HYPER MICRON

HYPERMICRON
VIDEO ANALYTICS & RECOGNITION SYSTEM

HYPER MICRON

HYPERMICRON PTE. LTD.

📞 (+65) 9162 2454

🌐 www.hypermicronsg.com

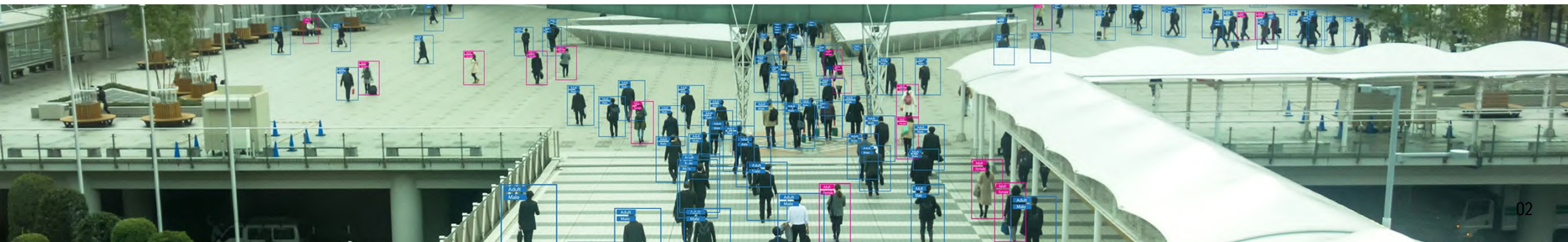📍 68 Circular Road #02-01, Singapore 049422

FACE RECOGNITION

HYPERMICRON

VIDEO ANALYTICS & RECOGNITION SYSTEM

HYP-VAR Hypermicron Video Analytics and Recognition - a next-generation, AI-driven video analytics platform designed to transform your security operations. Built on a robust AI analytics engine, this comprehensive solution delivers smart, real-time video analytics exploiting advanced IP camera network, boosting management efficiency while ensuring uncompromised security.

With its open, flexible architecture, the platform seamlessly integrates with a wide range of systems - whether it's CCTV, city surveillance, airport, railway, traffic management, intelligent transportation, and more. Leveraging advanced computer vision AI models and more. Leveraging advanced computer vision AI models

and cutting-edge image processing algorithms, it delivers impeccable accuracy in analyzing, detecting, classifying, and recognizing objects—including people, vehicles, and everyday items. It also identifies key attributes, behaviors, events, license plates, and faces with pinpoint precision.
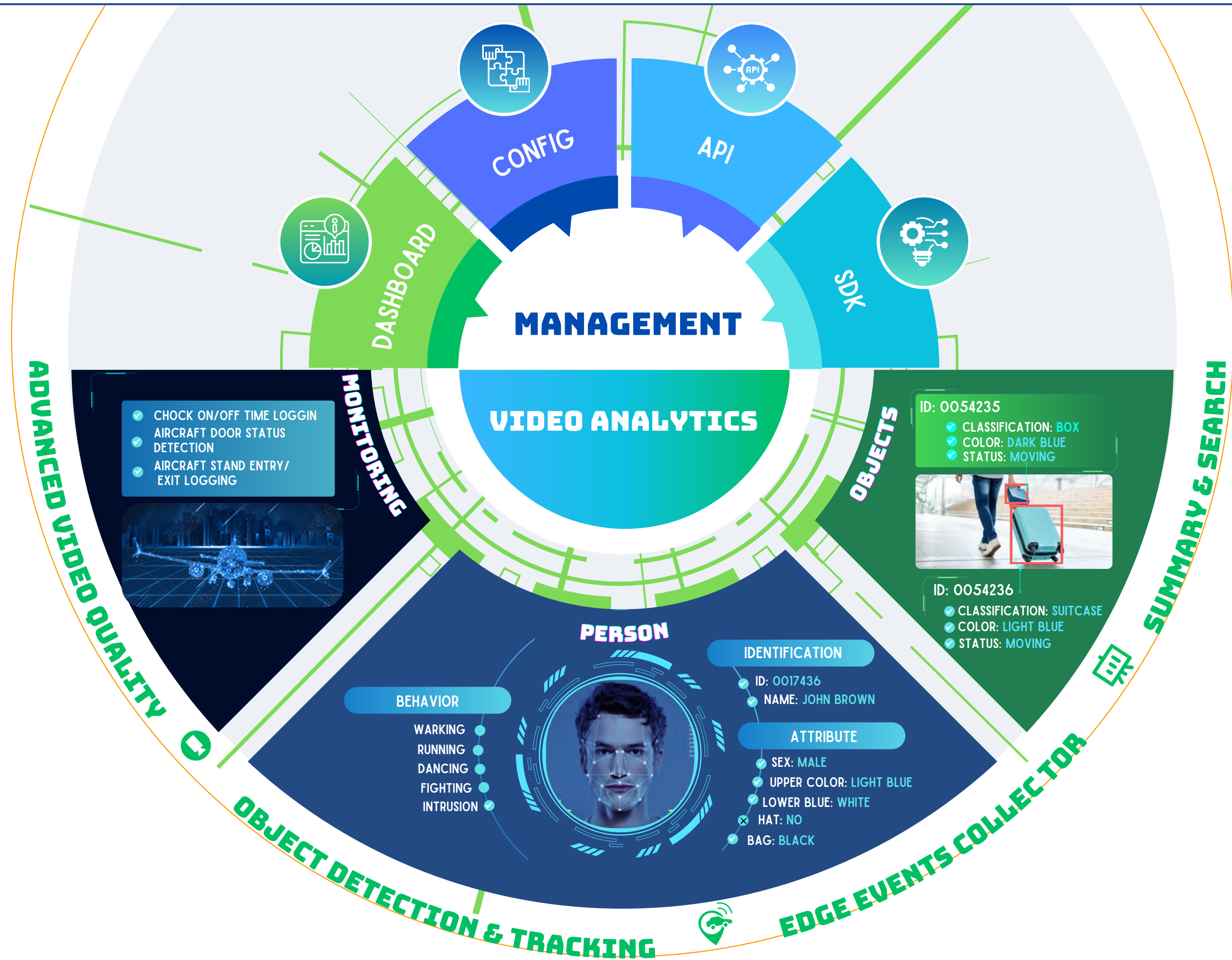
Engineered to adapt to diverse security landscapes, this dynamic solution meets the rigorous demands of critical environments—from traffic management hubs and secure buildings to airports, train stations, shopping centers, and other high-stakes zones—ultimately elevating your overall surveillance and security management to unprecedented levels.
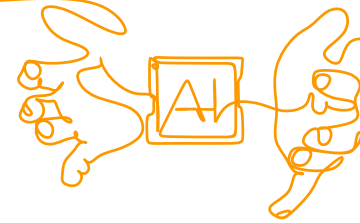
VIDEO ANALYTICS & RECOGNITION SYSTEM

