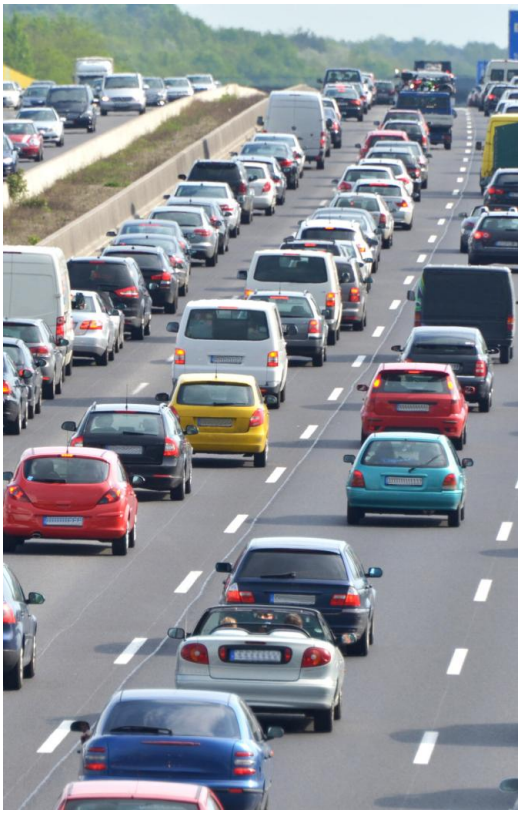
aivu
smart modules

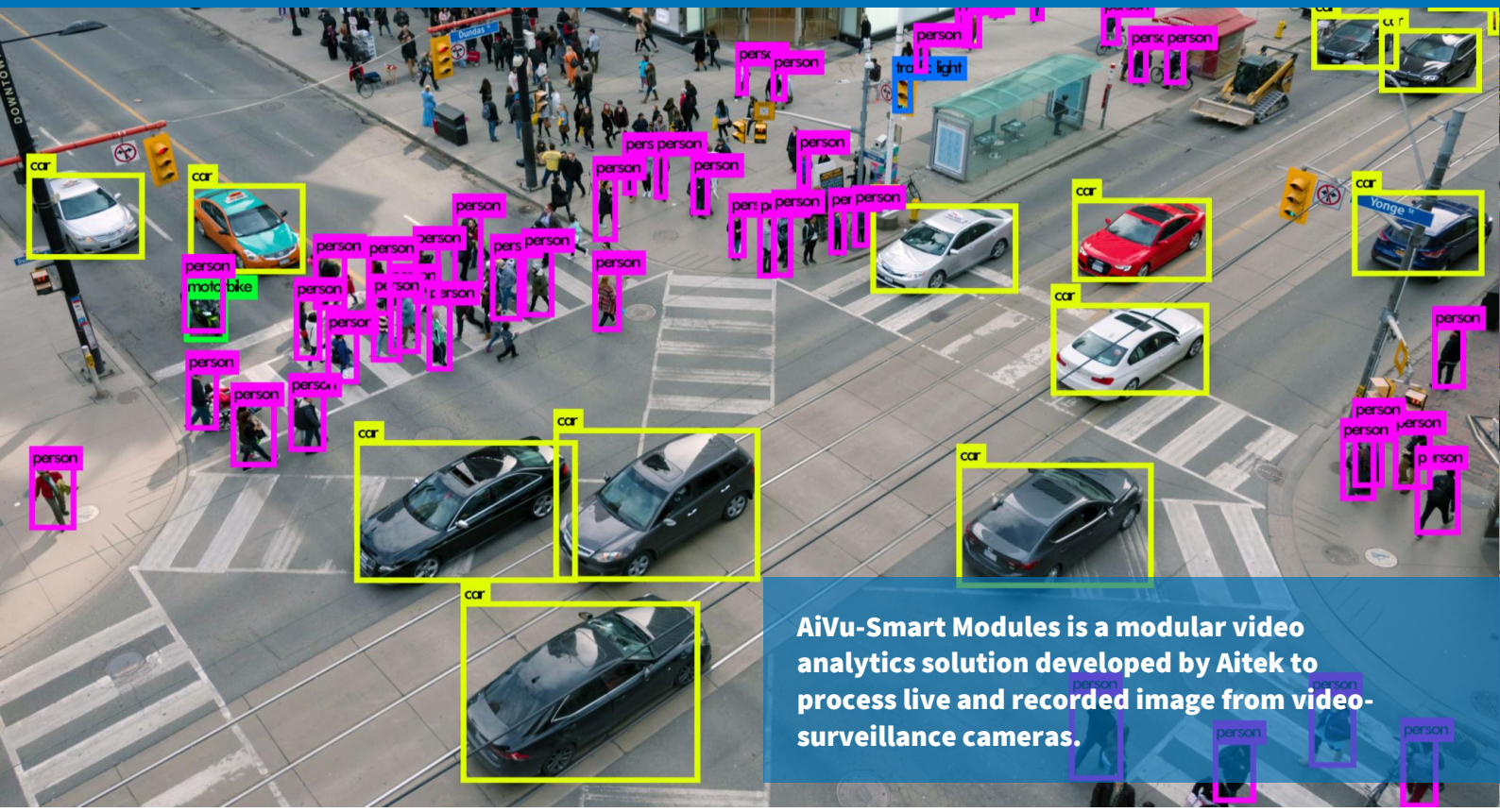
An integrated and customised video analytics solution for the real-time events detection



