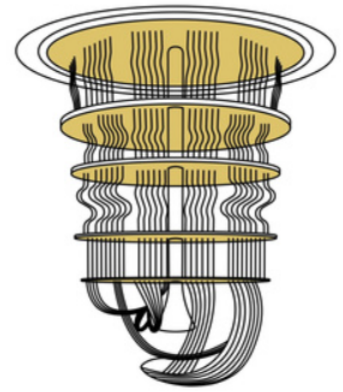




Automatic Wafer Edge Defect Detection Tool for Quantum Fab

[Google Quantum AI](#) | [UCSB ECE Capstone](#) | 2026 - 2027

Problem Statement

Within a fault tolerant quantum computer, there are thousands of individual components that must work with high yield and reliability. In the Google Quantum AI (QAI) cleanroom, many wafer processes are run through automated tools to achieve high levels of reproducibility and control. Many of these tools have some level of handling on the wafer with a robot arm, clamp, or wafer-edge grab system ([this music video](#) is a fun look at how wafers are moved in automated fabrication tools).

Defects, chips, or cracks along the edge of a silicon wafer can result in full wafer breakage inside a tool, leading to many hours of downtime for our process while the pieces are cleaned out. Our operations **manually** inspect the top side of a wafer for signs of defects that could cause breakage, but it is inefficient and does not capture any backside defects. Examples of defects that lead to full wafer breaks inside of tools:



Key Deliverables

The goal of this project is to deliver a stand-alone tabletop system that can map the edge of a silicon wafer, image the front and backside, and use machine learning to **automatically detect and flag the locations of defects or cracks**.

[Hardware Deliverables]

- System that can hold a 100mm, 150mm SEMI-spec wafer with major flat or notch
- Cameras (2x) for top and backside imaging
- Moveable stage (open to either the cameras fixed and wafer is moving or vice versa)

[Software Deliverables]

- Saved images of defects with constructed “wafer edge” full image
- Automatic classification of defects (crack, chip, residue, particles)

About Google Quantum AI

Google Quantum AI is working to build scalable quantum computers that enable humankind to solve problems that would otherwise be impossible. Our quantum processor fabrication facility in Goleta/Santa Barbara will bring the next generation of even more capable quantum processors to the world. [More Info](#)