evolon Evolon Verify™ Manual Note: All information contained in this manual is Proprietary material of Evolon Technology, INC. Any copying or distribution, in any form, is prohibited without written permission from Evolon Technology, INC.

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Understanding Verify™

What is it?

Evolon Verify™ is a Scalable, Al-based (using a neural network) video event verification system.

What is a neural network?

A set of learned pattern-matching filters similar to model fitting (regression analysis) derived from a Training dataset (People & Vehicles such as cars, trucks, busses, and motorcycles).

How does it work?

A confidence score is applied to each result based upon how well the object matches the set pattern filter. The confidence score is not to be confused with probability, which would be the likelihood that the object is what we think it is. For example, 50% confidence score would mean a 50% match in the pattern whereas a 50% probability would mean a 50% chance of accuracy.

Differentiation

Evolon Edge™ and Evolon Enterprise™ are designed to "Detect-Track-Notify" for targets in a video stream and are based on motion. They are optimized for detection and do not classify targets. They detect human and vehicle targets, and exclude others based on their size and location in the scene. They do not discriminate and/or eliminate similarly sized objects to humans and vehicles.

Evolon Verify™ is designed to "Classify and Qualify" targets in a video clip or image, and to "Prioritize" clips for Central Station operator review. Verify does not require a video stream and works on individual images. It requires algorithms to determine motion from one image frame to the next in a video clip.

Object Classification

As of now, the system classifies objects into *Humans* and *Vehicles (cars, trucks, motorcycles)*. There are certain conditions that can impact the system's ability to accurately classify objects: Object size/pixels on target, range to target, contrast & lighting, motion characteristics, supported data models (e.g. if it's not in our data model, the system will not verify the object), and color v. thermal cameras. If you ever want the system to classify other objects, the system can be "re-trained" for additional object that are not included in our model. However, we currently do not support classification models for other objects such as forklifts, lawnmowers, or other moving objects. The addition of new data models will require a business case from the RSM.

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Motion Detection & Tracking

When detecting human motion, the system is looking for human *presence* in the scene rather than actual human motion. When detecting vehicle motion, the system bases the detection on three different motion types – smooth motion, "jerky" motion, and presence/absence as motion. The factors that impact motion detection and tracking include: Size of the object (the system must be able to classify the object across frames to track it), Video frame requirements (motion detection requires at least 2-3 video frames to confirm), and Frame rates (a minimum of 3 fps is recommended; higher for vehicle motion perpendicular to the camera Field of View).

Classification Accuracy

The Machine Learning Model Accuracy is typically determined by the number of correct results from all results of the model. Verify results are *not binary*, they are presented via classification confidence scores in %, above or below pre-set threshold percentages. Various approaches are used with AI data to optimize confidence scores for binary results (e.g. truth tables or confusion matrices, statistics, etc.). Each camera scene is different. When determining the best classification threshold % to set for a specific camera, a bias toward fewer "false negatives" will result in higher "false positives." Most Central Stations we've spoken to prefer this approach to reduce risk of missed (i.e. unreviewed) events by the operator.

Remember -- this doesn't mean missed by Verify, it means they may have been classified below the preset threshold %, but non-zero.

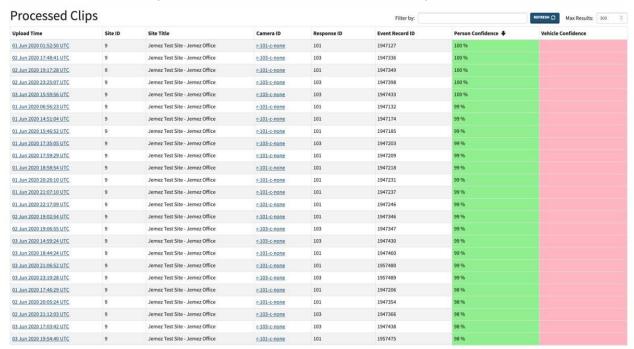
System Range

The # of pixels on target is primarily determined by the following: Distance from the camera, focal length of lens, contrast and lighting, camera resolution, camera angle, and video compression (e.g. h.264 → .mp4). We do not yet have explicit guidelines for these parameters for optimum performance, but we are working on them. As a general rule, higher quality video yields higher quality results. Fewer pixels on target will result in lower classification scores (%) and higher pixels on target and higher quality video always improve performance.

Verify™ Console

Processed Clips

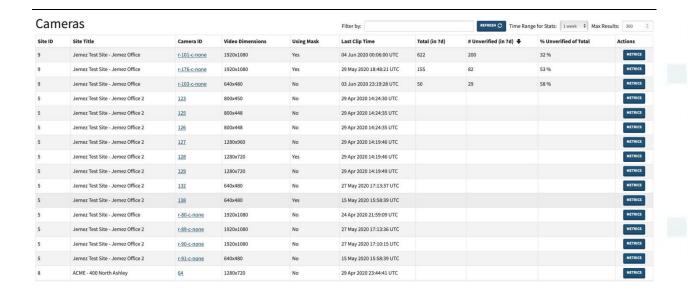
In this section of the Verify™ Console dashboard, you can get a list of all the video clips which have been processed by Verify™. For each clip, you'll also be able to: Get source metadata such as upload time, camera/site ID, event/response ID; Show the calculated confidence of person/vehicle detection.



Cameras & Sites

In both of these sections of the Verify™ Console dashboard, you can get a list of cameras, and a list of sites, from which video clips have been processed. Additionally, for each camera and site you can: Give statistics on how many clips have been processed from that site/camera over the last 1, 3, 7, or 30 days; Give statistics on how many of those clips were "unverified" (i.e. no person or vehicle was detected).

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Metrics

In this section of the Verify™ Console Dashboard, you can get metrics over a user-configurable period of time. These metrics are shown in a time-series histogram of the number of clips processed over the time of day, categorized (in stacked format) by the verification result (whether person and/or vehicle was detected). This histogram can be further broken down into three views: for a single camera only, for a single site only, or for the total of all sites/cameras.