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Synology Deep Learning NVR User Guide

Administrator's Guide for
Intrusion Detection in Deep Learning NVR

Based on
Synology Surveillance Station 8.2.9

Contents

Introduction

Overview

With its powerful AI Image Analysis, Synology Deep Video Analytics can instantly calculate millions of object attributes, filter out environmental interferences, and deliver accurate detection results. Backed with Smart Tag technology and a comprehensive management interface, it allows users to take control of events with ease and efficiency.

Among the supported algorithms, Intrusion Detection is designed to monitor unusual activities in specified areas. It can be applied to various fields, including:

- Dangerous areas: Railroad tracks, seasides, lakes
- Restricted zones: Military districts, computer facilities
- Home security: Garages, backyards, private properties

For you to achieve optimal precision, this guide aims to introduce the key factors of setting up Intrusion Detection tasks. Please follow the listed points as closely as possible.

Quick Start

Camera Selection

- Select multi-stream cameras with 1920×1080@20 FPS
- Select IR supported cameras if possible
- Use wired connections for stable streaming

Camera Mounting

- Position cameras 2.5 to 4 meters above the ground
- Angle cameras less than 60 degrees against the wall
- Point cameras directly at the target areas and do not tilt the screen
- Make sure the surroundings can provide lighting with over 300 lux

Software Configuration

- Place the detection fences in the middle of the screen
- Draw the detection fence and apply one-way or two-way detection
- Choose to focus the detection on people, vehicles, or all objects
- Choose to ignore small objects for optimal accuracy
- Fine-tune settings with the Parameter Adjuster to fit actual detection scenes

Accuracy Enhancement

- Remove possible interferences
- Avoid obstructions caused by height differences in the surroundings
- Exclude major roads with heavy traffic
- Use multiple cameras to cover wide areas

For more details, please refer to the following chapters.

Mount Cameras

This chapter introduces how to mount cameras and arrange proper lighting to collect clear footages for high detection accuracy.

Select and Position Cameras

Camera models, installation, and configurations directly influence the quality of recordings.
The following are some general guidelines:

- Select cameras that support multi-stream with 1920×1080@20 FPS or above for flexible stream qualities.
- Select wall-mount cameras that can be angled less than 60 degrees against the wall 2.5 to 4 meters above the ground.
- Do not use panoramic or fisheye cameras. The distortion of images may affect detection.
- Do not tilt cameras. Tilted images may lead to missed detections.
- Make sure the detection area can be drawn in the center of the screen so that the possible intruding objects and the course of their movement can be detected clearly.
- Make sure cameras have clear views from all different angles. Obstructions due to height differences in the surroundings may cause false detections.
- Keep camera signals 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.
- Firmly fix cameras for clear images.

Prepare Suitable Lighting

Good lighting is crucial. If the surroundings are too dark, details might be lost; if there is excessive illumination, images may blur.
When setting up your cameras, please mind the following:

- Provide sufficient lighting, preferably with a light level of over 300 lux. Moving objects are hard to recognize in the dark.
- Enable IR functions if possible. (While IR helps capture clearer images, please note that it cannot compensate for the poor lighting.)
- Add waterproof covers to outdoor cameras to avoid direct sunlight on the lens. Direct light may leave streaks in the images or cause overexposure, affecting the video quality.

