IRONYUN

BEST PRACTICE

VERSION 4.1.0

CONTENT

AI NVR 4.1.0

AI NVR Video Analytics Functions

Useful documentation:

1. Demo video for system setup: https://youtu.be/WK820iO4cBk

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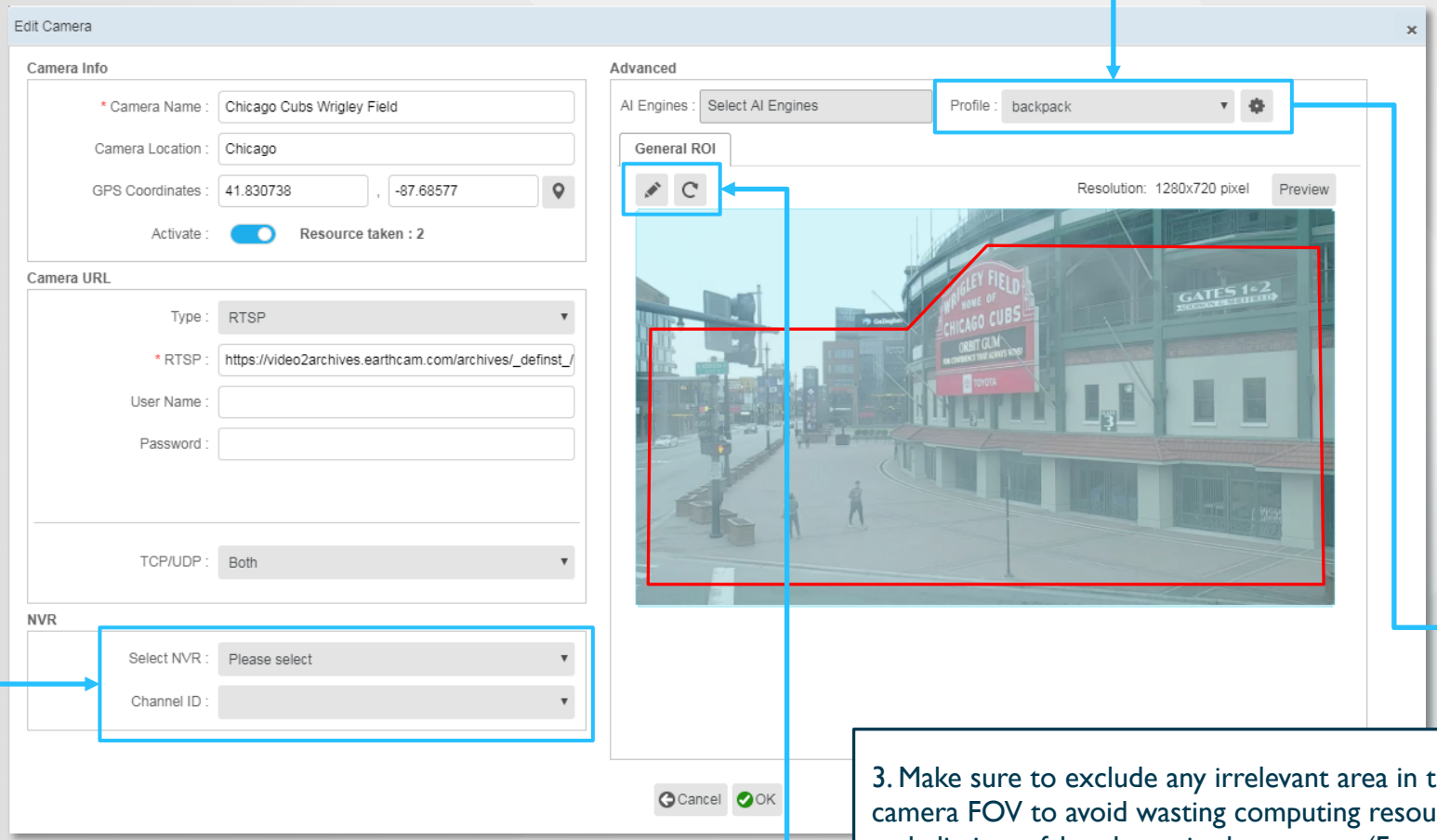
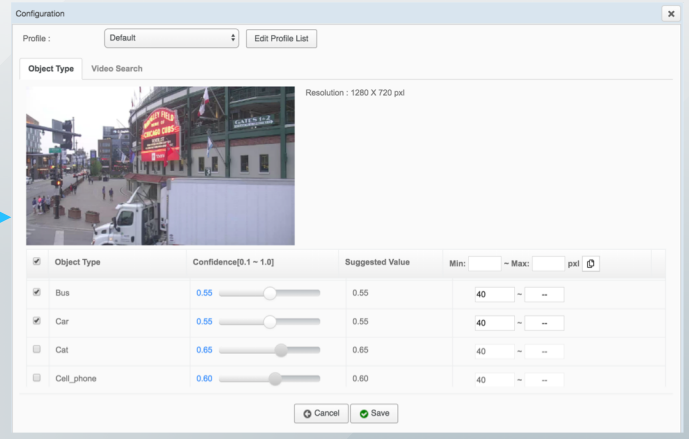
CAMERA CONFIGURATION



2. Make sure that the object types of interest are selected in the Profile (Access via Camera > Edit > Profile Configuration)
All cameras have the Default profile (person, face, bicycle, bus, car, motorcycle, truck). Any type selection should be saved to a new profile.
Select only relevant object types to optimize performance (e.g., deselect "car" for indoor environment)



1. Make sure to add 1 stream from the camera to the NVR connected to the AI NVR in order to have video playback

3. Make sure to exclude any irrelevant area in the camera FOV to avoid wasting computing resources and eliminate false alarms in those areas. (For example, the sky in this FOV can be excluded).
Use the Pencil icon in the ROI tab to draw the area of interest for the entire camera.

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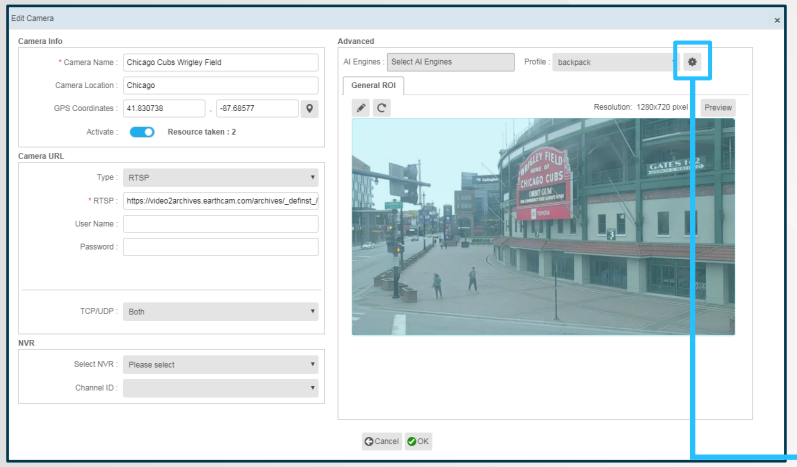
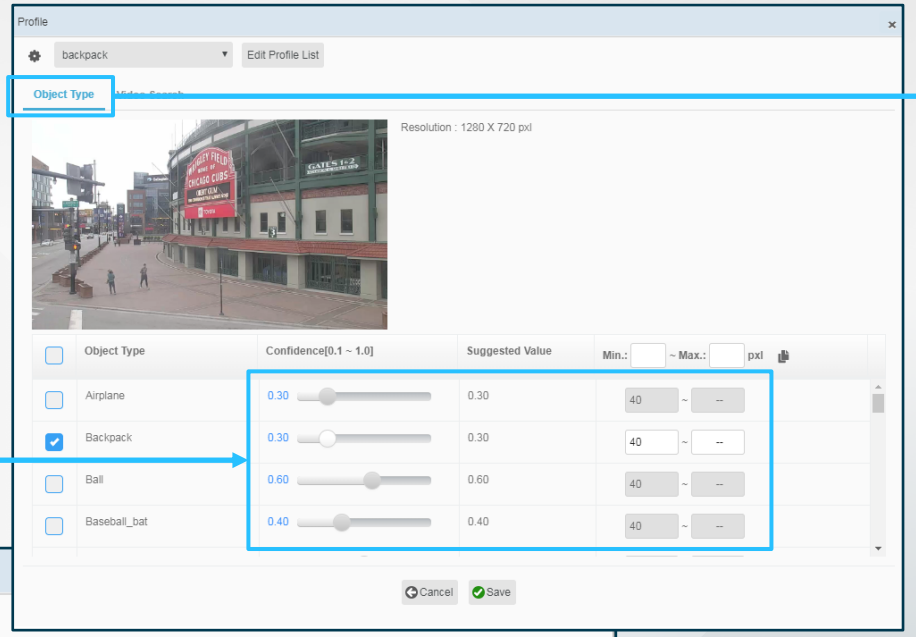
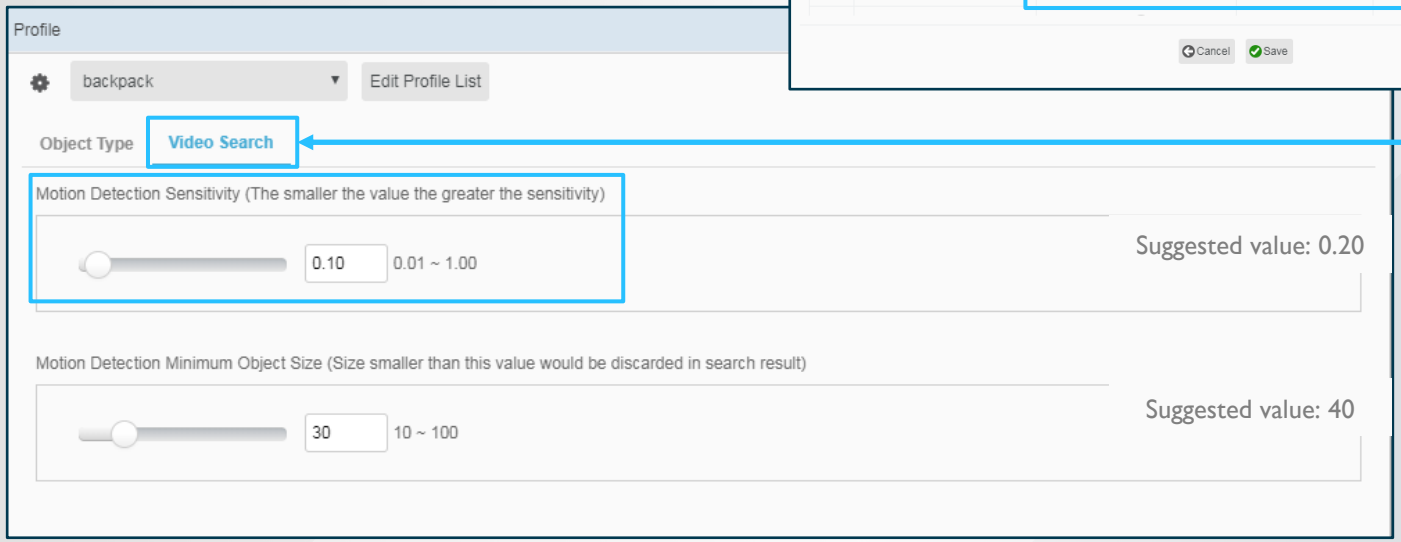
CAMERA CONFIGURATION







