Verkada

User Guide for
Occupancy Trends

Overview

Verkada's Occupancy Trends feature provides organizations with estimates of the foot traffic at critical locations within their facilities. These trends are determined by estimating how many people crossed a customizable digital line on the video feed. This feature is available for our Dome Series camera models and is part of our People Analytics suite of AI–powered computer vision technology.

Similar to other People Analytics features, the accuracy of Occupancy Trends is highly dependent on the proper installation of the supporting camera. Organizations should not use Occupancy Trends as an exact people counter or for applications requiring an extremely high level of precision.

This user guide provides an overview of:

- Key use cases
- Factors affecting accuracy
- How to navigate the user experience
- How to install cameras to maximize accuracy

Use cases

Occupancy Trends can provide valuable insights for optimizing staffing, adjusting hours of operation and or tracking the performance of marketing and promotional activities.

Retail, financial institutions and restaurants

With Occupancy Trends displayed over time, corporate and regional managers can analyze the data to benchmark the performance of a location, adjust staffing and optimize hours of operation. Likewise, brand managers and strategy teams have actionable data to determine where they should offer promotions to attract more customers and increase sales.

Schools, offices and infrastructure

In buildings that see varied traffic, understanding usage is also valuable in determining whether to further invest in additional space or downsize. With the increase of remote students and workers, facilities managers need data to justify the hours that they keep a location open and if the location is needed. With Occupancy Trends, facilities managers can effectively plan to secure additional space or close locations for efficiency.

Factors affecting accuracy

Since our computer vision model relies on the ability to clearly interpret visual inputs, the people detection capabilities are not infallible and our model may occasionally miss individuals. Factors like lighting, camera placement and line placement will affect the accuracy of Occupancy Trends. There are two main failure modes that might lead to the count not being accurate.

1. **Occlusion.** As a moving object passes in front of a camera, it may be temporarily or permanently hidden from view by another object. This can cause problems for tracking algorithms, which may struggle to recognize the object once it reappears. As a result, the algorithm may assign the object a new identification and create a new tracklet for it. This can lead to undercounting, especially if the tracklet is broken while the object crosses a virtual line. In cases of partial occlusion, the tracking system may be able to estimate the original size of the object and maintain the integrity of the tracklet.

2. **Object loitering on the digital line.** If an object stands on, or in proximity, of the digital line, it may trigger the digital line multiple times, leading to over-counting. Installing the camera properly can help mitigate both failure modes (occlusion and object loitering on the digital line), but some discrepancies are to be expected.

