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Machine Learning Based Image Analysis for Surface Defect Detection

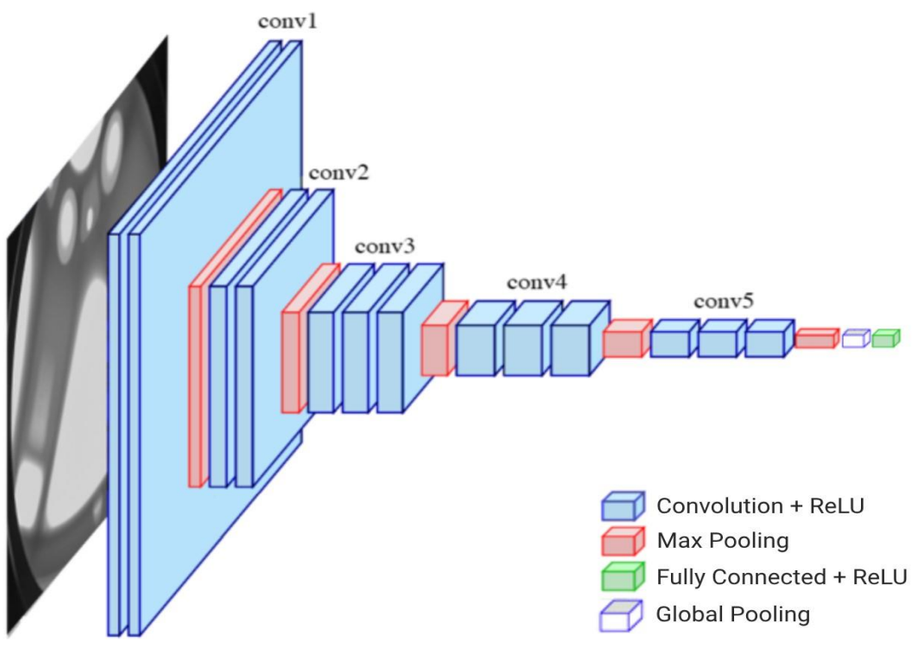
Project Objectives

This project aims to develop an automated surface defect detection system using machine learning, particularly Convolutional Neural Networks (CNNs). The goal is to accurately detect surface defects and draw bounding boxes around identified anomalies.

Methodology

The MVTec AD dataset was trained and tested for models. For classification, five pre-trained models and one custom model were compared. Localization used heatmaps for bounding box generation, while segmentation employed a custom U-Net framework.

Classification Model Architecture



Classification Model Performance

97.48%
Accuracy*

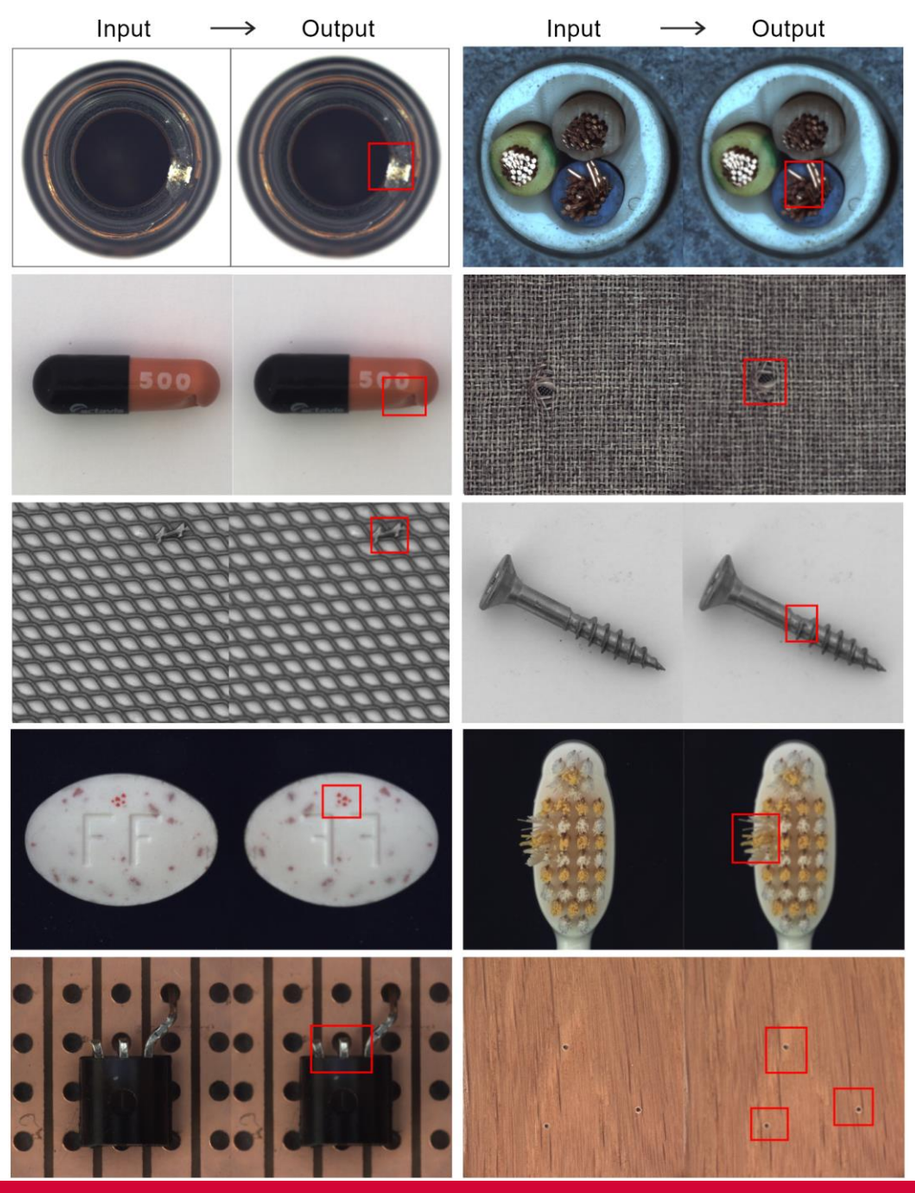
96%
Precision*

99%
Recall*

0.001s
Time Taken per Image

* average score across 15 different surface categories

Localization Output



Segmentation Output