



Evolon Verify™ Manual

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Understanding Verify™

What is it?

Evolon Verify™ is a Scalable, AI-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.

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 pre-set 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.

Processed Clips

Filter by: REFRESH Max Results: 300

Upload Time	Site ID	Site Title	Camera ID	Response ID	Event Record ID	Person Confidence ↓	Vehicle Confidence
01 Jun 2020 01:52:50 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947127	100 %	
02 Jun 2020 17:48:41 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947336	100 %	
02 Jun 2020 19:17:28 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947349	100 %	
02 Jun 2020 23:25:07 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947398	100 %	
03 Jun 2020 15:59:56 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947433	100 %	
01 Jun 2020 06:56:23 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947132	99 %	
01 Jun 2020 14:51:04 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947174	99 %	
01 Jun 2020 15:46:52 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947185	99 %	
01 Jun 2020 17:35:05 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947203	99 %	
01 Jun 2020 17:59:29 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947209	99 %	
01 Jun 2020 18:58:54 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947218	99 %	
01 Jun 2020 20:26:10 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947231	99 %	
01 Jun 2020 21:07:10 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947237	99 %	
01 Jun 2020 22:17:09 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947246	99 %	
02 Jun 2020 19:02:54 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947346	99 %	
02 Jun 2020 19:06:55 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947347	99 %	
03 Jun 2020 14:59:24 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947430	99 %	
03 Jun 2020 18:44:24 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947460	99 %	
03 Jun 2020 21:06:52 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1957480	99 %	
03 Jun 2020 23:19:28 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1957489	99 %	
01 Jun 2020 17:46:29 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947206	98 %	
02 Jun 2020 20:05:24 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1947354	98 %	
02 Jun 2020 21:12:03 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947366	98 %	
03 Jun 2020 17:03:42 UTC	9	Jemez Test Site - Jemez Office	r-103-c-none	103	1947438	98 %	
03 Jun 2020 19:54:40 UTC	9	Jemez Test Site - Jemez Office	r-101-c-none	101	1957475	98 %	

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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Cameras

Filter by: REFRESH Time Range for Stats: 1 week Max Results: 300

Site ID	Site Title	Camera ID	Video Dimensions	Using Mask	Last Clip Time	Total (in 7d)	# Unverified (in 7d) ↓	% Unverified of Total	Actions
9	Jemez Test Site - Jemez Office	r-101-c-none	1920x1080	Yes	04 Jun 2020 00:06:00 UTC	622	200	32 %	METRICS
9	Jemez Test Site - Jemez Office	r-176-c-none	1920x1080	Yes	29 May 2020 18:48:21 UTC	155	82	53 %	METRICS
9	Jemez Test Site - Jemez Office	r-103-c-none	640x480	No	03 Jun 2020 23:19:28 UTC	50	29	58 %	METRICS
5	Jemez Test Site - Jemez Office 2	123	800x450	No	29 Apr 2020 14:24:30 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	125	800x448	No	29 Apr 2020 14:24:35 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	126	800x448	No	29 Apr 2020 14:24:35 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	127	1280x960	No	29 Apr 2020 14:19:46 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	128	1280x720	Yes	29 Apr 2020 14:19:46 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	129	1280x720	No	29 Apr 2020 14:19:49 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	132	640x480	No	27 May 2020 17:13:37 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	138	640x480	Yes	15 May 2020 15:58:39 UTC				METRICS
5	Jemez Test Site - Jemez Office	r-80-c-none	1920x1080	No	24 Apr 2020 21:59:09 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	r-89-c-none	1920x1080	No	27 May 2020 17:13:36 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	r-90-c-none	1920x1080	No	27 May 2020 17:10:15 UTC				METRICS
5	Jemez Test Site - Jemez Office 2	r-91-c-none	640x480	No	15 May 2020 15:58:39 UTC				METRICS
8	ACME - 400 North Ashley	64	1280x720	No	29 Apr 2020 23:44:41 UTC				METRICS

Sites

Filter by: REFRESH Time Range for Stats: 1 week Max Results: 300

Site ID	Site Title	Total (in 7d)	# Unverified (in 7d) ↓	% Unverified of Total	Actions
5	Jemez Test Site - Jemez Office 2				METRICS
9	Jemez Test Site - Jemez Office	827	311	38 %	METRICS
8	ACME - 400 North Ashley				METRICS
5	Jemez Test Site - Jemez Office				METRICS
11	Jemez Test Site - Jemez Office (1) (1)				METRICS
5	Jemez Test Site - Jemez Office 2				METRICS
12	Jemez Test Site - Jemez Office (2)				METRICS
10	Jemez Test Site - Jemez Office 2 (1)				METRICS
13	Jemez Test Site - Jemez Office (3)				METRICS
14	Jemez Test Site - Jemez Office (4)				METRICS
15	Jemez Test Site - Jemez Office (5)				METRICS

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.