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.
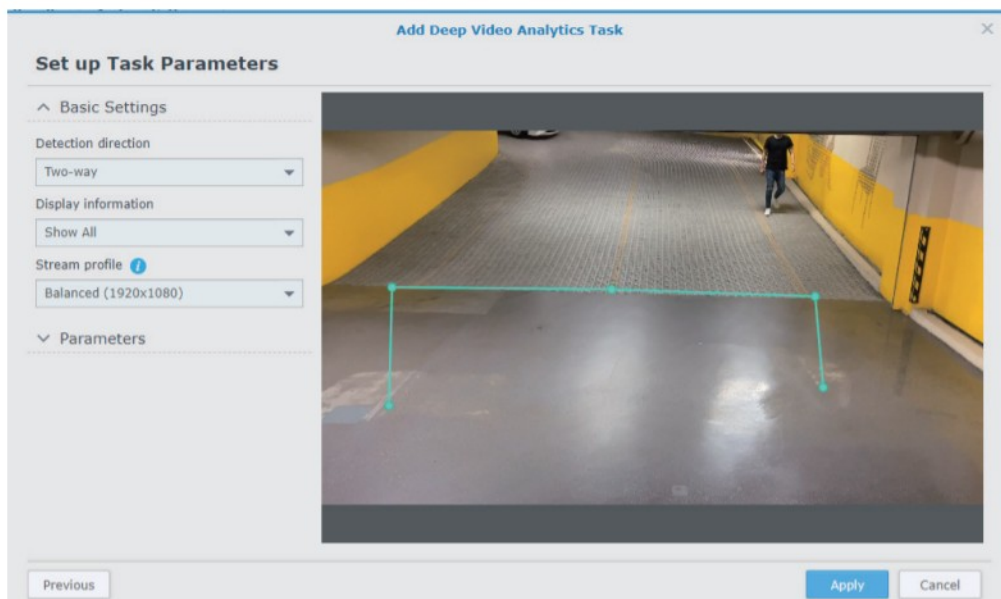
Select a Stream Profile

For optimal detection accuracy, select a resolution of at least 1920×1080@20FPS.

### Set Up the Detection Fence

Simply drag the nodes to adjust the position of the detection fence. You can left-click on the fence to add up to 18

nodes, or right-click to delete them.

Define the Detection Direction

Based on your target surroundings, you can apply either one-way or two-way detection. If you choose to monitor only a single direction, purple arrows indicating the detection direction will appear on the fence. Simply click on the arrows to reverse them. An event will be triggered when an object crosses the fence in the direction the arrows point to.
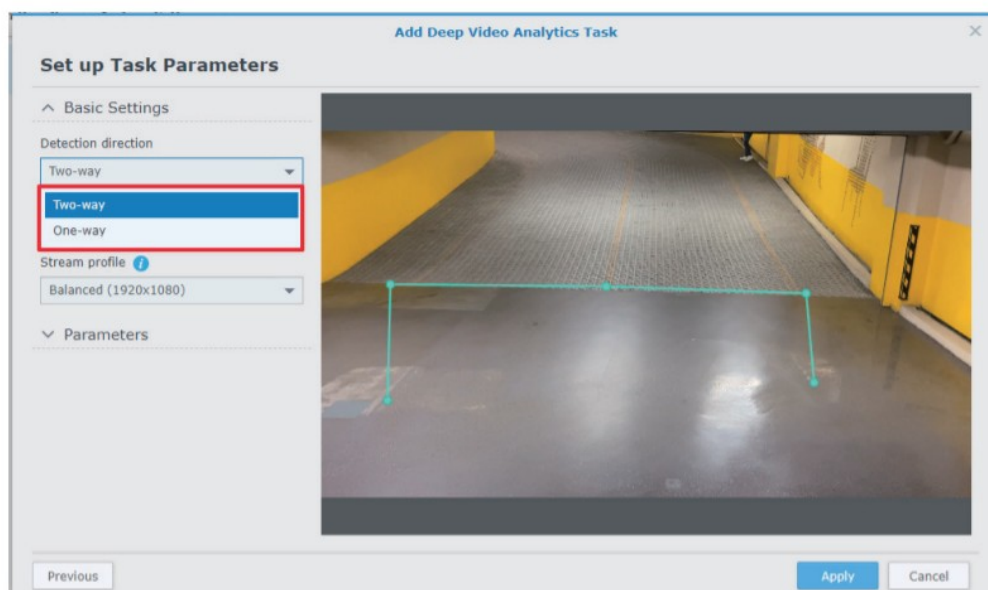