www.aitek.it

aitek

Video-analytics software platform



AiVu-Smart Modules is a modular video analytics solution developed by Aitek to process live and recorded image from video-surveillance cameras.

Whether transportation infrastructures, urban areas, points of sales, industrial sites or other are involved, security personnel require reliable solutions capable of detecting any threat in real time.

This is why video analytics have become an essential tool for guaranteeing immediate responses in case of events representing possible dangers to people, goods and infrastructures.

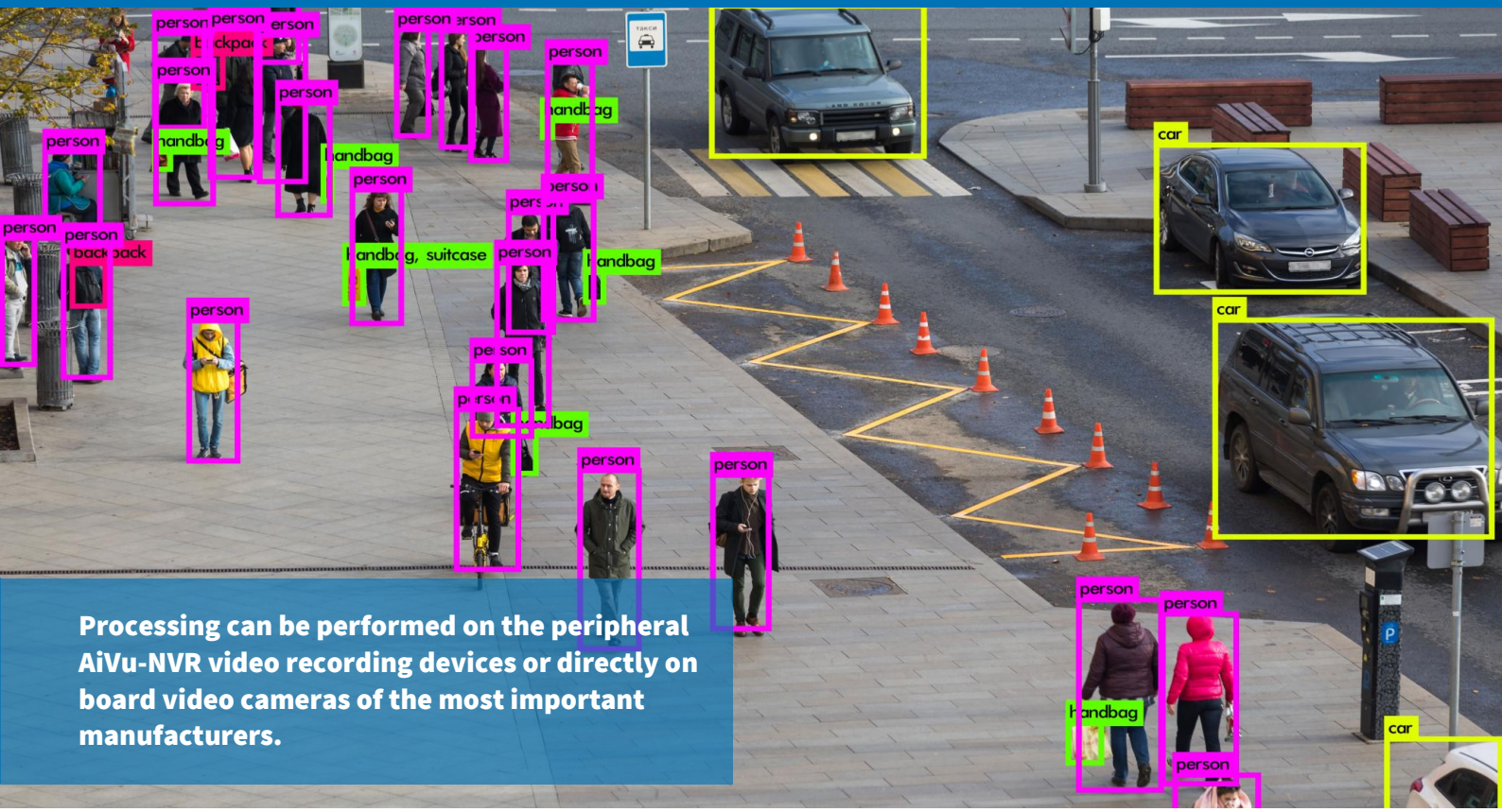
The AiVu-Smart Modules suite integrates existing CCTV systems by using video analytics techniques for real-time detection of a variety of different events focusing on people, vehicles and static objects. Our software modules are also designed to perform post-event analyses of recorded footage and acquire statistical data.

