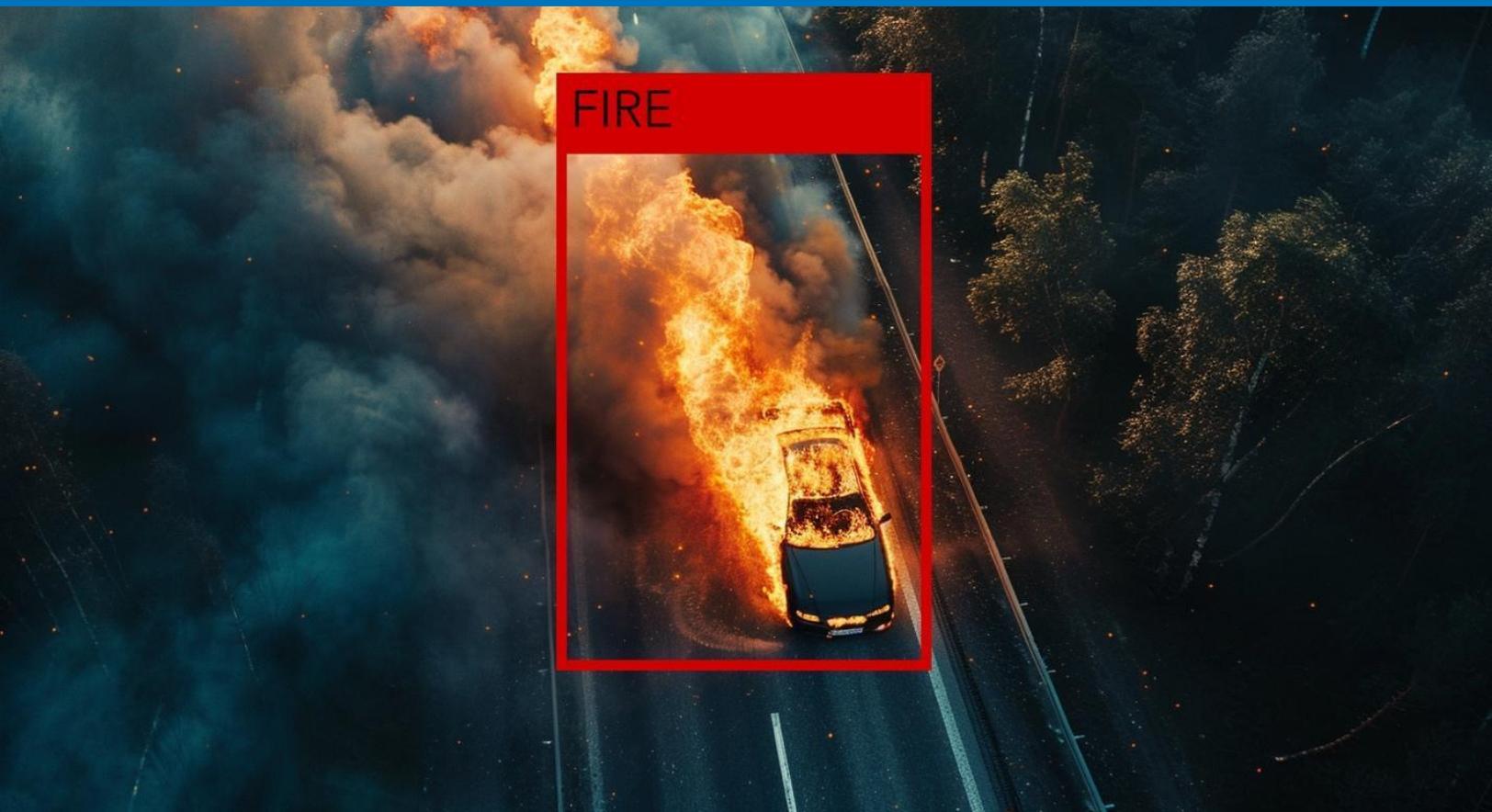
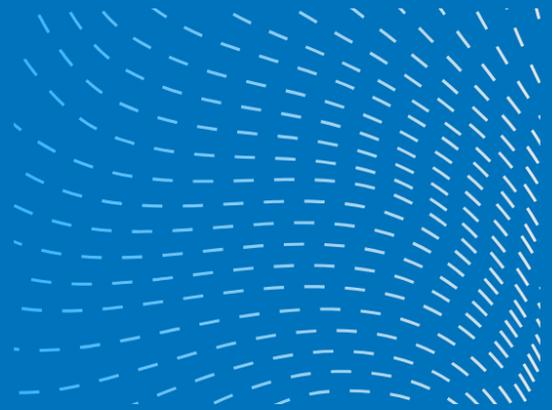


IPXAnalytics
Datasheet

Fire & Smoke Module



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Fire and Smoke Detection Module

Compatibility: IPXAnalytics STANDARD, 2.0 or higher.

