

# AllGoVision Operation Statement

## Video Analytics

Version 3.7

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## PURPOSE

The purpose of the document is to present the AllGoVision Advanced Video Analytics Solution installation and operation consideration for real time threat detection. This will outline Installation requirements and operation requirements of the solution for the use case.

## BACKGROUND

The video analytics technology evaluates the contents of video to determine the specific information about the video contents. The product analyses rapidly the video from surveillance cameras for specific data, behaviour patterns, tracking movement of people/objects in monitoring zones etc.

AllGoVision will provide the software and support to achieve the following objectives.

- Intrusion Detection – Tripwire
- Intrusion Detection - Trespass
- People Counting
- Loitering Detection
- Crowd management - Crowd Detection, Crowd Counting, Crowd Flow Analysis
- Left Behind Object/Abandoned Object Detection
- Missing Object Detection
- Wrong Way Detection / Flow control / Directional control
- Tailgating Detection
- Illegal Parking / Stationary Object Detection
- Congestion detection
- Speeding detection
- Camera Tampering
- Advanced Motion detection
- Queue Management / Queue Analysis
- Parking Availability Detection / Parking Management
- Face Detection & Face Capture
- Face Recognition
- Face Analytics Features: Face Count, Face Presence, Face Frequency
- Demographic Analysis: Age Detection, Gender Detection
- Auto PTZ Features: Smart Auto PTZ, Continuous Auto PTZ, PTZ Handoff, PTZ Pre-set Analytics
- Video Stitching
- Video Smoke & Fire Detection

**Note:** Site Survey may be necessary during installation for adjusting camera placement to improve performance.

## INSTALLATION AND SUPPORT

AllGoVision is easy to install and fine-tuned software for Analytics. The fine tuning support provided for calibration of scene for performance improvement for below mentioned video analytic features.

1. Crowd Detection
2. Counting (Objects, People, Vehicles)
3. Left Behind Object Detection
4. Missing Object detection
5. Speeding Detection
6. Smoke Detection
7. Auto PTZ Control
8. Face Capture, Face Recognition
9. Video Stitching

## SYSTEM HIGHLIGHTS

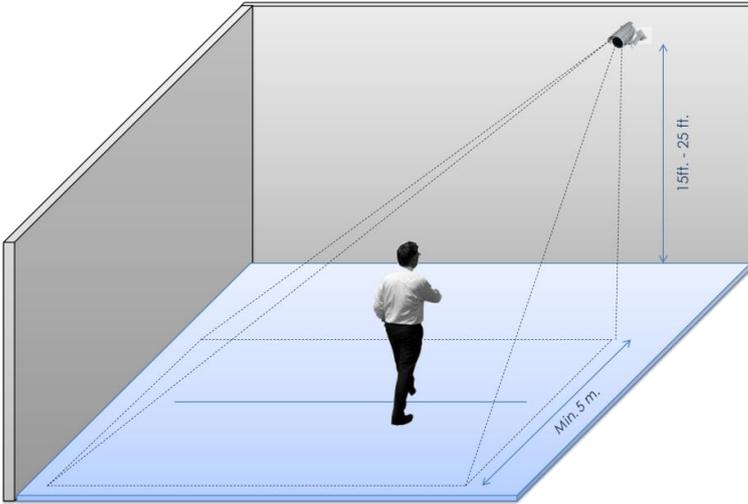
AllGoVision Analytics is integrated with VMS or with Direct Camera.

- 1) AllGoVision analytic server receives video stream from VMS or directly from camera.
- 2) AllGoVision performs analytic operation and sends alarms. The alarms can be seen either in integrated VMS clients or in AllGoVision Viewer client.

## INSTALLATION SCENARIO

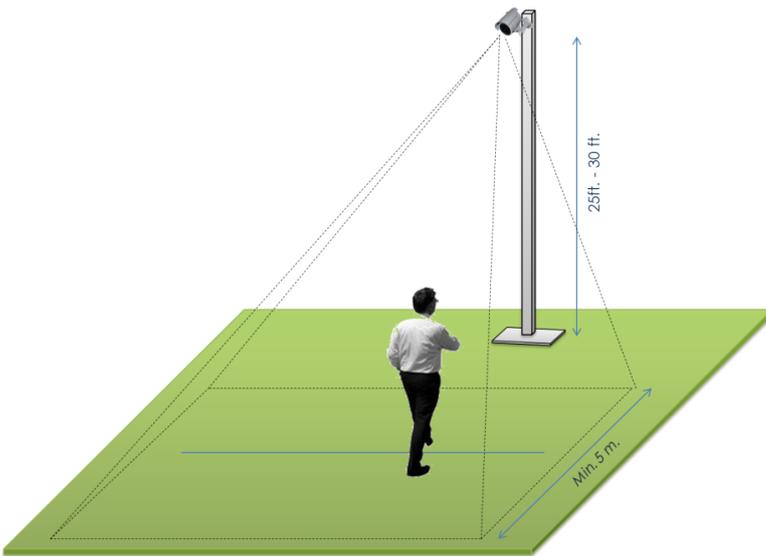
Camera installation requirements are different at different places for different types of video analytics:

### General Camera Setup - Indoor



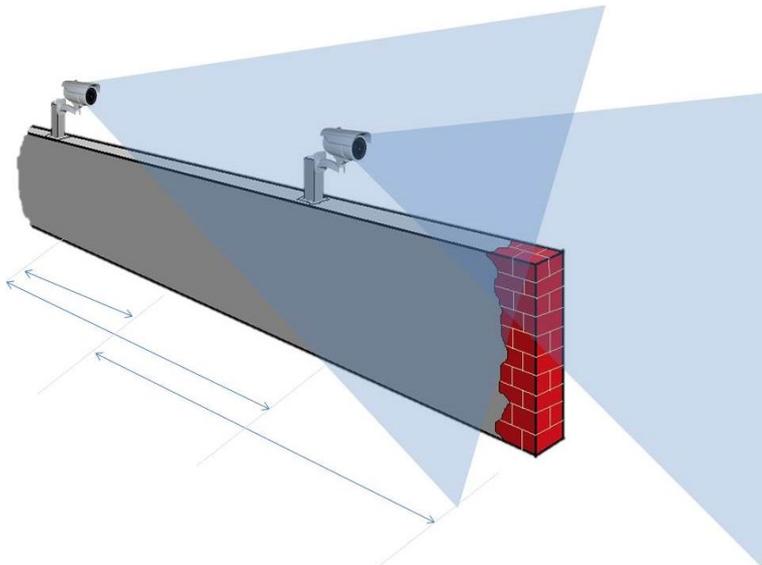
Angular Camera  
Height of Installation (Indoor) = 15-25 feet  
Focusing towards the monitoring zone  
No occlusion scenario

