes.

Carnival Corporation employs a talented, passionate, and diverse workforce of over 150,000 people from nearly 150 countries, and its brands host more than 13 million guests annually – about half of the overall global cruise market. Combining over 265,000 daily cruise guests and 100,000 shipboard employees, more than 365,000 people are sailing aboard the Carnival Corporation fleet every single day totaling about 93 million guest cruise days per year.

Revenue Analytics

Revenue Analytics is a SaaS company that helps big companies make big revenue decisions in pricing, products, and promotions. Our analytics solutions drive millions in revenue uplift and eliminate wasted time.

Founded in 2005, we leverage our deep experience in pricing and revenue management to empower our customers with predictive analytics engines that drive complex pricing decisions.

These capabilities have been deployed across many industries with Revenue Analytics being responsible for adjusting the prices on more than 40% of North American hotel rooms nightly, pricing 45% of all passenger cruise trips globally, and have over 42% of U.S. radio ad sales running through our platform.





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DEUTSCHE BAHN

On the Right Track: Deutsche Bahn Schedules Train Rotations Using Hypergraph Optimization

Deutsche Bahn (DB) uses novel operations research methods to optimize the rotations of its rolling stock in its cargo, regional, and long-distance passenger transport divisions. Advanced optimization methods allow DB to manage timetable changes in order to offer more and better services to its customers, cut greenhouse emissions, and enhance regularity. DB transports about 5.6 million people each day on trains throughout Germany, as well as 700,000 tons of goods. These are carried by over 1,400 long-distance trains, 22,000 regional passenger trains, and 2,800 cargo trains, which are operated by a fleet of 3,800 locomotives, 4,500 passenger coaches, more than 80,000 freight wagons, and over 4,000 railcars, among them 274 ICE high-speed trains.

With a constantly increasing number of trains and a continuously fluctuating demand on a limited infrastructure in a deregulated, competitive railway market, it becomes harder and harder to

schedule these services. It is difficult to direct the trains through bottlenecks and around construction sites to avoid cancellations, deadhead trips, and orientation mismatches. To address the challenges of using its rolling stock at full capacity, Deutsche Bahn drafted a vision of reinventing railways: “Strong rail” is DB’s overarching strategy to become more efficient in operations, develop a more powerful organization, and stimulate innovations. The cornerstone of this plan is the development and implementation of a new generation of advanced operations research methods, to first and foremost schedule DB’s core asset: its rolling stock of locomotives, wagons, and railcars.

To this purpose, DB launched the development of a new train/locomotive rotation optimization system called FEO/LEO in 2008. In order to provide a company-wide planning platform for three divisions, the solution was implemented as a modular system around adaptable optimization kernels. These kernels were flexibly customized to suit a large variety of planning tasks. FEO/LEO is directly linked to DB legacy planning IT, such that a seamless workflow is ensured. A particular strength in FEO/LEO is an integrated feedback algorithm that allows planners to approach an aspired solution by applying minimal changes with respect to the planning constraints. This had a profound impact on the scheduling methodology at DB, which changed from constructive to analytical planning. The FEO optimizers are based on completely

new and sophisticated mathematical methods of algorithmic network and hypergraph theory. This research is done together with Zuse Institute Berlin and LBW Optimization. The novel approach allows for an integrated treatment of the main operational requirements all within one generic model. A novel coarse-to-fine algorithm allows the solution of large-scale instances with up to 100 million variables. The approach also gives rise to deep theoretical developments in the mathematical foundations of operations research.

FEO has been operating since 2013 and has increased revenues in long-distance passenger transport by more than \$26 million per year by reducing cancellations, and by \$25 million per year in regional passenger transport by successful bids for tender contracts.

In the cargo division, LEO went online in 2018 with estimated savings of over \$29 million per year. Moreover, dangerous and arduous labor is reduced with less couplings. Resource planners benefit in their day-to-day work from the powerful scheduling functionality of FEO/LEO, which reduces repetitive tasks and allows room for analyzing different options.

FEO/LEO is a first and key step toward the implementation of DB’s strong rail strategy. Driven by advances in operations research, strong rail will provide fast, comfortable, and efficient transport with minimal environmental footprint.



ORGANIZATIONS

Deutsche Bahn AG (DB)

Deutsche Bahn AG (DB) is the largest European railway company. It is divided into several companies, including the rail transport service providers DB Fernverkehr (long-distance passenger), DB Regio (regional passenger), and DB Cargo (freight). DB Fernverkehr provides regular national and international daytime services. To ensure this, it operates a close network of almost 900 daily long-distance rail services in Germany.

Apart from national products, each day cross-border connections to neighboring countries are on offer – mainly in cooperation with partner railways. This enables DB Fernverkehr with its ICEs, ICs, and ECs to carry approximately 340,000 customers to their destinations every day. DB Fernverkehr has more than 16,500 employees. DB Regio is market leader in German regional public transport. It serves about seven million people in over 22,500 trains per day. It employs about 800 locomotives, 4,000 train cars and has over 35,000 employees.

DB Cargo is the largest European rail freight company. It operates most freight stations with the largest fleet on the continent, consisting of over 3,000 locomotives and 80,000 cars. Almost 60% of all transports are cross-border traffic. It serves both wagonload freight and single car freight all over Europe. The network goes from Lisbon (Portugal) over Nishnij-Novgorod (Russia) up to Shenyang (China).



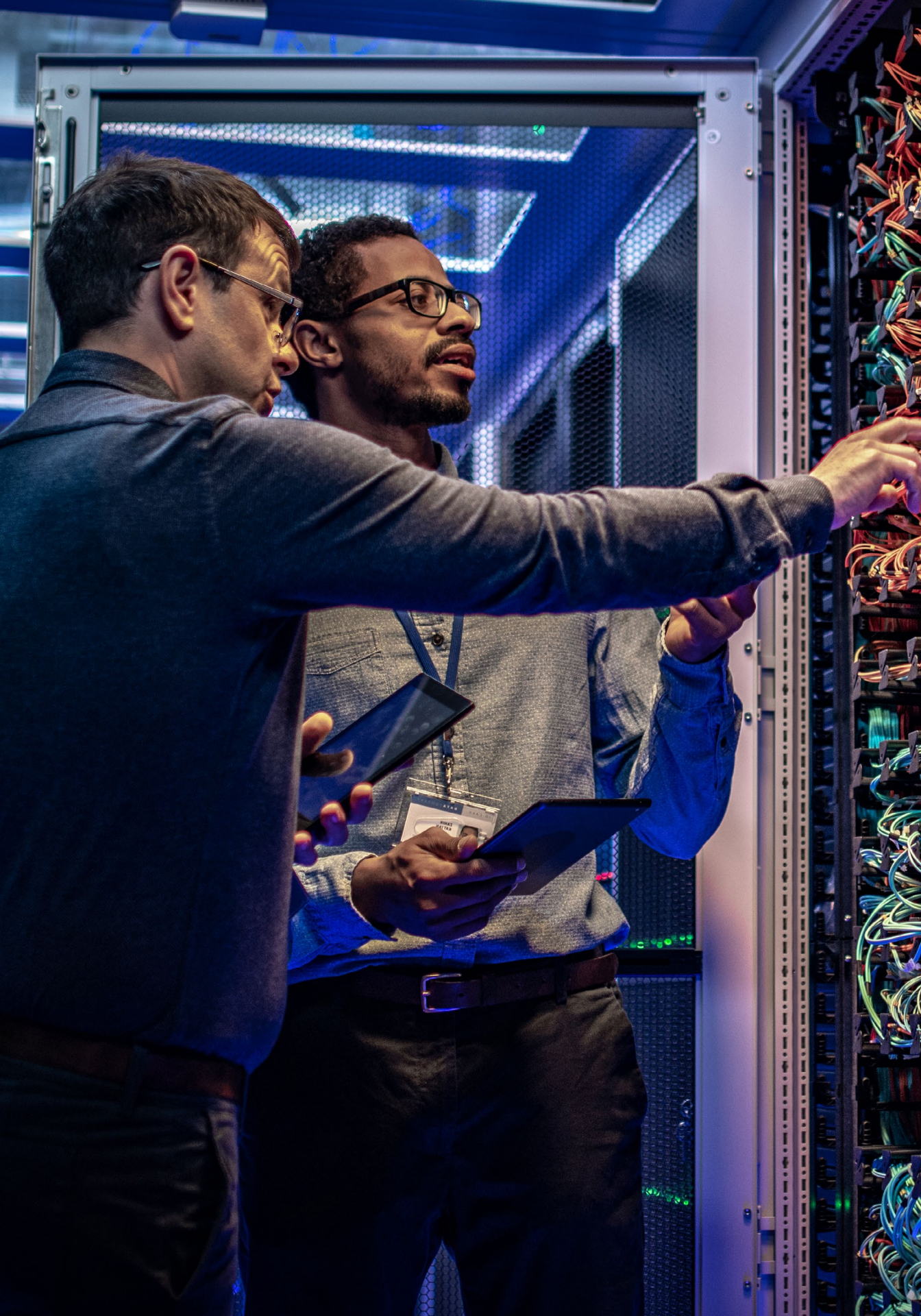
Zuse Institute Berlin (ZIB)

The Zuse Institute Berlin (ZIB) is an integrative research institute for application-oriented mathematics and data-intensive high-performance computing. Its research focuses on modeling, simulation, and optimization with scientific cooperation partners from academia and industry in application areas ranging from drug design to flight planning. ZIB's services to the scientific community include the operation of a tier two supercomputer and the BRAIN research network, research campus MODAL, Berlin-Brandenburg library cooperation, and the digis digitization office of Berlin. Named after German computer pioneer Konrad Zuse, the Institute is located on the campus of Freie Universität Berlin. ZIB is closely linked to the three Berlin universities and part of Berlin University Alliance. The institute has about 220 employees.

LBW Optimization GmbH (LBW)

LBW is a leading provider of consulting and optimization services for public transport operators, railways, airlines, and traffic management companies. It excels in numerical algorithms for the solution of large-scale optimization problems, in particular, for vehicle and crew scheduling applications, and for problems in network design and operation. LBW has strategic partnerships with leading suppliers of planning systems that bring LBW technology to customers all over the world. MCF, LBW's open source network simplex algorithm, is a long-standing component of SPEC's CINT CPU benchmark test library.