ADVANCED VIDEO QUALITY

SUMMARY & SEARCH

OBJECT DETECTION & TRACKING

EDGE EVENTS COLLECTOR

MANAGEMENT

VIDEO ANALYTICS

CONFIG

API

SDK

DASHBOARD

MONITORING

OBJECTS

PERSON

MONITORING
- CHOCK ON/OFF TIME LOGGIN
- AIRCRAFT DOOR STATUS DETECTION
- AIRCRAFT STAND ENTRY/ EXIT LOGGING

OBJECTS

ID: 0054235
- CLASSIFICATION: BOX
- COLOR: DARK BLUE
- STATUS: MOVING

ID: 0054236
- CLASSIFICATION: SUITCASE
- COLOR: LIGHT BLUE
- STATUS: MOVING

PERSON

IDENTIFICATION
- ID: 0017436
- NAME: JOHN BROWN

ATTRIBUTE
- SEX: MALE
- UPPER COLOR: LIGHT BLUE
- LOWER BLUE: WHITE
- HAT: NO
- BAG: BLACK

BEHAVIOR
- WARKING
- RUNNING
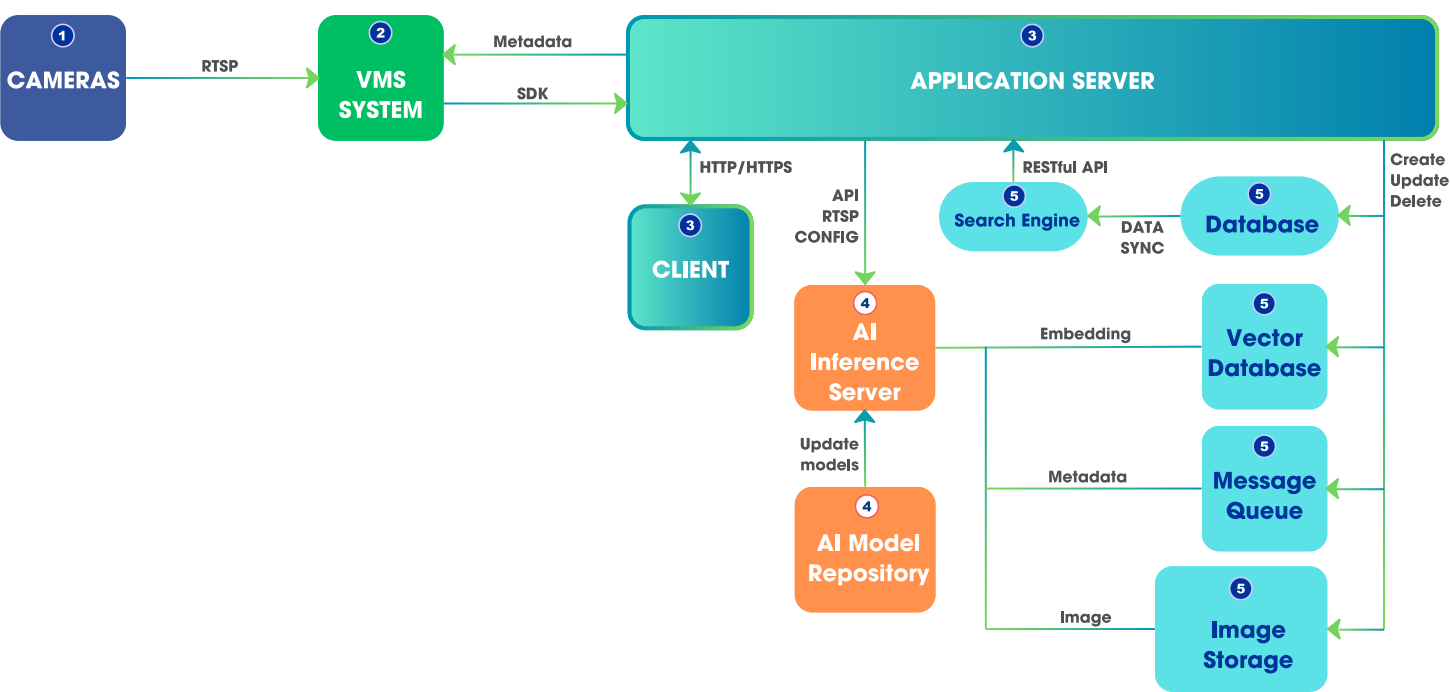- DANCING
- FIGHTING
- INTRUSION

Experience the next evolution in security with HYP-VAR groundbreaking video analytics and recognition solution - a self-improving platform built on state-of-the-art AI, Deep Learning, and Self-Learning technologies. Continuously refining its ability to analyze images and recognize objects with remarkable precision, this system sets a new standard for performance that only gets smarter over time.

Seamlessly integrated with various commercial off the shell Video Management Systems (VMS), HYP-VAR effortlessly taps into both live streams and archived footage, ensuring every object and event is analyzed with pinpoint accuracy. It automatically, detects, tracks, and alerts you to unusual activities, transforming raw data- timestamps, locations, images, and video clips -into actionable intelligence which securely stored and managed to provide for investigations and real-time decision-making.

Key intelligent recognition features include

Rapid detection, tracking, and classification of objects

In-depth analysis and recognition of human attributes

Advanced facial recognition for heightened security

Proactive identification and alerting of suspicious behavior

Comprehensive crowd detection and crowd management alerts

Unattended Baggage in Public Area

Chock On / Chock Off Time Logging

Aircraft Door Status Detection (Door Close/Open)

Aircraft Stand Entry / Exit Logging

Every detail is captured with precision- all analyzed data, including timestamps, detection locations, event details, images, and videos, is securely stored, managed and interact with VMS. Event videos can be effortlessly filtered, searched, and even transformed into concise summary clips, empowering operators to quickly review, verify, and respond to any object or event with swift, informed decisions. Leveraging this robust data, our solution features a dynamic, user-friendly dashboard that delivers comprehensive monitoring at a glance. With capabilities to generate quantitative statistical reports and intuitive trend analyses - presented through visually engaging tables and charts - rapid assessments and strategic decision-making become a reality. This seamless integration of detailed analytics optimizes processes and resources, dramatically enhancing your overall operational efficiency.
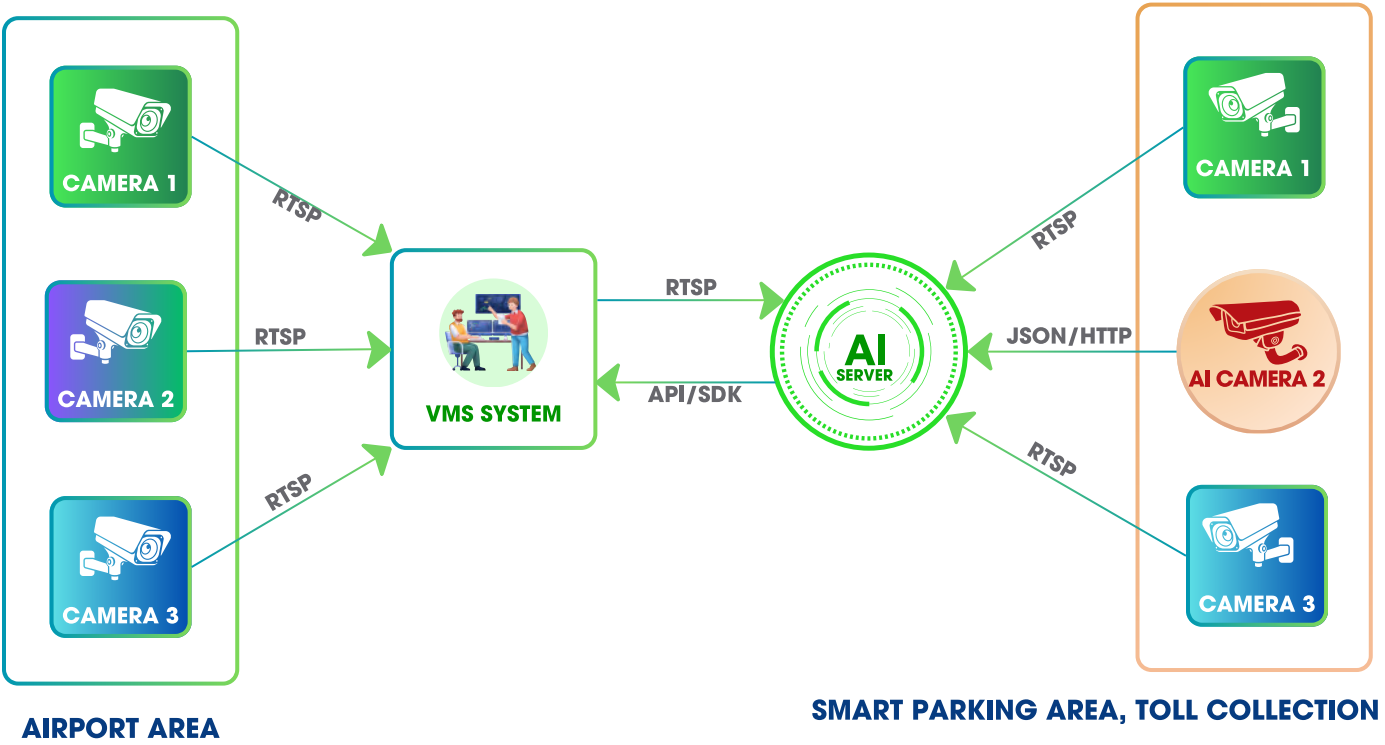
SYSTEM ARCHITECTURE

CAMERAS → RTSP → VMS SYSTEM → Metadata / SDK → APPLICATION SERVER

CLIENT — HTTP/HTTPS — API RTSP CONFIG

AI Inference Server — RESTful API — Search Engine — DATA SYNC — Database — Create Update Delete

AI Model Repository — Update models — Embedding — Vector Database

Metadata — Message Queue

Image — Image Storage

HYP-VAR video analytics and recognition solution delivers a robust and comprehensive framework that seamlessly integrates with a wide array of systems - ranging from VMS platforms and camera networks to database management systems and various hardware devices. By supporting ONVIF and leveraging versatile API libraries and SDKs, this high level of compatibility not only streamlines operational workflows but also enhances efficiency while bolstering safety and security.

Designed for flexibility, HYP-VAR supports integration with a diverse range of surveillance devices - including fixed, PTZ, and AI cameras - and is compatible with VMS solutions from many leading vendors. Whether cameras are connected via a Video Management System or linked directly to the analysis engine, they continuously provide video streams for real-time processing. The powerful SDKs and API libraries from VMS systems enable the central platform to seamlessly retrieve both live and stored video data for detailed analysis.

Harnessing state-of-the-art AI technology and advanced image processing algorithms, HYP-VAR meticulously analyzes, detects, and recognizes objects, behaviors, and events. The ability to detect and accurately recognize objects, behaviors, and events will depend on the image/video quality (minimum resolution from 1080P, 15FPS frame rate). When it identifies monitored items or abnormal occurrences, alerts and notifications are instantly displayed on the surveillance interface and can be automatically distributed via email or SMS to the appropriate units. With deployment options available as both web-based applications and standalone client software, the user interfaces are crafted to offer intuitive monitoring, efficient management, and smooth operation - customized to meet the specific functional permissions and professional requirements of each user.