Image processing algorithm-based detection is highly reliable and accurate. Alerts for user-configured events are generated automatically and any redundant or false alarms are automatically filtered out.

From design to installation, Aitek supports the Client step by step to satisfy any security needs. And… don't worry if your needs change along the way! AiVu-Smart Modules solutions are scalable and adapt to changing conditions: new features can be added at any time safeguarding investments in IT.

- **Perimetral protection and intrusion detection**
- **Tracking of veichles/objects/people**
- **Over-crowding detection**
- **Wrong way detection**
- **Detection of stationary vehicles/objects**
- **Vehicle queue and speed drop detection**
- **Vehicle speed estimation**
- **Interdistance measurement**
- **Counting of veichles/objects/people**
- **Size-based object classification**
- **Abandoned object/spilled load detection**
- **Automatic smoke & fire detection**

AiVu-Smart Modules architecture

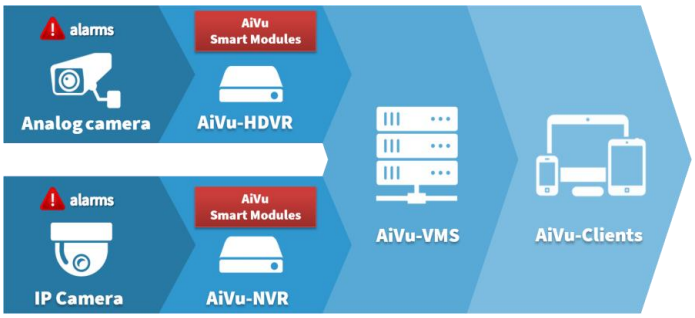


Processing can be performed on the peripheral AiVu-NVR video recording devices or directly on board video cameras of the most important manufacturers.

Server-based implementation

The video analytics modules run on the device hosting the video recording software (DVR, NVR and HDVR) without requiring any specific hardware.

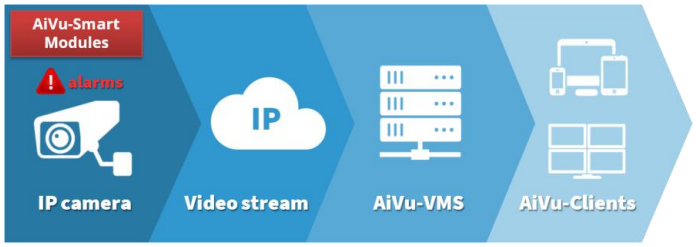
Image acquisition, processing and sending are performed by the device independently of the type and model of connected video cameras.