### General Camera Setup – Outdoor



Angular Camera  
Height of Installation (Outdoor) = 25-30 feet  
Focusing towards the monitoring zone  
No occlusion scenario

### Perimeter Camera Setup for Intrusion Detection

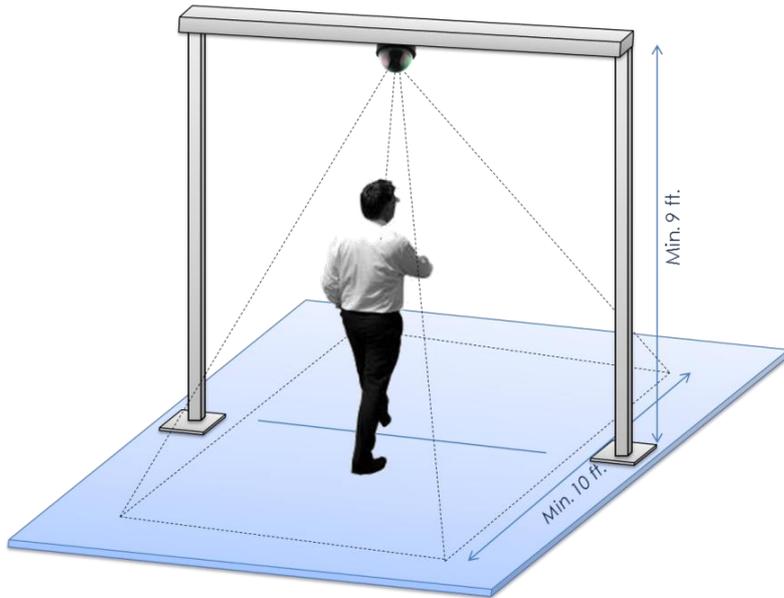


Angular Cameras  
Height of Installation = 15 feet  
To be placed along the boundary wall  
There should not be occlusion due to trees etc.

The distance between adjacent cameras = effective length = camera range – blind spot.

Example: for a camera installed at 15 ft height, with camera tilt of 5 degrees, focal length of 23 mm, camera resolution of 1920 x 1080 pixels, the effective length between adjacent cameras = 100m (=Camera Range 127m – Blind Spot Distance, 27m)

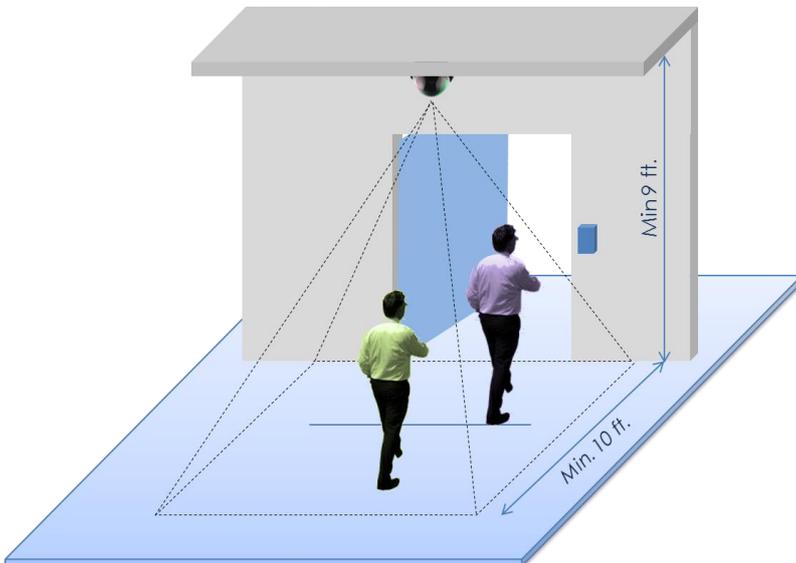
Camera Setup for People Counting



Overhead Camera

Height of Installation = minimum 9-10 feet  
 Focusing over the area where people are traversing through a narrow passage.  
 The distance covered in the camera view along the movement direction = minimum 10 ft.  
 No occlusion scenario

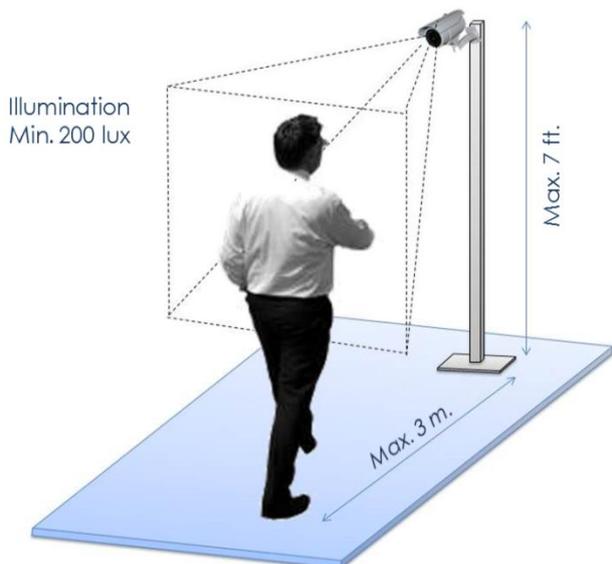
Camera Setup for Tailgating Detection



Overhead Camera

Height of Installation = minimum 9-10 feet  
 Focusing over the area where people are entering / exiting through accessing gate  
 The distance covered in the camera view along the movement direction = minimum 10 ft.  
 No occlusion scenario

Camera Setup for Face Capture & Face Recognition



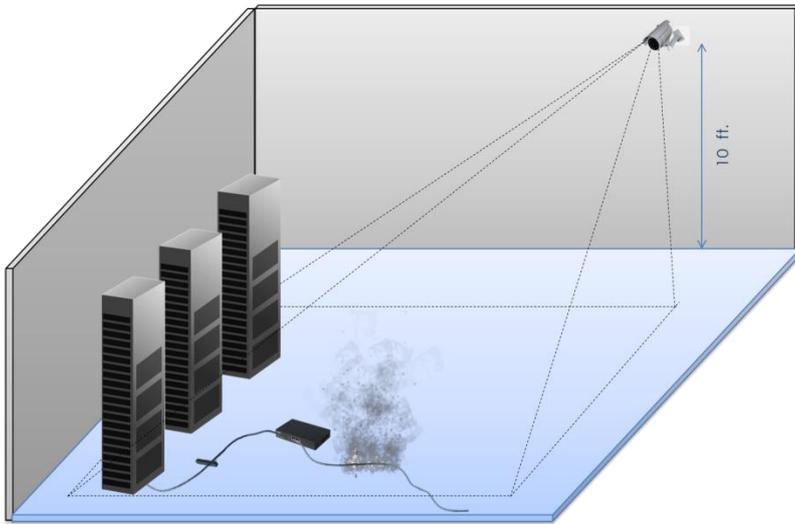
Angular Camera

Height of Installation = 6 - 7 feet

For greater height of installed camera, appropriate lens should be used and angle of incidence for face detection should be maximum 10 degree.

