

Multimodal Deep Learning for Lung Cancer Prognosis

Undergraduate Research Contribution - Arizona State University

The Problem

Lung adenocarcinoma (LUAD) is the most common subtype of lung cancer, responsible for roughly 1.8 million deaths globally in 2020. Despite decades of research, five-year survival rates remain below 30%. A core reason is treatment decisions are still made using incomplete, single-source data either a tumor image or a genetic profile, rarely both together.

The Approach

Under the supervision of Dr. George Poste, Regents Professor and Chief Scientist at ASU's Complex Adaptive Systems Initiative, our team proposed a multimodal deep learning framework designed to integrate two data streams simultaneously - digital pathology slides of tumor tissue and whole-genome sequencing data from liquid biopsy. The premise is that combining what a tumor looks like with what its DNA says can produce predictions perhaps better than what no single modality can achieve alone.

My Contribution

I joined this project as the only undergraduate on a team of PhD and Master's researchers. My primary responsibility was the literature review that shaped the project's direction. Surveying recent multimodal oncology studies to identify which cancer type offered the clearest scientific and clinical case for this approach. Our team concluded that LUAD was the optimal focus, given the strength of available data and the unmet clinical need.

This analysis directly informed a formal research proposal supporting an active institutional partnership between ASU and a publicly traded clinical genomics company which is in the pipeline as of now.

Why It Matters to Me

Both my parents died of cancer. For most of my life, oncology felt like a domain completely out of my reach, something like a locked room I had no key to. Working on this project, I realized that machine learning had changed that. A math and CS student could now contribute meaningfully to a field once reserved for biologists and clinicians. That realization shaped everything about how I think about what mathematics and computation are actually for and how technology empowers people.

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