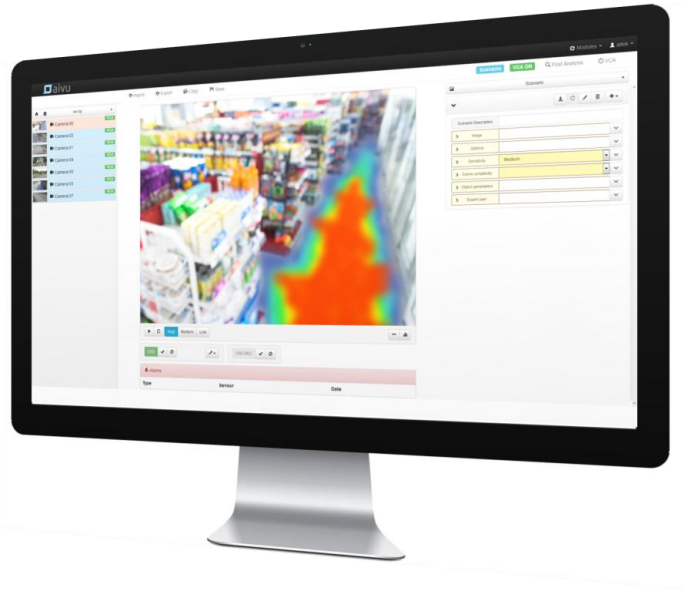
On-the-edge video analytics

Fixed, dome, PTZ video cameras: Aitek video analytics can be integrated on board a wide range of video-cameras.

Highly reliable and with excellent performance, Aitek video analytics are a cut above the rest. Their wide range of software modules allows to design flexible and effective solutions, with significant benefits in terms of computational resources.



Configuration interface



Easy and quick video analytics configuration

Virtual sensors ("rules") can be configured on the acquired images, or portions of the images, by using a web-based configuration interface supported by the commonest browsers and therefore easily accessible by workstations with different operating systems.

The interface's ease of use allows to quickly change the number and type of sensors. The number and type of sensors can be quickly changed, allowing several rules to be configured on each single video camera to simultaneously detect different types of events without interfering with each other.

Setting up video analytics on a video camera is extremely simple: one just has to select the rule corresponding to the event to be detected and to define the image area to which the analytics must be applied by drawing the virtual sensor using the mouse.

Furthermore, default values and/or suggested ranges are available for all parameters and thresholds, allowing even video processing novices to perform analytics configuration with no need for complex measurements or evaluations.

If a video camera points to a different location, video analytics can be restored simply by adjusting the position of the virtual sensors on the image.

Post-event analytics on recordings

The video analytics software modules can also be applied to recordings, allowing to quickly and automatically reconstruct events of interest, without having to examine hours of recordings.

Events can be quickly detected just by drawing the virtual sensors on the images: post-event analytics are performed at the highest possible speed, allowing to process hours of recordings in a few minutes!

Real-time alarm notification

All notifications generated by sensors, with the corresponding images, can be automatically sent to a control center provided with Aitek's **AiVu-VMS** video management portal or to third-party supervisory systems, using the AiVu format or Onvif specifications.

The control center automatically receives alarm notifications from video cameras any time unpredicted events occur, allowing the security personnel to view the recordings associated with the event and trigger the appropriate response procedures.

Deep learning

The evolution of video analytics

Aitek's video analytics have evolved using deep learning, the artificial intelligence technology for implementing algorithms capable of learning from experience by analyzing data extracted from processed images. An innovative approach to strengthen the video analytics performance and provide state-of-the-art solutions.

Data contained in images can be better exploited to obtain useful information by applying a new generation of video analytics which takes advantage of the potential of deep learning, an artificial intelligence technology allowing to implement algorithms capable of learning directly from experience, without following the constraints of predefined mathematical models.

Deep learning is based on training highly-sophisticated neural networks to achieve extremely high reliability in processing images and video streams. As the name suggests, neural networks are modeled after the human brain, even if at a much smaller scale. In fact, just as the human brain, the performance of neural networks improves as the events from which to learn grow in number, allowing the algorithm to dynamically adapt to new situations. AiVu-Smart Modules can apply these new technologies to the video streams acquired from any video camera, boosting the intelligence of their own algorithms and improving overall performance.

Extreme reliability, limitless possibilities

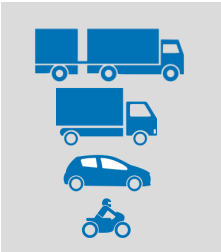
Thanks to its data-driven approach based on training, deep learning allows to develop sophisticated video analytics algorithms in shorter amounts of time compared to traditional ones, which are usually based on background estimation methods aiming at detecting objects by comparison with a previously created model of the scene.