Triggering Mechanism

Since Intrusion Detection is mainly applied to wall-mount cameras with high-angle shots, the analysis tracks the lower part of moving objects to trigger events. You can choose to detect anything that crosses the virtual fence or focus on people, vehicles, or both:
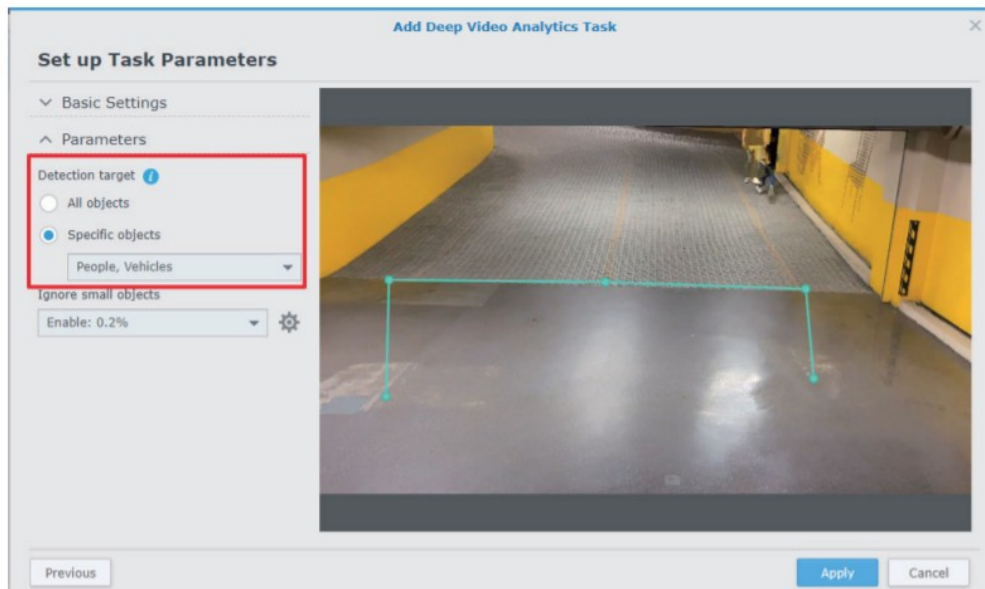
- **All objects:**

  This option is suitable for sites with higher alert levels as it includes all types of intrusions. Events will be triggered when 30% of the object areas cross the fence.

  Please try to keep the camera background color as different from the detection targets as possible, so that moving objects can clearly stand out and be detected correctly.
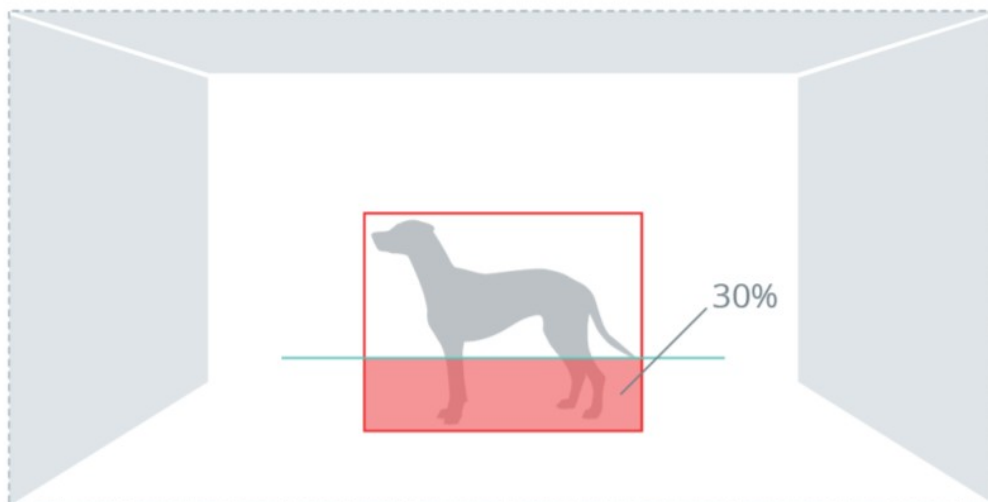
- **Specific objects:**

