Synology®

Administrator's Guide for

People Counting in Deep Learning NVR

Based on

Synology Surveillance Station 8.2.9

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Introduction

Overview

Synology Deep Learning NVR comes with powerful AI Image Analysis technology which is built into the Deep Video Analytics application in Surveillance Station. It's complete functionality is free of any hidden fees and requires no extra software or external device installation.

For you to achieve optimal analytic accuracy, this document will guide you through the essentials of deploying People Counting cameras and suggest the most suitable installation scenarios.

The inbuilt GPU display card of Synology Deep Learning NVR leverages Deep Learning AI to provide instant detection, tracking, and high-quality filtering of moving people in camera frames. When a mobile object is detected, Synology Deep Learning NVR will quickly run a calculation to identify features of heads and shoulders and determine whether the object in action is human.

Contrary to traditional image analysis techniques that sometimes cause false alarms, based on deep learning, Synology People Counting is now equipped with elevated object recognition skills, anti-interference capabilities, and the power to classify thousands of object features at once. Such abilities highly elevate human recognition accuracy and greatly reduce miscalculation.

Moreover, Synology Deep Learning NVR models support multi-channel image analysis and can track and trace several moving people. For instance, DVA3219 is capable of running four People Counting analyses with eight people in each channel simultaneously.

As unfitting environments and settings may affect accuracy, the following chapters will introduce the key factors to mount and configure cameras successfully:

- Design suitable installation scenarios
- Select fitting camera models and locations
- Assign appropriate software settings

Mount Cameras

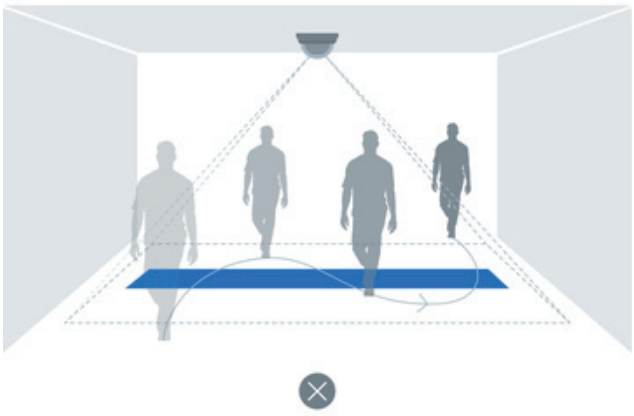
This chapter introduces how to mount cameras and arrange proper lighting. Please rest assured that the analysis will run with good precision even if some of the requirements below are not fulfilled.

Select and Position Cameras

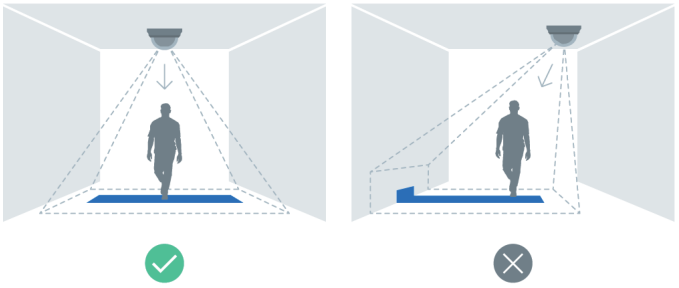
Camera model types and configurations influence the quality of images. As People Counting tasks identify characteristics of human heads and use them as the basis of calculation, big and clear images are key to accuracy.