IPXAnalytics

IPXAnalytics is a software that uses Artificial Intelligence to learn and detect events in surveillance cameras. The AI is based on neural networks and LLMs, which are algorithms that attempt to mimic the behavior of the human brain. Compared to current video analytics software, IPXAnalytics can significantly reduce the number of false alarms.

Standard Fire & Smoke Module

Protecting lives and property from fire is a non-negotiable priority. With our cutting-edge computer vision technology, we offer an advanced solution for real-time fire and smoke detection, both indoors and outdoors.

Examples of resources

For open environments:

Imagine a vast plot of land, a forest, or even a construction site where there's no fire protection system available. In these scenarios, our technology becomes a crucial line of defense. By integrating our fire and smoke detection module into your surveillance cameras, you can quickly identify any signs of fire, enabling an immediate response and potentially preventing major tragedies.

For indoor locations:

Even in locations with existing fire protection systems, our solution provides an additional layer of security. By double-checking the existing system, our technology can provide early detection. This means that if the primary system fails or malfunctions, you can still receive an alert from a supplementary system.

Ensuring complementarity:

It's important to note that our computer vision module doesn't replace any approved fire department system. It works as a complement, increasing the effectiveness and comprehensiveness of your fire safety system.

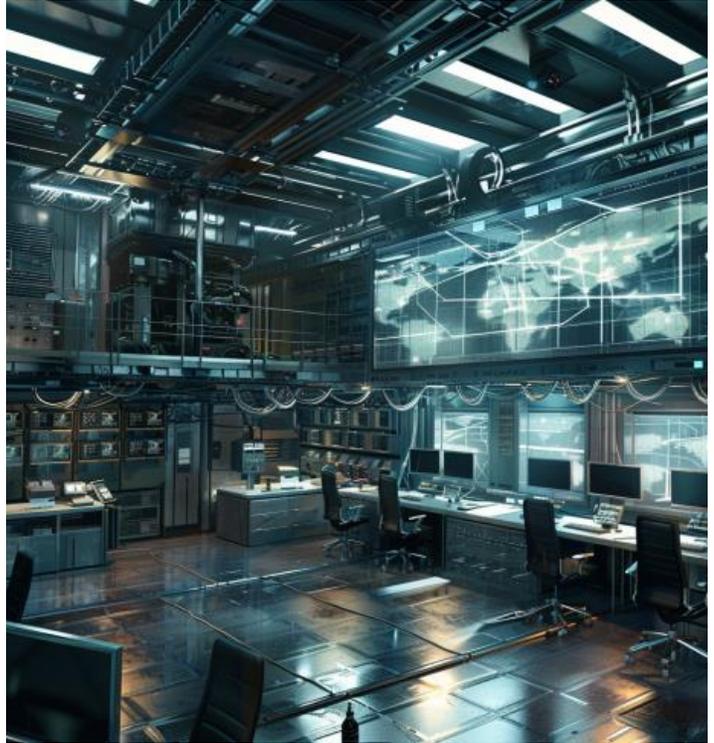
Integration

The software has an HTTP REST API that allows integration with any third-party system. It also integrates with market-leading VMSs: Digifort, D-Guard, Milestone, and Avigilon.

Check with our team about any additional licenses required for third-party software integrations.

For more information:

www.ipextreme.com.br



Customizations

In addition to the various features mentioned here, the software can also assist in countless other situations. It is designed to be customized to meet the customer's needs. For example, in a production environment, the software can identify errors and critical failures in a specific part. To request a customization proposal, contact us through our website: www.ipextreme.com.br.

Limitations and considerations

We understand the importance of reliability in critical applications. Therefore, it's crucial to note that no artificial intelligence software can guarantee 100% accuracy. Our solution offers robust and rapid detection, but we always recommend maintaining backup systems and additional security protocols to ensure a comprehensive response in emergency situations.

IPXAnalytics offers demo licenses and we recommend selling them to customers only after successful testing in the desired environment.