  This option has higher recognition accuracy for figures of humans and transportation. It is suitable for detecting and reporting unusual movements of people and vehicles and can minimize false alarms caused by objects other than the two.

  When people or vehicles enter the camera view, the analysis will continue to track their locations by defining a midline to mark their heights. When the bottom 10-percent-mark of the midline crosses the detection fence, an event will be triggered.
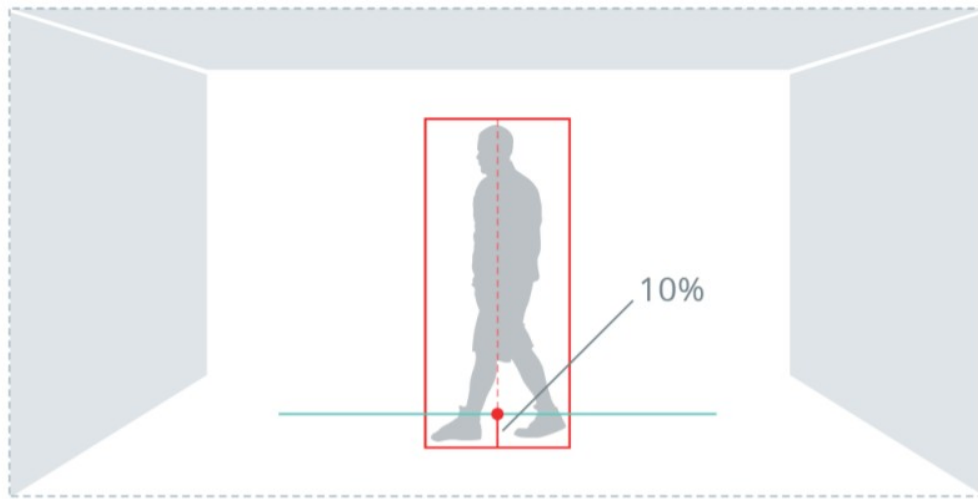
- While this option can focus on people, if wall-flipping may occur in your target scenario, please select **All objects** so that big movement will not affect the recognition of human figures.

Ignore Small Objects

To filter out interferences such as image noise, insects, or small animals, it is important to fine-tune the minimum object size. On the **Parameters** page, click the **Edit** button and adjust the yellow object frame to define the minimum object size.
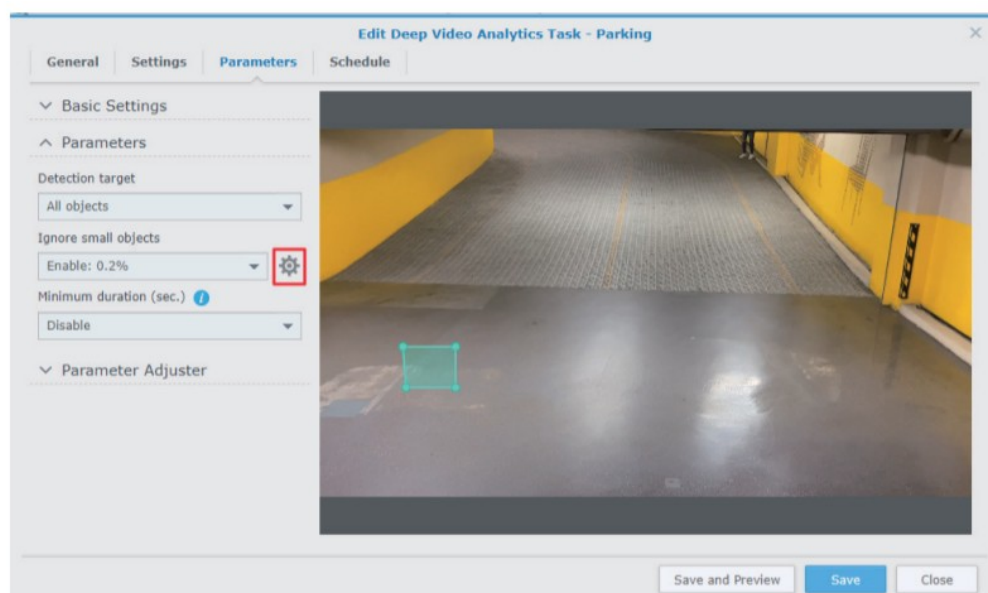