AIRPORT AREA

SMART PARKING AREA, TOLL COLLECTION

KEY FEATURES

HYP-VAR video analytics and recognition solution is built upon a sophisticated image and video analytics engine that leverages AI-driven video analytics models alongside advanced image processing algorithms to execute complex analysis and recognition tasks at high speed. Designed for efficiency, HYP-VAR seamlessly updates and deploys new deep learning models, harnessing the latest advancements in AI and optimized algorithms. These models are systematically retrained and refined, continually elevating the accuracy of object recognition and detection. The result is a dynamically powerful system that delivers a comprehensive suite of functions for detecting and recognizing objects and critical events - catering effectively and flexibly to the demanding needs of security surveillance and traffic safety.
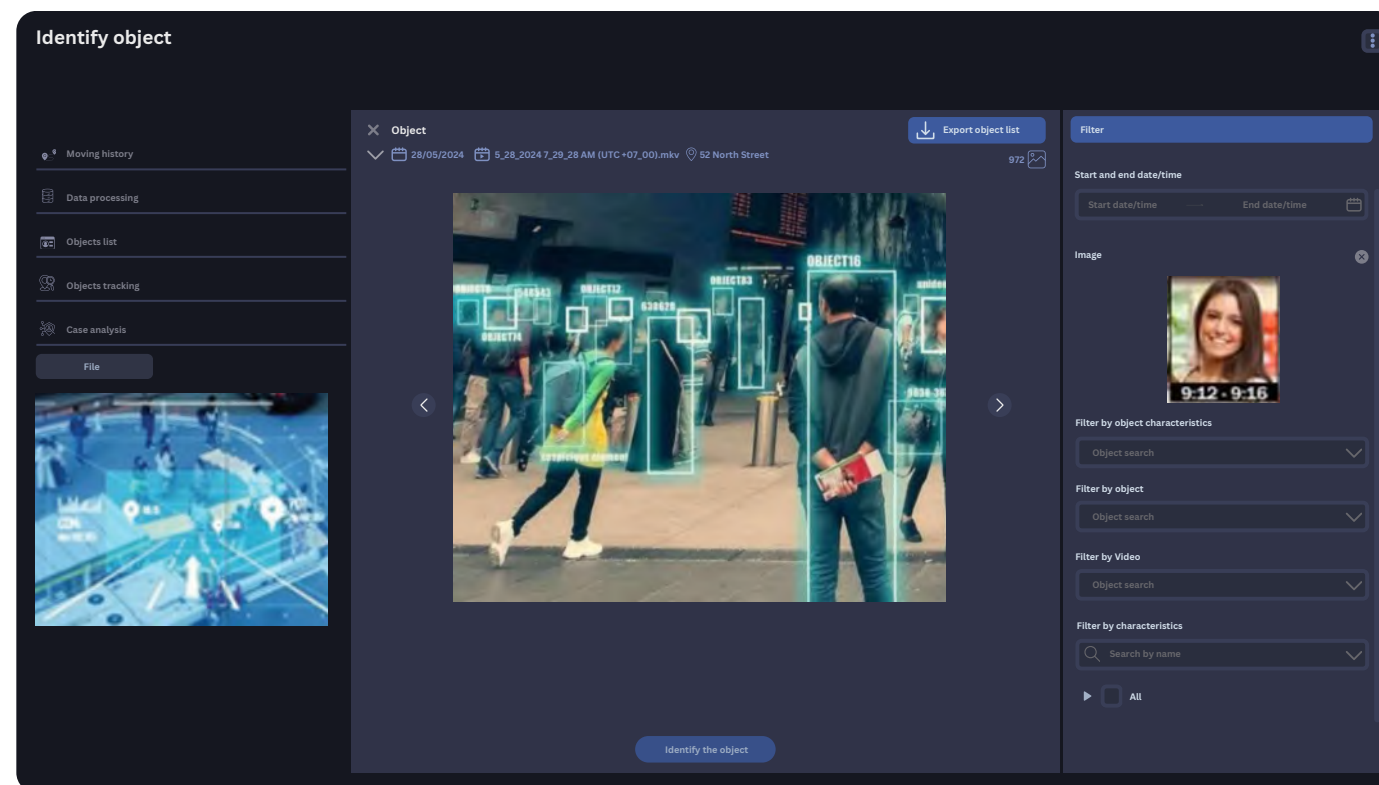
KEY FEATURES

OBJECT DETECTION, TRACKING, AND CLASSIFICATION

Utilizing state-of-the-art Deep Learning and cutting-edge Image Processing techniques, HYP-VAR meticulously analyzes images and video streams to perform precise object detection and classification. Powered by the innovative object detection models, it adeptly recognizes and categorizes a variety of entities - including people, vehicles, animals, and everyday items such as handbags, suitcases, backpacks, boxes, and bins. Whenever an object appears within the frame, HYP-VAR automatically captures its presence and tracks its movement with precision.

By aggregating this detailed data, HYP-VAR intelligently counts objects by category—a critical function for alerting operators to potential congestion and providing analytical insights through statistical reporting. This robust capability not only enhances overall surveillance management but also delivers actionable intelligence for proactive decision-making.

Traffic statistics

50,000 Vehicles

Motorbike	19,450	38.9%
Car	13,810	27.62%
Truck	7,270	14.54%
Bus	6,460	12.92%
Bicycle	1,310	2.62%
Others	1,455	2.91%%

Vehicle traffic statistics by area

High to low

Ha Noi City — 242.577 +20.41%

Hoa Binh Province — 12.840 -24.65%

Number of vehicles

Bus Car Motorbike Truck

Statistics on average vehicle density by time frame

7 hours
260 times

Total vehicles   Time frame

HYP-VAR harnesses advanced AI to accurately detect and analyze object features - including people, vehicles, and other items - by applying sophisticated multi-object tracking algorithms. This technology pinpoints and monitors object positions across environments equipped with multiple cameras. When a suspicious object is identified, HYP-VAR initiates a tracking function on the surveillance interface. It comprehensively captures features such as:

1 **Movement Behavior Analysis**

Analyzes movement patterns to detect unauthorized access to restricted zones.

2 **Unattended Baggage in Public Area**

Evaluating movement patterns, speed, and direction to support precise tracking.

3 **Restricted Area Intrusion Detection**

Detection of public disturbances, including fighting or aggressive behavior.

KEY FEATURES

OBJECT TRACKING ACROSS MULTIPLE CAMERA FRAMES

As objects move throughout monitored areas, the AI continuously updates their positions in real time, with all data securely stored in a database for future searches and analysis.

Furthermore, HYP-VAR provides an innovative historical movement feature through an interactive map. This map displays detailed location markers, timestamps, and images of each object's appearances, with multiple objects differentiated by distinct color codes. This powerful tool not only supports streamlined investigations and tracing but also enables a comprehensive review of an object's movement history at any given time.
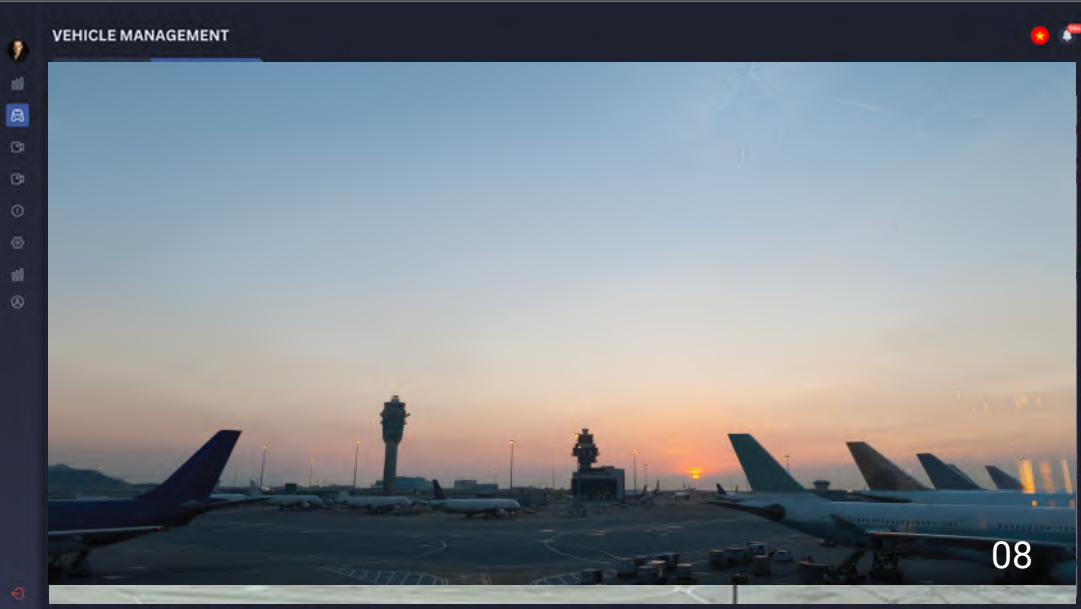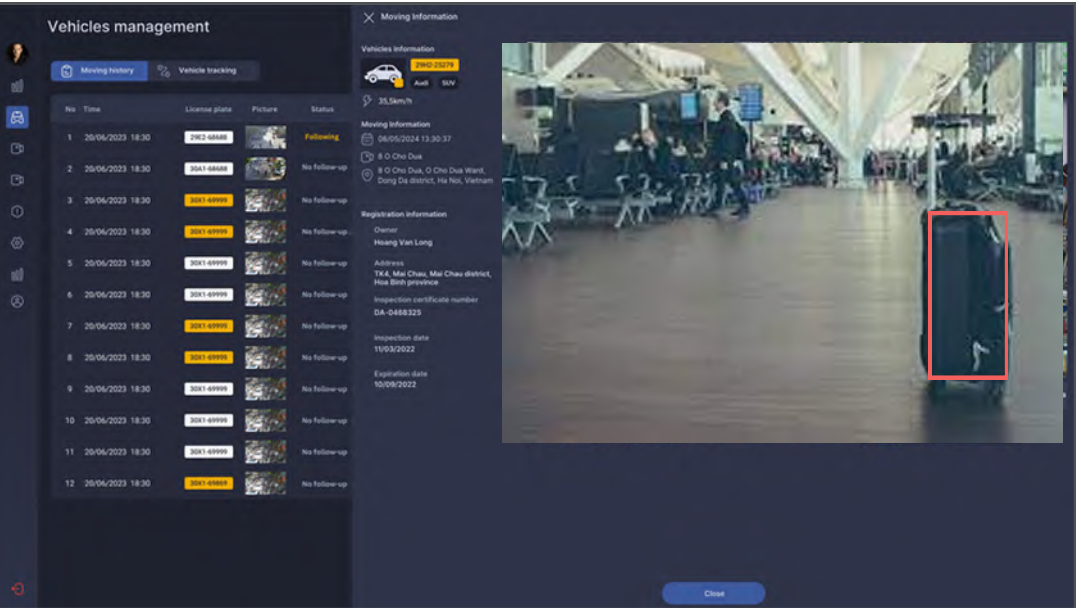
4 **Chock On / Chock Off Time Logging**

Logs the exact time wheel chocks are applied and removed.