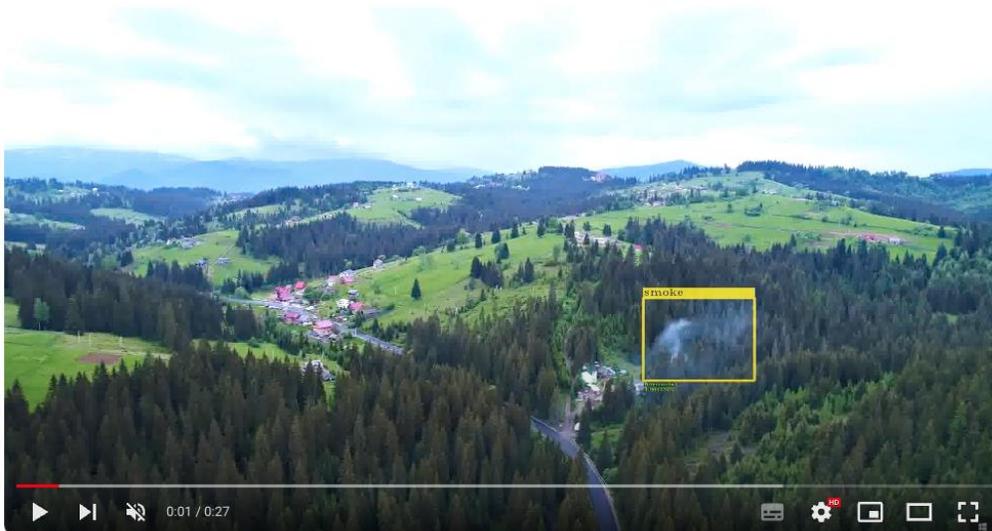
Examples:

Fire detection in enclosed spaces



<https://www.youtube.com/watch?v=GSwOPc1foG4>

Smoke detection in open areas



<https://www.youtube.com/watch?v=9H2r7CiMsMs>

Technical Sheet

Examples and descriptions of objects:

Objects

The Fire and Smoke Detection Module can identify these objects:

- person
- fire
- smoke
- raindrop

person

The person object is the main object that allows the software to perform several other detections. To detect a person, the software will look for legs, arms, and head. It can also detect people close to the camera, even if only the upper half of the body is present.



fire

The fire object allows the software to identify flames in different environments. Detection is based on visual characteristics such as color, shape, and flickering movement. The system can differentiate between fire and other bright light sources to minimize false alarms.



smoke

The smoke object allows the detection of airborne particles that indicate a possible fire. The software analyzes patterns such as color, density, and dispersion movement to accurately identify smoke. Detection can be adjusted to avoid triggering alarms due to vapor or dust.



raindrop

The droplet object detects raindrops or moisture on the camera lens. Identifying raindrops is crucial to maintaining clear visibility and ensuring the accuracy of other detections. The software can issue alerts when raindrops obstruct the lens, prompting maintenance actions such as cleaning or adjusting the camera's position.