Analytics page in Command
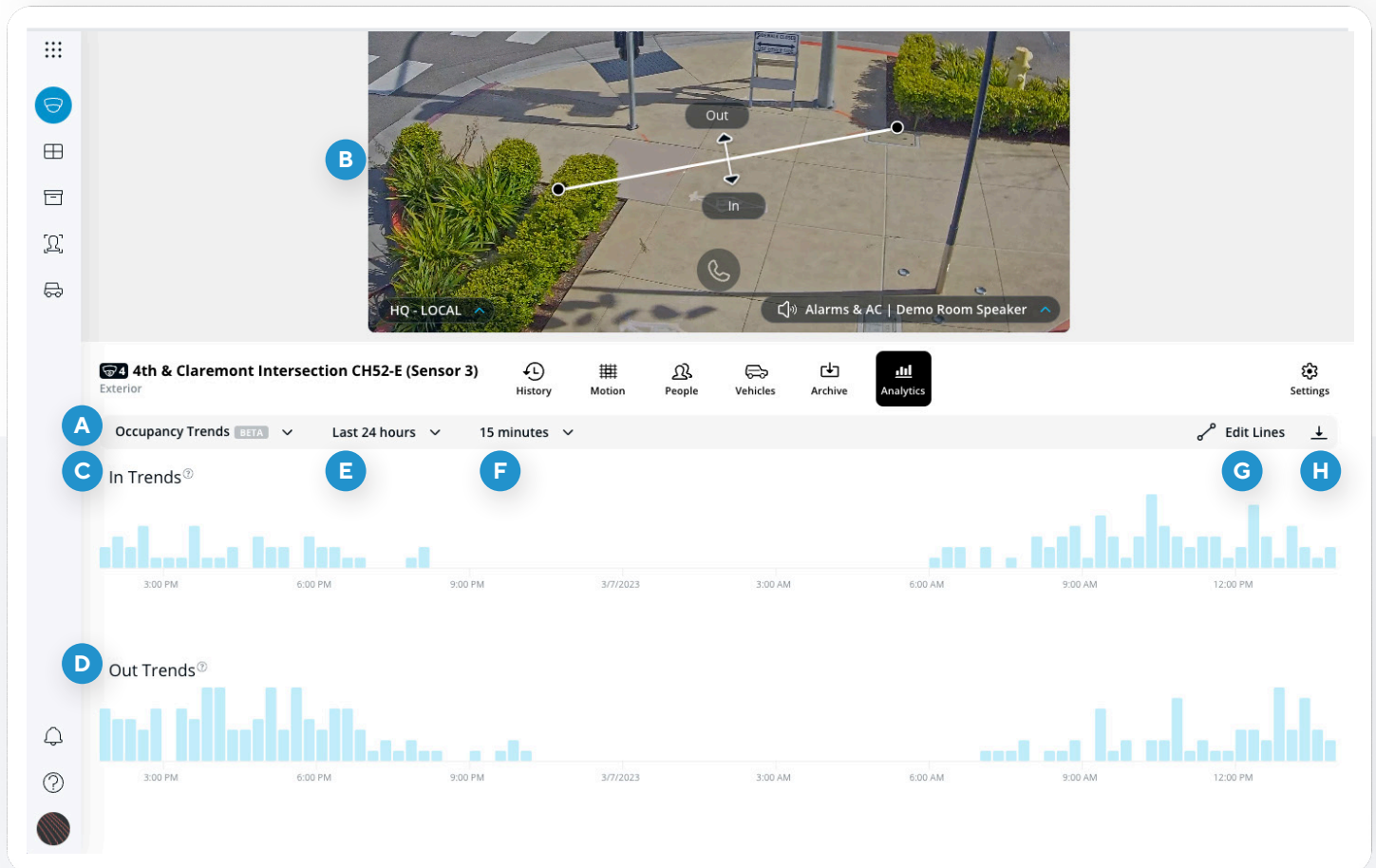
A

Accessing "Occupancy Trends" on the analytics tab

B

Camera feed

C

"In Trends" graph–estimate of people crossing line

D

"Out Trends" graph–estimate of people crossing line

E

Filter by last day, week, months, etc.

F

Filter by minutes, hours, etc.

G

Edit lines on the camera feed

H

CSV export

User experience

To use Occupancy Trends, People Analytics must be enabled. Org Admins can enable People Analytics in the Settings tab for each camera or on the devices page.