The following are some general guidelines:

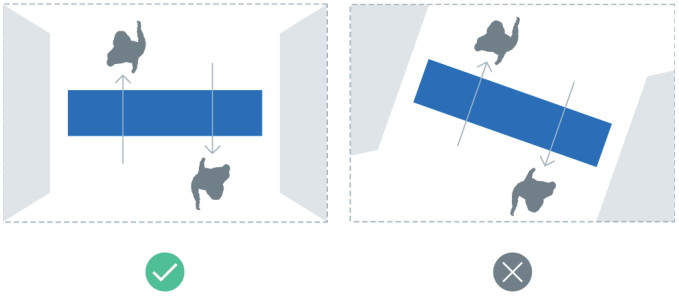
- For a flexible stream quality, select ceiling mount cameras which support multi-stream with 1920x1080@20 FPS or above for a flexible stream quality.
- Do not use panoramic or fisheye cameras. The distortion of images may influence the detection results.
- Keep the camera signal as stable as possible. Wired connections are highly recommended.
- Keep the lenses clean so that dust, insects, or other stains do not block the sight.
- Keep the traffic near passageways clear. Make sure visitors do not linger around the detection area and be counted multiple times, and try to remove mobile objects such as automatic doors, escalators, and cleaning robots from the camera frame.



- Position your cameras right above the entrances, face them straight down, and make sure the footage can include complete human heads.



- Arrange the lenses so that visitors can pass through the cameras' view horizontally or vertically.



- Mount cameras at least 2.5 to 4 meters (from floor to ceiling) above passageways. Depending on camera models and zoom settings, the height range and covered ground can be increased.

  The table below lists the recommended focal length and height values to cover a 4-meter-wide passageway:

Focal length (mm/ft)	Height (m/ft)
2.8 / 0.082	3.0 / 9.85
4.0 / 0.13	4.0 / 13.1

Prepare Suitable Lighting

Good lighting is crucial. If the surroundings are too dark, footage may blur and cause details to be lost; if there is excessive illumination, images can be overexposed and disturb the clarity.

If possible, please do the following:

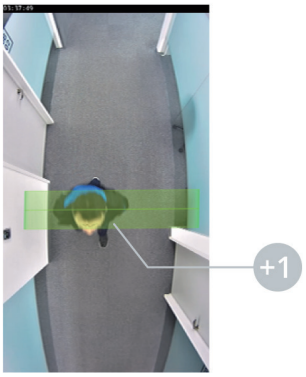
- Provide sufficient lighting, preferably with a light level over 300 lux. Features of moving people are hard to recognize in dark images.
- Avoid direct sunlight in the detection areas. Direct light may leave streaks in the images or cause overexposure, affecting the picture quality.
- Do not point lights directly at the cameras and overexpose footage.
- Camera night vision modes (IR modes) cannot compensate for insufficient light. Add additional lighting if needed.
- Remove flickering or glowing objects, such as neon lights.
- Avoid uneven illumination. Movements in the darker areas might not be detected correctly.
- Remove tilted light sources that create shadows as shadows may blur the shape of human features.
- Adjust the color of the lighting according to the actual environment so that hair can be separated from clothing. People may not be easily detected if the color of their hair and body are too similar.

Configure Software Settings

Once your cameras are mounted successfully, software configurations must be set up for DVA to suit your needs fittingly. This chapter covers the crucial settings to achieve high people-counting precision.

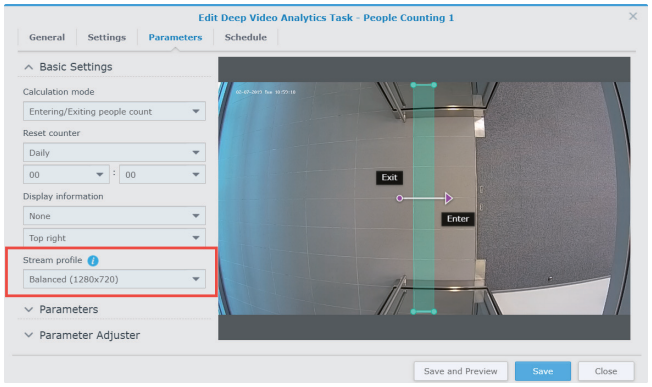
Begin with People Counting

People Counting works by tracking movements of heads. When a person passes by and the center of their head crosses the detection area, the number on the counter will increase.