IBM

Predictive Analytics for Server Incident Reduction in the Wild

While the Internet has become a major backbone of our society, the computers supporting this Internet can and will break.

IBM creates value for clients by providing integrated solutions and products that leverage data, information technology, deep expertise of industries and business processes, with trust and security and a broad ecosystem of partners and alliances.

IBM solutions typically create value by enabling new capabilities for clients that transform their businesses and help them engage with their customers and employees in new ways. These solutions draw from an industry-leading portfolio of consulting and IT implementation services, cloud, digital and cognitive offerings, and enterprise systems and software, which are all bolstered by one of the world's leading research organizations.

Among IBM's many businesses, Global Technology Services (GTS) is the main focus of our work. IBM GTS operates and manages some of the world's largest data centers, and thereby some of the world's most mission-critical workflows and franchises. GTS helps clients along their journey to the hybrid cloud, leveraging the best of their existing systems in the context of the regulatory, security, and workflow of their industry.

Every day, GTS operates many thousands of computers for IBM clients. To help them manage this, GTS and IBM Research have developed and deployed a system that identifies and proposes deep analytics and operations research (O.R.) remedies to keep IT systems operational. This Predictive Analytics for Server Incident Reduction (PASIR) solution developed at IBM has been broadly deployed to more than 360 IT environments since 2013. These environments, covering every sector from banking to travel to e-commerce, are serviced by IBM support groups.

More specifically, today, incidents occurring on servers, including the descriptions of the problems and the resolutions, are documented into an account-specific ticket management system. PASIR first classifies the incident tickets of an IT environment to identify high-impact incidents describing server outage and performance degradation issues by using the respective ticket descriptions and resolutions. Second, the occurrence of these high-impact tickets is correlated with server properties and utilization measurements to identify troubled server configurations and prescribe improvement actions through statistical multivariate analysis and simulation. In this contribution, we present the findings from deploying our machine learning solution in the wild.

We describe the PASIR methodology, from ticket classification to the recommendation of modernization actions. We also demonstrate the model effectiveness by comparing predictions on the impact of prescriptive actions with actual system improvements. We have applied PASIR to more than 840,000 servers since 2013 resulting in more precise refresh spending and environment

stability, saving our clients an estimated \$7 billion since that time.

ORGANIZATIONS

IBM

The International Business Machines Corporation (IBM) is an American multinational information technology company headquartered in Armonk, New York, with operations in over 170 countries. The company began in 1911, founded in Endicott, New York, as the Computing-Tabulating-Recording Company (CTR) and was renamed "International Business Machines" in 1924. IBM is incorporated in New York.

IBM produces and sells computer hardware, middleware, and software, and provides hosting and consulting services in areas ranging from mainframe computers to nanotechnology. IBM is also a major research organization, holding the record for most U.S. patents generated by a business (as of 2020) for 27 consecutive years. Inventions by IBM include the automated teller machine (ATM), floppy disk, hard disk drive, magnetic stripe card, relational database, SQL programming language, UPC barcode, and dynamic random-access memory (DRAM). The IBM mainframe, exemplified by the System/360, was the dominant computing platform during the 1960s and 1970s.

IBM has continually shifted business operations by focusing on higher-value, more profitable markets. This includes spinning off printer manufacturer Lexmark in 1991 and the sale of personal computer (ThinkPad/ThinkCentre) and x86-based server businesses to Lenovo (in 2005 and 2014, respectively), and acquiring companies such as PwC Consulting (2002), SPSS (2009), The Weather Company (2016), and Red Hat (2019). In 2015, IBM announced that it would go "fabless," continuing to design semiconductors, but offloading manufacturing to GlobalFoundries.

Nicknamed Big Blue, IBM is one of 30 companies included in the Dow Jones Industrial Average and one of the world's largest employers, with over

350,000 employees (as of 2018) known as “IBMers.” At least 70% of IBMers are based outside the United States, and the country with the largest number of IBMers is India.

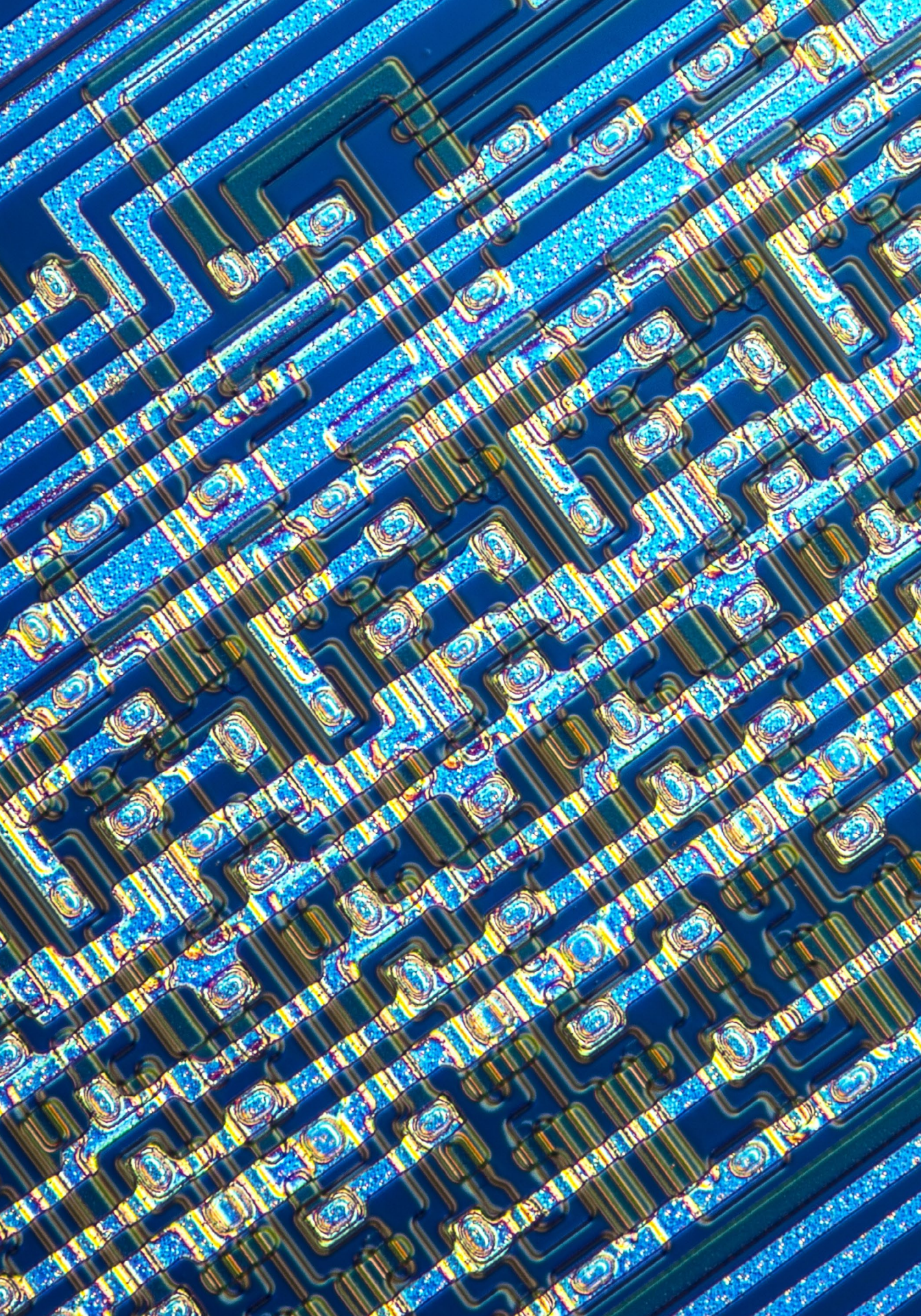
IBM Research

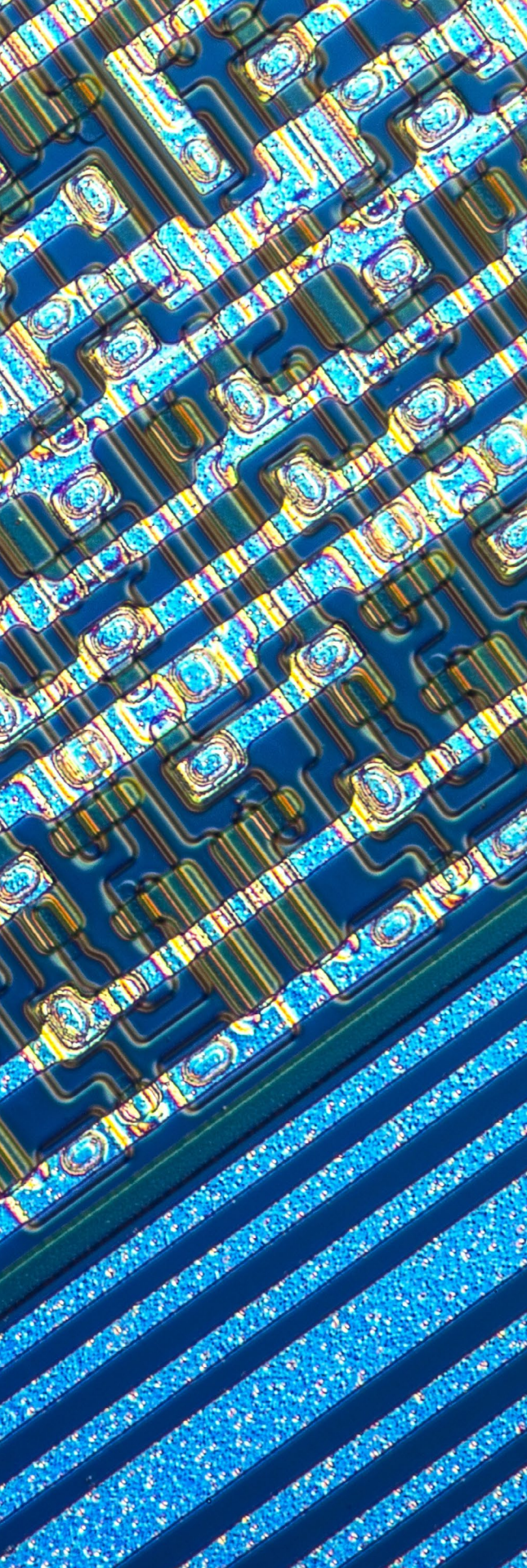
IBM Research is the innovation engine of the IBM Corporation. It is the largest industrial research organization in the world with more than 3,000 researchers in 12 labs across six continents. IBM Research plays the long game, investing now in tomorrow’s breakthroughs. IBM’s scientists are charting the future of AI, breakthroughs like quantum computing, how blockchain will reshape the enterprise, and much more. IBM is dedicated to applying AI, analytics, and science to industry challenges, whether it’s discovering a new way for doctors to help patients, teaming with environmentalists to clean up our waterways or enabling retailers to personalize customer service. Scientists from IBM Research have produced six Nobel Laureates, 10 U.S. National Medals of Technology, five U.S. National Medals of Science, six Turing Awards, 19 inductees in the National Academy of Sciences, and 20 inductees into the U.S. National Inventors Hall of Fame.