When a user navigates to the "Analytics" tab, they can scroll down to see usage data presented on a graph and divided between "In Trends" and "Out Trends." These graphs display estimates of foot traffic flow across an admin-defined digital line and represent approximations of how many people crossed the line traveling in a given direction.
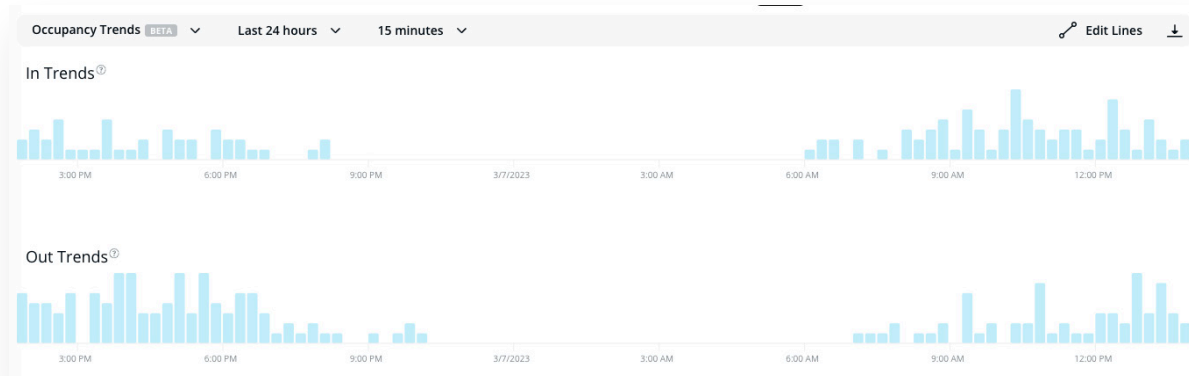
Whether a person is added to the "In Trends" or "Out Trends" graph depends on the direction the person was traveling as they crossed the digital line.

Users have the ability to change the granularity of the graph using the toggles in the UI.
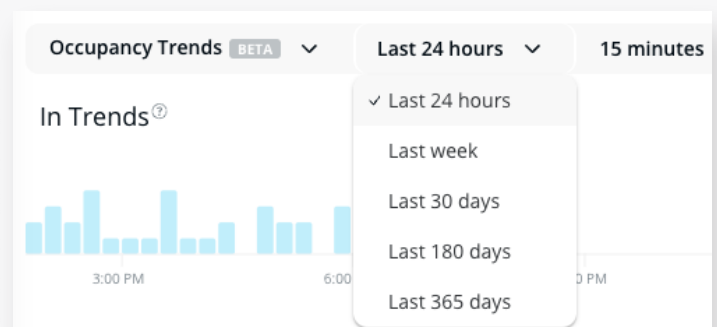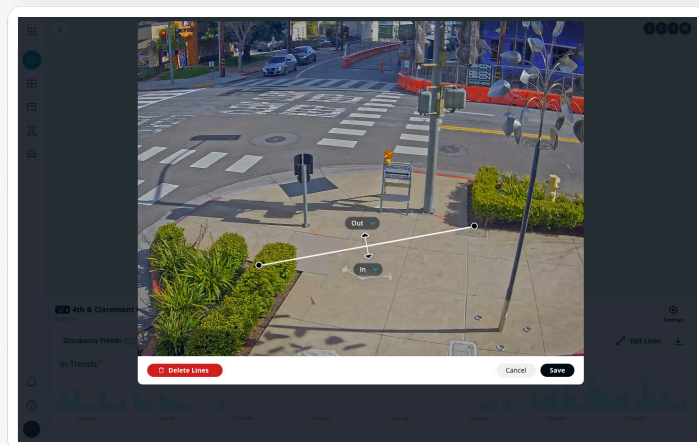
When downloading the data in CSV (see reference **H** on page 3), the format will match the granularity of the graph.

Number of Line Crossing In	Number of Line Crossing Out	Start Time	End Time	Camera ID	Camera Name	Organization Name	Camera Site	Camera Address
4	0	2022-04-28T12:15:00-07:00	2022-04-28T12:30:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
3	0	2022-04-28T12:30:00-07:00	2022-04-28T12:45:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
1	1	2022-04-28T12:45:00-07:00	2022-04-28T13:00:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
4	1	2022-04-28T13:00:00-07:00	2022-04-28T13:15:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
4	0	2022-04-28T13:15:00-07:00	2022-04-28T13:30:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
2	0	2022-04-28T13:30:00-07:00	2022-04-28T13:45:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
9	0	2022-04-28T13:45:00-07:00	2022-04-28T14:00:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
17	0	2022-04-28T14:00:00-07:00	2022-04-28T14:15:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
18	0	2022-04-28T14:15:00-07:00	2022-04-28T14:30:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
17	0	2022-04-28T14:30:00-07:00	2022-04-28T14:45:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
26	0	2022-04-28T14:45:00-07:00	2022-04-28T15:00:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
11	0	2022-04-28T15:00:00-07:00	2022-04-28T15:15:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
8	0	2022-04-28T15:15:00-07:00	2022-04-28T15:30:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
11	3	2022-04-28T15:30:00-07:00	2022-04-28T15:45:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA
18	3	2022-04-28T15:45:00-07:00	2022-04-28T16:00:00-07:00	XXXXXXXX-XXXX-XXXX-XXXX-XX	(03) Front Door - CD62	Local Business	San Mateo	405 E 4th Ave San Mateo CA 94401 USA