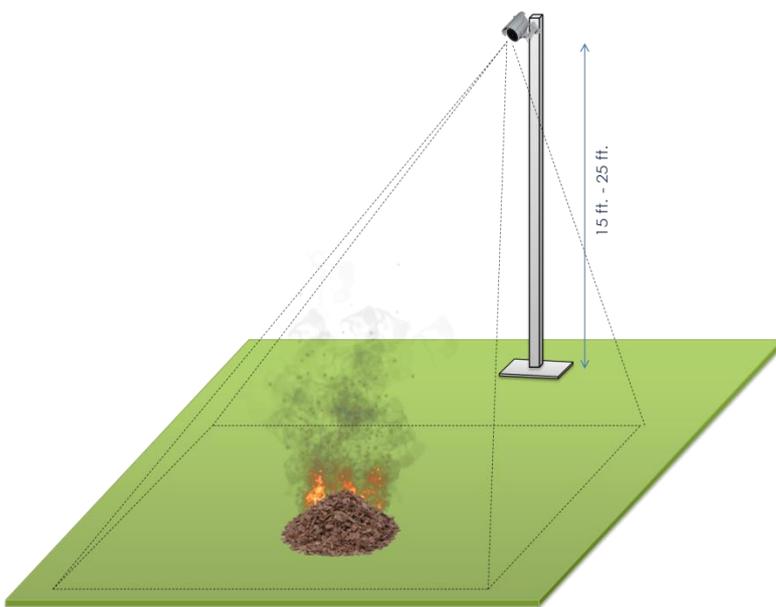
Camera should be facing the persons coming towards the camera with their front profile.  
 Distance between Camera & Person = max 3 m.  
 Distance depends on resolution of image (minimum 60 and 100 pixels required between the eyes for face detection and recognition)  
 Illumination to be maintained = min. 200 lux.  
 No occlusion scenario.

Camera Setup for Smoke & Fire Detection (Indoor)



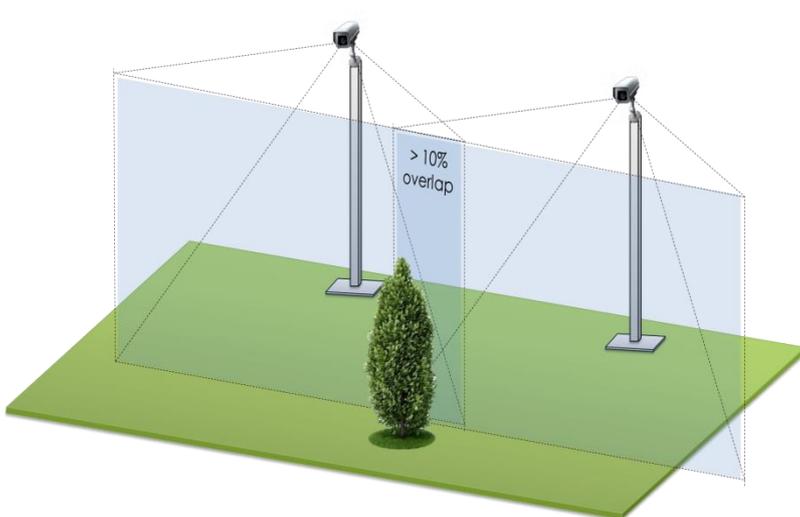
Angular Camera  
Height of Installation (Indoor) = approx. 10 feet  
Focusing towards the monitoring zone  
No occlusion scenario

Camera Setup for Smoke & Fire Detection (Outdoor)



Angular Camera  
Height of Installation (outdoor) = 15 - 25 feet  
Focusing towards the monitoring zone  
No occlusion scenario

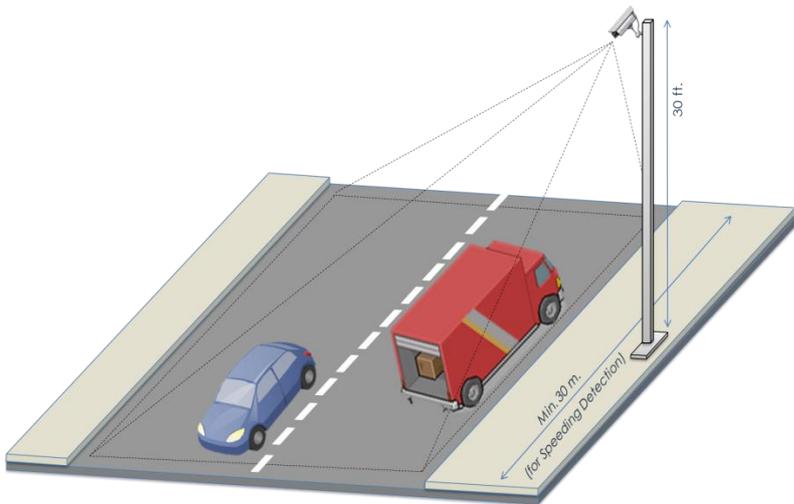
Camera Setup for Video Stitching



Angular cameras typically along the periphery  
Ideal conditions for effective stitching:  
Adjacent cameras with min 10% overlap of view  
The camera views should have common object  
Should be installed at uniform height and depth  
Should not to have high variation in zoom levels  
Should have same resolution and frame rate  
Steady background during Installation for the system to be stable and adaptive. Once installed in steady background without many movements in the scene, stitching can provide good results even if, later, there are movements and objects motions across the views.