IBM Global Technology Services

IBM Global Technology Services designs, builds, and runs the foundational systems and services that is the backbone of the world’s economy. IBM Services partners with the world’s leading companies to build smarter business by reimagining and reinventing through technology, with its business insights, industry-leading portfolio and world class research and operations expertise leading to results-driven innovation and enduring execution. IBM’s experts in business, technology, and industry use advanced technology to help clients reduce cost and risk, achieve compliance, accelerate speed to market, create new revenue streams, and establish a security-rich and reliable infrastructure that’s ready for AI and hybrid cloud. IBM Services’ clients represent the cornerstones of their industries and include 4 of the top 5 airlines by revenue, 8 of the 10 leading mobile operators, 8 of the 10 largest automobile manufacturers, 4 of the 10 largest global retailers, 7 of the 10 biggest insurance companies, and the world’s 10 largest banks are among IBM’s assets.







INTEL

Intel Realizes \$25 Billion by Applying Advanced Analytics from Product Architecture Design through Supply Chain Planning

Intel's products support a wide variety of customers spanning a broad spectrum of usage models each with a specific set of product requirements. The requirements differ with respect to number of compute cores, processor speed, power consumption, rapid memory access, and input/output ports. Efficient product feature design integrated with supply chain planning is critical to Intel's success given its scale, complexity of its products and manufacturing processes, and the highly capital-intensive nature of the semiconductor business.

At any point in time, Intel is delivering hundreds of different products to its customer base through its large and complex manufacturing and supply chain while at the same time designing the next generation of products to meet its customers'

needs. In response to an exponential increase in complexities, Intel developed an innovative set of capabilities using advanced analytics that span product feature design through supply chain planning with the goal of maximizing revenue while minimizing cost wherever possible. This set of corporate-wide capabilities is fast and effective, enabling analysis of many more business scenarios in much less time than previous solutions while providing superior results including faster response to customers.

A large part of the product feature design problem is defining a finite number of stock keeping units (SKUs) with associated values for key features to best cover market needs and balance against manufacturability and costs. Given the broad range of Intel's application areas and customers, the combinatorics faced by product feature designers is daunting and involves search spaces of plausible plans numbering from 10^{10} to 10^{50} .

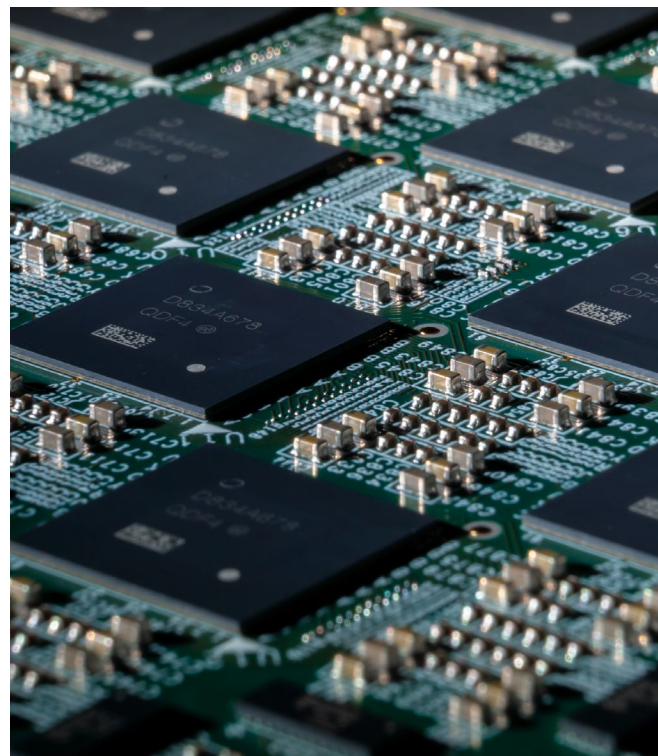
The output of the product feature design process feeds the supply chain planning and manufacturing execution process, which routes products through 6+ manufacturing stages, at 200+ internal and outsourced factories across 13 countries. Intel's manufacturing flow begins with wafer fabrication. Each wafer is a thin circular disk

of silicon 200-300mm in diameter and containing 15 to 15,000 complete integrated circuits, or die, depending on die size.

Each wafer is separated into a number of die that are placed into a protective container with external connectors, which will enable attachment to printed circuit boards. At times multiple die from different wafers are used for multi-chip products. Intel is especially focused on the efficiency of using every die on every wafer to supply a saleable product across the architectures of the entire Intel product portfolio.

The assembled items are then tested to measure actual performance. Tests help separate items into categories defined by performance ranges for a combination of the key features. Lastly, the items go through a Finish process that results in individual SKUs. Each wafer could have hundreds of thousands of possible manufacturing routes before it ends up as one of the SKUs shipped to customers. Faster, better, and more integrated decision making is increasingly important to Intel's decision process, as its products have become more complex.

Each year, Intel introduces several new products and plans for roughly 400 unique wafer types totaling 2.5 million of wafer volume, which results in 4,000 unique SKUs accounting for 600 million in



SKU volume. Products can flow through six or more manufacturing stages at more than 200 internal and outsourced factories across 13 countries.

Given the scale of Intel, the complexity of our products, and highly capital-intensive nature of semiconductor manufacturing, efficient product feature design integrated with optimal manufacturing processing and routing translates to billions of dollars of benefit per year, realizing increased revenue by an average of \$1.9 billion and reduced cost by \$1.5 billion annually, for a total benefit of \$25.2 billion to date.

It also supports Intel's sustainability efforts, enabling Intel to contribute to its environmental protection goals. Semiconductor manufacturing has a high reliance on water and Intel is leading the way with respect to reduction in water usage and the resultant waste water. Intel recycles the majority of the water it uses for manufacturing. The post-manufacturing treatment practiced by Intel produces water that often exceeds local government drinking water standards. Intel's supply chain planning capability resulted in the reduction of water usage by 2 billion gallons of water and more than 500 million gallons of waste water prevention so far over the 10-year timeframe of the project.

ORGANIZATION

Intel Corporation

Intel Corporation has been a driving force in the Information Revolution for over 50 years. Desktop and laptop computers have contributed to substantial productivity gains in the office and the factory. Modern supercomputers have revolutionized the scientific process by enabling research to move beyond the constraints of physical experimentation. Perhaps most importantly, servers and networking have revolutionized many activities of importance to the global society. This list includes telecommunications for individuals and businesses, banking and finance, commercial and recreational transportation, manufacturing and services industries, wholesale and retail businesses, medicine, education, agriculture, and others.

Recently, Intel-driven computers have enabled the advent of Cloud Computing, Big Data, and the practical resurgence of Artificial Intelligence. Equally important has been the way Intel has achieved these technical and economic results. We are a world leader in the use of green power and conflict-free minerals, and we have an ongoing focus on reducing water pollution and greenhouse gas emissions.





WALMART

A Multiobjective Price Optimization Framework in Stores Using Reinforcement Learning

Inventory optimization is one of the core merchandising operations for retailers. A key objective of the inventory optimization workstream is to reduce inventory on or by a specific date, often times through price reduction. Typically, this is done to make space for new items, reduce inventory of overstocked or seasonal items, or move perishable items such as meat or milk – but there are other reasons as well. As the world's largest retailer and grocer, Walmart strives to find the optimal price point for its general merchandise and groceries. However, when inventory reduction becomes necessary it traditionally implemented a price reduction strategy, which may require up to three different pricing changes, to help move unsold inventory from its stores.

Inventory reduction is a challenge for every retailer, but Walmart's size and scale means the challenges, opportunities and costs are greater than other retailers:

- More than 4,750 U.S. retail stores, including more than 3,500 Supercenters that can carry more than 125,000 SKUs each;
- More than 800 product categories across Grocery, Health and General Merchandise, of which more than 200 categories experience price reductions each year;
- Shelf space containing slow-moving or unsold merchandise needs to give way to opportunities to stock them with better-selling items, which impacts revenue and increased costs;
- Merchant's input into the suggested price reductions needs to be taken into consideration as it increases the complexity of their inventory optimization operations and impacts anticipated revenue.

With Walmart's previous strategy, the time and labor cost required to relabel discounted merchandise up to three times – across all stores and product categories – was substantial. Determining reduction strategies had to be done

on a store-by-store basis, as not all stores had the same inventory optimization issues. Afterward, the effort to remove and replace merchandise was also significant. In order to maximize sales revenue and reduce operating costs, Walmart created an intelligent algorithm that accelerates sales of time-sensitive merchandise across individual stores, categories and SKUs by optimizing price reductions and minimizing the associated costs of relabeling and removing time-sensitive goods.

Walmart's inventory optimization algorithm ingests data from individual stores including aggregated sales data and operating costs, how much and what types of merchandise to reduce, and the dynamic time frame for when the merchandise must be sold to make way for new merchandise. The core algorithms used to determine the repricing policy originate from mathematical optimization and deep reinforcement learning techniques. This approach applies data analytics, reinforcement learning, and dynamic optimization to make automated decisions (e.g., percentage of markdown, when to give the markdown price) for each individual product at each store. This results in a high-performance model and price adjustment policy tailored to each store.



Using machine learning to find the single best optimized price for merchandise and grocery items, Walmart is now able to successfully sell up to 80% of time-sensitive items with its initial price reduction, rather than going through the processes three separate times. This has resulted in lowered operating costs and increased sales of these designated items, with some stores experiencing up to 15% higher sales of these designated items.