5 **Aircraft Door Status Detection (Door Close/Open)**

Detects and records aircraft door open or close status in real-time.

6 **Aircraft Stand Entry / Exit Logging**

Logs the time an aircraft enters or exits the parking stand.

KEY FEATURES

DETECTION & ALERT OF SUSPICIOUS BEHAVIOR

HYP-VAR uses behavioral analysis technology based on human behavior patterns and continuous frame sequences to identify abnormal actions by individuals or groups. It analyzes human movement in video to determine behaviors such as standing, sitting, lying down, moving, running, fighting, or vandalism.

When a particular behavior is detected, HYP-VAR immediately records event images, extracts related information, and sends these data to the database. This information can then be used to alert security personnel, enabling prompt intervention.

Based on its ability to analyze human behavior, HYP-VAR can detect abnormal actions including:

Moving in the Wrong Direction

HYP-VAR defines permitted and non-permitted directions within the frame. If it detects a person moving contrary to the allowed direction, it flags this as reverse movement.

Running in Restricted Areas

HYP-VAR predefines zones with restricted access or no-parking areas. If a person is seen standing, walking, or running in these zones, it is identified as abnormal behavior.

Moving Quickly (Running)

HYP-VAR distinguishes between standing still, walking, and running. If a running action is detected within the surveillance area, it determines that the individual is moving too fast.

Remained in One Place for Too Long

In critical areas or zones that require strict security control, if a person remains in one place beyond a set duration, HYP-VAR will trigger an alert regarding that behavior.
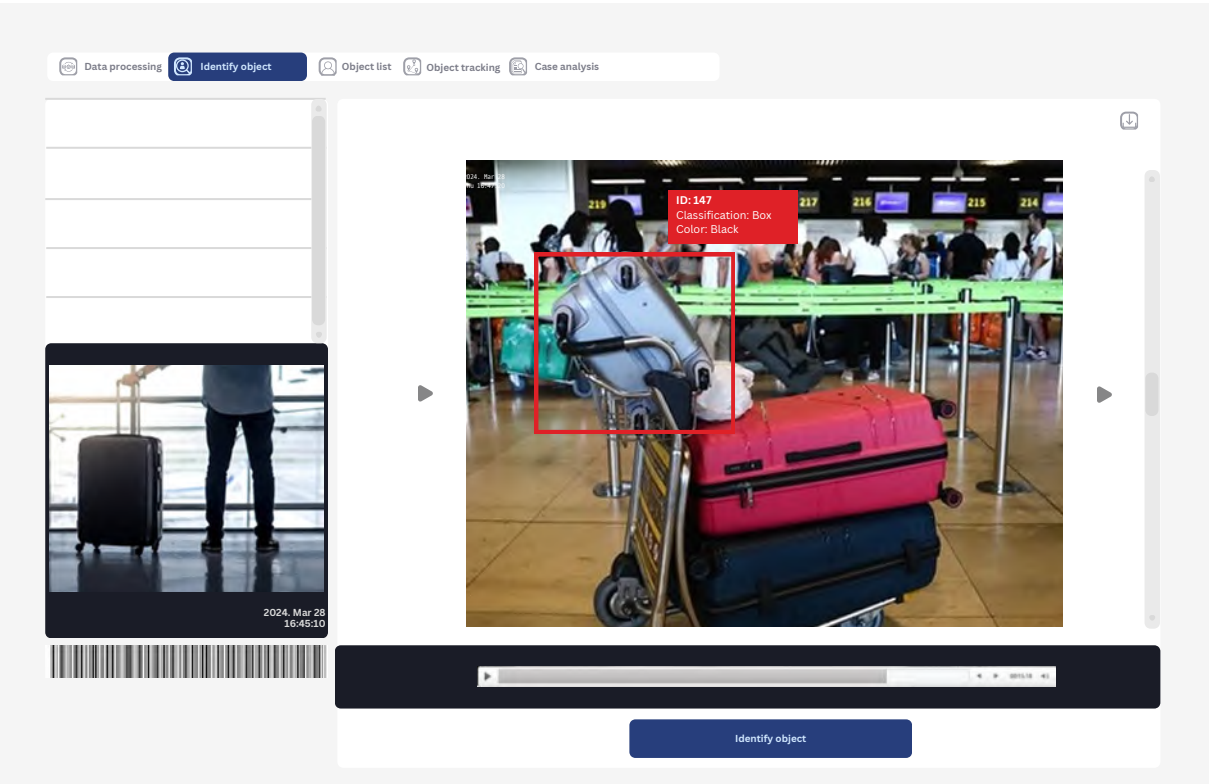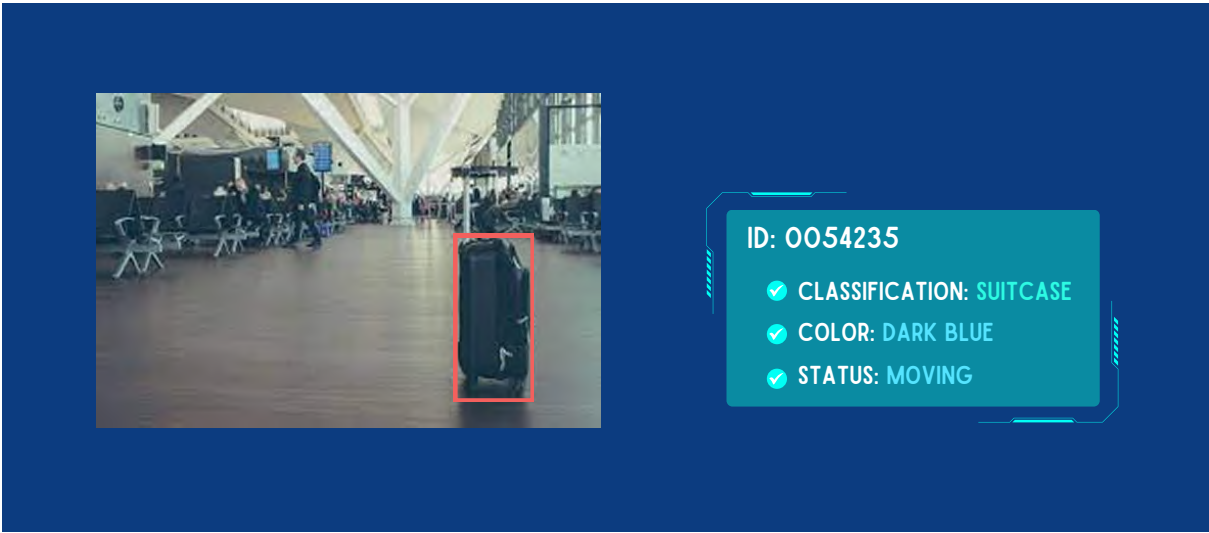
KEY FEATURES

DETECTION & ALERT OF ABANDONED OBJECTS

This function, based on AI in the image and video analysis platform, enables cameras to continuously analyze and automatically detect when unfamiliar objects or luggage (such as suitcases, handbags, bins, boxes, etc.) have been left behind in a surveillance area. Such abandoned objects can potentially pose security risks.

HYP-VAR collects image data from surveillance cameras for processing and analysis. It employs AI models and image processing algorithms to detect objects within the surveillance region. Once an object is identified, HYP-VAR monitors its status over a period to determine if it is accompanied by a person. If an object appears in the monitored area but remains stationary and shows no human interaction for a set period, HYP-VAR marks it as "suspected abandoned". Each detected object is timestamped to track its duration. A preconfigured time threshold (for example, 5–10 minutes) is used to determine suspected abandoned status. When such an object is detected, the operator interface displays a real-time notification and alert for immediate response.
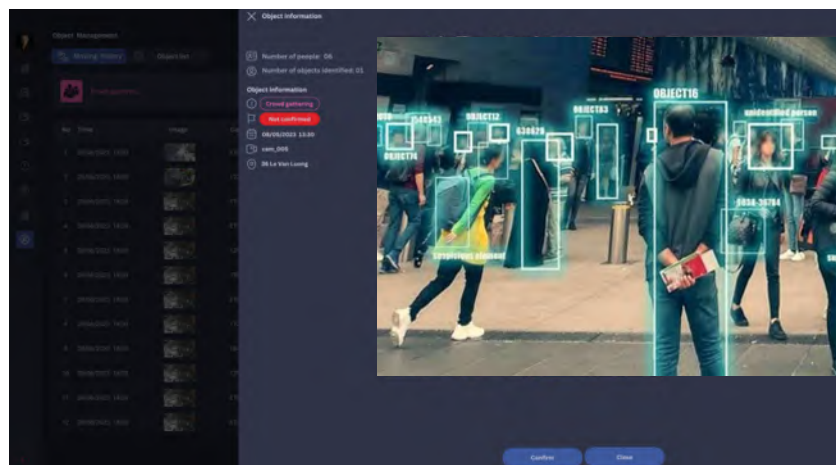
KEY FEATURES

RESTRICTED AREA INTRUSION DETECTION

Moreover, HYP-VAR employs advanced deep learning models and image processing algorithms to detect and locate individuals, differentiate people from other objects (such as luggage or trolleys), and classify and recognize individuals based on different demographic attributes (adults, children, men, women, individuals walking alone, people carrying luggage, etc.). Using these data, HYP-VAR can count the number of people in a crowd based on recognized features.