Improve Detection Accuracy

After adjusting software parameter settings, there are still some factors that may affect detection accuracy. This chapter lists some possible causes and solutions.

Clear Surroundings

The simpler the surroundings are, the more easily can Intrusion Detection analyze objects and provide accurate reports.
Please follow the guidelines below:

- If there are major roads with heavy traffic near your target detection areas, move the fences slightly away from the roads. This helps increase stability and lower the number of accidental triggers, and the accuracy will not be affected.
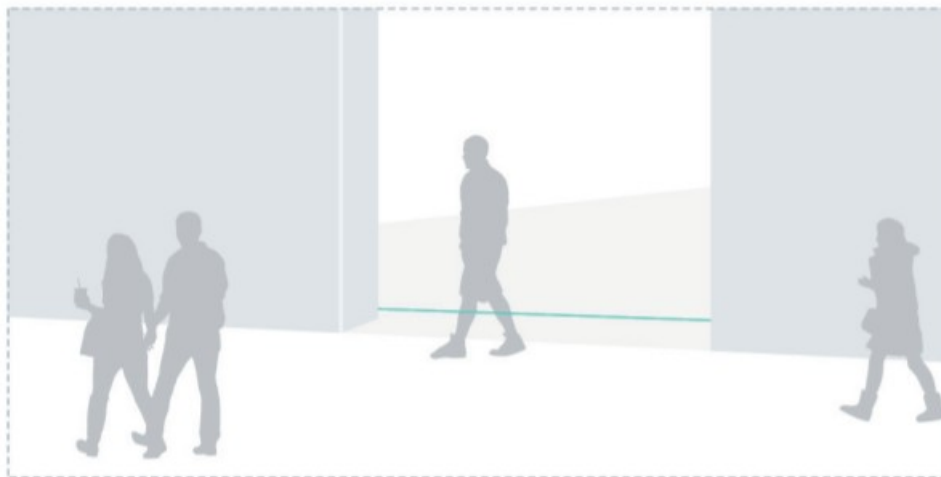
- Place the detection fences in the middle of the screen and remove obstructions like potted plants or columns, so that objects can be properly detected on either side of the fences.
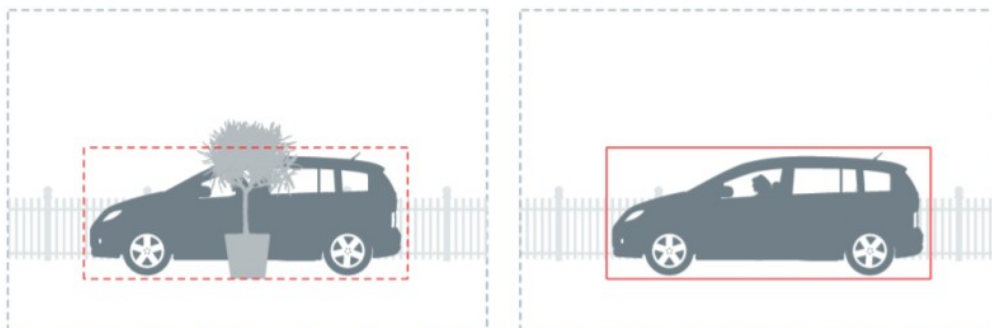
- When the areas your camera footages cover are rather wide, small objects in the distance may not be detected correctly. Please adjust the camera positions or add new cameras to include the farther corners.