Deep learning provides numerous advantages. Using neural networks provides robustness to rapid variations in the monitored scene such as changes in weather, lighting or video camera orientation, all of which may easily interfere with earlier video analytics systems.

Furthermore, algorithms can process in real time every single image with no need to employ a reference model of the scene and can detect with extreme reliability even partially overlapping or occluded objects or objects which have long been abandoned.

This is why neural networks can be trained to perform a wide variety of tasks, such as object detection based on object type or shape (vehicles, pedestrians, animals as well as everyday objects such as shopping carts, luggage, etc.), face detection and recognition, object state detection (open/closed door, raised/lowered barrier, standing/lying person, etc.), smoke fire detection, and much more.

Object dimensions



Object shapes

Motionless object

Smoke detection

Overlapped objects

Similar objects

Audio detection

Object status

Face recognition

Development of complex video analytics solutions with no need to develop complex algorithms

Extensive Aitek expertise in data analysis for neural network design

100% accurate indoor and outdoor smoke detection

Detection of individual objects even when overlapped or partially occluded

More accurate object detection: objects of any type and shape can be detected

Classification of objects comparable in shape and size (for example, bicycles/motorcycles)

Detection of motionless objects in the monitored scene (long-term tracking)

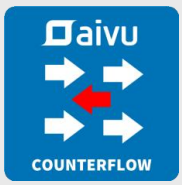
Image calibration for optical distortion and perspective correction for precise distance measurements

Audio stream processing for sound detection applications

Software modules

AiVu-Smart Modules-Calibration
Size classification of vehicles
By evaluating the perspective distortion, it allows to classify objects in the processing area and to distinguish them based on their size. Ideal for classifying light/heavy vehicles in transit.

AiVu-Smart Modules-Count
Object counting
Counts objects transiting through a sensor-defined area. This module is best suited for counting transit flows along a selected lane or through a selected access-gate.



AiVu-Smart Modules-Counterflow
Counterflow of objects
It detects objects moving in the opposite direction compared to all other objects in the scene, even in crowds.

AiVu-Smart Modules-Cover
Camera covering
Detects camera obscuration incidents that prevent video-analytics (caused by vandalism, dirty lenses and obstructions).

AiVu-Smart Modules-Crowd
Overcrowding detection
It allows to detect an excessive number of people in the monitored area. Ideal for monitoring squares, public spaces, railway platforms and stations, access gates, etc.

AiVu-Smart Modules-Danger
Detection of dangerous situations
This module detects the presence of people, vehicles and objects in a sensitive area. It is ideal for monitoring operational areas, warehouses and depots and for detecting potentially dangerous situations in railway scenarios such as objects on the rails, yellow line crossing, etc.

AiVu-Smart Modules-Direction
Detection of the direction of movement
It detects objects moving along a reference direction, defined during module configuration.
An alarm notification is generated any time an object crosses the monitored area moving along the configured direction. Ideal for detecting wrong-way vehicles or people crossing unidirectional gates in not allowed ways.

AiVu-Smart Modules-Heatmap
Detection of area occupation
It provides a graphical representation, using pseudo colors, of areas most frequently occupied by objects in the monitored scene. Ideal for the analysis of vehicle flows along roadways or for point of sale in-store analytics.

AiVu-Smart Modules-Interdistance
Interdistance measurement
Automatic estimation of the safety distance between vehicles (in metres). This modules allows to acquire data about traffic conditions along a road infrastructure (real-time measurement of the safety distance between two vehicles, minimum and maximum distance values detected by the virtual sensor and average calculation).

Software modules

AiVu-Smart Modules-Intrusion
Intrusion detection
This module detects unauthorized people in a monitored area. It is ideal for perimeter protection and detecting trespassing over gates and fences in industrial sites, port terminals, warehouses and depots, military sites, etc.

AiVu-Smart Modules-Position
Detecting objects in non-entry areas
An alarm signal is generated each time a person or vehicle transits through a monitored area. This module is best suited to the surveillance of non-entry or restricted areas, such as parking-lots, worksites, depots, warehouses, industrial sites, etc.

AiVu-Smart Modules-Queue
Detection of vehicle queues
An alarm notification is generated when the monitored area (a road lane) is occupied by vehicles over a set threshold percentage. Ideal for monitoring traffic flows and detecting queues and accidents.