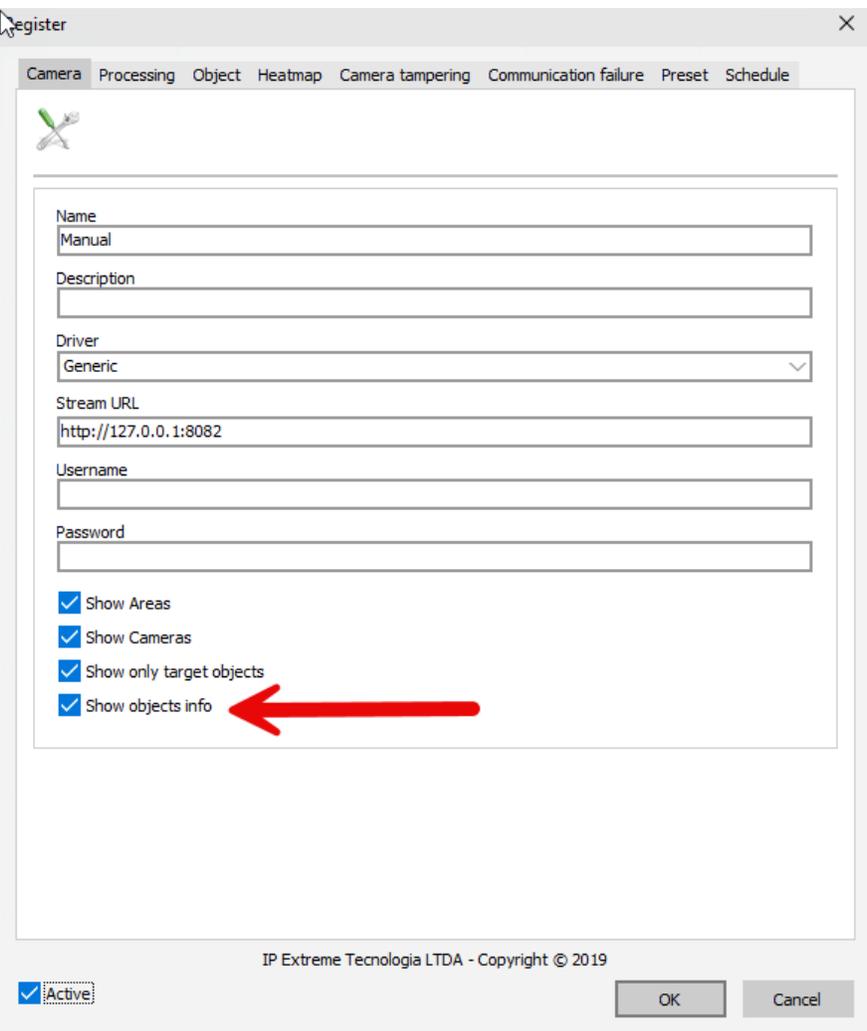
Recommended minimum sizes for detection

A common question is where to install a camera for optimal detection. It's difficult to say with complete certainty because cameras can have different lenses, angles, and zoom levels. The most important factors are the size of the object in the image and its visibility. The table below indicates the recommended minimum object size in the image as a percentage. The percentage refers to the relative size of the object, as there can be various resolutions and resizing options. So, when we say an object is 1% in size, we're indicating that, for example, in a 512x512 image, the object would be 5.12 pixels by 5.12 pixels. See the next chapter for instructions on how to check object size directly in IPXAnalytics.

Object	Minimum percentage size for identification	Camera height
person	1%	3-10 meters
fire	5%	1-15 meters
smoke	5%	1-15 meters
raindrop	1%	1-15 meters

How to identify the size of an object

In IPXAnalytics, you can view the live image in two ways: using debug mode or clicking View in the admin client. When registering a camera, in the first tab, select the "show object information" option. This option will display the size of each object detected in the image and its orientation (vertical or horizontal).



The screenshot shows a 'register' window with the following fields and options:

- Name: Manual
- Description: (empty)
- Driver: Generic
- Stream URL: http://127.0.0.1:8082
- Username: (empty)
- Password: (empty)
- Checkboxes:
 - Show Areas
 - Show Cameras
 - Show only target objects
 - Show objects info (highlighted with a red arrow)

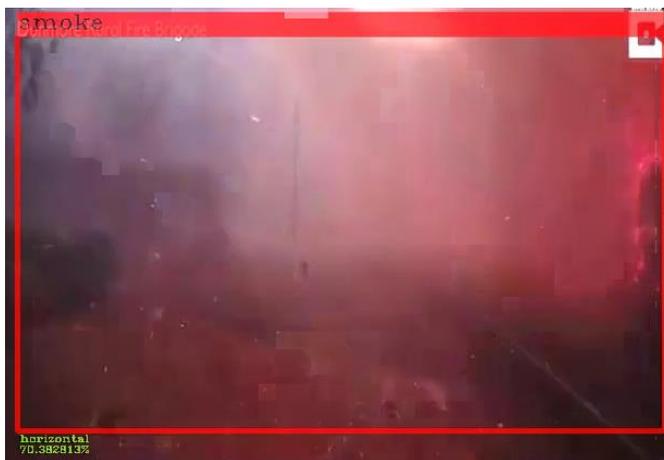
At the bottom of the window, there is a copyright notice: IP Extreme Tecnologia LTDA - Copyright © 2019, and two buttons: OK and Cancel.

Examples:

A fire detected in the image with a total size of 3.08%.



Smoke detected in the image with a total size of 70.38%.