Freed from the constant task of relabeling items, Walmart associates are able to perform higher-value tasks, such as helping more customers and providing better service. The algorithm has also had a significant impact on the daily lives of about 3,000 merchants by shifting responsibilities from repetitive, manual data-entry and manual decision-making on price fluctuations to handling exceptions and strategic scenario planning.

Walmart's new inventory reduction protocol was implemented in early 2019 and has achieved outstanding sell-through rate and cost-saving performance. The system has successfully reduced excess inventory while boosting sales of that inventory, resulting in significant cost savings.

This also improved customer purchasing power and reduced associate workload and related costs in stores. The operational savings and efficiency gains from Walmart's inventory optimization algorithm gets passed along to customers in the form of its Everyday Low Prices, so customers get the right product at the right price every time.

ORGANIZATION

Walmart

Walmart Inc. (NYSE: WMT) helps people around the world save money and live better with retail stores, online, and through their mobile devices. Each week, over 265 million customers and members visit around 11,500 stores under 56 banners in 27 countries and eCommerce websites. With fiscal year 2020 revenue of \$524 billion, Walmart employs over 2.2 million associates worldwide. Walmart continues to be a leader in sustainability, corporate philanthropy and employment opportunity. Additional information about Walmart can be found at corporate.walmart.com, on Facebook at facebook.com/walmart, and on Twitter @Walmart.



INFORMS



ABOUT INFORMS

The Institute for Operations Research and the Management Sciences

From increased efficiency in business processes that leads to millions in savings, to lifesaving advancements in medical treatments, to revolutionized transportation and delivery systems, analytics and operations research (O.R.) are truly saving lives, saving money, and solving problems. And the world is beginning to take notice. *U.S. News & World Report* listed operations research analyst as one of the top four best business jobs for 2020. At the heart of this growing field is INFORMS, the leading professional society for a vibrant community of nearly 12,000 operations research and analytics professionals, academics, and students, representing more than 82 countries around the world, whose impact on the economy and society has been and continues to be nothing short of remarkable.

INFORMS promotes best practices and advances in analytics and O.R. We are dedicated to encouraging, facilitating, and awarding excellence in our membership. Formed in 1995 when the Operations Research Society of America (ORSA) and The Institute of Management Sciences (TIMS) merged, INFORMS strives to provide opportunities of inspiration and collaboration among our members, fostering the life-changing ideas of the O.R. and analytics leaders of the future.

Each year, INFORMS hosts a number of events across the country and worldwide, including our Annual Meeting and Analytics Conference, that provide unique forums for thousands of attendees to interact and collaborate as well as celebrate those individuals and organizations who are making the biggest impact on the world around them. In

addition, the growing INFORMS advocacy program is leveraging the expertise of our members to provide policymakers in Washington, D.C. with valuable insight regarding the importance of data-driven decision making.

INFORMS publishes 16 scholarly, peer-reviewed journals, more than one-third of which are featured on the *Financial Times* list of 50 top academic journals, highlighting the latest methods and applications on a full spectrum of analytics and O.R. fields. Our continuing education and Certified Analytics Professional (CAP®) and Associate CAP (aCAP) certification programs provide opportunities for professional advancement at every career stage. With 22% of Fortune 100 companies now employing CAP certified professionals, these certifications enable industry leaders to identify and employ top talent.

INFORMS provides many resources to organizations of all sizes seeking information on the benefits of analytics, connecting them with the latest research and discoveries, as well as analytic and operational research professionals with the expertise they require. In addition, within our membership are smaller specialized subdivisions that are dedicated to a common theme or technical interest. Our members are embracing complex problems and unlocking the valuable data needed to enhance decision-making processes and improve day-to-day operations in almost every industry sector.

INFORMS would like to congratulate and thank the 2020 Franz Edelman Award finalists, both for their incredible contributions today, as well as inspiring the great discoveries and advancements of tomorrow.

ACCOLADES

PAST EDELMAN LAUREATES

2019

Angela Akridge*
Shubhi Asthana
John Beaver
Francisco Bernal Lozano
Dimitris Bertsimas
Maja Daczowska
Arthur Delarue
William Eger
Veronica Elvira Olalla
Martina Fischetti
Olivier Fradet*
Sandeep Gopisetty
Francois Grondin*
John Hanlon
Thomas Hjort
Yuting Jia
Stephanie Laughlin*
Sebastien Martin
Aly Megahed
Wolffie Miller*
Michele Monaci
Taiga Nakamura
Jay Nanduri
Anand Oka
David Pisinger
Martin Pleau*
David Rios
Michael Rose
Jesper Runge Kristoffersen
Leslie Shoemaker*
Mark Smith
Diana Tao*
Yung Wen Liu

2018

Diane Bryant
José Antonio Carbajal, CAP
Wes Chaar
Steven Charbonneau*
James Andrew Costa*
Anthony Coudert*
Umberto Dellepiane
Tianhu Deng
Melissa Dunford*
Gary Epstein*
Alexandre Fréchette*
Michael Gaies
Julien Guillen

Jingkuan Han
Karla Hoffman*
Sasha Javid*
Karl Kempf
Jean L. Kiddoo*
Evan Kwerel*
Eva K. Lee
Kevin Leyton-Brown*
Dingzhi Liu
Raffaele Maccioni
William Mahle
Matthew Manary
Charles E. Meisch, Jr.*
Dinesh Menon*
Neil Newman*
Susan C. Nicolson
Richard G. Ohye
Gail D. Pearson
Alessandro Pinzuti
Andreea Popescu
Enrico Procacci
Anthony Romero
Pierre Ruiz
Paul Salasznyk*
Ilya Segal*
Lara S. Shekerdeman
Zuo-Jun (Max) Shen
Brian Smith*
Rudy Sultana*
Michael Trick*
Brian Wieland
Sean Willems
Peter Williams
Madolin K. Witte
Mengying Xue
Junchi Ye
Yanfang Zhao
Zhongde Zhao
Shuhui Zhou

2017

Brandon Allen
Johanna Amaya
Felipe Aros-Vera
Turgay Ayer
Jeff Ban
Jerod Bieringer
Peter Boggis
Srinivas Bollapragada

Robert Boute
Sylvie Bouffard
Jay Brantley
Matthew Brom
Shama Campbell
Mary Deck
Kristof Deneire
Sheila Donahoe*
Fred Ehlers
Sandra Fleming
Marc Garbiras
Carlos A. Gonzalez-Calderon
Stacey Hodge
José Holguín-Veras
Kai Hsiao*
Amber Hyde*
Miguel Jaller
Loskesh Kalahsthi
Alain Kornhauser
Ahmet Kuyumcu*
Kevin Lee
Randy Markley
Michael Marsico
Susan McSherry
Bryan Monk
Heath Morgan
Melanie Murray*
Kaan Ozbay
Zeynep Ozkaynak
Giampaolo Orrigo
Marianela Pereira
Asheque Rahman
Michael Replogle
Keith Quan
Mason Samuels
Iván Sanchez-Diaz
Mark Simon
Michael A. Silas
Caesar Singh
Erdem Telatar
Charlie Turnipseed
Maud Van den Broecke
Roshan J. Vengazhiyil
Cara Wang
Andrew Weeks
Chelsea C. White III
Scott Wills
Jeffrey Wojtowicz
Shamim Wu*

Xia Yang
Utku Yildirim*
Chenxi Zeng
Can Zhang

2016

David Aebischer
Fernando Alarcón
William Aldrich
Bradford Alex Baker
Brian Blank
Stefan Conrady
Guillermo Duran
Michael Kevin Geraghty
Gnanadeeban Gnanapandithan
Michael Grimes
Mario Guajardo
Song He
Amanda B. Hepler
Chuck Holland*
Michael Johnson
Roderick Jordan
Captain Michael Joy
Boris Kats
Katherine Lajoie
Prasad Lakshminarasimhiah
Evan Levine
Jack Levis*
Erika Lunceford
Suzanne M. Mahoney
Matthew Maron
Jaime Miranda
John Morik
Hugo Muñoz
Christopher Myers
Ranganath Nuggehalli, CAP*
Victor O'Laughlen
Pavithran Rajendran
Luis Ramirez
Mario Ramirez
Madhusudan Rana
Carlos Reinoso
Luis Reinoso
Madangopal Revoor
Daniel Ruble
Gary Salomon
Bob Santilli*
Denis Sauré
Matias Siebert

* Indicates Member of Winning Team

Eric Sonmezer
Sebastian Souyriz
Anthony Tasso
Joseph A. Tatman
Jessica Tisch
Andrew Vatterott
John Vatterott
Rodolfo Villalba
Andrés Weintraub
Jeff Winters*
Darrin L. Whaley
Rodrigo Wolf-Yadlin
Gonzalo Zamorano

2015

Habib Z. Al Abideen
Brian Alford
Tovey Bachman
David Basset
Aaron K. Baughman
Richard Bogdany
Joseph Byrum*
Robert W. Carroll
Kristen M. Cheman
David Culhane*
Jeffrey Curtis
Craig Davis*
Scott Davis
Greg Doonan
Tracy Doublet*
Shatiel Edwards
David Foster*
Brandon Frankel
Ferrari Griarte
Meggen Gullo
Knut Haase
Benjie Harrison
Andrew Hazlewood
Dirk Helbing
Stephen Henry
Scott Johnson
Matthew Hoffman
Mathias Kaspé
Jack M. Kloeber, Jr. *
Matthes Koch
Craig Lawton
Ni Li
Bruce Luzzi*
Stephen Mack*
Jim Martineau
Cameron McAvoy
Michael McCarthy
Darryl Melander
Reeto Mookherjee

Ronald Mowers*
Frank Muldoon
Jeet Mukherjee
Sven Müller
Brian O'Connell
Herbie Pearthree
Roy Rice
Liliana Shelton
Sandy Sun
Gerald Teper
Clay Upton
Pamela J. Williams
Liang Xu
Xiaochuan Zhang
Kailai Zhou
Chris Zinselmeier*