Clicking on the bar chart allows the user to see a collection of images of the people that were detected and that comprise the occupancy data for a segment of time. This feature allows the user to better explore the data and understand how a trend was calculated. This feature also allows the user to identify cases in which data had not been collected correctly by the model, allowing the user to appropriately ignore irrelevant spikes.
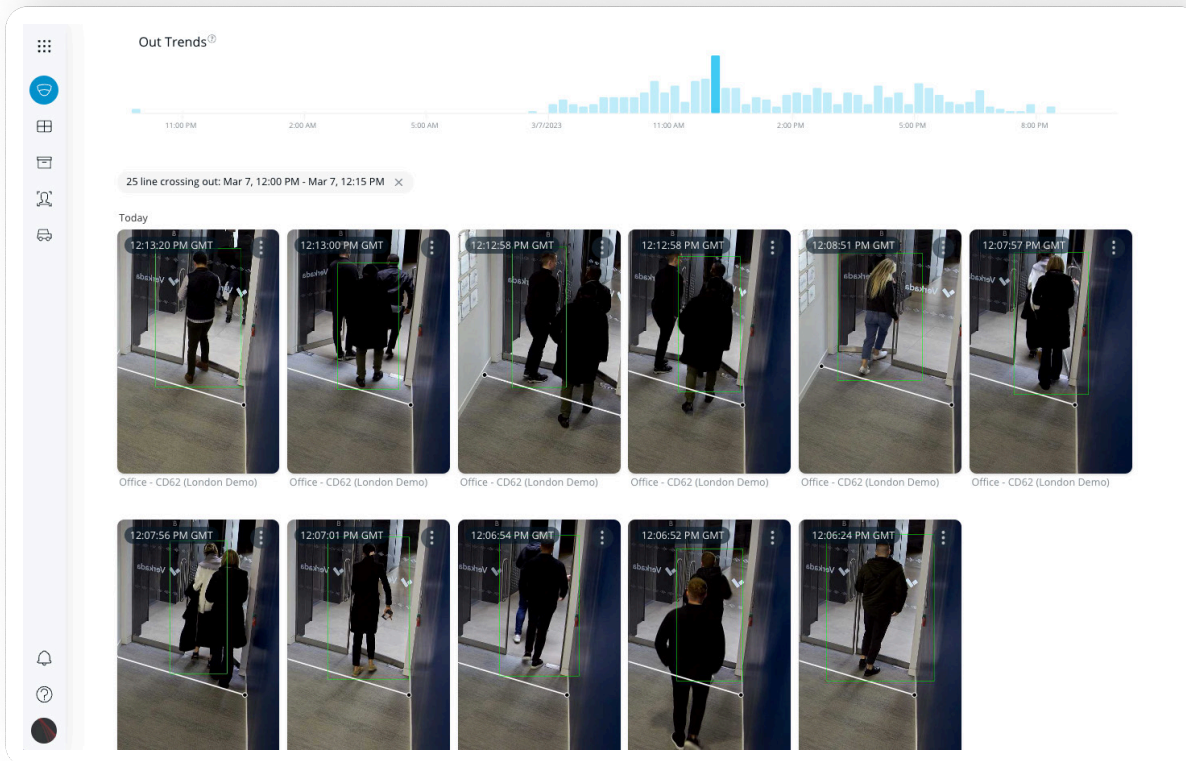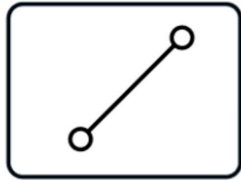

Occupancy Trends allows the user to collect trend related data for up to 365 days, but the associated images of people will only be available for up to the retention period of the camera.