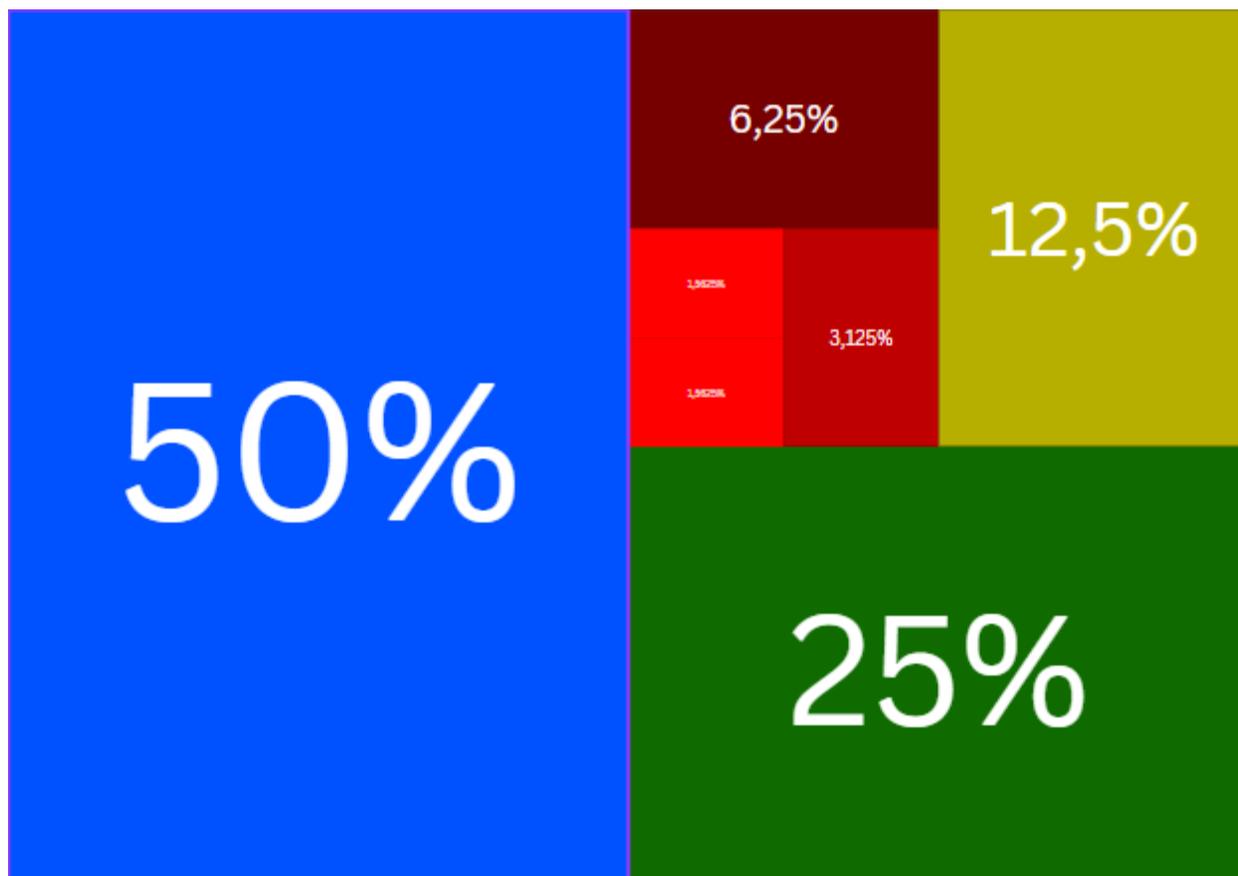


One person detected in the image with a total size of 4.0%.



The image was created to visually illustrate the proportion of an object relative to the overall screen. It divides the space into different percentage areas, making it easier to understand the minimum size required for computer vision software to accurately recognize an object.

