Engineering Project 7: Profilometer Metrology Image Classification

Problem statement

- Develop a convolutional neural network (CNN) to automatically classify **profilometer metrology images** into normal and defect/outlier categories using machine learning.

The problem this project solves

- Manual review of profilometer maps is time-consuming, subjective, and not scalable.
- Simple thresholding fails to distinguish between true process defects and measurement artifacts such as spikes, drift, scratches, or vibration-induced patterns.
- This project converts complex surface-height patterns into consistent, data-driven classifications.

Applications

- Automated metrology outlier detection and triage before SPC or yield analysis.
- Early identification of tool drift, vibration, and surface damage signatures.
- Reduction of false alarms by separating measurement artifacts from real surface defects.
- Integration into inline metrology pipelines for real-time defect labeling.

Why it's important

- Improves metrology throughput and consistency by removing manual inspection bottlenecks.
- Enables earlier detection of process and tool issues that impact yield and reliability.
- Provides a scalable foundation for advanced analytics and closed-loop process control.