2014

Ross Anderson
Itai Ashlagi
Hany Atallah
Kristen Baker
Abel Chan
Stephen Cochi*
Radboud Duintjer Tebbens*
Peter Ferris
Chris Forbes
Joseph Forbes
Michael Forbes
David Gamarnik
Ashish Goel
Pankaj Gupta
Siva Gurumurthy
Leon Haley
John Hauptert
Zengjian Hu
Paul Kennedy
Eva K. Lee
Joshua Morrison
Edmond Mount
Mark Pallansch*
Eleanor Post
John Putz
Michael Rees
Alvin Roth
Aneesh Sharma
John Sirois
Tayfun Sönmez
Yohan Sutjandra
Calvin Thomas
Kimberly Thompson*
Utku Ünver
Dong Wang
Steven Wassilak*

Michael Wright
Daniel Wu

2013

Carlijin Bak*
Tejinder Kaur Bimbraw
Brett Bonner
Ruud Brekelmans*
Graeme Case
K. Chandrasekhar
Lijun Chen
Zhi-Long Chen
Parag Chitalia
Pawan Chowdhary
Margery Connor, CAP
Robert Creek
Mark Davis
Dick den Hertog*
Youssef Drissi
Matthijs Duits*
Carel Eijgenraam*
Bob Gooby
Randhir Hebbar
Ganesh Hegde
Mary Helander
Guofen Hu
Matt Johnson
James Kalina
Kaan Katircioglu
Nick Kenaston
Jarl Kind*
Mahesh Krishnan
Wim Kuijken*
Rahul Kumar
Ted Kutz
Lin Li
Lebin Lin
Jiyin Liu
Yan Liu
Sudeep Maity
Karl Martin
Doug Meiser
Ying Meng
Nathan Mott
Murugan Pugalenth
K. Raghava Rau
Kees Roos*
Rohit Saxena
Howard Smith
Karthik Sourirajan
Craig Stenstrom
Karthik Subbian
Sumathi Subramanian
Lixin Tang

Pieter Vermeer*
David Wagnon
Gongshu Wang
Takashi Yonezawa
Bo Zhang
Xinhui Zhang

2012

Ahmar Abdullah
Suresh Acharya
Sofia Archontaki
Bernard A. Benecke
Greg Burel
Arnab Chakraborty
Kyle Christianson
Frederic Deschamps
John Dimotikalos
Prasanna Dhore
Feryal Erhun
Phillip Finch
Hein Fleuren*
James Fuller
Chris Goossens*
Marco Hendriks*
Erik F. Hertzler
David W. Hill
Karl G. Kempf
Iraklis Lazakis
Eva K. Lee
Marie-Christine Lombard*
Kathleen Mallery
Jacquelyn Mason
Ronald P. Menich
Ineke Meuffels*
Pelin Pekgün
Chen Peng
Ferdinand H. Pietz
John Poppelaars, CAP*
Timothy R. Rosenberg
Bharathan R. Shamasundar
Manav Shroff
Ritwik Sinha
Girish Srinivasan
Suresh Subramanian
Rohit Tandon
Osman Turan
James Van Sistine
Orestis Varelas
Takis Varelas

2011

Naoki Abe
Fernando Alarcon



Gary F. Anderson
 Gustavo Angulo
 Alex Beiza
 James J. Bennett
 Cristian Berner
 Brian Carlson*
 Jaime Catalan
 Yonghong Chen*
 Brent R. Cooley
 Kenneth Cooper
 Jin Dong
 King Dong Zhang
 Craig Eister
 Rafael Epstein
 Timothy Gardinier
 Edward Godlewski
 Cristian Gonzalez
 Guillermo Gonzalez
 Jon A. Higbie
 Mingguo Hong*
 Liu Xiao Hu
 Sergio Hurtado
 Florencio Infante
 David L. Jensen
 Roy Jones*
 Dev Koushik
 Kevin Larson*
 Gregory Lee
 Guo Li Jie
 Xingwang Ma*
 Prem Melville
 Gerard Miller
 Mauricio Naveas
 Andres Neely
 Peter Nieuwesteeg*
 Cezar Pendus
 Xi Quan Wang
 Chandan K. Reddy
 Haili Song*
 Kimberly Sperry*
 Matthew Tackett*
 Doug Taylor*
 Li Thomas
 Vince P. Thomas
 Fernando Valenzuela
 Jie Wan
 Melissa Weatherwax
 Andres Weintraub
 Ming Xie
 Jun Yin Wen*
 Daniel Yung
 Eugene Zak*
 Bin Zhang

2010

Gerkotze Bonthuys
 Ebert Cawood
 Jay Cunningham
 Miguel de Lascurain*
 Luis de los Santos*
 Esmi Dreyer
 Ingrid Farasyn
 Andrea Feunekes
 Ugo Feunekes
 Marc Fischer
 Michele Fisher, CAP
 Tjark Freundt
 Wolfgang Giehl
 Francisco J. Herrería*
 Salal Humair
 Johan Janse van Rensburg
 Jaco Joubert
 Joel I. Kahn
 Peter Kolesar
 Willem Louw
 John MacNaughton
 Kim Mathisen
 Marelize Meyer
 David Fernando Muñoz, CAP*
 John J. Neale
 Arturo Palacios-Brun*
 Steve Palmer
 Hylton Robinson
 Omar Romero-Hernandez*
 Oscar Rosen
 Ruan Rossouw
 John Ruark
 James Serio
 Francisco Solis*
 Gerrit Streicher
 William Tarlton
 Hentie van den Berg
 Anette van der Merwe
 Wim Van de Velde
 Lorraine van Deventer
 Jaime Villaseñor*
 Glenn Wegryn, CAP
 Sean P. Willems
 Cecile Wykes

2009

Dharma Acharya
 Jason Amaral*
 Dirk Beyer*
 Ann Brecht*
 Matt Callahan
 Brian Cargille*
 Felipe Caro

Russ Chadinha*
Kathy Chou*
Matt Collins
Juan Correa
José Manuel Corredoira
Prashant Dave
Gavin DeNyse*
Miguel Díaz
Alexey Ershov
Graeme Everett
Qi Feng*
Chris Fry*
Jérémie Gallien
Javier García
Rune Gjessing
Michael F. Gorman
Sharon Hormby
Shailendra Jain*
Shiva Kumar
Rick Lawrence
Michele Meyers
Holger Mishal*
Marcos Montes
Julia Morrison
Thomas Olavson*
Cookie Padovani*
Claudia Perlich
Andy Philpott
Sesh Raj*
José Antonio Ramos
Saharon Rosset
David Sellers
Kurt Sunderbruch*
Robert Tarjan*
Timothy Tenca
Kjetil Vatn
Krishna Venkatraman*
Julie Ward*
Joseph Woods*
Bin Zhang*
Jing Zhou*

2008

Erwin Abbink*
Terra Baranowski
Jonathan Berry
Erik Boman
Michael Brennan
Robert Carr
Lorne Cass
Michael Cirillo
Maria Delbom
Charles B. Duke
Helga Einarsdottir

Mats Eklund
Patrik Eveborn
Pieter-Jan Fioole*
Matteo Fischetti*
Marte Fodstad
Kim Fox
George Gray
William Hart
Lars Hellemo
Jonathan Herrmann
Ken Howard
Dennis Huisman*
Robert Janke
Leo Kroon*
Miro Lehky
Vaughn Lowe
Gábor Maróti*
Kevin Morley
Regan Murray
James Oiesen
Cynthia Phillips
Cyndi Quan-Trotter
Sudhendu Rai
Lee Ann Riesen
Frode Rømo
Mikael Rönqvist
Thomas Scheermesser
Lex Schrijver*
Adri Steenbeek*
Ved Sud
Midori Tanino
Thomas Taxon
Asgeir Tomasgard
James Uber
Jean-Paul Watson
James Wetherly
Roelof Ybema*

2007

Corne Aantjes
Deirdre Borrego
Dwight Branvold
Vinayak Deshpande
Kent Everingham
Matt Gaskins
Jerry Hwang
Tim Hyatt
Irina Ionova
Ananth Iyer
Michael Jacks
Goos Kant
Alexei Khavaev
Eva K. Lee*
Patty Mackenroth

Venu Nagali
Gary Polaski
Mark Pridgen
Frederick C. Riedlin
David Sanghera
Patrick Scholler
William V. Shearin
Michael A. Shirk
Greg Shoemaker
Jorge Silva-Risso
Tim Thurston
Marco Zaider*

2006

William Best*
Raymond H. Bittel
Richard Carnevale
Sridhar Chandrasekaran*
Louis Cox, Jr.
Ross Darrow
Stéphane Dauzère-Pères
John Elieson
Christopher A. Forgie
Dirk Guenther
Kjetil Haugen
Ulrich Koester
William H. Lee
Per Olav Myrstad
John J. Nestor
Atle Nordli
Asmund Olstad
Robert M. Peterson
Douglas Popken
B.V. Rao
Alf Reistad
Barry C. Smith
Mandyam Srinivasan*
Geir Teistklub
Russell Wooten
Faker Zouaoui

2005

Jeffrey Alden*
Dennis Begg
D.A. Beis
Ann Bixby
Lawrence Burns*
Michael Concordia
Theodore Costy*
Brian Downs, CAP
Toshiharu Hasegawa
Rick Hughes
Richard Hutton*
Craig Jackson*

Jim Jacobs
David Kim*
Kevin Kohls*
David Levine
P. Loucopoulos
Paul Martyn
Jonathan Owen, CAP*
Y. Pyrgiotis
Tuomas Sandholm
Mihiroasaki
Katsushige Sawaki
Mike Self
Atsuo Suzuki
Mark Turnquist*
David Vander Veen*
K.G. Zografos

2004

Martin Barkman
John C. Butler
Alexander Chebeskov
Herman Chiu
Mathieu Clercx
Ton de Kok
Jacques Desrosiers
Yvan Dumas
James Dyer
Thomas A. Edmunds
Rob Harlan*
Richard Hicks
Fred Janssen
Jianmin Jia
Mike Kanaley
Joshua Kanner*
Alev Kaya, CAP
Byung-In Kim
Seongbae Kim
Bob Kraas
Benoit Lacroix
Kam-Keung Lai
Edmond Leung
Jiyin Liu
Yong Liu
Richard Madrid
Sean Marshall
Theresa Metty*
Chris Milligan
Tom Moore*
Thomas Morris*
Katta Murty
Alexander Oussanov
Winfried Peeters
Alexander Popov
Kevin Potts*