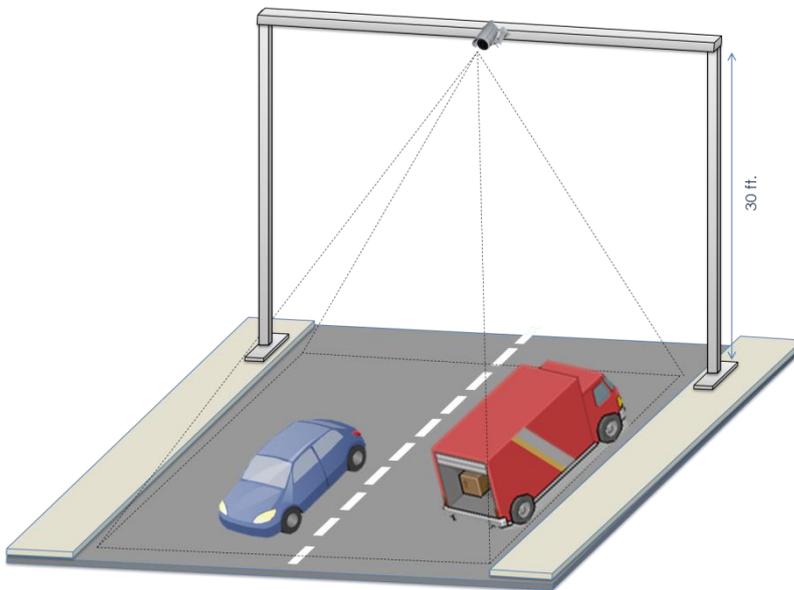
Non overlapped cameras are simply stitched together side by side to create single view.

Camera Setup for Vehicle Counting, Illegal Parking, Wrong Way Detection, Speeding Detection



Angular Cameras,  
Height of Installation (outdoor) = 30 feet  
Cameras installation should be parallel to the road facing the monitored zone.  
Moving traffic (no-congestion) scenario.  
For speed measurement the view should cover min. 30 m. length (along the motion-direction).

Alternative Camera Setup for Illegal Parking & Vehicle Counting



Vehicle Counting and Illegal parking shall also be detected with overhead/angular camera installed from a bridge over the road / highway.  
Height of Installation = 30 feet

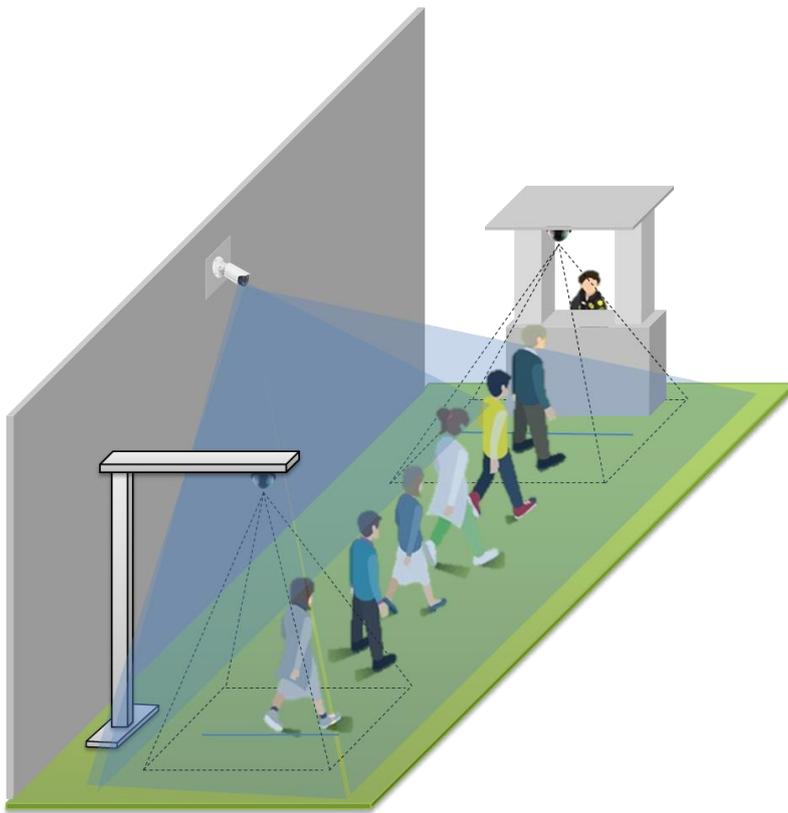
Camera Setup for License Plate Detection (Capture) & Recognition



Detection and recognition of license plates for Vehicles facing / moving towards the camera.  
Height of installation = approx.4 feet  
Camera focus has to be adjusted such that the license plate covers min.15-20% of camera view

Good quality camera with high shutter speed.  
Full HD, 120 DB WDR, 30 fps Frame rate required.  
Illumination =min 200Lux. With night IR illuminator

### Camera Setup for Queue Management



IP dome cameras installed overhead at the entry and the exit points of the queue.  
Height of Installation = min. 10 feet  
Camera views should cover the stepping in the queue & stepping out of the queue.

A third angular camera can be optionally placed for the overview across the queue length for matching the results.

Queue management feature can be run with either two overhead cameras above entry and exit of queue or with single camera overlooking the length of the queue (for smaller queues).

No intermittent entry and exit to be ensured midway through the queue. Queue barriers / guide rails to be available for maintaining both the straight and zigzag queues.

## FUNCTIONAL AND PERFORMANCE SPECIFICATION

### Operational Scenarios

#### Intrusion Detection (Tripwire & Trespass)

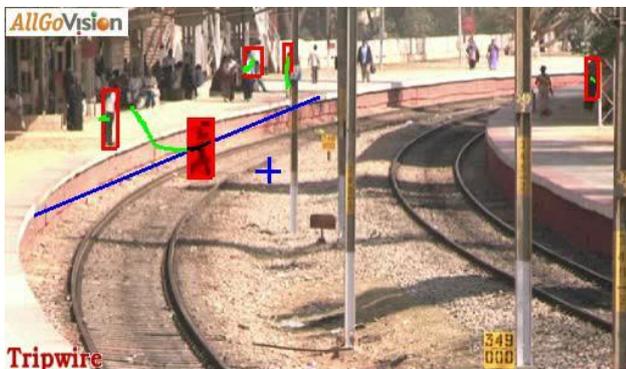
The feature will detect intrusion of a person or vehicle into any forbidden area or movement towards such area beyond a line. The rules can be defined either by defining virtual area or virtual line. Tripwire can enable unidirectional or bidirectional intrusion. For Trespass, the polygonal area can be created with up to 10 lines.