AiVu-Smart Modules-Smoke Detection
Smoke detection
It detects the presence of smoke, not necessarily of the dense type, in indoor or outdoor areas (such as tunnels or industrial sites), generating alarm notifications in case of the onset of fires.

AiVu-Smart Modules-Speed
Vehicle speed estimation
Automatic speed estimation of vehicles in transit through a virtual sensor. This module allows to acquire data about traffic conditions along a road infrastructure (real-time estimation of the speed of each vehicle, minimum and maximum speed values detected by the sensor and average calculation).

AiVu-Smart Modules-Speed Drop
Vehicle speed drop detection
Detects speed drops within a sensor-defined area. An alarm is generated each time the average speed of vehicles transiting through a sensor falls below a configured threshold for longer than a defined time. This module is best suited to manage vehicle flow and detect gridlocks or accidents.

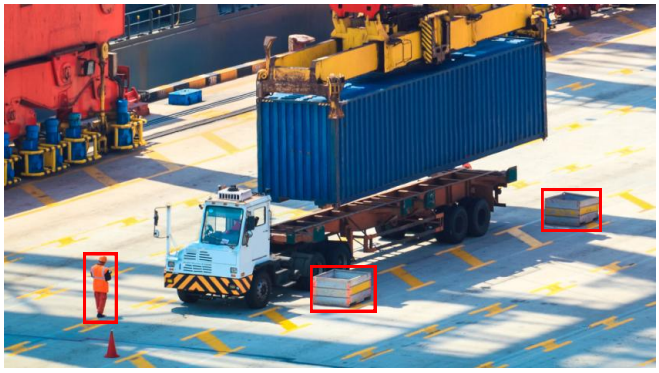
AiVu-Smart Modules-Stop
Detecting stationary vehicles / objects
An alarm signal is generated each time stationary objects or vehicles are detected within a configured sensor area for longer than a defined time. It detects vehicles or objects stationing on carriageway and/or inside tunnels, accidents, spilled loads, abandoned objects, etc.

AiVu-Smart Modules-Tamper
Camera moving or tampering detection
Detects camera movements that prevent video-analytics. This module is best suited to detect vandalism.

Fields of application

➔ Ports and Dry Ports

In a terminal, detecting in real time events which may affect the safety of people and the security of goods and operational areas is of the utmost importance. To achieve a higher level of security, software modules from the AiVu-Smart Modules suite can be added to video surveillance systems.



Protection of quays, depots and perimeter areas
Intrusion detection
Detection of people/vehicles in non-entry or dangerous areas
Abandoned object / spilled load detection
Tracking of vehicles/pepole
Counting of vehicles/people
Automatic smoke & fire detection

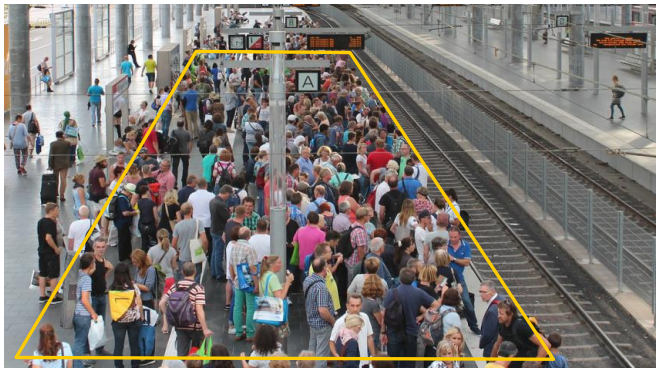
➔ Road network

The human eye is not enough to detect dangerous events and guarantee high standards of traffic and infrastructure security. This is why video analytics provide a set of advanced features allowing roadway operators to manage in real time any critical event and to acquire useful statistics for traffic flow analysis.

Intrusion detection
Detection of pedestrian in non-entry or dangerous areas
Abandoned object / spilled load detection
Automatic smoke & fire detection
Detection of stationary vehicles
Wrong way detection
Queue / Speed drop detection
Vehicle speed estimation
Interdistance detection
Counting and size classification of vehicles

➔ Rail and subways

The wide range of software modules allows the design of highly customized solutions to support the management of distributed video security systems covering an entire railway system and detecting in real time events which may affect the safety and security of vehicles, infrastructures and passengers.