In restricted areas, if any individual or object is detected entering a predefined no-access ROI, HYP-VAR will immediately trigger an alert on the operator interface to prompt timely intervention and ensure area security.

HYP-VAR provides an interface that allows users to define the Region Of Interest (ROI) for surveillance, set rules for automatically counting people entering or exiting the area, and record movements within the monitored zone. This function is typically set up in critical areas, restricted access zones, or areas where crowd density is regulated. If HYP-VAR detects that the number of people in a crowd exceeds the predefined threshold, it identifies the gathering as abnormal.
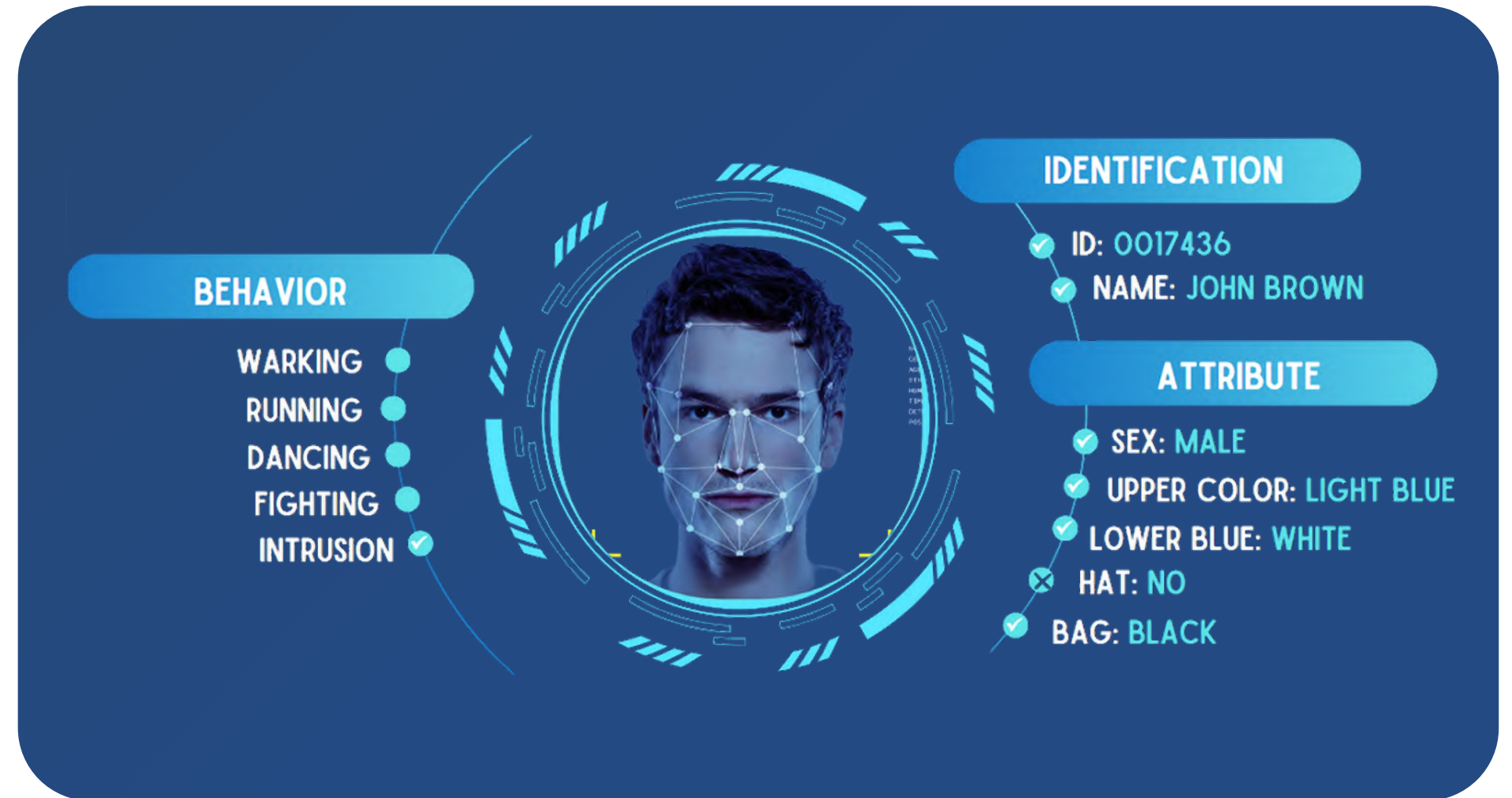
KEY FEATURES

ANALYSIS AND RECOGNITION OF HUMAN ATTRIBUTES

Any person entering the designated surveillance ROI is framed and tracked as they move through the scene. Based on pre-trained models for human features, HYP-VAR automatically classifies and recognizes individual attributes. These automatically identified attributes include:

- Object type: child, adult, or elderly
- Clothing characteristics: length, color
- Accessories: such as handbag, suitcase, backpack, bin, or box.

All detected and recognized human attribute data are recorded and stored in a database for further operational applications.

This function is ideal for investigations or tracing an individual within a specified surveillance area using archived video footage. HYP-VAR allows analysis of one or multiple video files of varying lengths to conduct searches.

The user can select the personal features to be analyzed, providing the basis for the evaluation. The analysis results return as a list of individual images with attributes similar to the preconfigured ones. Based on this information, HYP-VAR offers mapping functions to display the historical movement of the object by locations and time intervals during which they appeared in the analyzed videos.
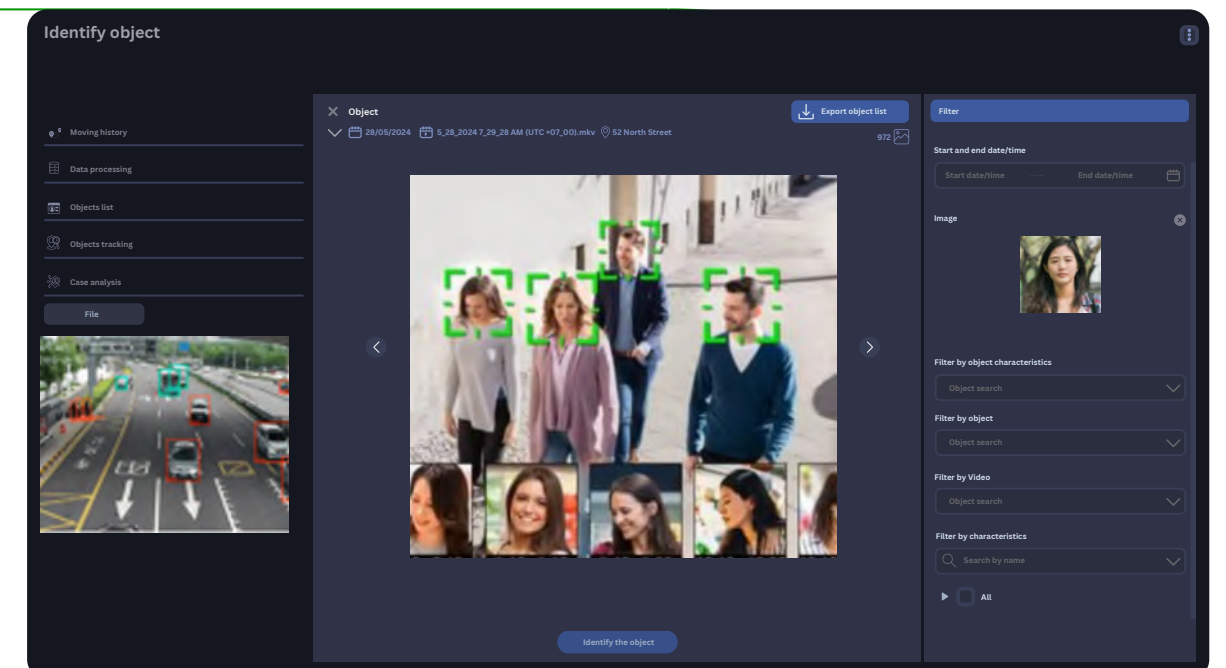
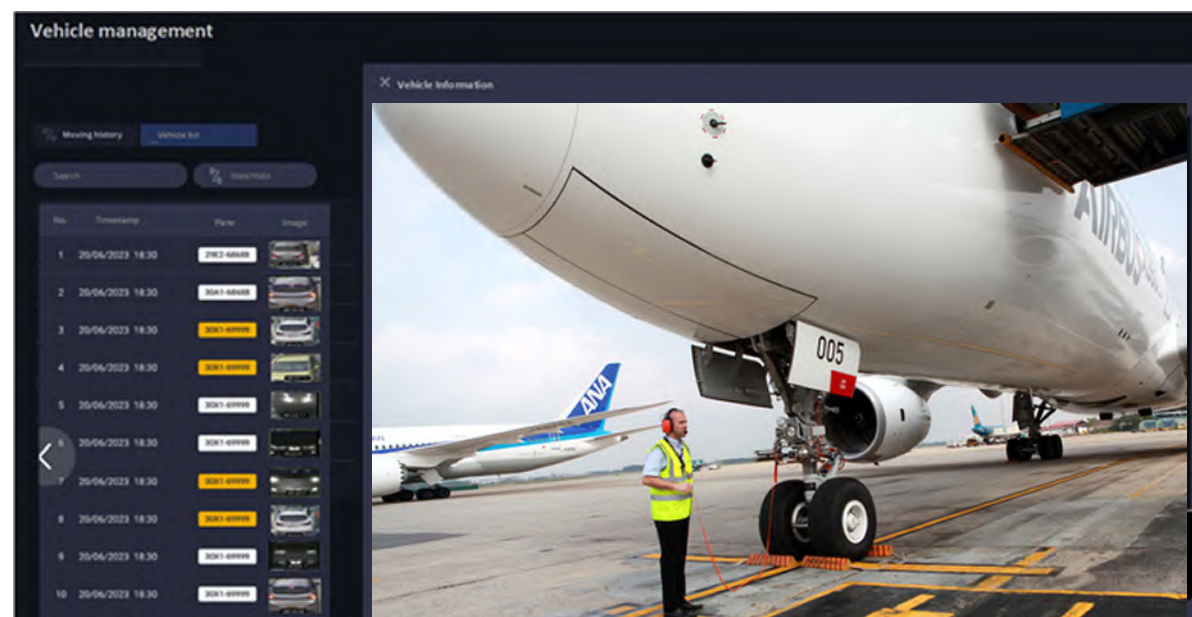# KEY FEATURES

