3×LOGIC

Edge Based Deep Learning Analytics
WHITE PAPER

Introduction:

3xLOGIC Edge Based Deep Learning Analytics cameras offer a new line-up that has all the leading-edge specifications and functionality you would expect from VISIX Gen III cameras, but with additional capabilities and processing power under the hood to provide powerful edge analytics capabilities. Our Edge Based Deep Learning Analytics cameras share many of the same specifications (camera housings, IP/IK ratings, etc.) so the look and feel of the cameras doesn't change. What does change is the ability to activate powerful analytics that can be pushed to local servers or the CLOUD

Specific analytics are specialized for the **3xLOGIC** platforms. For instance, edge-based Person, Object, and Vehicle detection capabilities are integrated to VIGIL CLOUD so that only actionable detection and notifications are delivered to you via email, SMS, or in-app notices. VIGIL Server provides support for Edge Based Deep Learning analytics for use cases such as perimeter protection, business intelligence and alarm notifications via VIGIL Server.

What is 3xLOGIC Edge Based Analytics?

3xLOGIC VISIX Cameras feature included Standard edge-based analytics engines supporting applications such as presence, object tracker, and camera tamper detection. 3xLOGIC X-Series network cameras have Edge Based Deep Learning Analytics included to suit a variety of business needs that require specialized detection.

Standard Analytics
(Included in VISIX Gen III Cameras)

VISIX Gen III cameras come with **Standard** analytics:

- » **Presence (Polygon and Line)**
- » **Object Tracker**
- » **Tamper Detection** (bagging, defocus, moving)

Edge Based Deep Learning
(Included with Edge Based 3xLOGIC X-Series Cameras)

VISIX X-Series Cameras are licensed with **Edge Based Deep Learning Analytics**

- » **Enter and Exit**
- » **Appear and Disappear**
- » **Stopped and Dwell Time filters**
- » **Abandoned and Removed Object**
- » **Object Direction and Tailgating**
- » **Counting and Counting Line(s)**
- » **Logical Rules and Non-detect Zone(s)**

What is Edge Based Deep Learning Analytics?

3xLOGIC Edge Based Deep Learning Analytics cameras use Object, People, and Vehicle trackers to accurately detect and track people, types of vehicles, and selected objects in dense and busy scenes. These deep learning models are trained from vast volumes of representative data reflecting challenging scenes containing people, objects, and vehicles. The camera continuously analyzes movements and behavior and uses predictive analysis to track each object constantly. No calibration on the camera is needed and the rules and object filters allow you to only classify what you are interested in. This filtering is particularly effective in improving accuracy or detecting complex behaviors in cases where person, object or vehicle detection is important.

Edge Based Deep Learning utilizes appearance-based models and are trained to locate objects, persons, and vehicles. This differs from motion-based solutions that solely depend on changes in pixels over time to indicate movement. These algorithms decrease the opportunity for false positives traditionally present from illumination changes or foliage as the trackers ignore these because they do not look like any of the objects of interest. Once an object begins tracking, a unique ID is assigned that stays with the object in the field of view. The ability to set up zones, presence lines, and directional interactions provides flexibility and performance in identification and notification.

How does Edge Based Deep Learning Compare to Other Solutions?

While some analytics utilize one tracking algorithm to detect all objects in all situations and use cases, **3xLOGIC** Edge Based Deep Learning Analytics have dedicated trackers that target retail applications, perimeter alarm monitoring and protection, and person/object/vehicle recognition and notifications. The availability of dedicated trackers allows for the enhancement of performance and adds further refinement to what needs to be identified. This adds a competitive edge to our analytics offering in the industry.

Deep Learning models and datasets that power these analytics are trained on specific use cases and not on data that is publicly sourced. Rather, industry specific fields of view, environments, camera image sensors, and focused use cases allow Edge Based Deep Learning Analytics to dramatically decrease false alarms and increase accuracy.

Where is Edge Based Deep Learning Analytics Most Effective?