Installation guidance

Setting up Occupancy Trends

The first time a user accesses "Occupancy Trends" in the "Analytics" tab, they will be prompted to establish at least one digital line on the camera feed. To do so click on the "Add Lines" button and follow the instructions in the UI.

The user can set up multiple lines on the camera, but the count will always be presented at an aggregate level.

For each line, the user can select the following options; **In, Out, or Ignore.** By selecting "Ignore", estimates of traffic flow will not be reported for people traveling across the line in that given direction.

Add lines to the camera view area to count the objects crossing the line.

+ Add Lines
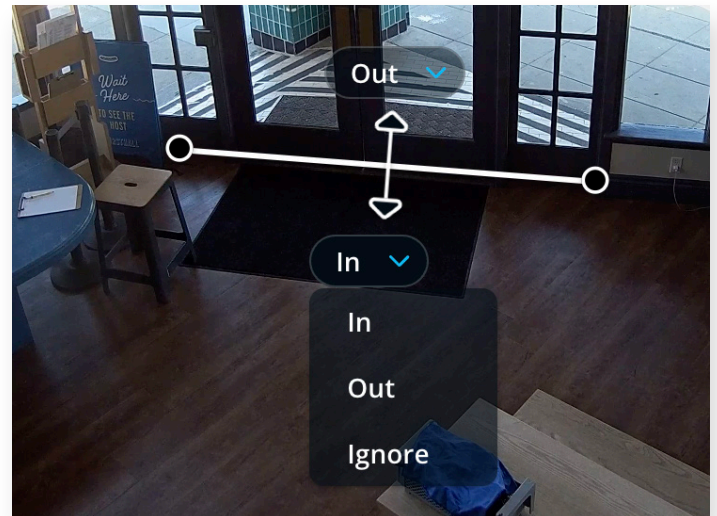
Installing cameras for best performance

1. **Choose a one-directional path:** Occupancy Trends works particularly well when set up in a location where people follow a one-directional path that traverses the line, such as doors and hallways. Cameras should be mounted on the ceiling directly in front of the door or path.

2. **Install the camera 8–12 feet (3–4 meters) from the digital line:** Cameras provide the most accurate data when the digital line is no less than 8 feet and no more than 12 feet away from the sensor.

3. **Proper positioning improves accuracy:** Cameras should be positioned no more than 40°–60° degrees vertically from the location of the digital line.

4. **Minimize occlusions and obstructions:** It is important to establish the line in a part of the frame that is not blocked by an object, and in an area that minimizes occlusions (e.g., people overlapping.)

5. **Ensure good illumination on both sides of the line:** Significant discrepancies in lighting can make it difficult for our model to accurately track subjects and register when they cross the line. Avoid placing the digital line in a naturally dark area where external lighting might intermittently turn off.