CHOCK ON / CHOCK OFF TIME LOGGING

The image and video analysis system utilizes AI-based object detection models to automatically recognize and record the placement and removal of aircraft wheel chocks. By connecting to real-time camera streams or analyzing stored video footage, the system identifies key visual elements, including technician movements and the presence or absence of chocks in defined regions near the aircraft wheels.

HYP-VAR is designed to detect:
- Technician entry into the undercarriage area for chock handling;
- Rectangular-shaped objects with high-visibility colors (yellow/orange) near the aircraft wheels;
- The exact timestamp when chocks are placed or removed;
- Associated event data including location, aircraft identification, type of event (Chock On / Chock Off), and relevant images or video clips.

AI training is based on common chock positions (near nose or main landing gear), object appearance (shape and color), and technician behavior during chock operations. These capabilities can be further enhanced by expanding training datasets and incorporating operator feedback for continuous model improvement.

This function supports automatic logging of chocking activities to improve ground handling efficiency, operational transparency, and safety compliance.

KEY FEATURES

## AIRCRAFT DOOR STATUS DETECTION
(DOOR CLOSE/OPEN)

The image and video analysis system leverages AI technology to automatically detect and record the exact moment an aircraft door is closed. By analyzing live camera feeds or recorded video, the system identifies door components and monitors their status changes using a combination of Object Detection and Pose Estimation models.

Arrafift Open//Close Detecion System
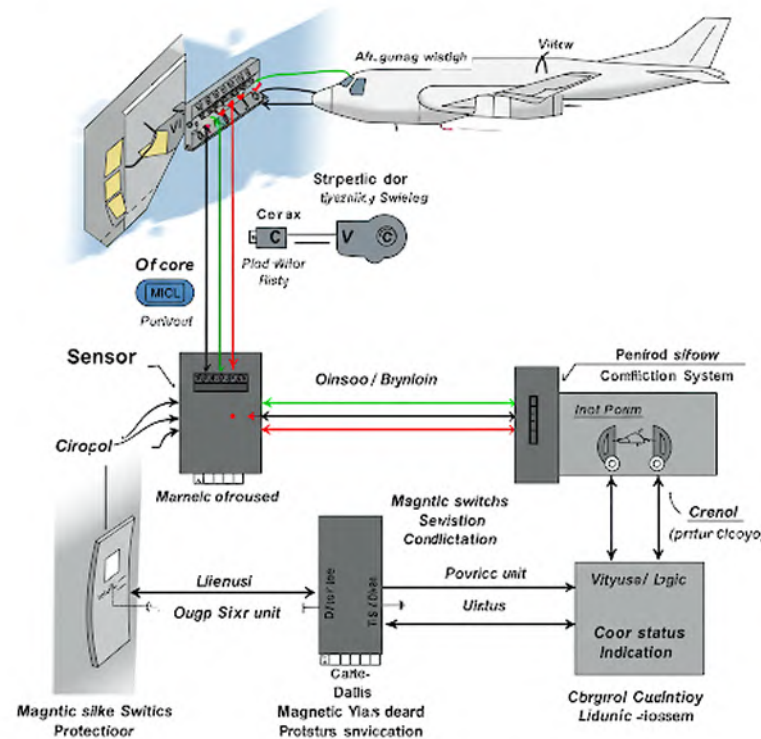
HYP-VAR is capable of detecting:
- The presence and shape of the aircraft door in the field of view;
- The progressive rotation and alignment of the door toward the fuselage during the closing process;
- Operator activity near the door, indicating manual closure operations;
- The exact timestamp when the door is fully closed, indicated by flush alignment with the aircraft body and latch engagement.
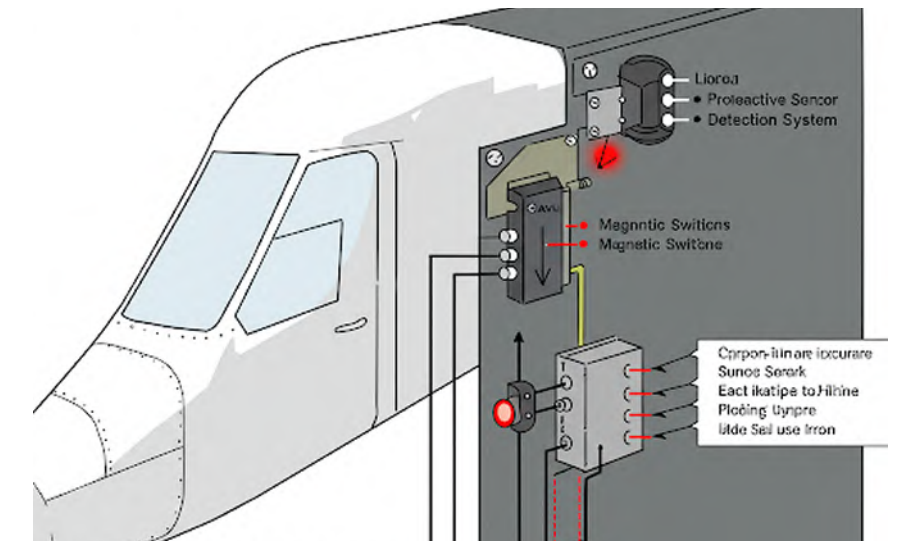
- AI models are trained to differentiate between door states:
- Open: Visible gap between the door and fuselage, door partially or fully extended;
- Closing: Door in motion, often with human interaction visible;
- Closed: Door fully sealed against the fuselage with latches engaged and no visible gaps.

Event data is logged with precise time, aircraft identity, door status, location, and supporting image/video records. These capabilities support real-time monitoring of ground operations, improve turnaround time tracking, and enhance safety compliance.

KEY FEATURES

AIRCRAFT STAND ENTRY / EXIT LOGGING

The Aircraft Stand Entry / Exit Logging function enables automated, real-time detection of aircraft arrival to and departure from designated parking stands by processing video streams from airport surveillance cameras. Using advanced AI technologies, the system captures and records the exact timestamps when an aircraft enters or exits the stand area. Each logged event includes comprehensive metadata: time, location, aircraft identification, event type (entry or exit), and supporting images or video clips.

This functionality is powered by a combination of Object Detection and Motion Tracking algorithms. The AI engine continuously scans the monitored Region of Interest (ROI) to identify and track aircraft and ground service vehicles, differentiating between stationary and moving states.

- Entry Detection:
- Aircraft approach movements toward the designated stand are detected and analyzed. When the aircraft comes to a full stop within the defined parking boundary, the system automatically logs the entry time.
- Exit Detection:
- Aircraft departure is triggered by detecting movement (either self-propelled or via pushback tug). Once the aircraft is no longer visible within the defined frame, the exit time is recorded. The system can also identify the involvement of pushback equipment as part of the departure sequence.

AI Data Processing Parameters
- Aircraft position and movement relative to virtual parking zone.
- Aircraft stationary vs. dynamic states based on frame-by-frame motion tracking.
- Vehicle type differentiation (aircraft vs. tug) using object classification.
- Event confirmation logic that ensures stability before logging (to avoid false positives from taxiing near the zone).

This function supports operational accuracy, timekeeping for ground handling, and integration into airport resource management systems. Event logs can be used for performance analysis, dispute resolution, or compliance verification.

KEY FEATURES

## ANALYSIS & RECOGNITION OF VEHICLE ATTRIBUTES

The image and video analysis system utilizes AI technology to detect and recognize vehicle characteristics. It connects to camera streaming feeds or extracts stored video files for analysis. Employing AI-based Object Detection & Classification, it identifies and determines the type of vehicle. Vehicle attributes are automatically recognized, including color, type, and manufacturer.