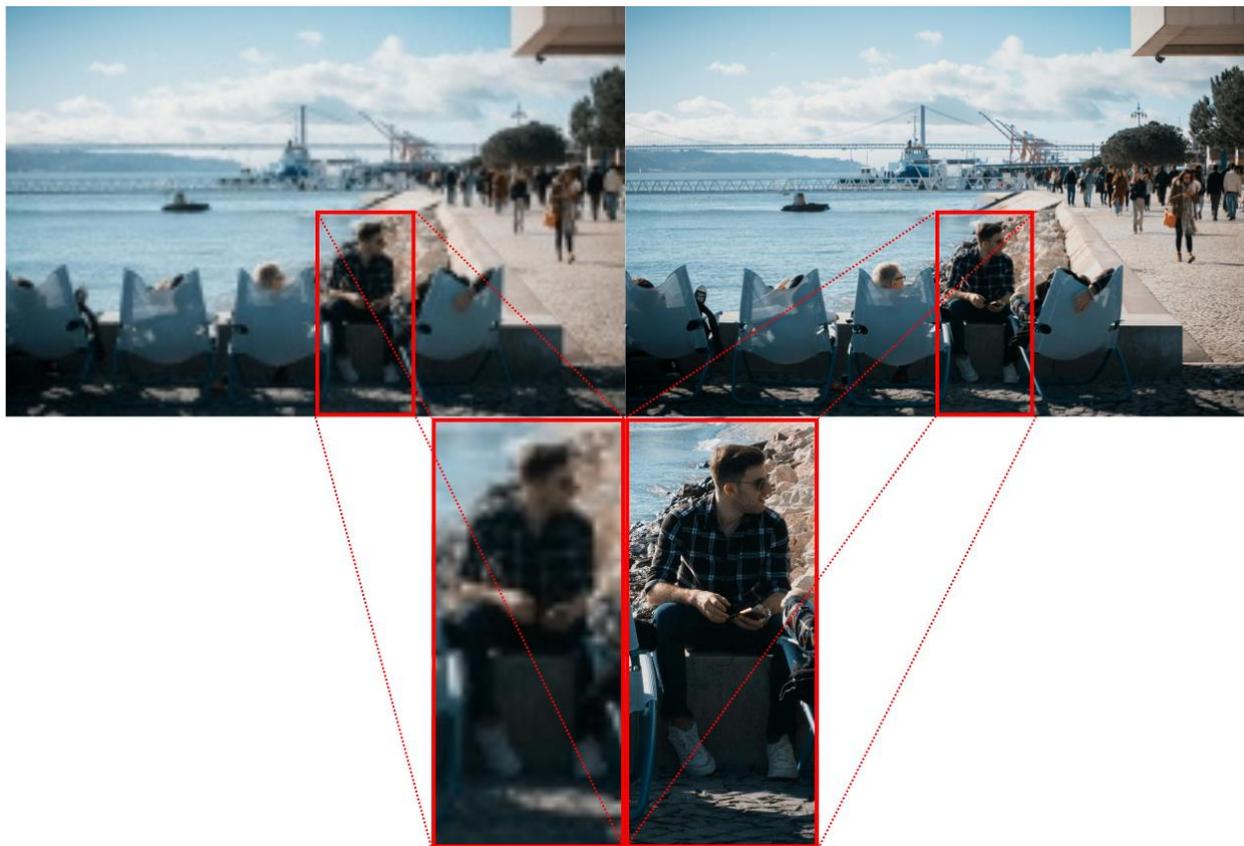
Each rectangle represents a specific fraction of the total screen, starting at 50% and successively subdividing each area into halves. This way, the user can intuitively understand how different sizes affect detection and what minimum dimensions are recommended for effective recognition.



Optimal camera resolution for object recognition

For effective object recognition, camera resolution is crucial. The minimum recommended resolution for optimal performance is **512x512**. This resolution provides sufficient detail for accurate detection and classification while balancing computational efficiency. Higher resolutions, such as 1080p or 4K, require more processing power without significantly improving accuracy and can lead to diminishing returns. Conversely, lower resolutions can result in blurry or distorted images, making object recognition more difficult. Therefore, a resolution of 512x512 is the ideal minimum for reliable and efficient object detection.

Low Resolution vs High Resolution Comparison:



Example of camera placement recommendation

Proper camera positioning is crucial for accurate fire and smoke detection. Cameras should be positioned to minimize false positives caused by environmental factors such as clouds, which can often be mistaken for smoke. Strategic positioning, considering altitude, angle, and field of view, increases detection accuracy and reduces classification errors.

Clouds can be mistaken for smoke, camera positioning can increase fire assertiveness and smoke recognition

Cloud formations under specific lighting conditions can resemble smoke, leading to false detections in automated fire monitoring systems. Optimizing camera positioning by adjusting angles, avoiding horizon-heavy compositions, and incorporating multispectral imagery can improve the reliability of recognition algorithms. Additionally, integrating AI-based pattern analysis can help differentiate between cloud formations and actual smoke plumes.



Black and white image - smoke detection only

Monochrome imaging is often used for smoke detection because it increases contrast levels and improves the visibility of smoke patterns, especially in low-light or high-brightness environments. Grayscale processing allows for better edge detection and contour analysis, making it effective for early warning

systems. However, it lacks the ability to differentiate between fire and other high-temperature sources, requiring additional sensors for comprehensive fire detection.