Robert Pruneau
Olga Raskina*
Jeffrey Robbins*
Surya Sahoo
Quentin Samelson*
Avner Schneur*
Rina Schneur*
James Smith
Ron Sorensen
François Soumis
Sridhar Tayur
Loren Troyer
Mitchell Tseng
Jan van Doremalen
Erik van Wachem
Yat-Wah Wan
Elan Yaniv

2003

Kirk Abbott
Surain Adyanthaya
Vedat Akgun
Andrew P. Armacost
Mordecai Avriel
Cynthia Barnhart
Corey Billington
Chris Born
E. Andrew Boyd
Gianpaolo Callioni
Monica Carbajal
Rod Case*
Barrett Crane
John Fallis*
Edward Feitzinger
Chyi-Fu Hong
Phil Ireland*
Curtis Keller
Jason Kuehn*
Jin Liu
Ronit Meiri
Marc Meketon*
Wayne New
Avi Peretz
Robert Prior
Hanna Pri-Zan
Julie Unruh Rapp
Tom Rieger
John Ruark
Robert Slavens
Pat Smith
Jerry Trimarco
Carl Van Dyke*
Mark Wallace
Keith A. Ware

Trace White
Sean P. Willems
Alysia M. Wilson
Bert Winemiller
Ron Woestemeyer

2002

Chae An
Michael Argüello*
Fred Blakeley
Burçin Bozkaya
Buyang Cao
Andrew Davenport
Ralf Elsner
Wolfgang Hall
Gail Hohner
Arnd Huchzermeier
Philip Jones
Jayant Kalagnanam
Greg Kegler
Gilles Kern
Joseph Knolmayer
Manfred Krafft
Ho Soo Lee
Thierry Lemoine
Timothy Lowe
Sandra McCowan*
Ed Ng
Alain Patchong
Grant Reid
John Rich
Gao Song*
Rodney Traub
Anna White*
Gang Yu*

2001

Stuart Altschuler*
Rick Ayer
Vince Barabba
Donna Batavia*
Jeff Bennett*
Srinivas Bollapragada
Robert Butchers
José Vicente Caixeta-Filho
Hong Chen
Fred Cooke
Antonio de Pádua
Wagemaker
Robert Fancher
Marc Garbiras
Tim Gibbs
Gregory Hoscheit
Chet Huber

Mark Humphresville
Jeenyoung Kang
James Knowles
Russell P. Labe, CAP*
Robert Leachman
Bonnie Liao*
Vincent Lin
Kevin Lyman
Raj Nigam*
Je Oh*
Mark Paich
Greg Parlier
Mary Phillips
Nick Pudar
Surya Sahoo
Michael Scholes
Jim Smith
Jan Maarten van Swaay Neto

2000

Eric Bibelnicks
Mark Bullock
E. Rod Butchers
Deb Campbell
Kan Chang
Kenneth Chelst
Harlan Crowder
Paul R. Day
Randy Erdahl
Andrew P. Goldie
Michael Haydock
Ken Howard
Doug Johnson
Elena Katok*
Jeffrey Lockledge
Peter Lyon
Jeff A. Meyer
Demetrios Mihailidis
Stephen Miller
R. John Milne
Rick Oiesen
Robert Orzell
Alex Przebienda
Robert Rice
David Ryan
Amanda Scott
Laura Shisler
John Sidelko
Midori Tanino
William Tarantino*
Ralph Tiedeman*
Chris Wallace
Michael Wambsganss

1999

Rob Allan*
Ken Ambs
James Angelo
Nader Azarmi
Sugato Bagchi*
Steve Buckley*
Rony Cremmery
Sebastian Cwilich
Mei Deng
Nicolas De Schuyter
Markus Ettl*
Gordon Gould
Ron Holcomb
Terry Holeman
Richard Hopson
David Houck
John Hudson
Dean Jones
Kerry Kim*
Edwin Kjeldgaard
Lisa Koenig
Marc Lambrecht
David Lesaint
Grace Lin*
George List
David Lynch
Clive Morgan
Charles Muir
John Mulvey
Bret Naccarato*
George Pfeil
Shahram Taj
Mark Turnquist
Nico Vandaele
Christos Voudouris
Dicky Yan
David Yao*

1998

Henry Alden
Dean P. Angelides
Franz Behlau
Dimitris Bertsimas
Buyang Cao
James Causby
Christopher Darnell
Rafael Epstein*
Matthew J. Etzenhouser
L. Russell Fletcher
Corrie Heynen
Scott P. Holmen
R. Jaikumar
Ralph Kaiser

Albert Kuttner
 Ramiro Morales*
 Frederic Murphy
 Murthy Murrageda
 Kumar Rajaram
 Jorge Seron*
 Robert Soucy
 Raymond Taylor
 Izaak van de Wege
 Franz van Esch
 Michael Vasu
 Don Weigel
 Andrés Weintraub*
 Steven Welch

1997

Nejib Ben-Kheder*
 Paul Brinkley
 Mitchell Burman
 W. David Carr
 John Folger
 Stanley Gershwin
 Claudia Grief
 Kristopher Haag
 Jackie Hueter
 Raymond Johnson
 Josephine Kintanar*
 Kuanlian Liou
 Cecile Queille*
 Eric Schweitzer
 David Stepto
 William Stripling*
 Curtis Suyematsu
 Alva Svoboda
 William Swart
 Alireza Vojdani
 Detlof von Winterfeldt
 Kui Wang
 Fulin Zhuang

1996

Sally Botha*
 Jeffrey Camm
 Roy Carr-Hill
 Thomas Chorman
 George Curnow
 Franz Dill
 A.A. Elimam
 James Evans
 Kevin Geraghty
 Kamal Golabi
 Maurice Gripis
 Ivan Gryffenberg*
 Geoffrey Hardman

Rauten Hofmeyr*
 Ernest Johnson
 Gary Kochman
 S. Kotob
 Jean Lausberg*
 Stephen Martin
 Steven Meester
 Ruppert Nicolay*
 Stuart Peacock
 Dabashish Sarkar
 Trevor Sheldon
 Richard Shepard
 Willem Smit*
 Peter Smith
 Dennis Sweeney
 Stephanus Uys*
 Willie van der Merwe*
 Glenn Wegryn, CAP
 Gysbert Wessels*
 Keith Wilton

1995

Tal Barnea
 Michael Barnum
 Dan Benanav
 Robert Benson*
 David Bowen
 Kabir Dutta
 Ivy Eisenberg
 Jim Euchner
 Elissa Gilbert
 Afshin Goodarzi
 Shravan Kotha
 Robert Leachman*
 Edwin Lee
 Yu-Ling Lin
 Chihwei Liu*
 Leon Marom
 John Martin
 Richard Ormerod
 Justin Peterson
 Randy Pope
 Dale Raar*
 Rangu Salgame
 Sanjeev Sardana
 Gary Sevitsky
 Yishay Spector
 Miguel Taube-Netto

1994

Bruce Arntzen
 Gerald Brown
 B.S. Chandrasekaran*
 A. Roy Choudhury*



Zhang Chuntai
Peter Cook
Steven Cosares
Zhou Dadi
David Deutsch
Scott F. Donahue
Anthony Durso
Goutam Dutta*
Lin Fatang
Terry Friesz
Terry Harrison, CAP
Toshiharu Hasegawa
Michael Kubly
Niloy Mitter*
Susan Neuman
Rong Qiang
Shi Qingqi
P.N. Roy*
Iraq Saniee
Tsuna Sasaki
Gao Shenhui
S.B. Singh*
Gopal Sinha*
Linda Trafton
Ondria Wasem
Thawat Watanatada
Cao Wei
Yu Xiaodong
Sun Xufei
Wang Xusheng
Tsuyoshi Yoshino
Xie Zhijun

1993

Anthony Brigandi*
David Carino
Dennis Dargon*
Paul Fischbeck
Paul Katz
Terry Kent
Roy Marsten
David Myers
M. Elizabeth Paté-Cornell
John Quillinan
Amir Sadrian
Richard Scheff
Thomas R. Sexton
Michael Sheehan*
Sally Sleeper
Thomas Spencer*
Celine Stacy
Radhika Subramanian
Mike Sylvanus
Robert Taggart

Patrick Tendick
Andrew Turner
Kouji Wantanabe
D. Steve Wiper
William Ziembra

1992

Benedo Beltrán
William Burnett
Michael F. Cahn
A. Dale Flowers
Earl D. Geyer, Sr.
Louis Goldring
Bruce Hoadley
Edward H. Kaplan*
Paul Katz
Richard Larson
Dominic Monetta
José Pablo Nuño
Elaine O'Keefe*
José Manuel Padillo
Amir Sadrian
Martin Shell
Dan Shunk
Barry Silverman
Arthur Swersey

1991

Yosi Ben-Dov
John Braklow
Ingrid Busch
Michael Cerby
Ross Darrow*
Anura de Silva
Fred DiLisio
Jeffery L. Dodge
Joseph Ecker
William Graham
Donna Granfors
Gerald Hahn
Glen Harrison
Stephen Hassler
Lakhbir Hayre
Michael Hilliard
Carolyn Jack
Sheng-Roan Kai
Ronald Kraemer
John Leimkuhler*
Cheng Liu
William Makuch
Ken Peck
Vincent Pica
Warren Powell
Alexander Shulman

Barry Smith*
Rajendra Solanki
Lawrence D. Stone

1990

Ranga Anbil
Bruce Andrews
J.T. Day
S.R. Erwin
A. A. Farley
Robert Fetter*
Eric Gelman
Lonny Gorban
Jim Griffith
K.D. Le
E. William Moore
Henry Parsons
Bruce Patty
Phillip Quinn
Rajan Tanga
Alberto Vasquez-Marquez
Janice Warmke
J.T. Wood
C.K. Yin

1989

Nicola Aversa*
Jean-Yves Blais
Anthony Brigandi
Angel Chiarri
Morris Cohen
Dennis Dargon
Ron Dembo
Hisham El Sherif
Kenneth Fordyce
Dennis Gensch*
Pasumarti Kamesam
Paul Kleindorfer
Jacques Lamont
Hau Lee
Jesus Gomez Martin
Steven Moore*
Luis Paradinas
Jean-Marc Rousseau
Michael Sheehan
Thomas Spencer
Gerald Sullivan
Armen Tekerian

