

# Introduction to Edge Detection

Edge detection identifies significant changes in intensity in images. It reduces image data while keeping critical details. This technique powers computer vision in medical imaging, autonomous vehicles, and object recognition, making machines smarter and efficient.

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# Edge Detection: Foundational Concepts

## Image Gradients

Measure pixel intensity changes to find edges.

## Derivatives

Highlight edges by calculating intensity rate changes.

## Gradient Magnitude & Direction

Quantify edge strength and the direction perpendicular to edges.



# Basic Edge Detection: Sobel Operator



## Definition & Purpose

Detects edges by convolving images with specific kernels.



## Computation

Uses horizontal and vertical kernels for edge detection.



## Strengths & Limits

Simple and fast but sensitive to