#### Normal Scenario

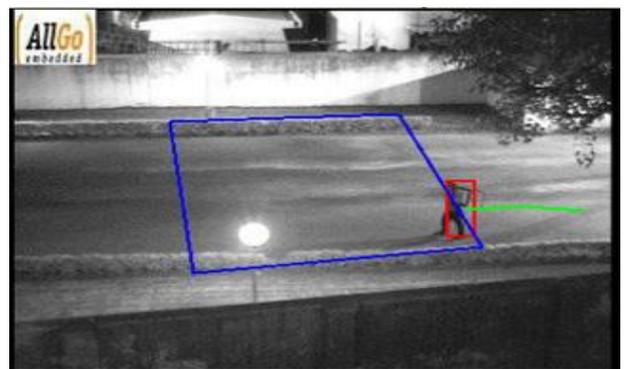
1. Tripwire: The person or vehicle is not touching or crossing the virtual line
2. Trespass: The person or vehicle is not inside the restricted area or alarm area and not moved into it.

#### Alarm Scenarios

1. Tripwire: The person or vehicle crossed or came in the contact of the virtual line. The alarms are sent for crossing line in the specified direction by Tripwire.
2. Trespass: The person or vehicle entered into restricted area or alarm area. The alarms are sent for entry into an area and exit from the area.



Tripwire alarm with object path tracking



Trespass at night

## People Counting

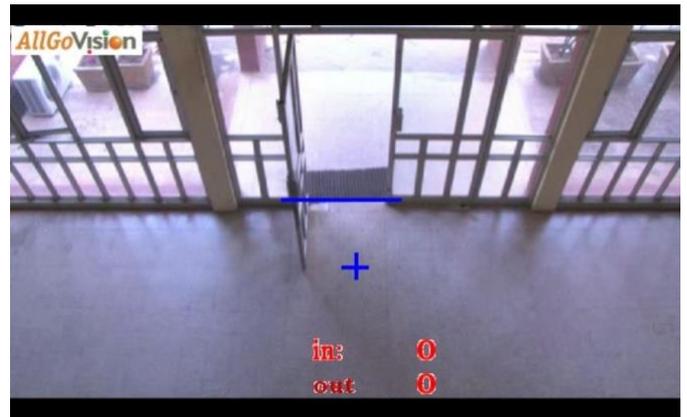
The feature will count the people and provide statistical results. The counting can be done for both directions, like people coming in and going out through the gates.

### Counting Scenario

1. Over Head Camera – The people walking in the scene. Counts the people crossing the line
2. Angular Camera – The camera is fixed in angular direction. It counts the people crossing the line.



People count normal scenario



People counter

The counting is provided by drawing single line for both directions. The people should be visible 4ft before the line and 4ft after the line. For overhead people counting ceiling height for camera installation is 9ft-15ft. The people can walk alone or together.

The calibration setting is required for people counting. Different calibration settings are provided for overhead and angular people counting. There are different options provided to handle trolley, crowd and count based on heads. The frame rate should be 25 fps.

The report generation is provided for the counting. The report generation can take starting time and ending time and generate report for each camera. The report generation can include plots (JPG format) at different intervals as well provides CSV report.

The accuracy can drop due to crowded scenario or shadows.

## Loitering

The loitering detection feature detects people or object (like vessel or vehicle) loitering in an area beyond specified time. The detection time is set in seconds and gives alarm for up to few minutes. The minimum and maximum size of the object can be set. This feature can also be used for advanced motion detection. The frame rate should be at least 15 fps.

### Normal Scenario:

1. Person walking or moving around or part stationary in the scene inside an area below a specified period.
2. Object is moving around or part stationary inside an area below a specified period.

### Alarm Scenario:

1. Person walking or moving around or part stationary in the scene inside an area beyond a specified period.
2. Object is moving around or part stationary inside an area beyond a specified period.



Person loitering in an area

## Left Object Detection

This feature detects objects left behind by person. The left behind object detection identifies owner and if the owner is leaving behind the object and is not in the scene, the object is detected as suspicious object and alarm is generated.

### Normal Scenario:

1. Person walking and present in the scene.
2. Person present with the baggage adjacent to it or carrying it.

### Alarm Scenario:

1. Owner leaves the object and goes out of the scene. The object is unattended for more than pre-defined duration.
2. Owner leaves the object and goes out of the scene. The object is occluded by some other person when walking across. The object is uncovered and no one attends it for a preset duration.

The detection time is set in seconds and gives raise alarm for up to minutes. The minimum and maximum size of the object can be set. The static left object detection is also provided where the owner of the left object need not be identified for sending alarms. The motion sensitivity of stationary object (due to noise in object stationarity) can also be altered using advanced settings.



Person carrying or with the bag – No Alarm



Person leaving the bag behind – Left Object Detection

## Crowding Detection

This feature will detect assembling of crowd. It sends alarm when crowd exceeds pre-defined threshold. There is also another type of crowd detection (Congestion detection) where crowd exceeds predefined percentage inside the area.

### Normal Scenario

1. There are many people moved inside the area but it doesn't exceed the strength.
2. The number of moving people is less than the pre-specified percentage of area.

### Alarm Scenario

1. The people assembled inside the area exceed predefined count.
2. The moving people inside the area exceed predefined percentage.

In case of crowding event, alarms are sent at regular interval till crowd recedes.



Crowd Detection – when count exceed the predefined count

## Missing Object Detection

This feature will detect removal of object which is present in the scene for long time in a defined area.

The minimum and maximum size can define size limit for the object. The motion sensitivity settings (via unit distance setting) will control false alarms

### Normal Scenario

1. Object is present in the scene for long time

### Alarm Scenarios

1. The object present in the scene for long time is removed

## Wrong Way Detection / Flow Control / Directional Control

This feature will detect object (vehicle/person) moving in wrong direction in the scene.

### Normal Scenario:

1. The person is walking in proper direction.
2. The vehicle is moving in proper direction.

### Alarm Scenarios

1. The person moving in the wrong direction defined by the user in the scene.
2. The vehicle moving in the wrong direction defined by the user in the scene.



Wrong way detection for vehicle

## Illegal Parking/ Stationary Object Detection

This feature detects Vehicle or object (like vessel or person) stationary in an area beyond specified time. The time is specified in seconds.

The detection time is set in seconds and gives raise alarm for up to several minutes (longer duration). The minimum and maximum size of the object can be set.

### Normal Scenario:

1. Vehicle or object stationary in the scene inside an area below a specified period

### Alarm Scenario:

1. Vehicle or object stationary in the scene inside an area beyond a specified period



Illegal parking detection

## Speeding Detection

This Speeding Detection feature detects vehicle speeding (or a person running) beyond specified limit. The speed limit is specified in kmph.