3xLOGIC Edge Based Deep Learning Analytics has effective camera-based indoor as well as outdoor detection capabilities in dawn, daytime, dusk, and well-lit nighttime applications with visible light or sufficient IR illumination. As the analytics are visible light based, optimal results can be achieved in those lighting conditions. As with all visible light solutions, impacts from rain, fog, or other weather conditions may affect detection. It is recommended that all measures be taken to protect camera locations and that proper maintenance is performed to keep detection capabilities at an optimal level.

Regarding vehicle detection, speeds of 30 mph or less will produce optimal detection results. Highway or high-speed vehicle situations should be avoided for detection. If a highway is part of a scene requiring EBDL analytics, it should be set as a non-detection area.

Use Cases by Product and Verticals

VIGIL Server, VIGIL TRENDS:

The Edge Based Deep Learning X-Series cameras give you all of the tools you need for edge and server-based Business Intelligence with detection capability for person, object (bag), vehicle (truck, bus, van, car, motorcycle), cyclist, and bicycle using a variety of different rule sets. Using the **3xLOGIC** Edge Based Deep Learning cameras, business owners can gain valuable insight into their business with customer dwell time, line data, and people counting analytics. Combine this with the VIGIL Server Advanced Reporting engine w/POS, and you have all the tools you need for a server-based BI solution. The Edge Based Deep Learning X-Series camera is also fully integrated with VIGIL TRENDS and provides a window into your business and, combined with TRENDS powerful POS KPI engine, further provides value to Business Intelligence analytics from the Cloud.

Use Cases

» Perimeter Intrusion Protection
» People Counting
» Line Queue Dwell Time
» Vehicle Detection/Counting
» Alarm Notification via VIGIL Server

Verticals

» Small/Medium Business
» Commercial
» Education
» Warehouse/Shipping Yard
» QSR/C-Stores
» Finance/Brokerages/Credit Unions

Presence	Tamper Detection	Enter	Exit
When an object type is first detected within a selected zone	Detects interference events for selected camera(s)	When an object crosses from outside of a zone to inside of a zone	When an object crosses from inside of a zone to the outside

Appear	Disappear	Stopped Filter	Dwell Time
When an object starts being tracked inside a zone	When an object stops being tracked inside a zone	When an object stops in a zone for longer than a set period	When a moving object remains present in a zone past a duration

Object Tracker	Object Direction	Abandoned Object	Tailgating
On-screen tracker indicators display around objects	When object crosses line in a direction and meets criteria	When an object is left stationary in a zone for a specified time	When two objects cross a line or zone in a defined time

Counting	Counting Lines	Logical Rules	
Increases the count based on defined parameters	Increases the count when a line is crossed towards a set direction	Combines rules to create a complex filter to reduce false events	

VIGIL CLOUD:

3xLOGIC Edge Based Deep Learning X-Series Cameras, combined with the power of VIGIL CLOUD, gives you all the tools you need for edge-based person, object, and vehicle (car, truck, van, bus) detection and notifications using a variety of different rule sets. Up to four separate zones and detection rules can be configured per camera along with targeted notifications. The ability to track and detect what you want to see, along with timeline and side panel searches, allows an extensive overall view of what matters to you. For example, you may want to know when a restricted area is breached after-hours. Dealers can simply draw a zone and assign the Presence Detection rule and the customer can set the notifications schedule to send a text after-hours. Flexible rules, notifications, and extensive search capabilities make Edge Based Deep Learning a new tool in the in the VIGIL CLOUD platform.

Use Cases

- » Person/Object/Vehicle Detection
- » Perimeter Protection
- » Loitering Notifications
- » After-hours Indoor Notifications
- » After-hours Parking Lot Detection
- » Entrance Gate Monitoring

Verticals

- » Small/Medium Business
- » Quick Serve/Dining
- » Education
- » Finance/Brokerages/Credit Unions
- » QSR/C-Stores
- » Municipalities
- » Medical, Research, and Urgent Care
- » HOA and Real Estate

Presence	Stopped Filter	Enter	Exit
When an object type is first detected within a selected zone	When an object stops in a zone for longer than a set period	When an object crosses from outside of a zone to inside of a zone	When an object crosses from inside of a zone to the outside

Object Tracker	Object Direction	Dwell Time	
On-screen tracker indicators display around objects	When object crosses line in a direction and meets criteria	When a moving object remains present in a zone past a duration	