1988

Adedeji Badiru
Donald Brenner
Hung-Po Chao
Stephen Chapel
Charles Clark

Calvin DeWitt
Bobbie Foote
Paul Green
Richard Grimes
Stephen Huxley*
Ibrahim Kavrakoglu
Ali Riza Kaylan
Leon Lasdon
Lawrence Leemis
Simon Melhem
Peter Morris
Süleyman Özekici
A. Ravindran
M. James Sandling
Marsha Scarbrough
James Schierer
Douglas Shifflet
Kenneth Stott
Güniz Tamer
Phillip Taylor*
Francis Vasko
Allan Warren
Larry Williams
Jerry Wind
Floyd Wolf

1987

Susan Atherton
Richard Box
Kevin Butterbaugh
Donald Chung
Ellen Curtis*
Amir Elger
Donald Herbe
Jonathan Jacobs
Leonard Lodish*
Michael Ness*
Kenneth Nickerson
Warren Powell
James Selsor
Yosef Sheffi
M. Kerry Simpson*
Jacob Ulvila

1986

James Beam
Bell Beckert*
Dennis Blumenfeld
Robert Breitman
Gerald Brown
Lawrence Burns
Carlos Daganzo
Dennis Dare
Elmer Dougherty
Carol Ellis

Michael Frick
Glen Graves
Randolph Hall
P.A. Hutchinson
Jim Keyes*
Darwin Klingman*
John Lastavica
Enrico Lombardino
John Lucas
Charles Noon
Nancy Phillips*
David Ronen
Gary Salton
David Steiger*
Warren Young*

1985

T.A. Araripe Neto
Judson Bryn
Uli Chi*
George Gross
J.F.R. Gussow
Gene Hall
Thomas Holloran
Yoshiro Ikura
Mark Lembersky*
Anne Litke
Joseph Miller
Mario V. F. Pereira
Lucius Riccio
P. R.H. Sales
L.F. Silva
L.A. Terry
Norma Welch

1984

Raymond Boykin
Bill Bulloch
Douglas Cochard
Mark Daskin
David Eaton
Jerry Edwards*
Bruce Goeller
Glen Jansma
Peter Kleutghen
J.C. McGee
Dennis Simmons
Harvey Wagner*
William P. Wood*
Kirk Yost

1983

Walter Bell*
Ronald Bierbaum
Louis Dalberto

James Farrell
Marshall Fisher*
Arnold Greenfield*
Thomas Hatch
Donald Holland
R. Jaikumar*
Gerald Katz
Pradeep Kedia*
Russell Leslie
Robert Mack*
Paul Putzman*
Robert Sauder
Alvin Silk
Glen Urban
William Westerman

1982

Emily Bassman
James Dyer
Kamal Golabi*
Joseph Graves
Ram Kulkami*
Alan Kuritsky
John Little
W.L. McMahan
Alvin Silk
Bruce Smith
George Way*

1981

Henry Barker*
Donald Brout
Lewis Chakrin
Wayne Dawson
Luca Donno
Warren Erickson
Said Hilal
S. Lakshminarayan
Andre Landry
J. Bruce McLeod
Joseph Pilskin
Dilip Sen*
Ed Sharon*
Janet Showers
William Swart
Eileen Tell

1980

Lee Brosch
Richard Buck
Dale Cooper
Kenneth Cooper
Lynn Davidson
Robert King*
Robert Love*
Shmuel Oren

Michael Rothkopf
Richard Smallwood
William Sparrow
James White

1979

William Bingham
William Boyce
Eric Brodheim*
Fred Glover
Carl Hamilton
Gene Jones
Andrew Kalotay
David Karney
John Mote
Greg Prastacos*
Miles Vogel

1978

Dalip Bammi
Deepak Bammi
D. Wayne Darnell
Joseph Debanne
Adel Gaballa
Harry Harrison*
William Jahnke
Ronald Lanstein
Jean Noël Lavier
Carolyn Loflin
Richard Thomson
Charles Tiplitz

1977

John Chambers
Stephen Chen
Dwight Crane
Martin Edelstein
William Fudge
Ronald Hudson
Robert G. Johnston
Frederick Knoop
Leonard Lodish
Charles McCallum
Myron Melnyk
William Pettigrew
Thomas Saaty
F. Paul Wyman*

1976

J.H. Henry
R. Jaikumar
M.E. Kamrass
D.B. Kotak
J. McDonald*
J. Orlansky
U.R. Rau

R.E. Reichenbach
T.C. Rowan
K.W. Shepherd
J.A. Svestka

1975

Joseph Balintfy
Douglas Beene
William Bleuel*
James Bruce
Robert Clark
Joseph Debanne
James Gilean
Suresh Jain
James Reddy

1974

David Ahlers
Homer Bishop
Edward Blum
Grace Carter
Dale Cooper
Joseph Debanne*
Wayne Drayer
Sidney Hess
Ronald Hudson
Edward Ignall
Peter Kolesar
Robert Machol
A.K. (Raj) Nigam
Steve Seabury
Arthur Swersey
Warren Walker

1973

R.L. Anderson
L.D. Bodin
Leo Boucher
T.O. Carroll
Donald P. Coveleski*
James Fitzsimmons
Mark Grossman
Allen Lee
Robert Stark
Sally Stout
Elden D. Thomas*

1972

Donald Blumberg
Julio Bucatinsky
Richard Condon*
Robert Cutler
Ralph Keeney
Robert Meyer
Peter Salomone



EDELMAN ACADEMY MEMBERS

360i

ABB Electric, Inc.

ABB Power Systems, Inc.

ACT Operations Research

AD OPT Technologies, Inc.

Aeon Decision Engineering, Inc.

Agrico Chemical Company

AIMMS Inc.

Air New Zealand Ltd.

Air Products & Chemicals, Inc.

Alliance for Paired Donation

ALSTOM Grid, Inc.

Alternative Management Solutions

AMEC Foster Wheeler

American Airlines

American Airlines Decision Technologies

American Edwards Lab

American Red Cross

American Trade School

American Water Works Association

Analytics, Inc.

Animal Health Institute

ANR Freight System

ANSER, Inc.

Anthony Durso Associates, Inc.

Applied Decision Analysis, Inc.

Argonne National Laboratory

Arizona Department of Transportation

Arizona State University

Arthur D. Little, Inc.

Asociación Nacional de Fútbol Profesional

Aspen Technology, Inc.

AT&T

AT&T Capital Corporation

AT&T Capital Leasing Services

AT&T Laboratories

AT&T Long Lines

AT&T National Technical Center

AT&T Network Services

Athens University of Economics and Business

Babcock & Wilcox Company

Banco de México

Bank Hapoalim

Bankers Trust Company

Baosteel

Barco

Bechtel Power Corp.

Becton Dickinson & Company

Bell Communication Research (Bellcore)

Bell Laboratories

Bethlehem Steel Corp.

BHP Billiton

Biarri

Blue Bell, Inc.

BNY Mellon

Bombardier Aerospace

Bombardier Flexjet

Booth Fisheries

Bosques Arauco

Boston College

Boston Public Schools

Boston University

British National Health Services

British Telecommunications

Burger King Corp.
 Cabinet of Egypt
 Cahill May Roberts, Ltd.
 CALEB Technologies Corp.
 California Power Exchange
 Canadian Forest Products
 Canadian National Energy Board
 Canadian National Railways
 Canadian Pacific Railway
 Canal del Fútbol
 Carlson Rezidor Hotel Group
 Carnegie Mellon University
 Carrefour
 Case Western University
 Center for Transportation Analysis, ORNL
 Centers for Disease Control and Prevention
 Centro de Enseñanza Técnica y Superior
 Centrum Wiskunde & Informatica
 CEPTEL
 Cerestar
 Cerestar Benelux BV
 Cerestar Deutschland
 Chessie System, Inc.
 Chevron
 Children's Healthcare of Atlanta
 Children's Hospital of Philadelphia
 China National Petroleum Corporation
 China Petroleum Planning and Engineering Institute
 Chinese State Planning Commission
 Chinese University of Hong Kong
 CIM Systems Research Center
 CITGO
 City of Austin
 City of Cleveland
 City of Los Angeles Fire Dept.
 City of New York
 City of San Francisco Police Dept.
 City of Stockholm, Sweden
 Cleveland State University
 Cleveland Trust Company
 Coca-Cola Enterprises Inc.
 Cognia System Corp.
 Columbia University
 Columbus America Discovery Group
 CombineNet, Inc.
 Compañía Sud Americana de Vapores
 Consilium, Inc.
 Continental Airlines
 Cooper Associates
 Cornell University
 Cox Associates
 CQM
 CSX Railway
 CubeSmart
 D. K. Shifflet & Associates, Ltd.
 D.S.I. Consulting
 DaimlerChrysler Corp.
 Danos
 David M. Griffith & Associates, Ltd.
 Decisio
 Decision Focus Inc.
 Decision Insights
 Decision Science Consortium, Inc.
 Deere & Company
 Defense Headquarters
 Defense Logistics Agency
 Delaware River Basin Commission
 Delaware River Foundation
 Delft University of Technology
 Dell Computers
 Deloitte & Touche Consulting Group
 Delta Air Lines
 Deltares
 Department of Transport, Canada
 Department of Transportation - State of CA
 Deree-Pierce College
 Detroit Diesel
 DHL
 Digital Equipment Corp.
 District of Columbia Public Service Commission
 Double-Click SAS
 Dowling College
 DSApps, Inc.
 DuPage County
 Dutch Delta Programme Commissioner
 Eastern New Mexico University
 Ecole des Mines de Saint-Étienne
 École Polytechnique
 Economic Research Institute
 Electric Power Research Institute
 Electronic Data Systems Corp.
 Eletrobras
 Emeraldwise, LLC
 Emergency Medical Services Department of Austin
 Emptoris, Inc.
 Energy Research Institute
 Erasmus University Rotterdam
 ESRI
 ETH Zürich, Switzerland
 Europcar
 Exxon Company
 Farm Credit Banks, NY
 Federal Aviation Administration
 Federal Communications Commission
 Federal Highway Administration
 Fingerhut Companies, Inc.
 Flexjet
 Fluor Corporation