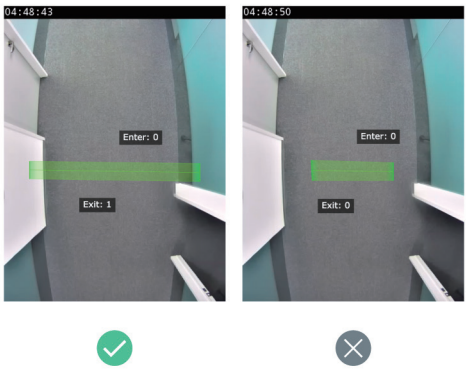
Select a Stream Profile

For optimal detection accuracy, select a resolution of at least 1920x1080@20FPS.



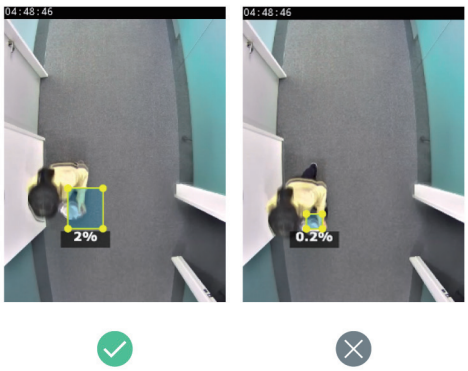
Define the Detection Line

The detection line should be located on the ground, be in the center of the camera screen, and cover the entire width of the passage. If the line is drawn too short, people might pass through the entrance without crossing over it and be missed. The maximum length is 4 meters long.



Edit the On-Screen Head Size

To accurately detect human heads, it is important to define the on-screen head sizes after mounting cameras. Under **Parameters**, you can click the **Edit** button and adjust the yellow object frame to define the head size.



Improve Detection Accuracy

After adjusting software paramater settings, there are still some factors that may affect the accuracy of People Counting. This chapter lists some possible solutions, causes, and provides a setup example.

Select Proper Flooring

The simpler the surroundings are, the more easily People Counting can analyze human features and provide accurate reports. Here are some general guidelines for arranging the flooring:

- If your flooring has light reflection or if sharp shadows may appear, place a mat or carpet on the detection area.
- Apply flooring that contrasts with the hair color of your target visitors. For instance, use light carpets for black hair and dark carpets for blonde hair.
- Apply plain flooring so that complex patterns do not affect the analysis.

Note Possible Interferences

Even with thorough planning of the camera mounting environment, it is still possible that human heads are not detected or wrongly identified. Please be advised that the points listed below may cause miscalculation, but be assured that People Counting can still function normally:

- The heads of people under 120 cm might be too small to be identified and filtered out due to the on-screen head size settings. If you wish to reduce the on-screen head size, please note that this may increase the chance of interference from other small, moving objects.
- Weather sometimes affects the accuracy of outdoor cameras. Rain and snow, changes of shadows, or differences between day and night are all possible influences.
- People walking closely side by side might not be recognized correctly.
- People running pass too quickly might not be detected.
- People with hats, in costumes, holding umbrellas, or wearing accessories that cover heads might miss detection, or even affect the detection of others.
- Pets passing by might affect calculation.

Setup Example

The following are some do and don'ts of installing cameras:

- Human heads need to be complete to achieve high accuracy. If they always appear in the edges of the screen, please adjust the camera height or use cameras with a larger angle of view.

- Keep passing people in the middle of the camera frame for better precision.

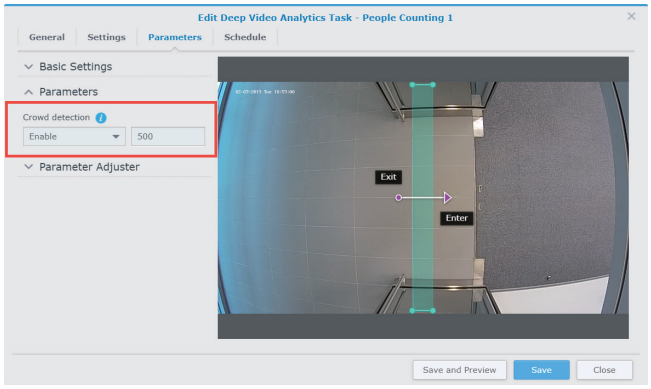
- If the passageways are over four meters wide, please set up two cameras to keep the head images complete and try not to let the sizes vary too much.