HYP-VAR is currently capable of analyzing:
- 14 basic vehicle colors;
- Differentiation of 4 license plate colors: blue, yellow, white, red;
- Classification of 10 types of vehicles;
- Recognition of over 10 car models;
- Recognition of over 30 vehicle brands.

These analysis and recognition capabilities can be further enhanced with larger training datasets and self-training through feedback from operators.

This function is suitable for investigating or tracking a vehicle within a monitored area using stored video footage. HYP-VAR allows analysis of one or multiple video files at varying lengths for search purposes. The vehicle features to be analyzed are selected per user requirements, serving as the basis for the evaluation. The analysis results in a list of vehicle images with recognized features matching the pre-configured ones. Based on this information, HYP-VAR provides mapping functions to display the historical movement of the vehicle by location and the time intervals during which it appeared in the analyzed videos.
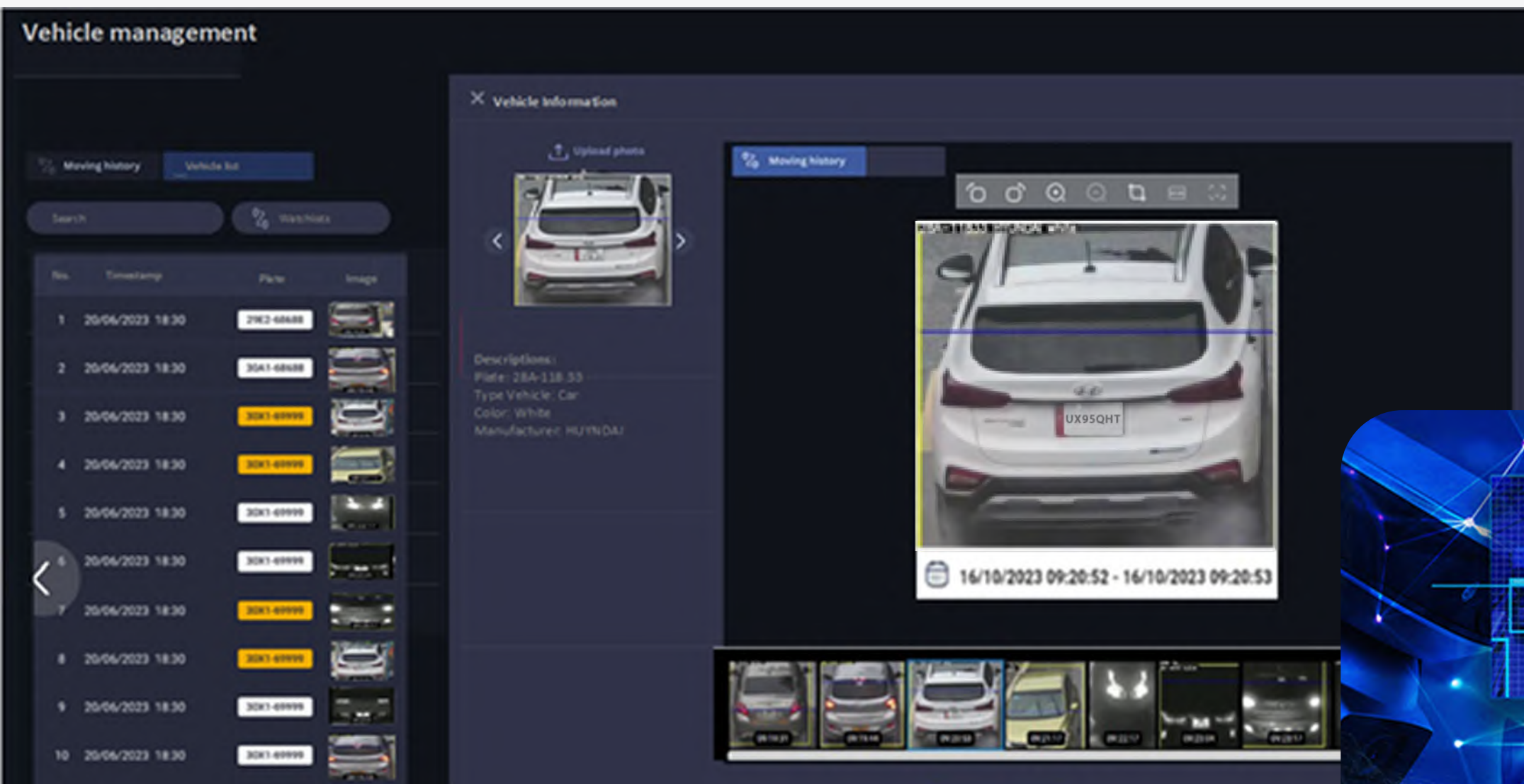
KEY FEATURES

LICENSE PLATE RECOGNITION

The image analysis system can detect, recognize, and store license plate information when vehicles enter or exit controlled areas such as toll stations, parking lots, entry/exit gates, or restricted zones. Automatic License Plate Recognition (ALPR) technology uses deep learning models to quickly and accurately recognize the license plates of vehicles traversing these areas.

Each time a vehicle enters the designated license plate recognition zone, HYP-VAR analyzes and recognizes the plate based on the captured vehicle image. It supports license plate recognition under various environmental conditions (daytime/nighttime), distinguishes among plate types (color, numbering pattern, etc.), and can even recognize plates partially obscured by screws or scratches.

Intelligent image processing algorithms are employed to reduce noise, enhance sharpness, and improve the clarity of the characters on the plate. To achieve high accuracy, the surveillance cameras must meet configuration, technical specifications, and installation guidelines to ensure accurate recognition. High-resolution

cameras (HD or higher) are recommended to clearly capture license plates; infrared (IR) illumination or low-light sensors are preferred for nighttime capture, and be installed so that the plates can be clearly visible to the naked eye. The best license plate images shall be automatically selected to reduce negative effect from dirt, blur, glare, distortion, or partial/full obstruction to improve recognition accuracy.

License plate data is stored in a database to support tracking and analysis tasks such as:
- Tracking the entry and exit history of vehicles;
- Providing evidence for security incidents or violations;
- Alerting on vehicle density or congestion in a specific area.

The recognized license plates can be checked against watchlist or priority-list databases to trigger events or alerts to support security surveillance or business workflow. HYP-VAR can also generate statistical reports in the form of charts, dashboards, or trend analysis graphs regarding vehicle flow, or provide evidentiary data for investigations and tracking abnormal events.

123ABC
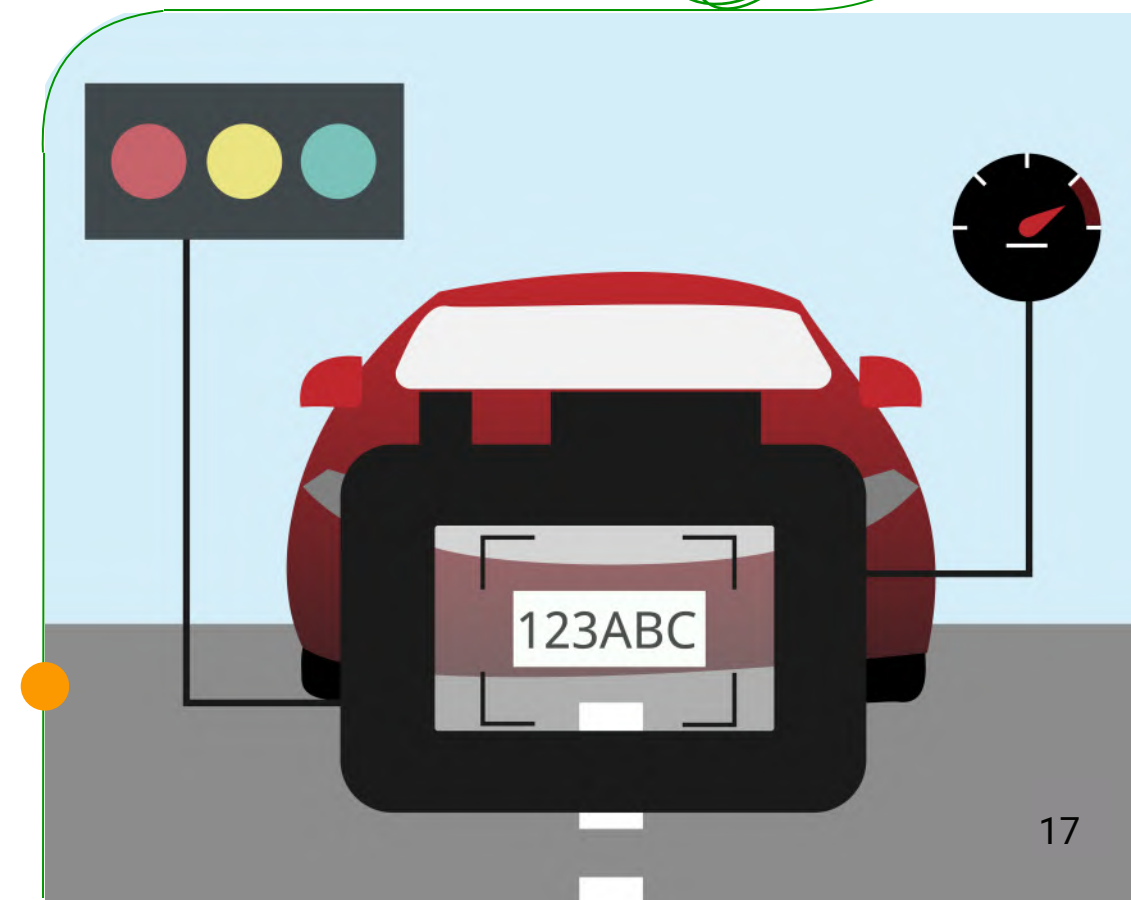
KEY FEATURES

FACIAL RECOGNITION/ FACE MASKING

The image and video analysis system integrates facial recognition technology to enhance surveillance and security operations within the airport premises. This feature is powered by high-performance deep learning models, enabling the system to:

- Analyze biometric facial features (eyes, nose, mouth, etc.) and extract facial embeddings.
- Compare and match faces against a centralized facial database to identify individuals.
- Support automatic face enrollment through integration with biometric systems at security checkpoints, or manual enrollment by authorized users.
- Return a ranked list of search results based on similarity scores, with the highest match reviewed for identification.