6. **Ensure good visibility on both sides of the line:** People must be clearly visible on both sides of the line for at least a second prior to crossing the line. Avoid placing the digital line where someone might suddenly appear. For example, on a corner, or right on the doorway of a wood or opaque door that opens inwards.
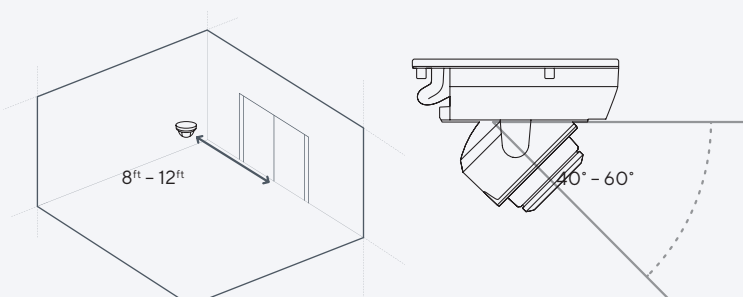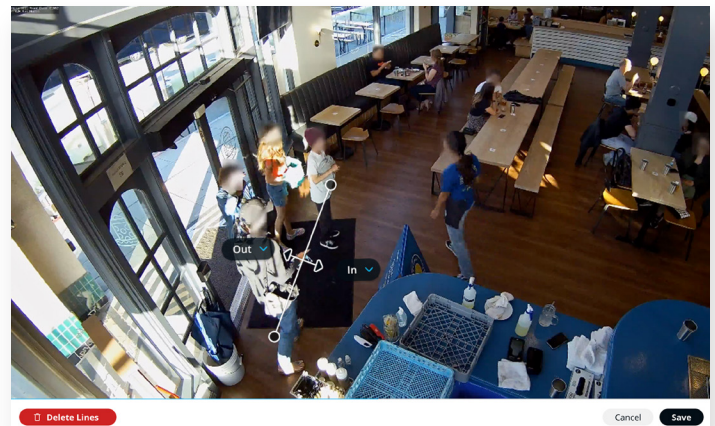
Examples of bad installations
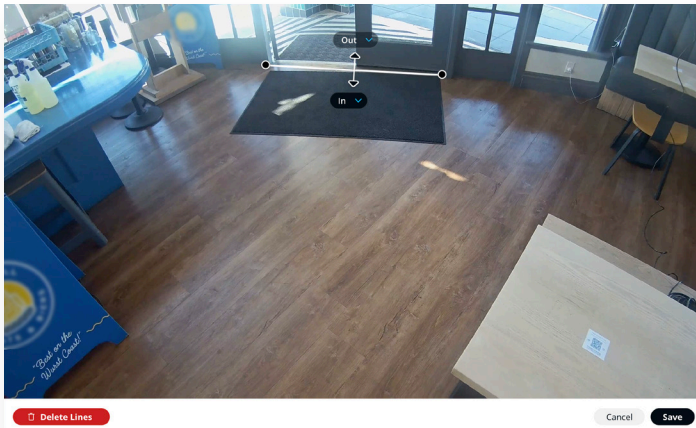
Poor line placement on the camera feed. If a line is established at the top of a camera feed, our model might not be able to track a clear trajectory across the line and register the crossing occurrence.

The line is not established across the entire entrance to an area. If a line does not span the width of an entry or hallway, our model will not register people crossing outside of the established span. If the supporting camera is installed at a viewpoint which is not head on, we recommend establishing a line that is wider than the entrance.
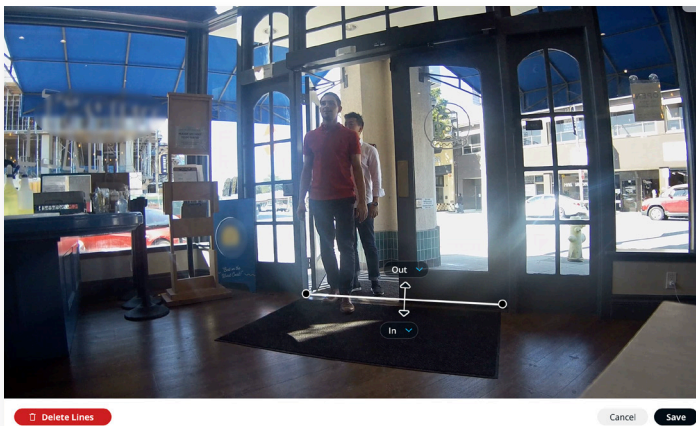
The line is established in an area where occlusions will naturally occur. In situations where one person's body may obstruct the view of a person following behind, our model is likely to not register the person behind. This issue could occur in areas with queues.