4. In Camera > Edit > Profile Configuration, open Profile window. In Object Type tab, increase Confidence and Min/Max pixel size per object to decrease false positive if necessary

5. In Video Search tab, adjust Motion Detection Sensitivity (MDS) as necessary: Higher MDS value = Lower sensitivity level = higher certainty + fewer false positive
Increase MDS value to 0.3-0.5 to decrease false positive

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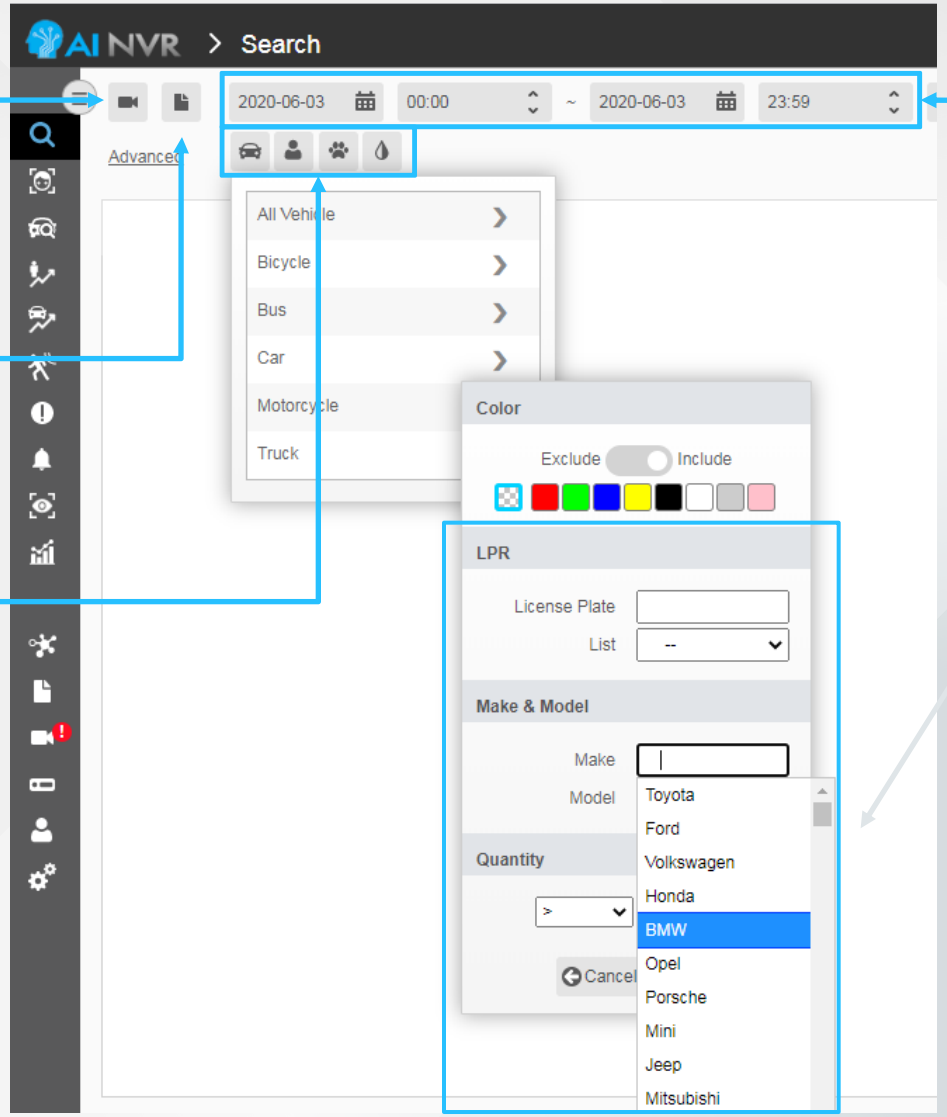
BEST PRACTICES: VIDEO SEARCH

1. Default: Search through all cameras (live streams)
2. Click on Camera icon to select/deselect certain cameras to search

3. Click on File icon to search in uploaded files

4. Click on icons of object category to search for certain object types & their attributes. The categories are (from left): Vehicle, People, Animal, and All Other Objects (e.g., backpack, cell phone)



5. Make sure that the correct time zone has been set in System > Time and synced with the camera/NVR (if connected)

6. License plate + Make + Model search are available for object types in the Vehicle category.
To search for license plate, make and model, please make sure that:
LPR is turned ON for the camera of interest
Enter at least 3 letters/digits in the LPR search
Type the make/model to see the options

Note: with LPR in Search, enter the **full** plate number. For partial plate search, use LPR

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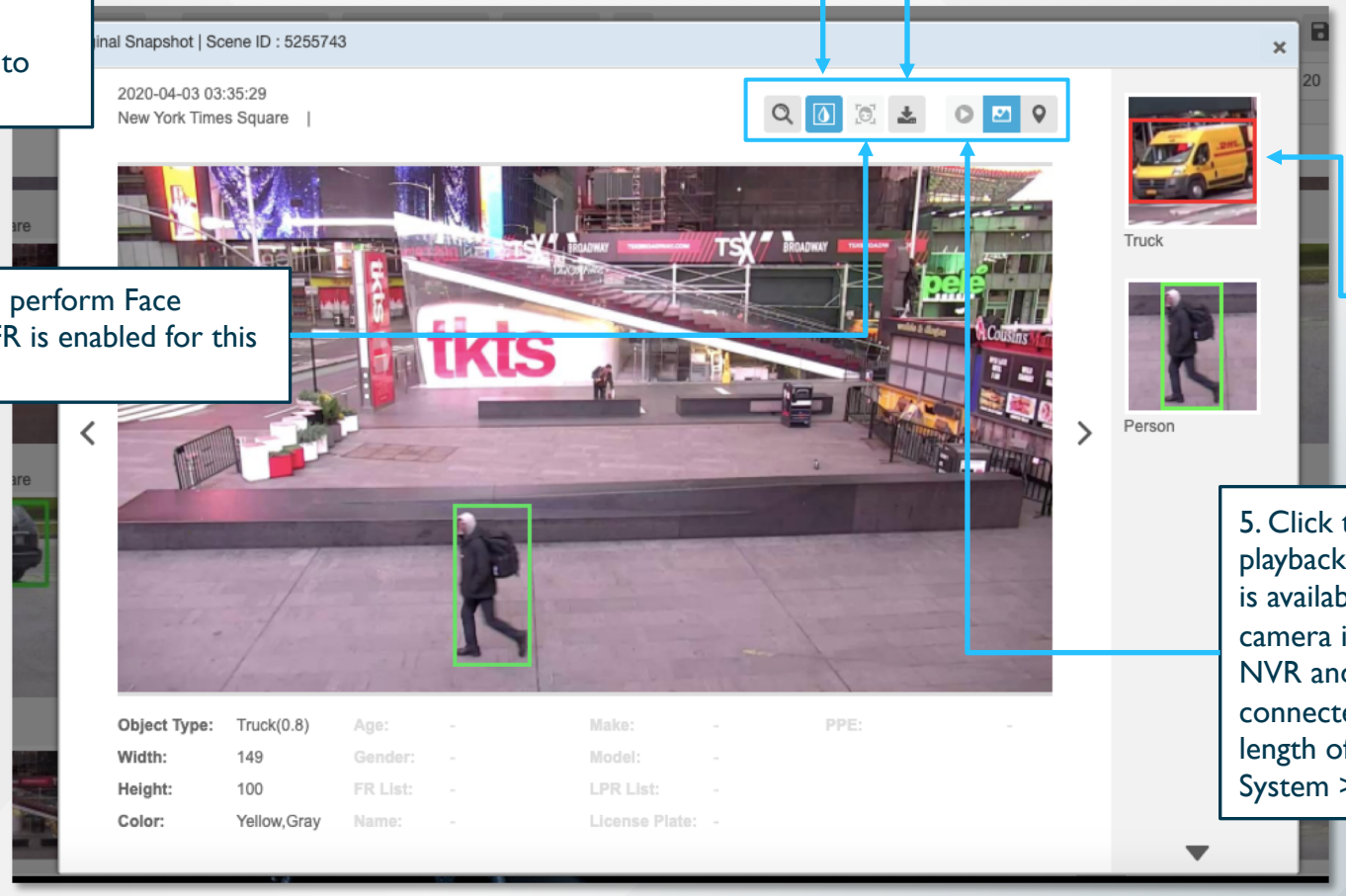
BEST PRACTICES: VIDEO SEARCH

1. Click on each image in the search result to have a popup of a larger view of the scene.
Hover cursor over the image to magnify the details

2. Turn on the bounding box to see the objects detected

3. Download snapshot



4. Click to perform Face Search if FR is enabled for this camera

5. Click to view 10-s clip playback of the event. The clip is available if one stream of the camera is connected to an NVR and the NVR is connected to the AI NVR. (the length of the clip can be set in System > Setting)

6. Click on each object image to identify its location in the entire scene

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BEST PRACTICES:
VIDEO SEARCH – WEAPON DETECTION / FIRE DETECTION

Weapon detection

- Select **Weapon** model in **System > AI Model**. (Deselect General model)
- Increase Confidence level for "handgun" and "rifle" object types (in **Camera > Edit > Configuration**) to above 90% and min size to above 100 px for best results
- Use the **Intrusion Detection** function (NOT Video Search function) to set real-time alert for weapon detection to have the best accuracy
  - Set the **Sensitivity** to 3 frames every 3 seconds
- Set Alert: for the alert rule, include "face" or "person" with "handgun" or "rifle" (e.g., "person" AND "rifle") to minimize false positive. Reasoning: a weapon is only dangerous if it is being held by a person
- See **Slide 19** for **Intrusion Detection** best practices

