# Defect Detection in Semiconductor Wafers Using Image Classification

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***Abstract*—ABSTRACT**

## I. Introduction

Defect detection is a critical process in the semiconductor manufacturing industry. Traditional inspection methods often rely on manual analysis or rule-based systems, which can be time-consuming and prone to human error. Additionally, the increasing complexity and miniaturization of semiconductor devices necessitate highly precise defect detection methods to ensure manufacturing yield and device reliability. Semiconductor wafer defects, such as cracks, scratches, and contamination, can significantly impact the performance and lead to costly failures. Recent advancements in deep learning and computer vision have enabled automated defect detection using image classification models, offering improved accuracy and efficiency [1].

In this work, I propose to explore and analyze deep learning-based and pattern recognition-based approaches for multi-class defect classification in semiconductor wafers. Specifically, the project will investigate convolutional neural networks (CNNs), support vector machines (SVMs), and k-nearest neighbors (KNNs) for their effectiveness in classifying defects from high-resolution wafer images. Additionally, a fusion model that integrates the strengths of these methods will be developed to further enhance classification performance.

## II. Background

## III. Related Work

## IV. Approach

This section outlines the methodology for defect detection in semiconductor wafers using image classification techniques. The approach consists of several key steps: dataset selection and preprocessing, model development, training, and evaluation.

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### A. Dataset Description

## V. Results

## VI. Discussion

## VII. Conclusion

## References

[1] Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning," Nature, vol. 521, no. 7553, pp. 436–444, 2015.