Ford Motor Company
Frank Russell Company
Gas Research Institute
Gassco
GE Capital Corporation
General Electric Company
General Electric Transportation
General Motors
General Motors Research Lab
General Research Corporation
George Darling & Associates
George Mason University
George Washington University
Georgia Institute of Technology
Getty Oil Company
GIRO, Inc.
GIS/Trans, Inc.
Goodyear Tire and Rubber Company
Govt. of the Sudan & Kuwait Fund for Arab Economic Dev.
Grady Health System
Grantham, Mayo, Van Otterloo & Company LLC
Great Lakes Transmission
Great Northern Paper Company
Greater NY Blood Program
GTE Laboratories, Inc.
Hanshin Expressway Public Corp.
Harris Corp./Semiconductor Sector
Harvard University
Hazardous Waste Remedial Actions Program
Health Care Financing Administration
Hebrew University
HEC
Hewlett-Packard Company
Hewlett-Packard Laboratories
Hidroelectrica Espanola, S.A.
HKV Consultants
Holiday Retirement
Homart Development Company

Honeywell, Inc.
Hongkong International Terminals
Hong Kong Productivity Council
Hong Kong University of Science & Technology
Huaneng Corp.
IBM Corp.
IBM Global Services
IBM Korea, Inc.
IBM Microelectronics
IBM Optimizer
IBM Personal Systems Group
IBM Printing Systems Company
IBM Research
IBM Research-China
IBM Services
IBM T.J. Watson Research Center
IESEG School of Management
Indeval
Industrial and Commercial Bank of China
Information Resources, Inc.
Ingalls Shipbuilding
Ingram Micro
Innovative Decisions, Inc.
Institute for Physics and Power Engineering
Institute of Comprehensive Transportation
Institute of Information Technology, Inc.
Institute of Tech-Economics
Intel Corporation
Intelligent Systems Research
Interativa S/C Ltda.
InterContinental Hotels Group
Intuit
Israeli Air Force
Istanbul Chamber of Industry
ITAM
Jan de Wit Company
Jansma Consulting, Inc.
JDA Software Group

J.D. Power and Associates
 Jeppesen Sanderson, Inc.
 John Laing Engineers Ltd.
 Johnston County (NC) Public Schools
 Kansas Geological Survey
 Katholieke University
 Kelly Springfield Tire Company
 Kenan Systems Corporation
 KeyCorp
 Kid Risk, Inc.
 Kinki University
 Kodak Australasia
 Kroger Co.
 KU Leuven
 Kutztown University
 Kuwait Institute for Scientific Research
 Kyoto University
 Lawrence Livermore National Laboratory
 Leachman and Associates LLC
 Level 3 Communications
 Liberty National Bank & Trust Co.
 Linköping Municipality
 L.L. Bean, Inc.
 LMI
 Loughborough University
 Louisville Metropolitan Sewer District
 LTC Techno-Economics Research Group, Inc.
 LTV Steel Company - Cleveland Works
 MA Dept. of Public Health
 Management Decision Systems
 MARACO, Inc.
 Maritrans, Inc.
 Marriott Corp.
 Marriott International
 Mars, Inc.
 Mason and Hanger Corporation
 Massachusetts Institute of Technology
 McKesson
 McKinsey & Company
 Memorial Sloan-Kettering Cancer Center
 Menlo Worldwide
 Merit Brass Company
 Merrill Lynch
 Merrill Lynch Management
 Metron Aviation
 Metron, Inc.
 Mexico City
 M-Factor, Inc.
 Microsoft Corporation
 Military Airlift Command
 Ministry of Infrastructure and the Environment
 Ministry of Municipal & Rural Affairs, Kingdom of Saudi Arabia
 Ministry of Railways
 MISO
 Mobil Oil Corporation
 Molde University College
 Monash University
 Monsanto Corp.
 Motorola, Inc.
 MPSA
 MPT Associates, Inc.
 MultiModal Applied Systems, Inc.
 Nanzan Educational Complex
 Nanzan University
 NASA
 Nash, Phillips-Copus Company
 National Airlines
 National Broadcasting Company
 National Bureau of Standards
 National Car Rental System
 National Dong Hwa University
 Naval Postgraduate School
 NBN Co.
 NC Dept. of Public Instruction
 Netherlands Railways
 New Brunswick Dept. of Transportation
 New England Merchants Leasing Corp.
 New Haven Fire Dept.
 New Haven Health Dept.
 New York City Department of Transportation
 New York City Fire Department
 New York City Police Department
 New York State Dept. of Tax and Finance
 NHH Norwegian School of Economics
 Norfolk Southern Railroad
 Norske Skog
 Norske Skog Tasman Ltd.
 Nortel
 North American Van Lines
 North-Atlantic Traffic System
 North Carolina State University
 North Dakota State University
 Northeast Computer Services
 Northern Telecom
 Northwest Airlines
 Northwestern University
 Norwegian School of Economics & Business Admin.
 NYNEX
 Office of Technology Assessment
 OFMD
 Ohio State University
 Old Dominion University
 Olympic Organizing Committee
 Omya Hustadmarmor
 Omya International AG
 Optiant, Inc.
 Optima, Inc.
 Optimal Decision Technologies Ltd.



- Optimal Solutions
- Oregon State University
- ORTEC
- Pacific Gas & Electric Company
- Pacific Lumber Company
- Pantex
- Pediatric Heart Network
- Pennsylvania State University
- Pfizer, Inc.
- Philadelphia Federal Reserve District
- Philip Morris, USA
- Philips Semiconductors
- Pillsbury Company
- Primary Children's Hospital
- Princeton University
- Procter & Gamble Company
- Prorize LLC
- PROS Revenue Management
- Prudential-Bache Capital Funding
- Prudential Securities, Inc.
- PSA Peugeot Citroën
- Purdue University
- Quantas Airways, Ltd.
- Queues Enforth Development, Inc.
- Rand Corporation
- Rappaport Institute
- RCA Corp.
- Realization Technologies
- Remsoft
- Rensselaer Polytechnic Institute
- Revenue Analytics
- Reynolds Metals Company
- Rhenania Group
- Richard Costain Ltd.
- River Logic
- Rolls-Royce Commercial Marine
- Royal Academy of Sciences
- SABRE
- Sabre Holdings
- SADIA Concordia S.A.
- Sainsbury's Supermarkets
- Samsung
- Sandia National Laboratories
- San Francisco Police Department
- San Francisco State University
- SANTOS Limited of Australia
- Sasol
- Schindler Elevator Corp.
- Sears
- Seaway Transport Canada
- SINTEF
- Sleeper Associates
- SmartOps Corp.
- SNCF
- Soar Technology Inc.
- Sola-Syntex Ophthalmics
- Solomon Brothers
- Soros Fund Management
- South African Defense Headquarters
- South African National Defense Force
- Southern Company Services, Inc.
- Southern Railway Company
- Spanish Aviation Safety & Security Agency (AESA)
- Spicer Off-Highway Products
- Standard Brands, Inc.
- Standard Oil Company
- Stanford University
- State of New York Mental Health
- State University of New York-Stony Brook
- StatoilHydro
- S.T.C.U.M.
- Strategic Management Solutions
- Swift & Company
- Syncrude
- Syngenta
- Syngenta Seeds, Inc.

Syntex Laboratories, Inc.
 Taco Bell Corp.
 Tata Iron and Steel Company, Ltd.
 Technical University of Denmark
 Technische University
 Technological Education Institute of Crete
 Temple University
 Tetra Tech, Inc.
 Texaco Inc.
 Texas Children's Hospital
 The American University in Cairo
 The Boeing Company
 The Egyptian Cabinet
 The Energy Authority, Inc.
 The Finance Ministry of Kuwait
 The Hertz Corp.
 The Logistics Institute of Northeastern U., China Lotus Dev. Corp
 The Netherlands Rijkswaterstaat
 The World Bank
 Tieto Enator
 Tilburg University
 Tinker Air Force Base
 TNT Express
 Towers Perrin-Tillinghast
 TransCanada-Great Lakes Transmission
 Transportation Security Administration
 Travelocity
 Tsinghua University
 Turkiye Sise ve Cam Fabrikalari A.S.
 Turner Broadcasting System, Inc.
 Twitter, Inc.
 Tyecin Systems, Inc.
 UNISOMA
 Unisys Corp.
 United Airlines
 United States Air Force
 United States Air Force Academy
 United States Army
 United States Army-Center for Army Analysis
 United States Coast Guard
 United States Marine Corps
 Universidad de Chile
 Universidade de São Paulo
 University of Alberta
 University of Antwerp
 University of Auckland
 University of Bologna
 University of British Columbia
 University of California, Berkeley
 University of California, Los Angeles
 University of California, Riverside
 University of Cincinnati
 University of Dayton
 University of Detroit
 University of Hamburg, Germany
 University of Iowa
 University of Manchester
 University of Maryland, College Park
 University of Michigan
 University of Michigan C. S. Mott Children's Hospital
 University of Montreal
 University of North Carolina at Chapel Hill
 University of North Carolina at Charlotte
 University of Oklahoma
 University of Pennsylvania
 University of San Francisco
 University of Southern California
 University of Southern Maine
 University of Technology Dresden, Germany
 University of Tennessee-Knoxville
 University of Texas at Austin
 University of Toronto
 University of Wisconsin-Milwaukee
 University of York
 UPS
 U.S. Army ASA (ALT)
 U.S. Army Communications-Electronics Command
 U.S. Army Program Executive Office Ground Combat Systems
 U.S. Department of Energy
 U.S. Department of Housing & Urban Development
 U.S. Environmental Protection Agency
 USAREC
 USCAP
 Vattenfall
 Verizon Laboratories
 VESTRA
 Veterans Administration
 Veteran Technology Group
 Vilpac Corporativo, S.A.
 Visteon Automotive Systems
 Visteon Sterling
 Vlerick Business School
 Volpe National Transportation Systems Center
 Wagemaker Consultoria Ltda.
 Warner Robins Air Logistics Center
 Warwick Business School
 Waste Management, Inc.
 Wayne State University
 Wells Fargo Investment Advisors
 Westfälische Wilhelms University
 Weyerhaeuser Company
 Wissenschaftliche Hochschule für Unternehmensführung
 Wright State University
 Xerox Corp.
 Yale University
 Yasuda Fire & Marine Insurance Co., Ltd.
 Yellow Freight System, Inc.
 Zara

Winning the prestigious Franz Edelman Award was a hard-earned validation and a huge recognition for Louisville MSD and its longtime partner Tetra Tech.

— Angela Akridge, Louisville MSD



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