Fire detection

- Select Fire model in System > AI Model. (Deselect General model)

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BEST PRACTICES: FACE SEARCH

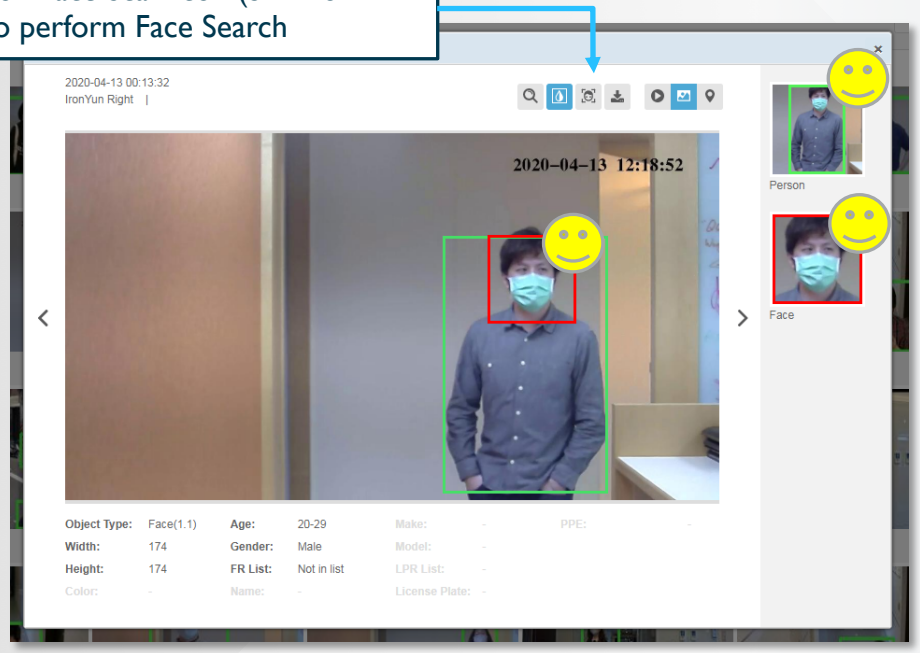
Note: to detect facial features for Face Search & Recognition, please make sure that:

1. Object type "face" is enabled for the camera of interest in **Camera > Edit > Configuration** (see Slide 4)
2. Function "**FR**" is enabled for the camera of interest in **Camera > Edit > Advanced**

Two methods to find a person of interest using Face Search:

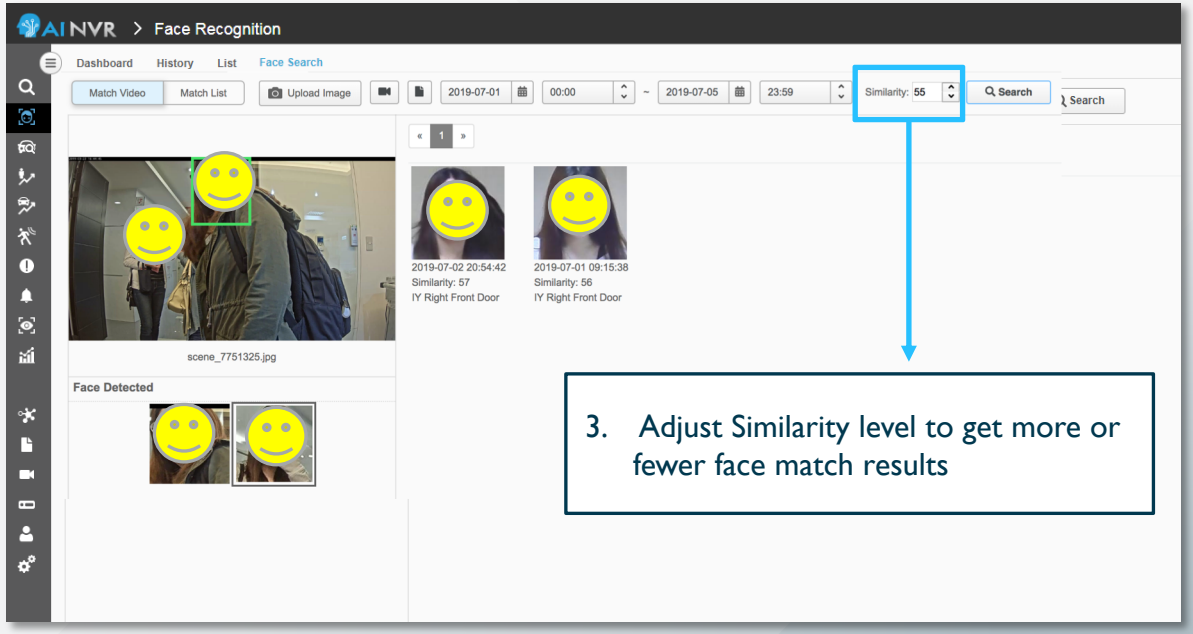
A. From recorded image on camera:

1. Search for "face" in the time frame and camera of interest using Search
2. Click on an image, verify that it is the person of interest
3. Click on Face Scan icon (3rd from left) to perform Face Search



B. From uploaded image:

1. Upload image from computer/mobile device using FR > Face Search > Upload Image
2. Select the face of interest to search if multiple faces are detected



3. Adjust Similarity level to get more or fewer face match results

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BEST PRACTICES: FACE RECOGNITION

To detect facial features for Face Recognition, please make sure that:

1. Object type "face" is enabled for the camera of interest in Camera > Edit > Configuration (see Slide 3)
2. Function "FR" is enabled for the camera of interest in Camera > Edit > Advanced
3. Each face is at least 120 px wide for clear detection
4. Face image for each person in the database (can add max. 5 images per person in FR > List) should have similar resolution to face captured on surveillance camera. Too high-res image would not result in matching because the similarity level between uploaded image and captured image would be too low.

Visible Zone Definition:

- Camera's Field of View.

Detection Zone Definition:

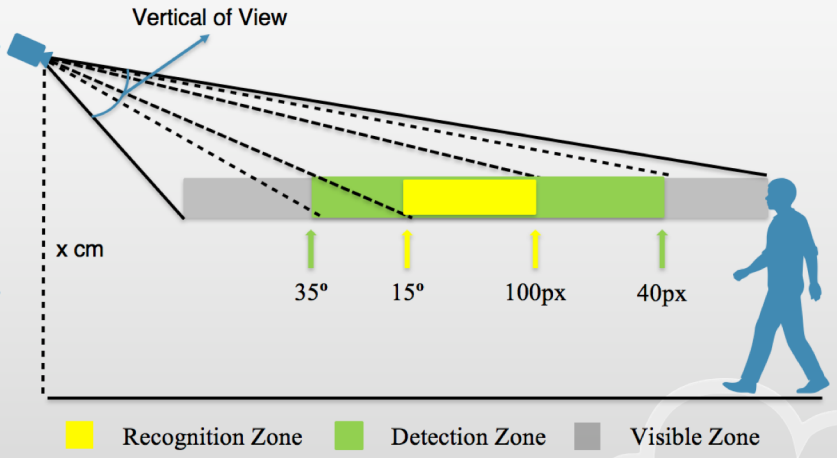
- Camera can detect face object.
- Head pose deviations ≤ 35° horizontally and vertically.
- Face size ≥ 40px (FD), (Recommend ≥ 60px)

Recognition Zone Definition:

- Camera can recognize face object and get better accuracy.
- Head pose deviations ≤ 15° horizontally and vertically.
- Face size ≥ 100px (FR), (Recommend ≥ 120px)

Condition:

- Average face size of adult: 20 cm
- Average people height of adult: 175 cm
- Camera height: x cm



Recommended face image to save in list:

- Capture images from surveillance camera and save in list (Passport photos often do not yield good results)
- Save 5 images for better results

Recommended camera placement for FR:

- Camera is placed at an angle as close to eye level as possible

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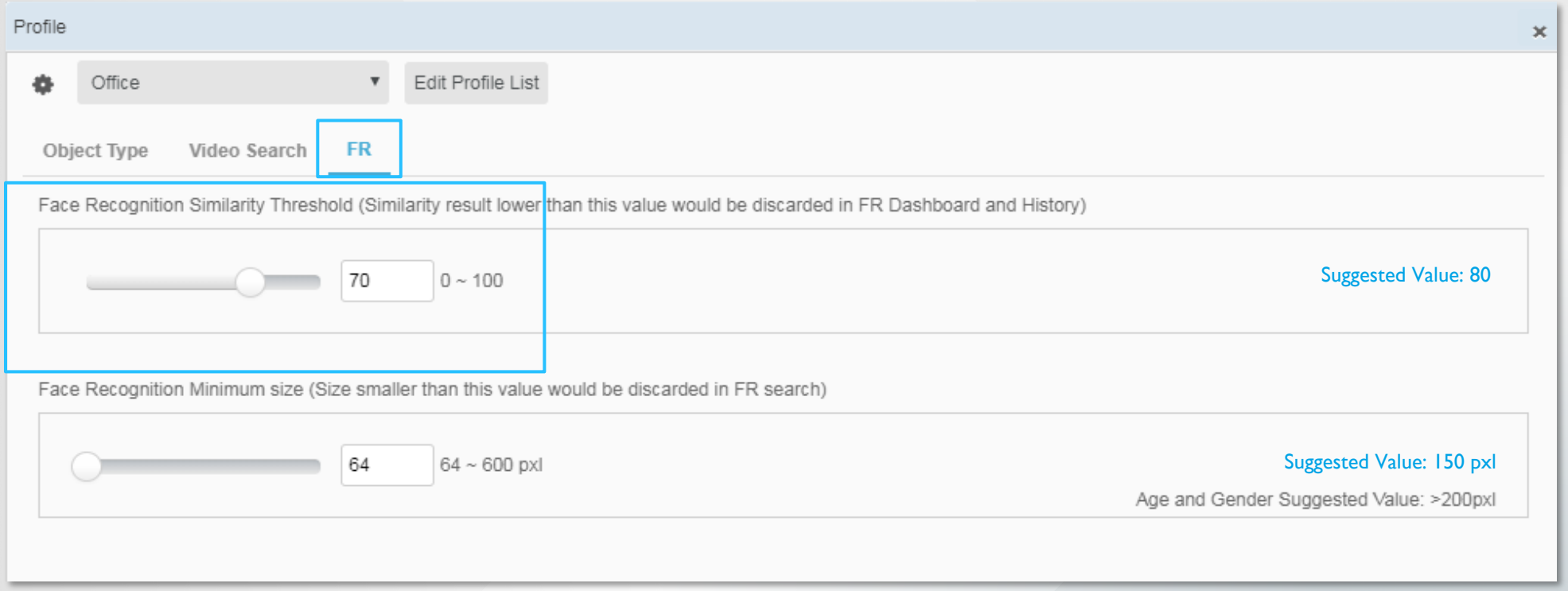
BEST PRACTICES: FACE RECOGNITION