Collect Footfall Data

With People Counting tasks set up, you can start collecting and tracking footfall data. This chapter introduces how to work with People Counting.

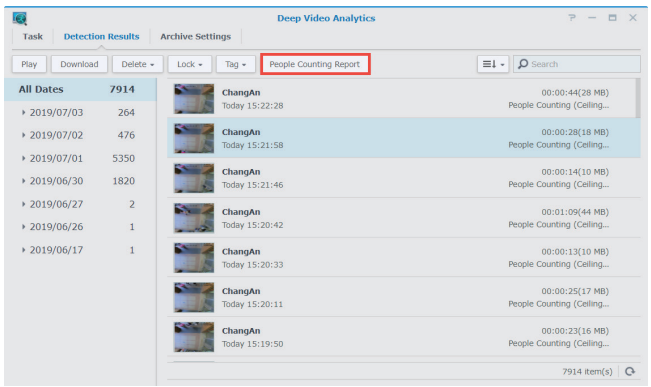
Enable Crowd Detection

Crowd Detection can send event notifications and trigger alerts in Live View when the number of people in given premises exceeds the set number. It is thus suitable for places where footfall must be limited for safety concerns, such as stadiums and malls. Its headcount is highly dynamic: the number is calculated by subtracting the outgoing people from the entering people.

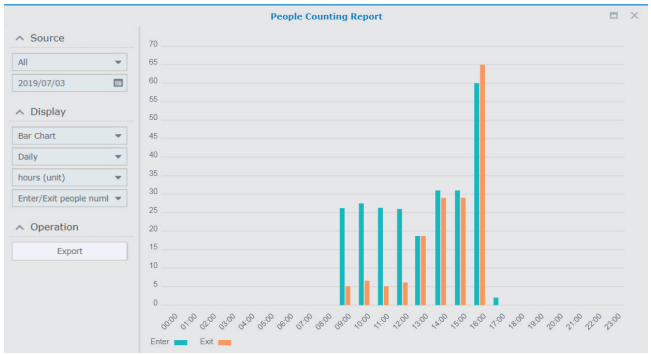


Generate Reports

After collecting footfall data, you can go to the **Detection Results** page to generate a **People Counting Report**.

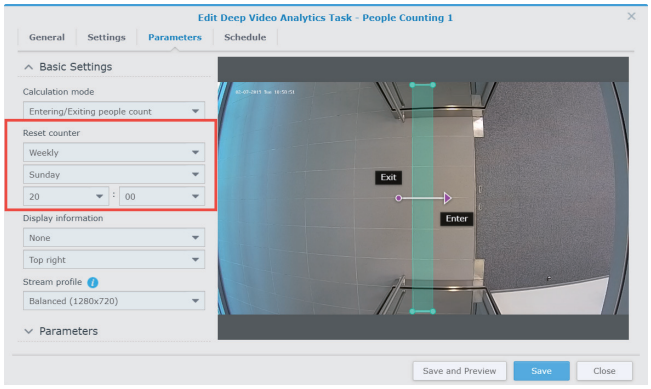


The reports list the number of entering and leaving people within a given date and time. With the flexible **Display** design, you can easily adjust the time unit from hour to seasons. Data of different tasks can also be shown simultaneously to accommodate spaces with multiple entrances. If you wish to save a copy of the report, click **Export** to download an HTML file.



Reset People Counter

As shown in the figure below, the counter provides simultaneous two-way counting of people moving in and out of passageways. You can set a schedule to reset the counter.



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