The line is established in an area where people commonly stand on top of the digital line. People standing on the digital line might get counted multiple times, skewing the trends.

Examples of bad installations (cont.)

The line is established in an area with different levels of luminosity on one side and the other of the digital line. Our model will have a difficult time accurately registering crossing occurrences if bright areas in the feed are overexposed.

Users can enable Wide Dynamic Range (WDR) to help compensate for dramatic differences in light exposure across a camera's image.
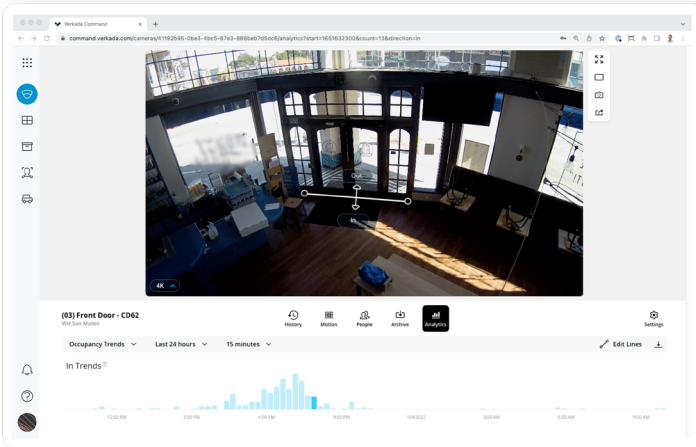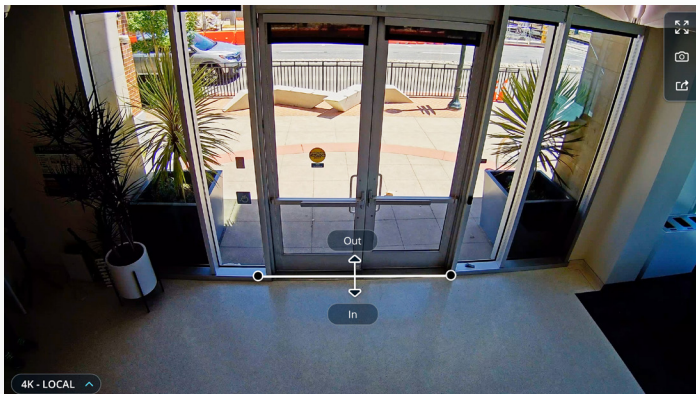

Without WDR
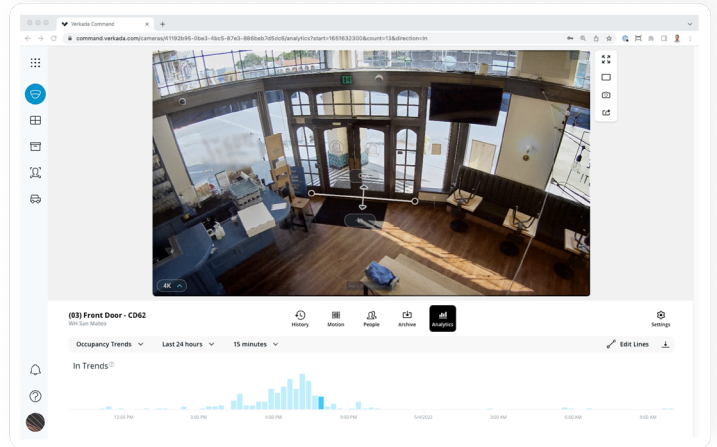
With WDR

Example of a good installation

- One–directional path
- Camera 12 feet from door
- Camera positioned at 50 degrees vertically
- Clear windows minimize occlusions and obstructions
- Good illumination on both sides of line
- Good visibility on both sides of the line