If too few faces are matched to lists, decrease **Similarity Threshold** in Camera > Edit > Profile Configuration > click on the Configuration icon (hammer & wrench icon) > **FR tab**

- **Suggested value: 80**

Vice versa, if camera is placed at a great angle/lighting for face recognition and too many detections occur, increase Similarity Threshold for higher accuracy

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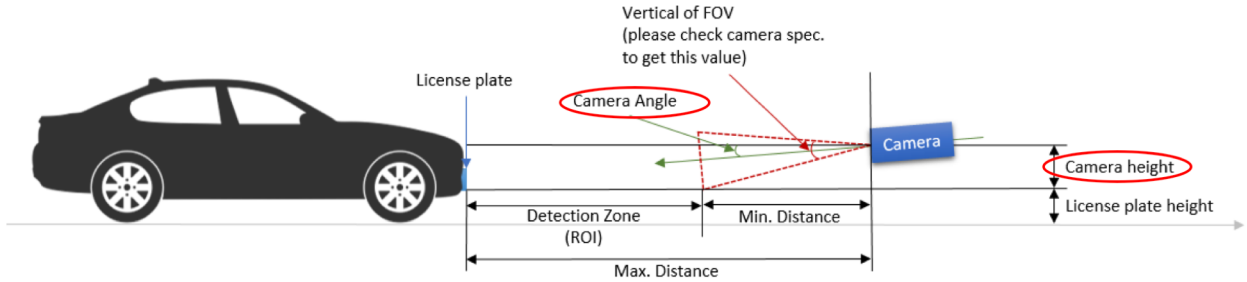
BEST PRACTICES: LICENSE PLATE RECOGNITION

To detect license plate for LPR, please make sure:

- Object type "license_plate" is enabled for the camera of interest in **Camera > Edit > Configuration** (see Slide 3)
- Function "**LPR**" is enabled for the camera of interest in **Camera > Edit > Advanced**
- **Each character on license plate is at least 16 px wide** for clear detection, e.g., a plate with 6 alphanumeric characters should be at least 100 px wide for clear detection
- Typical best-performance deployment**: cameras at 4 ft high** at parking lot entrances and traffic light, car moving at **< 10 mph**, and detecting **max. 3 lanes** of vehicles at the same time



Focal Length	f = 2.8 ~ 12 mm
Aperture	F1.4 ~ F2.8
Auto-iris	P-iris
Field of View	32° ~ 93° (Horizontal) 18° ~ 50° (Vertical) 37° ~ 110° (Diagonal)

Example of camera specification

Recommended camera placement for LPR:
Camera is placed at an angle as close to license plate level as possible

Maximum car speed supported = ROI_distance x FPS

1. FPS is an adjustable parameter in AI NVR. For AI NVR 3.1.0, FPS = 2 frames/s as in parking lot mode, FPS = 4 as in city road mode, FPS = 6 as in highway mode. Other values can be requested after discussion with IronYun team
2. ROI_distance = max distance – min distance (see Figure)
3. Calculator for detection zone & speed: contact IronYun team

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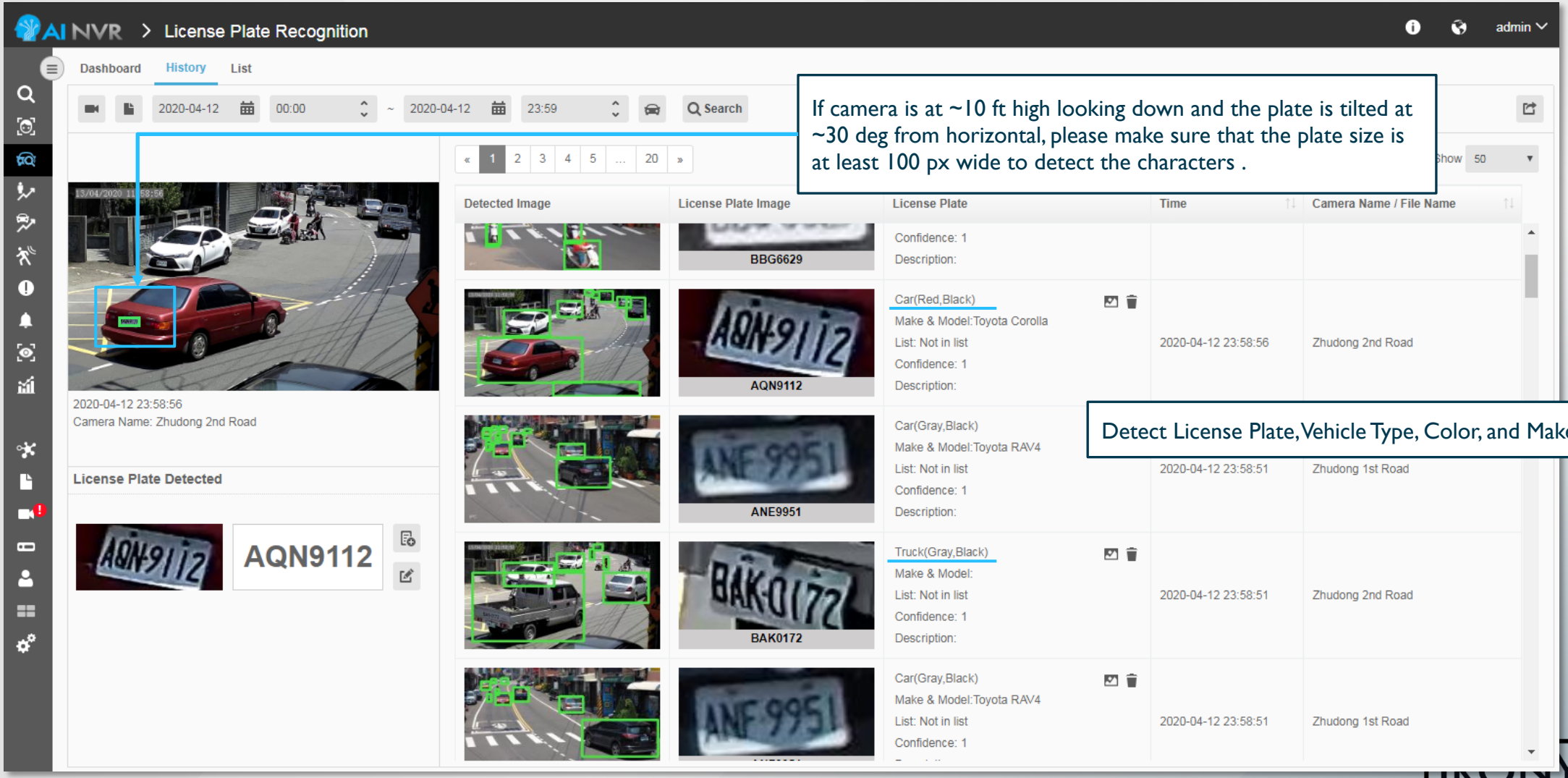
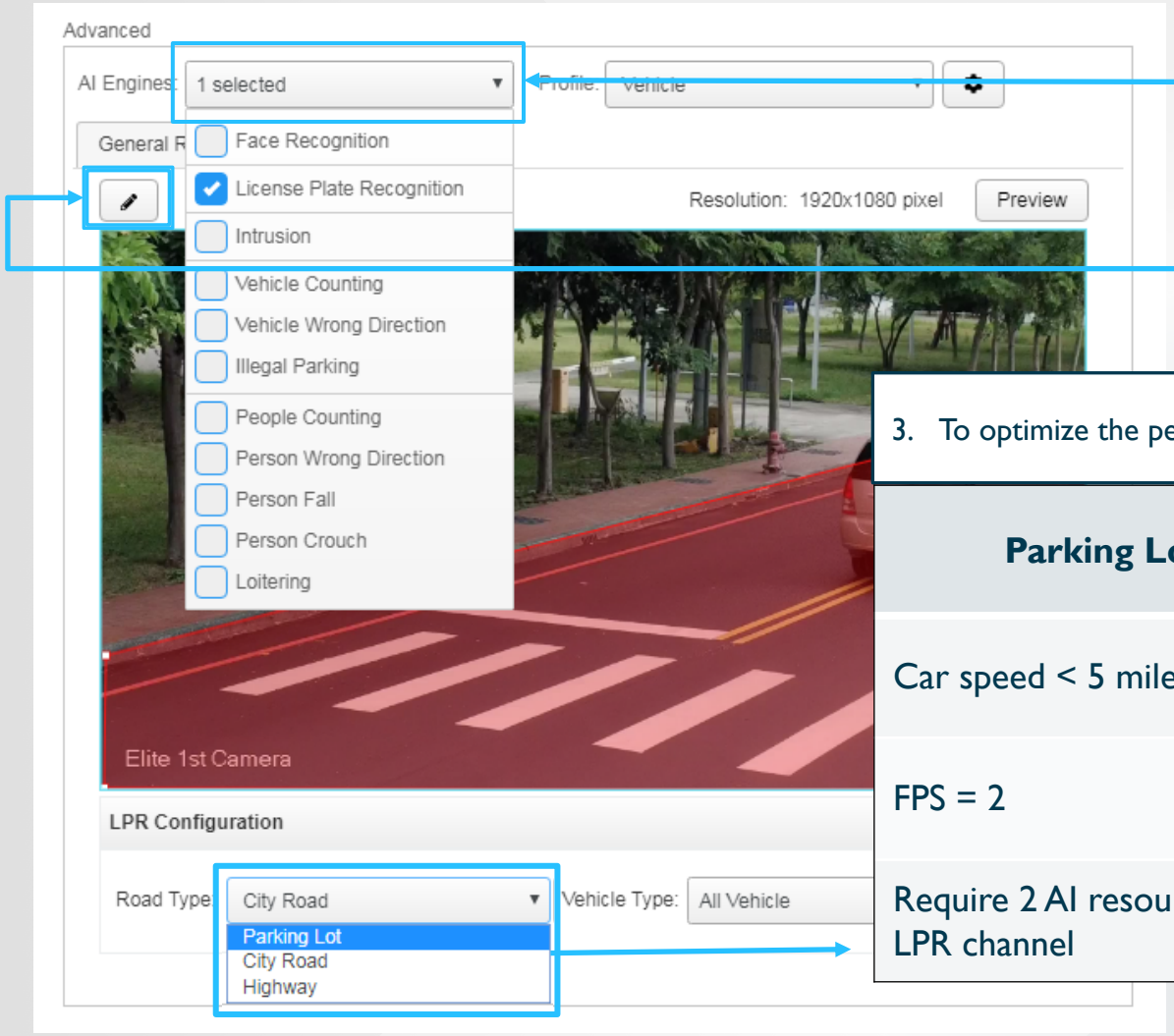
BEST PRACTICES: LICENSE PLATE RECOGNITION