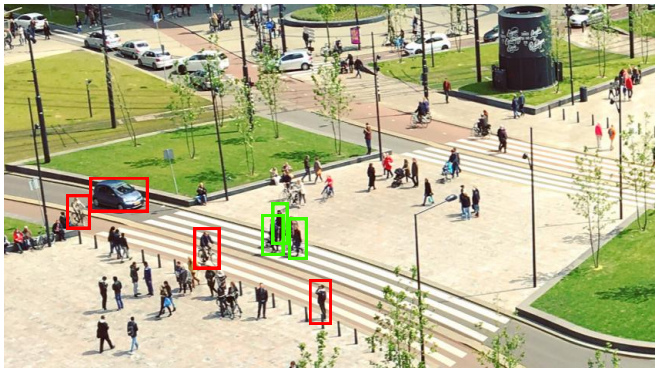


Yellow line overstepping detection
Overcrowding detection
Intrusion detection
Detection of people/vehicles in non-entry or dangerous areas
Abandoned object / spilled load detection
Automatic smoke & fire detection
Empty carriage detection
Integration into railway traffic control systems

Fields of application

➔ City surveillance

In urban areas anything can happen, anytime. Being everywhere is impossible. This is why video analytics are essential in detecting automatically and in real time situations or events which may affect the safety of people and the security vehicles of goods and infrastructures.



Intrusion detection
Abandoned object detection
Detection of stationary vehicles
Spilled load detection
Queue / speed drop detection
Accident detection
Integration into IT systems: traffic monitoring, civil defence, etc

➔ Retail

Video analytics modules complement video surveillance systems to ensure the highest security in points of sale and shopping malls, in addition to providing business support thanks to the automatic detection of empty shelves, missing products, queues at check-out and the analysis of client flows in different departments.

Perimetral protection and intrusion detection
Abandoned object detection
Overcrowding detection
Automatic smoke & fire detection
In-store analytics to optimize the point-of-sale management
Heat map to analyze customer flows inside the point-of-sale

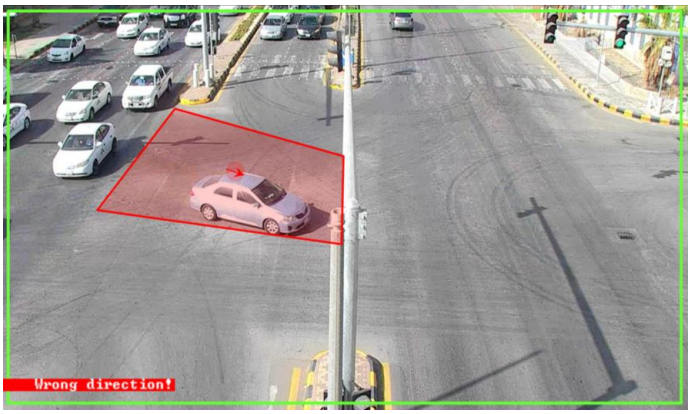
➔ Industrial sites

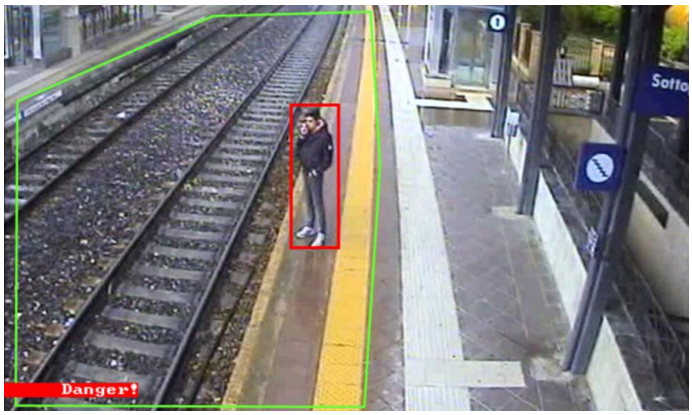
AiVu-Smart Modules guarantee complete, round-the-clock control of any industrial site, no matter how large, hazardous or inaccessible: theft of raw material and goods, accidents, sabotages and other events which may interrupt production and pose a threat to workers' safety can be detected in real time.