Note Possible Interferences

Even with thorough planning of the camera installation, there are still chances of miscalculation.
Please note the points below:

- Weather sometimes affects the accuracy of outdoor cameras. Rain and snow, changes of shadows, or differences between day and night are all possible influences.
- Detection fences set up in relatively unstable areas, such as in shaking bushes or rippling waters, may sometimes have lower precision.
- Flickering or glowing objects, such as neon lights, may disturb the analysis.

Utilize Advanced Features

Besides detailed configuration options, DVA also offers labeling features for easy file management and a Parameter Adjuster that helps fine-tune parameters.

Integrate with Motion Detection

Intrusion Detection can be integrated with Surveillance Station's motion detection so that cameras' recording, notifications, action rules, and other settings can also be triggered when an intrusion event is detected.

Label and Comment

Labels and descriptions can be added to DVA detection results. For example, you can create a "Courier" label to mark related events or easy access to the video file afterward.
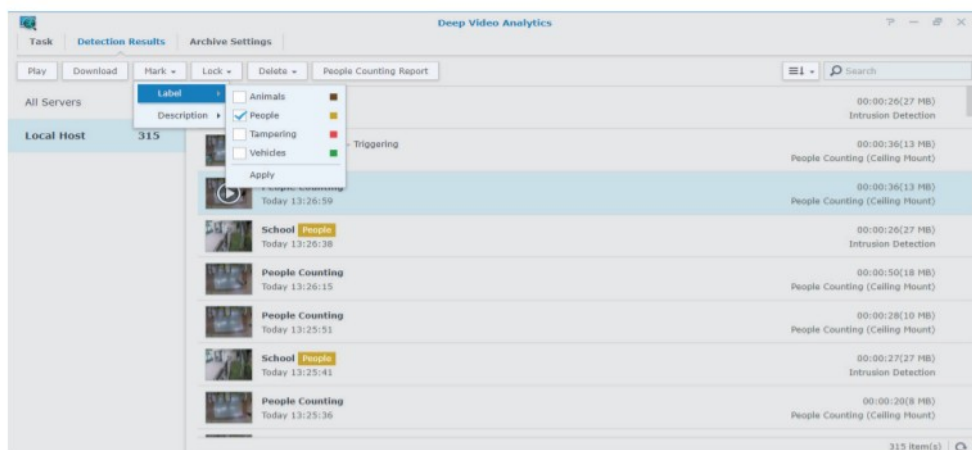
Optimize Parameter Settings

The parameter adjuster allows you to use previous camera recordings or DVA detection results to fine-tune task parameters. This helps fit your actual usage scenarios.

Select a clip from the **Video Source** panel and drag the nodes to adjust the detection zone. Basic settings and parameters in the left panel can be edited as well.

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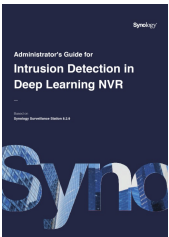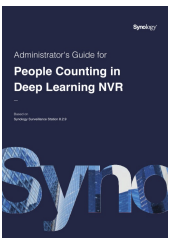4F, No. 3-1-2, Higashikanda,
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Synology

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Documents / Resources

Administrator's Guide for **Intrusion Detection in Deep Learning NVR**	[**Synology Deep Learning NVR**](#) [pdf] User Guide Synology, Deep Learning NVR
Administrator's Guide for **People Counting in Deep Learning NVR**	[**Synology Deep Learning NVR**](#) [pdf] User Guide Synology, Deep Learning NVR

References

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