Key capabilities of the HYP-VAR facial recognition system include:

- Recognition of faces from live video streams or static images.
- Management of watchlists with a capacity of over 10,000 faces (subject to system configuration).
- Real-time alerts upon detecting a face matching a watchlist entry through the operator interface.
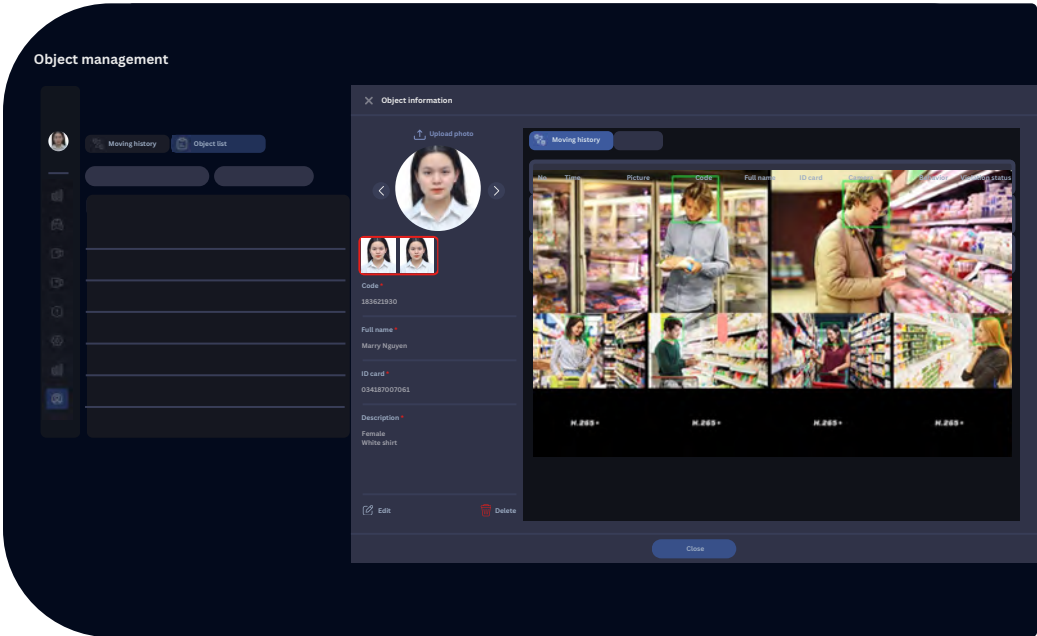

Example scenarios

CRITERIAS	SCENARIO 1	SCENARIO 1
Heights	2m	3m
Face height	1.4m	1.7m
Recognition angle	10 deg.	10 deg.
Distance	~ 3.4m	~7.3m

Facial image quality requirements:

- IP cameras should be installed at an oblique angle toward areas with frequent human traffic.
- The angle of incidence must not exceed 10°.
- Image resolution should meet DORI standards at the "Identification" level.
- Camera placement must avoid overexposure or underexposure, ensuring key facial features are clearly visible and unobstructed.
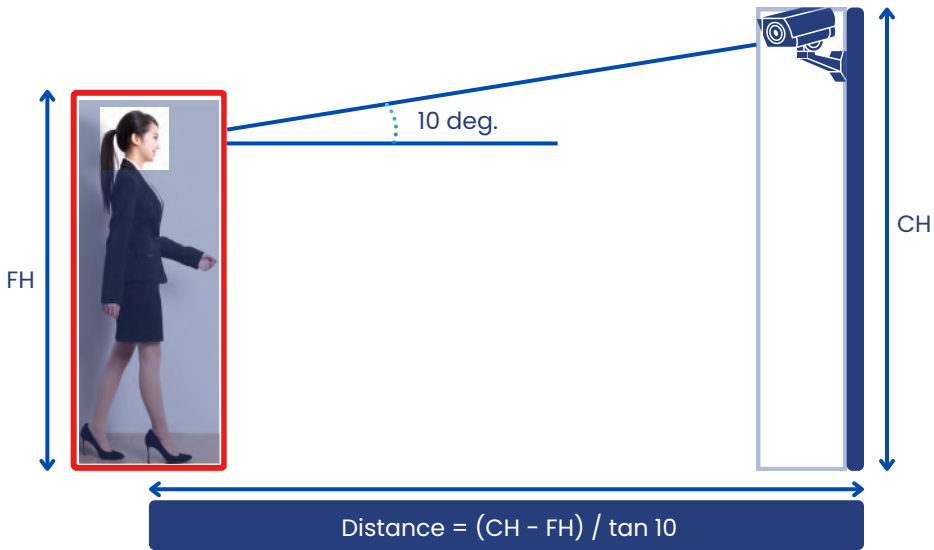
Face Masking (Face Redaction) Function

The face masking function is designed to comply with personal data protection and privacy requirements. When enabled, the system can:

- Detect and recognize faces within video frames or still images.
- Apply masking techniques such as blurring, pixelation, or graphical overlays to anonymize identified faces.
- Allow configurable masking options, such as masking only faces not on an approved list.
- Perform real-time face masking (live masking) or apply it to recorded media (offline masking).

This function is essential for scenarios involving video sharing, investigation support, or public release of footage while maintaining compliance with privacy and data protection regulations.
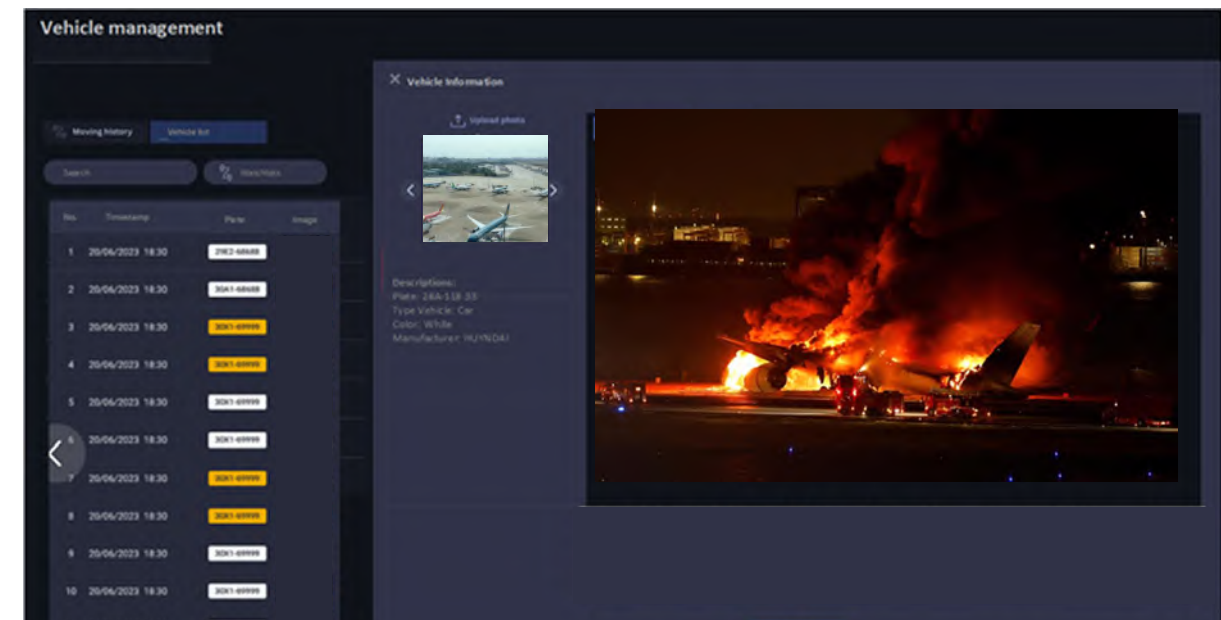
KEY FEATURES

FIRE AND SMOKE DETECTION & ALERT

The image and video analysis system defines a virtual Region Of Interest (ROI) for continuous surveillance within designated airport zones such as terminals, hangars, cargo areas, or aprons. HYP-VAR can be configured to periodically capture image frames (e.g., every few minutes) from camera feeds covering the specified ROI. Using advanced AI-based object detection algorithms, the system analyzes each frame to identify visible signs of flames or smoke.

To minimize false positives and ensure detection accuracy, the system validates the presence of smoke or fire by confirming it persists for a user-defined minimum duration. Once confirmed, HYP-VAR immediately generates an automated alert via the operator interface, allowing for quick response by emergency personnel.

In addition to real-time alerting, the system also stores associated event metadata such as:

- Timestamp of detection
- ROI location coordinates
- Snapshot image and video excerpt of the event
- Confidence score of flame/smoke presence

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Thank you