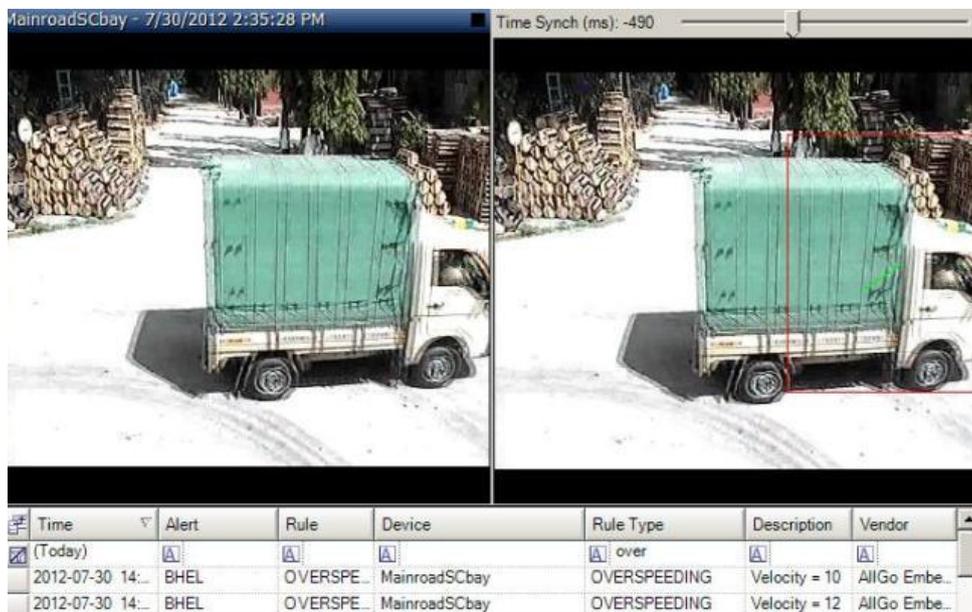
The installation requirement is that the camera needs to be parallel to the road. The coverage of the camera should be at least 30 m. The vehicle should run along the road. The frame rate should be minimum 25 fps.

### Normal Scenario:

1. The vehicle below speed limit. No alarms are sent.

### Alarm Scenario:

1. The vehicle is above speed limit.



Speeding Detection

## Video Smoke Detection

This feature detects Video Smoke in large indoor and outdoor area. It is an early warning feature.

The camera should be installed angular. The detection time and sensitivity can be set. The detection time is at least 5 sec. Higher sensitivity means the better detection but more false alarms. Lower sensitivity means very few false alarms but drop in detection accuracy. The frame rate should be 25 fps. User to define the minimum and maximum size for the smoke.

### Normal Scenario:

1. There is no smoke generated.

### Alarm Scenario:

1. The smoke is generated. The smoke covers 10-15% of the view. The smoke is medium or high density



Smoke Detection

## Face Capture

This feature detects human face present in the camera view and can also capture those faces record keeping.

Single or multiple faces can be detected. Sensitivity adjustments are provided. Lower complexity results in drop in detection accuracy. The frame rate should be 15 fps. Detail on lighting condition is provided in the "installation scenario" section earlier in this document.

### Alarm Scenario:

1. The camera is angular, typically installed at a height of 6-7 feet and the view covers up to 10 ft. For greater height of installed camera, appropriate lens should be used for covering larger distance and angle of incidence for face detection should be maximum 10 degree. People face is visible in front of the camera. Distance between the eyes should be greater than 60 pixels. In such a scenario the face detection alarm is initiated.



Face Capture

## Face Recognition

This feature matches the Face detected with the registered faces in the database and sends alarms based on matched (recognized) or unmatched (unrecognized) face.

The camera should be generic IP cameras with good quality at Angular direction. The camera is able to track the detected face when it is moving and does not generate multiple alarms. The face recognition works at various resolutions above 640x480 and frame rate above 10 fps.

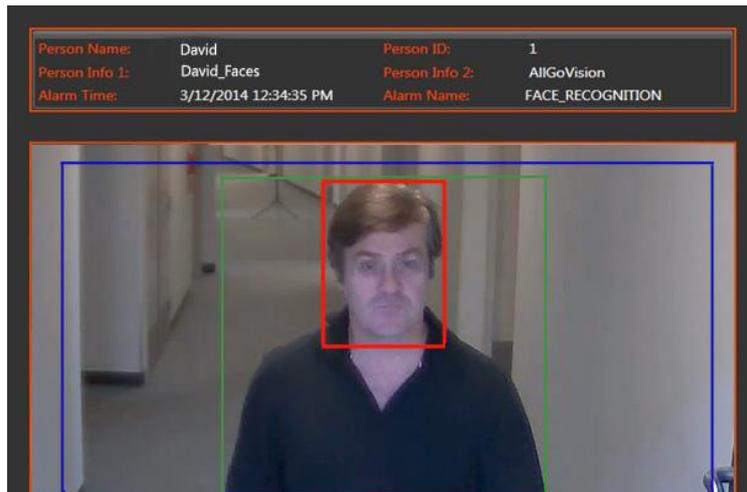
The camera installation should be Angular at a height of about 1.7 m facing the region where people can walk towards camera. The height of installation depends on resolution. The pixel distance between eyes should be above 60 pixels for detection. The pixels between eyes for Face registration is above 100 pixels.

People face should be visible in front of the camera, covers typically up to 10 ft. For greater height of installed camera, appropriate lens should be used for covering larger distance and angle of incidence for face detection should be maximum 10 degree

The environment is indoor as well as outdoor. The illumination should be above 200 lux. Good constant illumination should be maintained throughout the day.

### Alarm Scenario:

1. The people who are walking towards camera are recognized. The face detection allows  $\pm 20$  degree tilt in both x and y direction. Upon Face recognition it is alarmed whether it is accepted or rejected. The recognized person details are displayed in real time.



Face Recognition Alarm

## Queue Management

This feature detects queue waiting time and queue length (number of people in the queue).

### Queue Analysis Scenario:

1. Overhead IP cameras to be installed at the entry into the queue and exit from the queue.
2. Single camera can be used for both entry and exit of queue only for small straight queue.
3. For standard size queue there should be overhead cameras both at entry and exit.
4. An overview camera covering across the queue can be optionally placed for matching the results with overhead camera.
5. Queue line can be straight queue or zigzag (snake) queue.
6. The queue should be managed by railings and entry and exit line is provided.
7. The counting accuracy may be affected if baggage is involved.

The number of people entered into queue and exited from queue is sent. The waiting time is sent.