BEST PRACTICES: LICENSE PLATE RECOGNITION



1. Select AI Engines: LPR in Camera > Edit > Advanced

2. Click on Pencil icon in LPR tab to draw the regions of interest. (ROI can be of any shape).

3. To optimize the performance and resource usage, LPR has 3 modes for different applications.

Parking Lot	City Road	Highway
Car speed < 5 miles/hour	Car speed within 40 miles	Car speed > 40 miles/hour
FPS = 2	FPS = 4	FPS = 6
Require 2 AI resources per LPR channel	Require 4 AI resources per LPR channel	Require 8 AI resources per LPR channel

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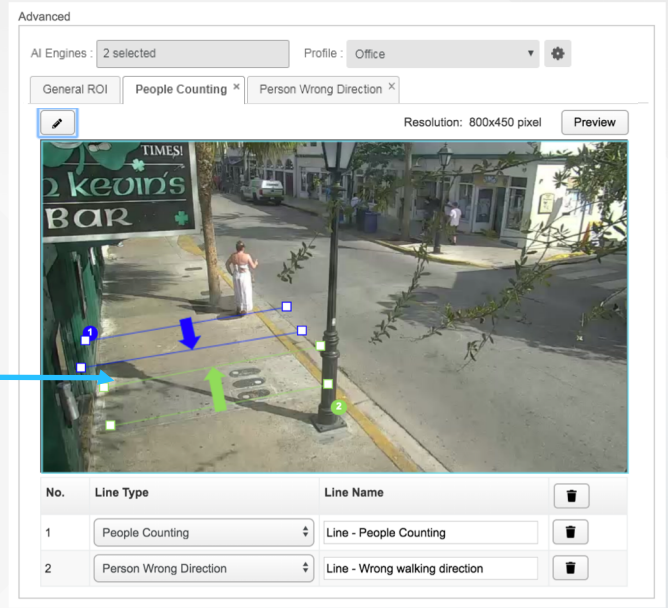
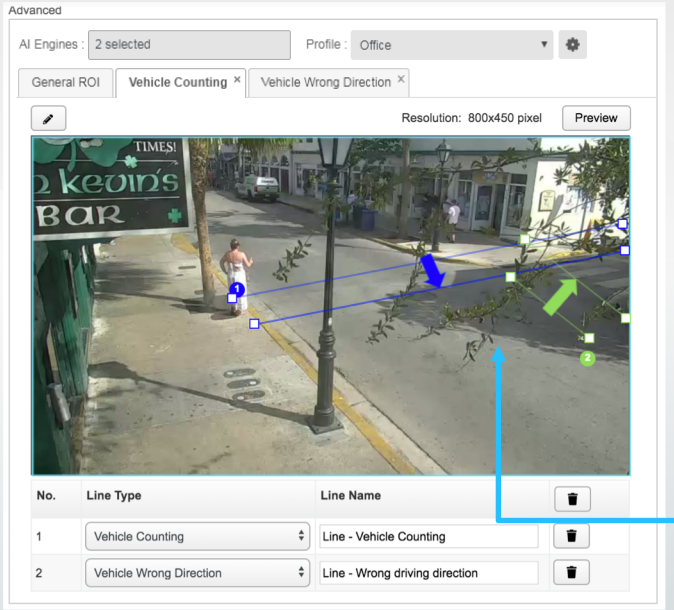
BEST PRACTICES: PEOPLE / VEHICLE COUNTING

People Counting and Vehicle Counting are two independent functions in AI NVR

- VSA-110 (evaluation unit) should enable **max. 1 channel** of People Counting or 1 channel of Vehicle Counting at any time for best performance (enterprise-grade VSA-5xx units can support multiple counting channels simultaneously)
- For all sub-functions of People Counting (i.e., Person Falling/Crouching Detection, Loitering Detection), **camera should be placed such that the full person body is visible**, not directly overhead





- Line with blue arrow: bi-directional counting, arrow direction is IN
- Line with green arrow: wrong-direction detection, arrow direction is the correct direction (no alarm triggered)
- Recommended number of lines per function per FOV: **maximum 8 lines**
- Camera placement: should show the full person height, not directly overhead.

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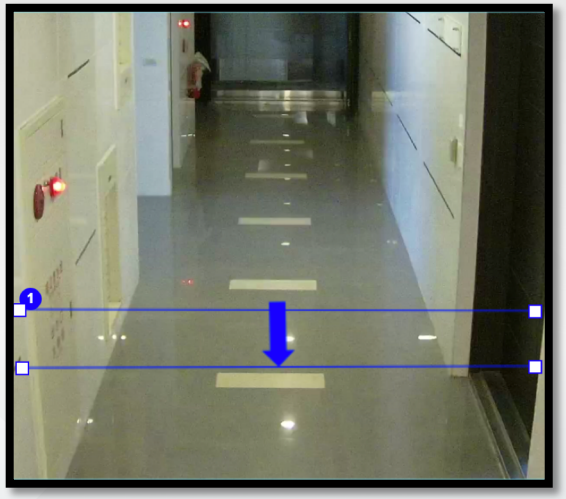
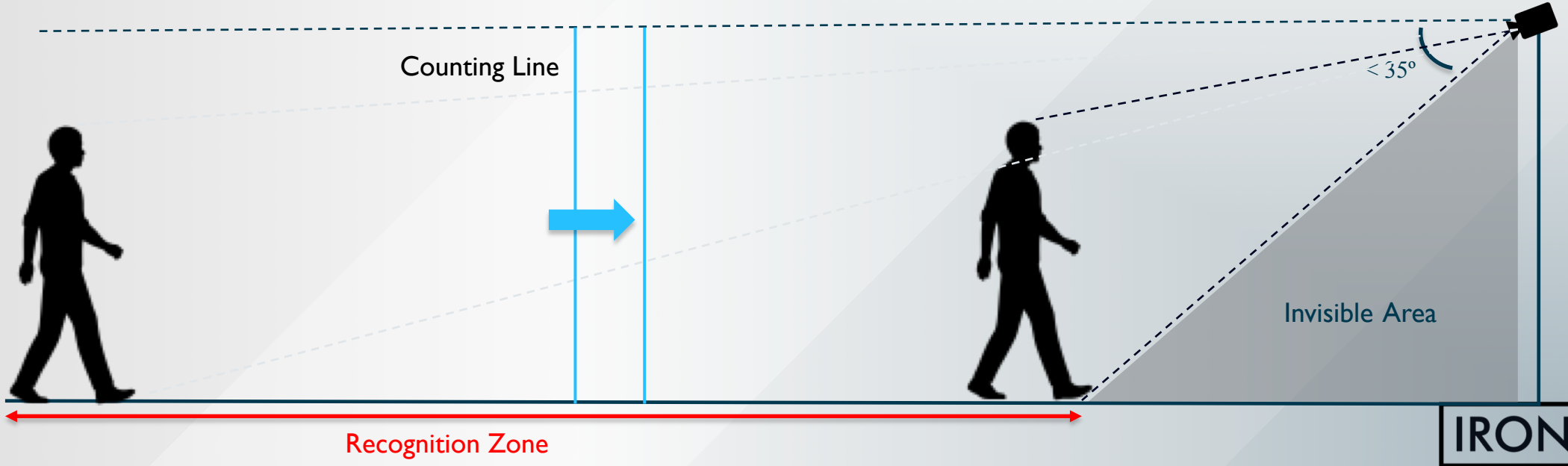
SCHEMATIC DIAGRAM OF PEOPLE COUNTING

For better accuracy of People Counting, the following configuration is recommended:

1. The angle of the camera should be < 35 degrees in the recognition zone.
2. Object type configuration should be as follows:

Object Type	Confidence Suggested Value (0.1 ~ 1.0)	Minimum Size (px)
Person	0.80	**30**





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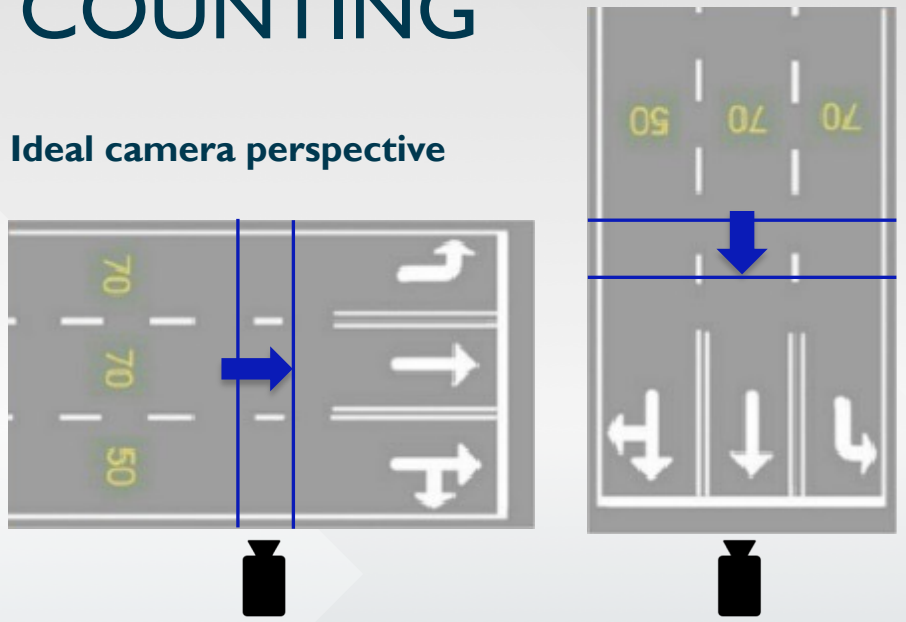
SCHEMATIC DIAGRAM OF VEHICLE COUNTING