Perimetral protection and intrusion detection
Detection of people/vehicles in non-entry or dangerous areas
Abandoned object / spilled load detection
Overcrowding detection
Automatic smoke & fire detection
Tracking of vehicles/pepole

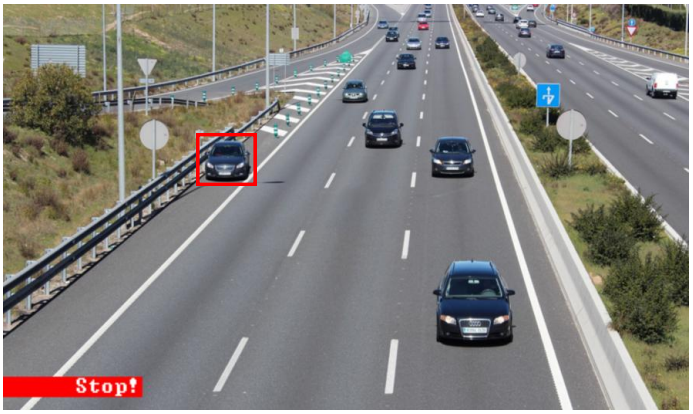
AiVu-Smart Modules features

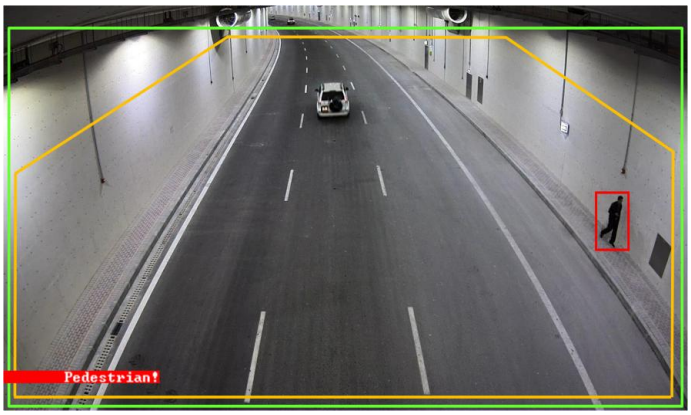
- Modular video analytics platform for the design of solutions tailored to the Cusotmers' needs
- Easily expandable with new functionalities
- User-friendly web-based configuration interface that does not require specific know-how
- In case of variations in video camera positioning, full functionality may be restored simply by re-defining the virtual sensors
- Real-time detection of critical events and support for proactive decision-making for preventive actions
- Increased operating efficiency and reduced response times in case of emergencies
- Post analysis on recorded video streams to detect events without having to browse hours of recordings
- Automatic forwarding of alarms and relevant recordings to the control centre and to hand-held devices
- Simple configuration procedures, allowing even non-video analytics experts to manage the system
- Default values and/or advised interval ranges for each parameter
- Machine learning, data analysis and design of neural networks for even more reliable video analytics
- Integration in third-party systems (i.e. railway traffic control systems, traffic management, SCADA , etc)
- Use of heat maps and counters for computing statistics and business intelligence analysis





Compatibility





Aitek is a technological partner of world-leading video-camera manufacturers. Providing Clients with secure and reliable solutions, always.

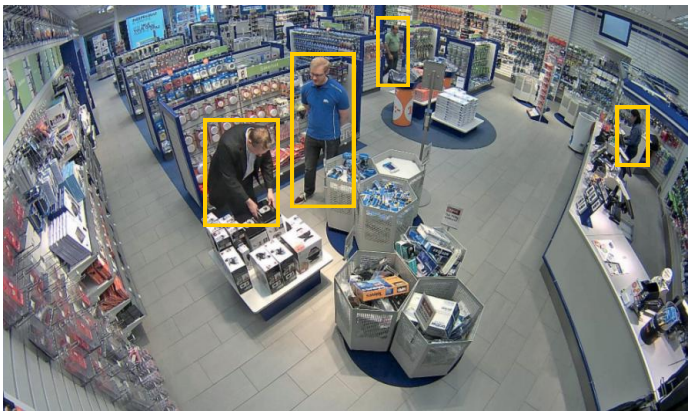
AXIS COMMUNICATIONS COMPATIBLE APPLICATION

BOSCH Integration Partner Program - Member

HIKVISION

The AiVu software is compatible with all video camera and video server models compliant with ONVIF 2.0 profiles S produced by the main industry-leading manufacturers.

ONVIF | S



Aitek S.p.A.
Via della Crocetta, 15
16122 Genova - Italy
Ph. +39 010 846731
Fax +39 010 8467350

www.aitek.it

info@aitek.it