**Ingress** – count of people coming into queue

**Egress** – count of people coming out of queue

**Waiting time** – Waiting time in the queue



Schematic of Queue Management

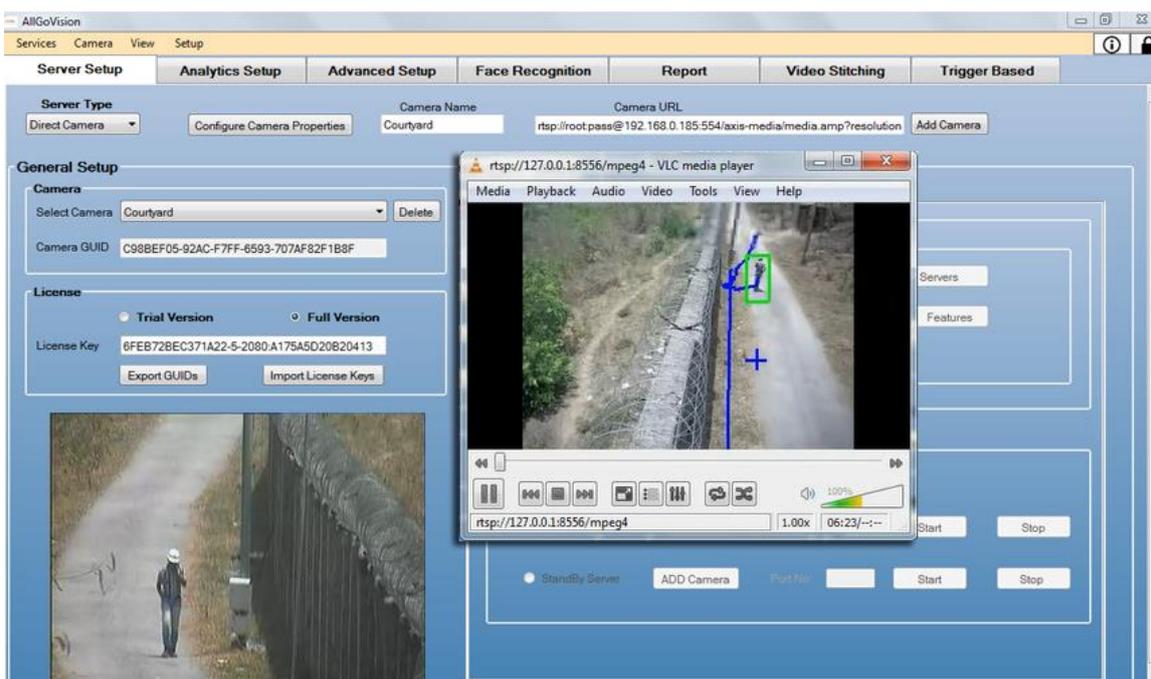
## Auto PTZ Control

This feature provides 3 types of Auto PTZ control.

1. Smart Auto PTZ - This feature allows automatic one step PTZ operation to capture closer video of violator as well as monitoring of violation with closer capture of violator for evidence.
2. Continuous Auto PTZ - The feature will continuously track single object with Pan, Tilt & Zoom.
3. PTZ Handoff – With this feature, violation detected on any Fixed camera triggers PTZ camera to its view for auto tracking of object
4. PTZ Pre-set Position Analytics – This feature enables a PTZ camera to zoom to different pre-set positions and run analytics in that specific zone in the zoomed view in a periodic way.

### Alarm Scenario:

1. Smart Auto PTZ – Analytics rules like Tripwire or Trespass is set for the PTZ camera. If there is any violation of rules, the automatic zooming into violator is initiated by software. The PTZ operation is done directly issuing command to camera (if supported) or through VMS. The camera installation will be similar to detect any violation of rules
2. Continuous Auto PTZ - This feature can continuously track single or multiple objects. This feature is used for Intrusion detection. Camera installation is similar to Intrusion detection.
3. PTZ Handoff - Whenever any triggering event such as line crossing happens in fixed camera view, the PTZ camera moves to a position and starts tracking that object. There can be one fixed camera with multiple PTZ cameras.
4. PTZ Pre-set Position Analytics – Analytics rules are configured for different pre-set positions and the PTZ camera while in patrolling mode, zooms into each pre-set and detects any defined rule violation in the zoomed view.



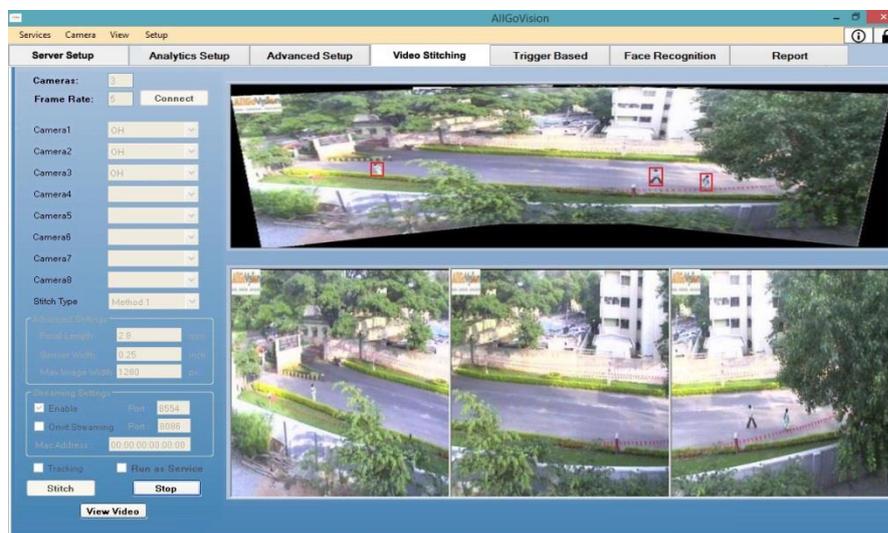
PTZ Handoff: Tripwire in Fixed Camera View (Overlay Video) triggers PTZ camera to get closer view

## Video Stitching

This feature stitches the video of overlapped view cameras and creates a larger view. The objects are tracked in the larger view.

### Stitching Scenario:

1. Outdoor: Cameras looking down from high altitude across the open grounds like parking lots, big pathways, campus premises, Road intersections etc.
2. Indoor: Cameras with unobstructed views of spacious rooms, long passages, uniform depths of views across the cameras in the premises
3. Installations can be made both indoor and outdoor.
4. Single camera brands for all the cameras produces better stitching.
5. Camera should not have high variation in zoom levels
6. Camera should have same resolution and frame rate
7. Installation should be made at places where there is a wide view of larger area at equidistance from the cameras. If the views vary with distance to nearest landscapes across the cameras, the stitched image might produce variable results.
8. Best performance when installed during the steady background scenario for the system to be stable and adaptive. Once installed in steady background without many movements in the scene, stitching can provide good results even if, later, there are movements and objects motions across the views.
9. Works for 10%-100% overlap for stitching. If there is no overlap, images are displayed side by side
10. The setup effort is one time. Stitched Video is seen continuously after that.