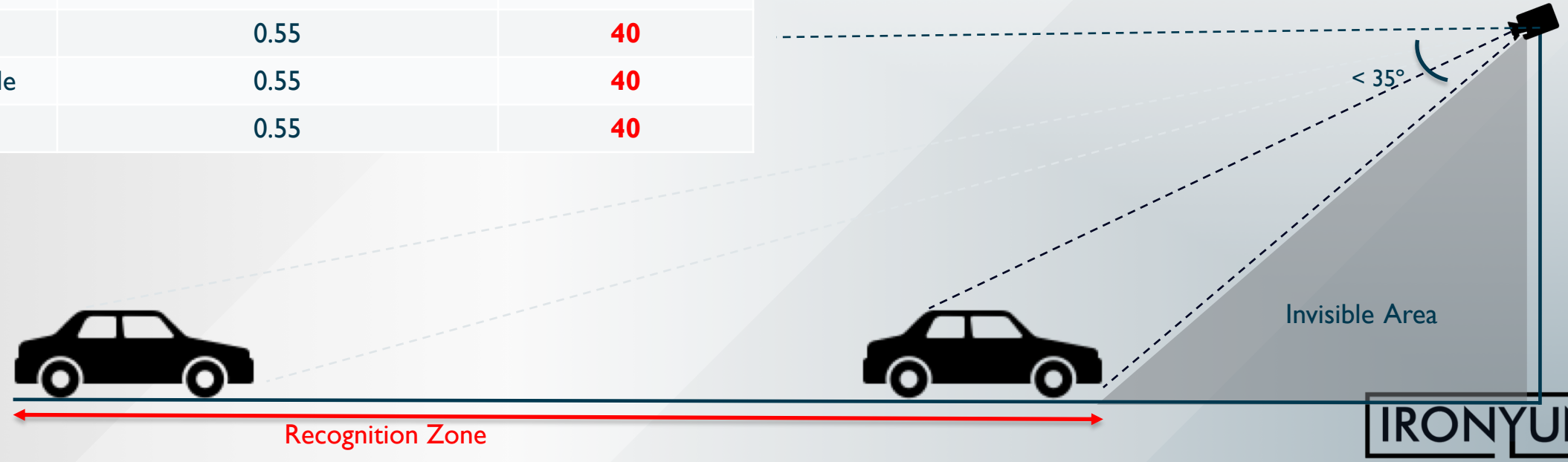
For better accuracy of Vehicle Counting, the following configuration is recommended:

1. The angle of the camera should be < 35 degrees in the recognition zone.
2. Object type configuration should be as follows:

Object Type	Confidence Suggested Value (0.1 ~ 1.0)	Minimum Size (pxl)
Car	0.55	40
Bus	0.55	40
Truck	0.55	40
Motorcycle	0.55	40
Bicycle	0.55	40

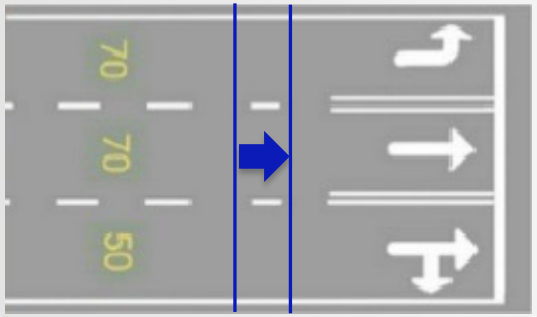
Ideal camera perspective





SUGGESTION:
HOW TO DRAW A COUNTING LINE FOR BEST ACCURACY

1. Draw the pair of counting lines in the middle of the camera FOV.
   - Reserve a space on both sides of the line for the AI NVR to perform object detection.



2. Do not have too much space between the two lines.
   - If there is too much space, it may cause the AI NVR to lose track of the object.
   - The object cannot be counted when the tracking is lost.

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BEST PRACTICES: ALERTS

Types of Alerts

1. **Video Search**: allow all combinations of object types + attribute (color, quantity, etc.). The entire FOV is the region of interest (ROI)
   - Can set alert for crowding using ***person > n***
2. **Intrusion**: similar to Video Search with higher fps, more ROIs, exclusion zone
3. **FR & LPR**: set alert for any list and/or Not in list (for unidentified person/vehicle)
4. Person/Vehicle wrong direction
5. Person falling/crouching
6. Loitering & Illegal parking

For alert functions 2-6, must enable function for the camera (**Camera > Edit > Advanced**) before adding new alert (**Alert > Alert Rule > New Alert**)

For alert functions 2, 4 and 6: must configure the region of interest (ROI) of each function independently (intrusion, loitering, illegal parking) or line with direction (person/vehicle wrong direction) in Camera > Edit > Advanced before adding new alert

Types of Trigger Actions

1. Email notification:
   - Can add up to 3 emails
   - Add email server at System > Notification > Email to receive notification (e.g., for Gmail server, use smtp.gmail.com, port 465, secure connection SSL)
2. HTTP: to connect to VMS (e.g., Nx VMS) and other systems (e.g., gate closing)
3. Alerts in VMS:
   - BTX Bridge to Milestone XProtect
   - Genetec
   - Network Optix
4. APP notification:
   - download AI NVR app (available for iPhone and Android)
   - add IP address of AI NVR unit in Server Address
   - Connection type: HTTP

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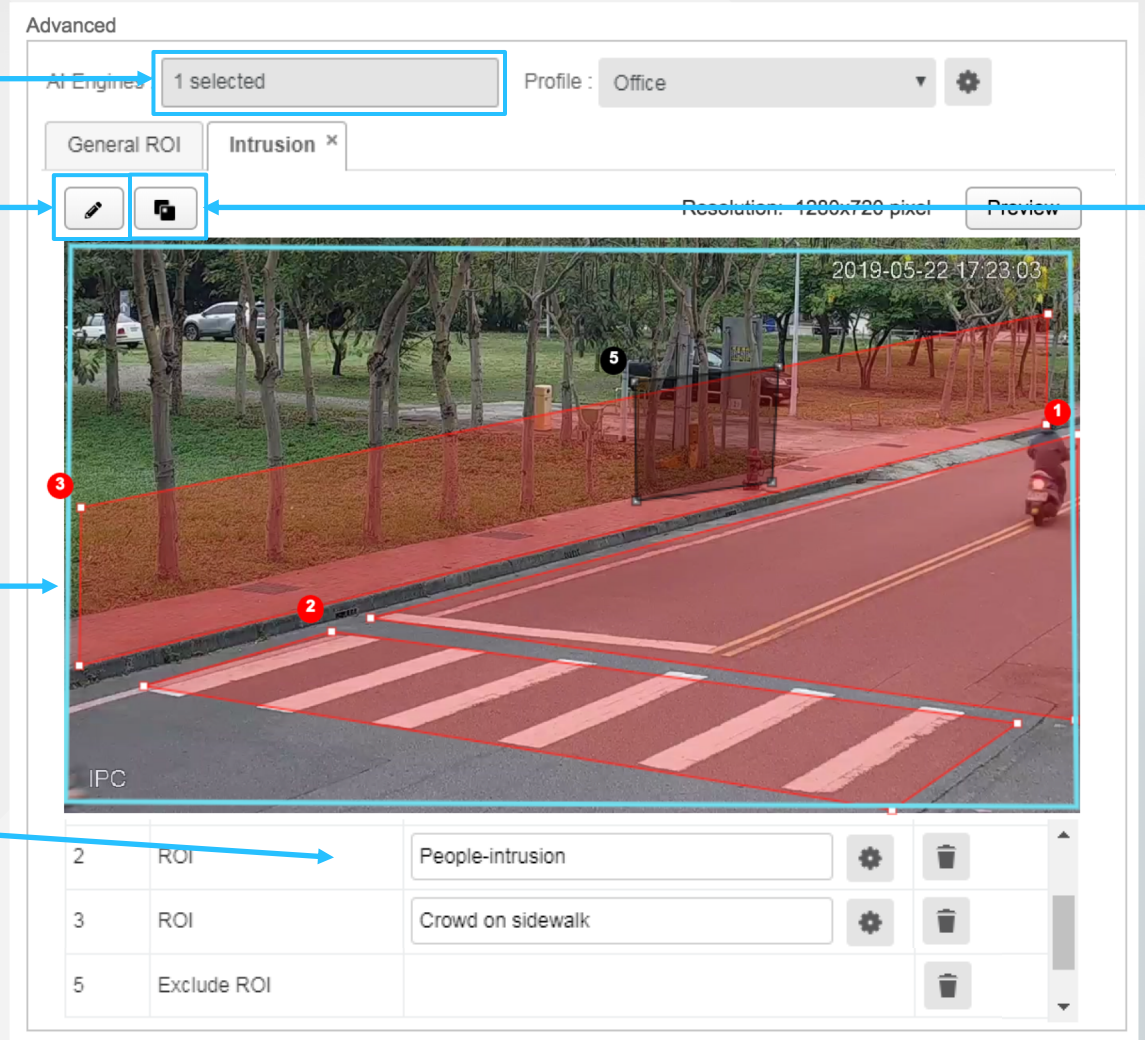
BEST PRACTICES: ALERTS – INTRUSION DETECTION

1. Select Intrusion in Camera > Edit > Advanced

2. Click on Pencil icon in Intrusion tab to draw the regions of interest (Note: the ROI tab is to adjust the entire field of view of the camera, i.e., the blue box in this image)

3. Adjust the shape of the intrusion ROI as necessary (ROI can be of any shape and can overlap other ROIs).
4. Click on green Checkmark icon when ROI has been drawn as desired.
5. Name ROI



6. Add Exclusion region as necessary: no object is detected in Exclusion region; can use this feature to exclude areas that cause false alarms, e.g., statues in person-detection ROI