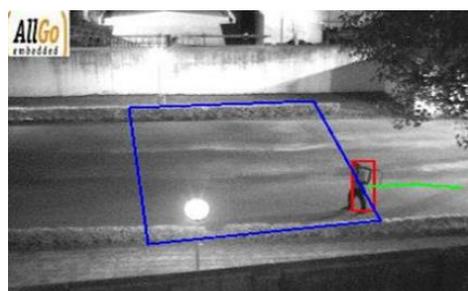
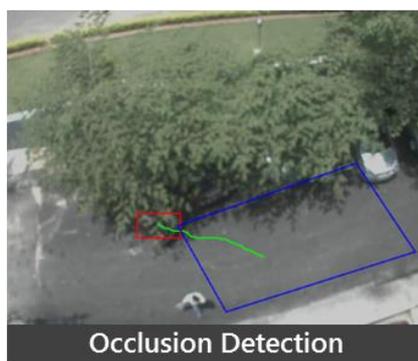
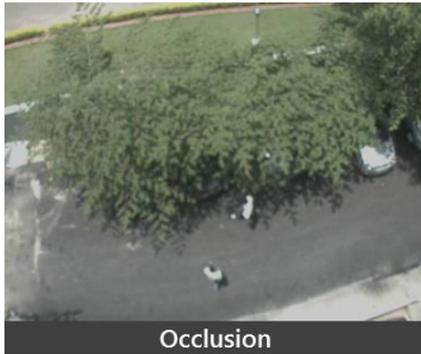


Video stitching

## DETECTION CAPABILITY

The algorithms are robust to

1. Sudden or gradual illumination change
2. Environmental change like Wind, rain, hail
3. Tree Swaying
4. Occlusion
5. Crowd



The following occurrences may cause false alarms

- 1) Tree Swaying
- 2) Day to Night, Night to Day camera video transition
- 3) Strong shadows

The system shall respond to the following:

Scenario	Action	Response
1	Person (s) standing, running or walking along the detection zone for left object alarm.	Ignore
2	Litter or birds or animals that is smaller than the defined size is present in the area.	Ignore
3	Stationary objects smaller than defined area inside the region	Ignore
4	Gradual or sudden illumination changes	Ignore
5	Wind, rain, hail	Ignore
6	Left behind object in an empty scene or less crowded area.	Alarm
7	Missing object from an empty scene or less crowded area	Alarm
8	Crowd/Vehicle density above threshold	Alarm
9	Crowd/Vehicle density below threshold	Ignore
10	Person/Vehicle travelling in the wrong direction	Alarm
11	Person/Vehicle attempt to enter an unauthorized area	Alarm
12	Crowd/Vehicle congestion in an given area	Alarm
13	Person loitering suspicious behaviour in an empty scene or less crowded area	Alarm
14	The vehicle clearly speeding above the speed limit when travelling in a lane	Alarm
15	The vehicle parking in a zone more than defined time limit	Alarm
16	There is a dense smoke generated in a larger indoor area or outdoor	Alarm

## SPECIFICATIONS

Features	Camera Angle	Camera Height*	Minimum Pixels	Light Requirement	Indoor/Outdoor	Resolution	Detection rate
Intrusion detection	Angular	Above 4 m	200 (10x20)	> 1 Lux	Indoor or Outdoor	320x240 or 352x256, up to 1080p. Any resolution can be down sampled appropriately.	>90%
Left Object detection or Missing Object Detection	Angular	Above 5m	200-400 (10x20, 20x20)	Good (> 10 Lux)	Indoor or Outdoor	320x240 or 352x256, up to 1080p. Any resolution can be down sampled appropriately.	>80% Indoor, >60% outdoor
People counting	Overhead or Angular	Above 3m (overhead) Above 4 m Angular	400 (20x20)	> 5 Lux	Indoor	320x240 or 352x256, up to 1080p. Any resolution can be down sampled appropriately.	>90% overhead >80% angular
Crowd Detection and Loitering	Angular	Above 6 m angular,	10x10	> 5 Lux	Indoor or Outdoor	320x240 or 352x256, up to 1080p. Any resolution can be down sampled appropriately.	>90%
Face Detection	Angular	1.5-2m	60 pixels between eyes	>100 Lux	Indoor or Outdoor	640x480 or 720x576. . up to 1080p. Any resolution can be down sampled appropriately.	>90%
Face Recognition	Angular	1.5-2m	100 pixels between eyes	>200 Lux	Indoor or Outdoor	640x480 or 720x576. . up to 1080p. Any resolution can be down sampled appropriately.	>85%
Fire & Smoke Detection	Angular	> 3m	10-15% of total resolution	>10 Lux	Indoor or Outdoor	320x240 or 352x256, up to 1080p. Any resolution above will be down sampled appropriately	>90%
Wrong Way detection	Angular	> 4m and parallel to road and at a coverage distance on road > 10m	20x20	>10Lux	Indoor or Outdoor	320x240 or 352x256, up to 1080p. Any resolution above will be down sampled appropriately	>90%
Speeding detection	Angular	> 5m and parallel to road and at a coverage distance on road > 30m	30x30	>50Lux	Indoor or Outdoor	320x240 or 352x256, up to 1080p. Any resolution above will be down sampled appropriately	+/- 10Kmph

\*With suitable lens adjustment, the height can be changed for greater coverage area. Refer focal length V/s. coverage area calculation from Camera Manufacturers.

## SERVER UTILIZATION

Following table provides server utilization for different analytics features when run on a video of given resolution.

Feature	Resolution	Minimum Server Requirement (Video Analytics Processing)
Generic Features	240p	3 Channels / Core
People Counting	240p	2 Channels / Core
Smoke & Fire Detection	240p	2 Channels / Core
Video Stitching	480p	Core i7 (6 Core), 3 GHz for 3 Channels Video Stitching
Face Detection/Capture	720p	1.5 Channels / Core (9 Channels on a 6 Core Machine)
Face Recognition	720p	1 Channel / 2 Cores (3 Channels on a 6 Core Machine)
Face Counting & Analysis	720p	1 Channel / Core (6 Channels on a 6 Core Machine)
Age & Gender Detection	720p	1 Channel / Core (6 Channels on a 6 Core Machine)

**Note:** For specific project/application, get recommended server specification directly from AllGoVision