Recommended number of ROIs: max. 3 ROIs per FOV

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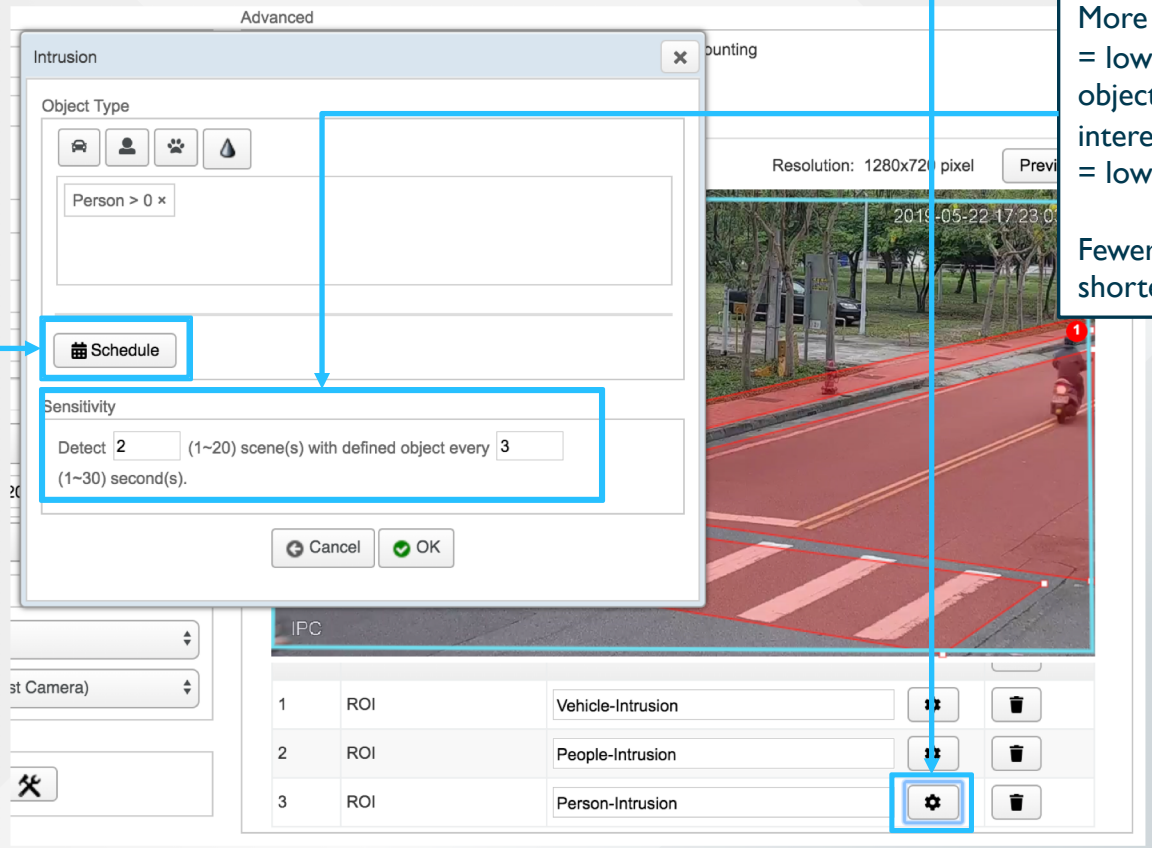
BEST PRACTICES: ALERTS – INTRUSION DETECTION

7. Click on Gear icon to set object type(s), attribute(s), scheduling and sensitivity parameters

Schedule is left blank by default, can be set in Alert > New Alert > Alert Type: Intrusion



8. Adjust Sensitivity:

More scenes with object per second
= lower sensitivity + higher certainty that the object detected is the correct object type of interest
= lower probability of false alarms

Fewer scenes per second = higher sensitivity = shorter delay time

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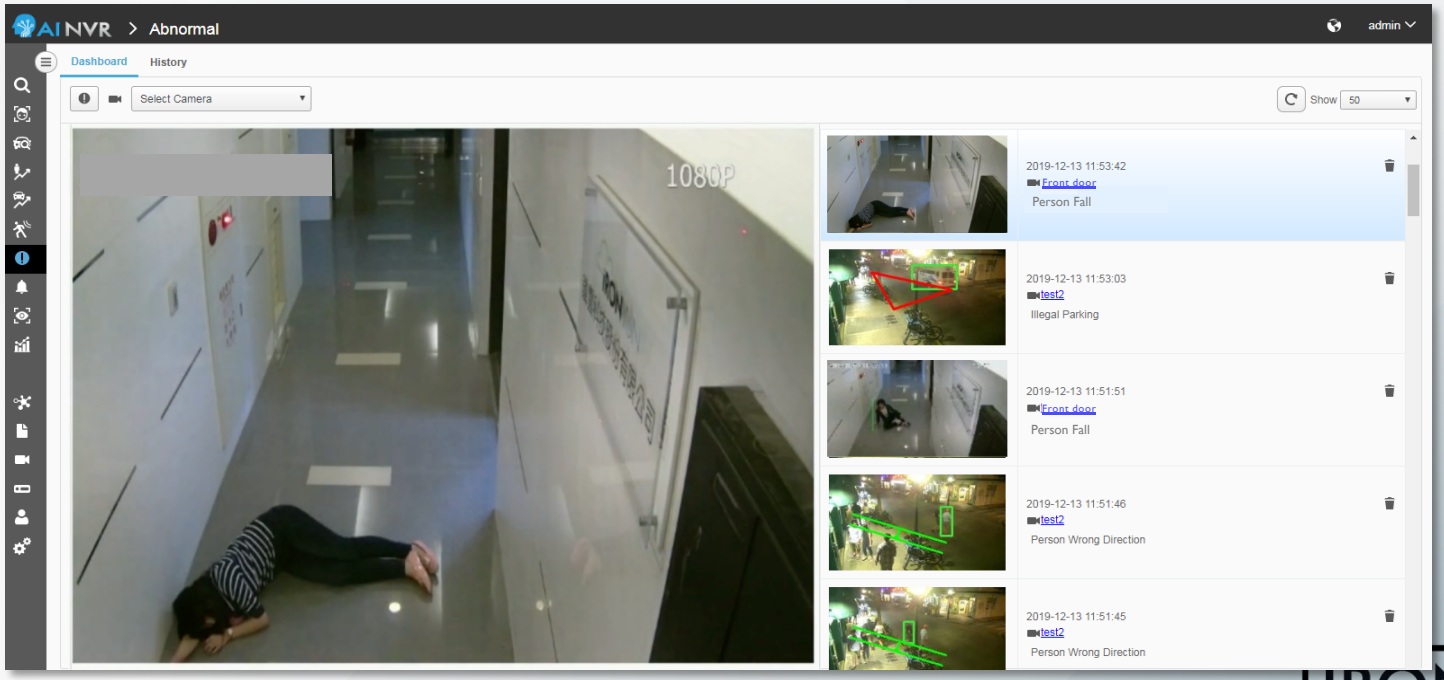
BEST PRACTICES: ALERTS – PERSON FALLING DETECTION

1. Detect person falling:
   - Enable People Counting in Camera > Edit > Advanced
   - Enable Person Fall
   - Camera placement: should show the full body, not directly overhead
2. Alert for person falling is only triggered after the person fell and remained on the ground for more than 10 seconds, hence the delay is 10 s. Reasoning: if one can stand up and walk away shortly after, falling, the fall did not cause serious injury and does not require attention



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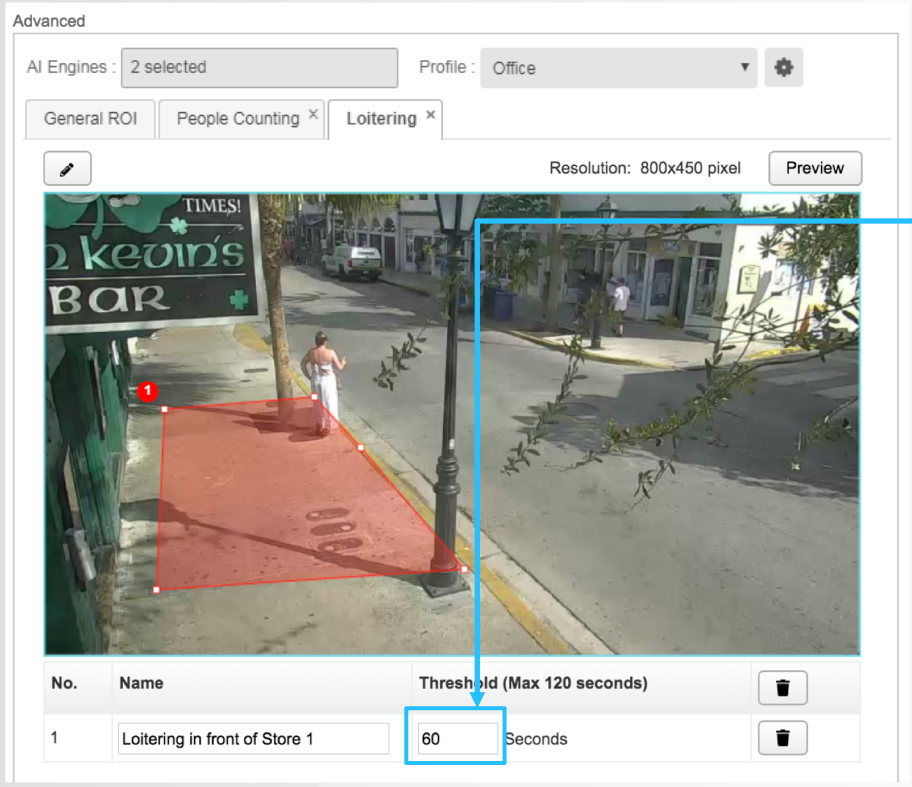
BEST PRACTICES: ALERTS – LOITERING/ILLEGAL-PARKING DETECTION

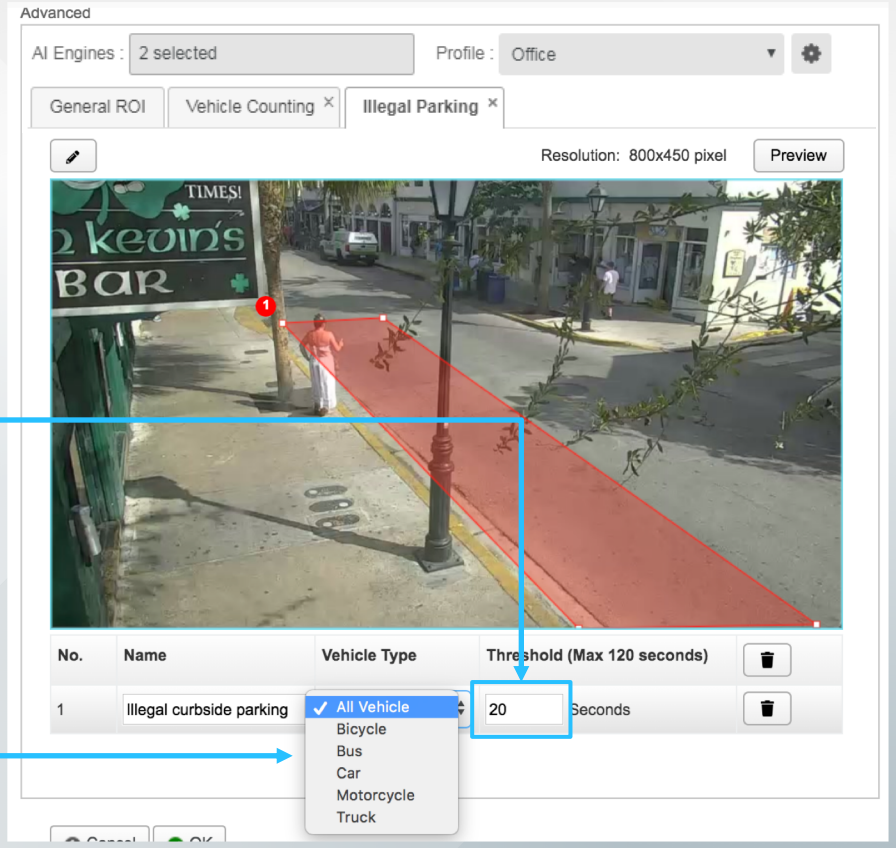
Detect loitering or illegal parking:

- Enable **People Counting** or **Vehicle Counting** in **Camera > Edit > Advanced**
- Enable **Loitering** or **Illegal Parking**
- Draw loitering ROI in Loitering/Illegal Parking tab in Camera > Edit > Advanced
- Recommended number of ROIs: **max 3 ROIs**



Max threshold is 120 s for best performance.
To have longer threshold, please contact IronYun technical support team to discuss

Select vehicle type that should not park



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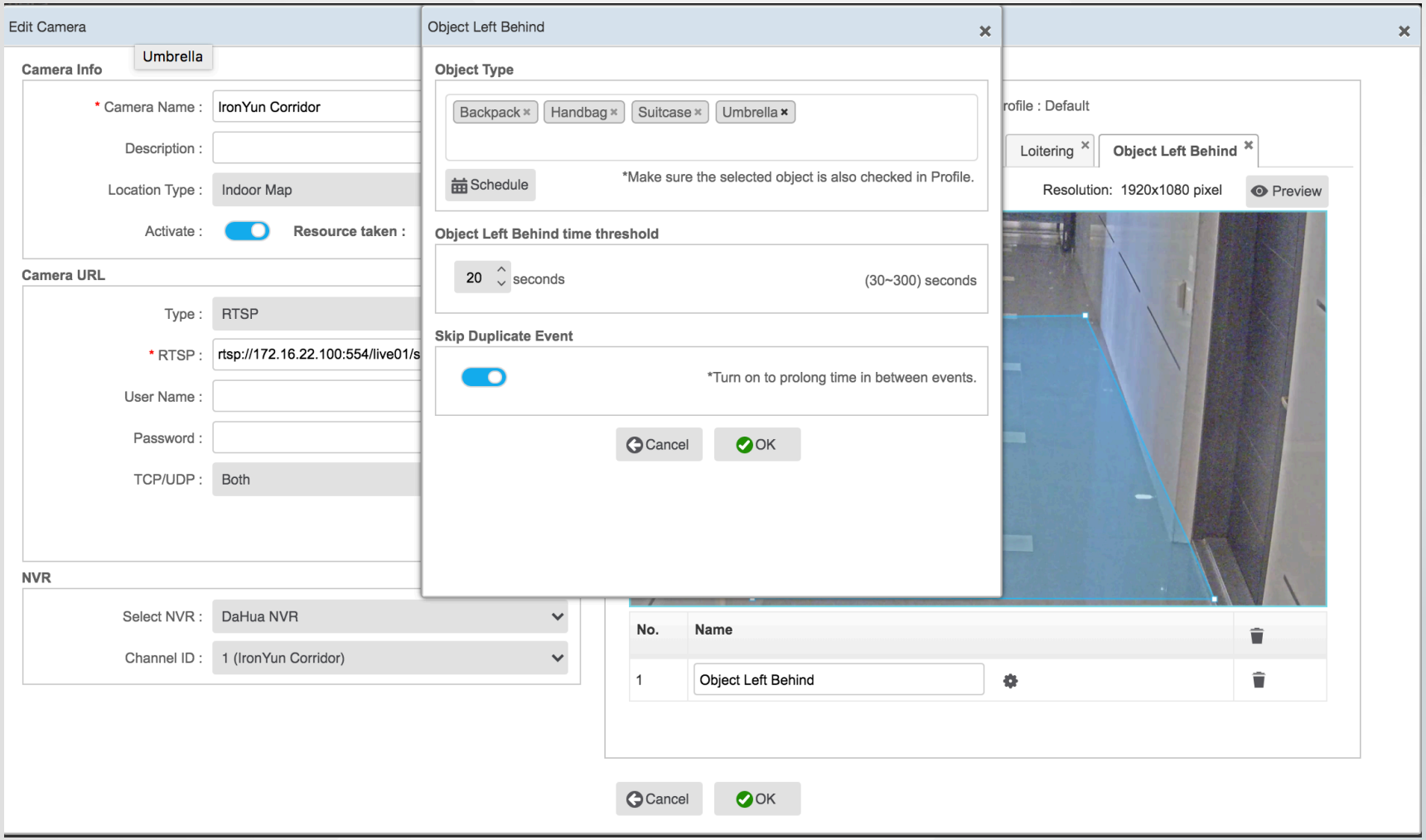
BEST PRACTICES: ALERTS – OBJECT LEFT BEHIND



- Only applicable for **low-traffic area**
- An alert is triggered when **both** of the following conditions are satisfied:
  - The listed objects are in the ROI for at least the duration of the time threshold
  - No **person** has been detected in the ROI for the same duration
- The "OR" rule is applied for object types, i.e., **if at least 1 object type is detected, an alert is triggered.**
- The user can set maximum 10 object types in each ROI.

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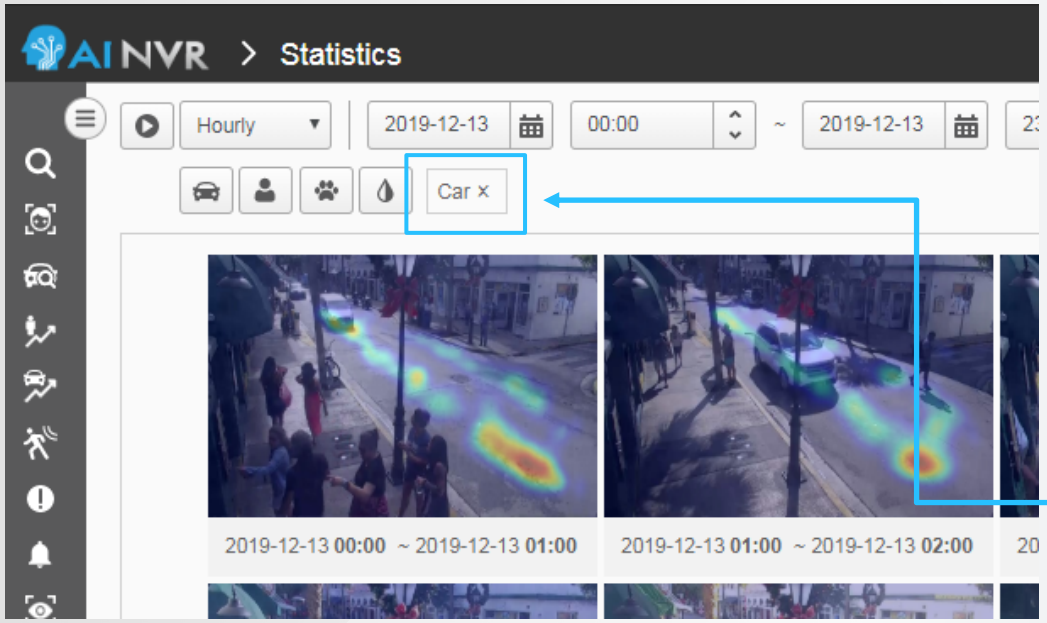
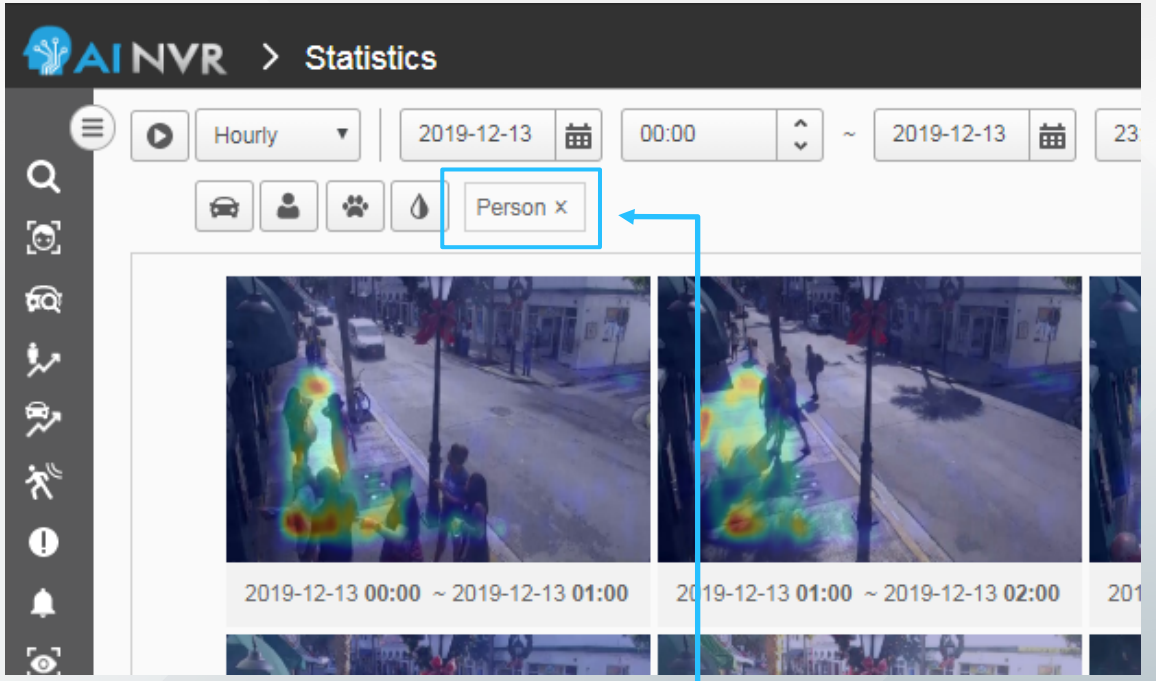
BEST PRACTICES: STATISTICS – HEATMAP

AI NVR 3.2.0 Heatmap function can generate heatmaps for any combination of object types in a 24-hour period. The results are displayed by the hour or aggregated as 1 image of the entire 24-hour period.

To be noted:

- **One video source** per heatmap search: The source can be the real-time stream from a camera or an uploaded video.
- To have meaningful results to compare the activity in different hours, the video source should be longer than 1 hour.





Select the specific object type and generate the heatmap.

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THANK YOU

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