# Research Statement

Every city promises that a store, a bus stop, a park is close enough to walk to. I wanted to check if that's true for everyone, or just some neighborhoods. My master's capstone builds a walking network model for the Denver-Aurora-Lakewood area and measures who can really reach groceries and transit within 15 minutes, then uses spatial statistics (Moran's I, hot spot analysis, GWR) to see which regions are inaccessible and why. The results were stark: about 1.5 million people have no walkable access to groceries, mostly in the outer suburbs, while access near downtown is easy. I'm now adding parks, schools, hospitals, and income data to see how these gaps connect to social equity.

Building this model, I ran into a problem bigger than the numbers themselves. Like most accessibility research, my model depends on map data such as OpenStreetMap to know what sidewalks and paths exist. But there is little to no data available in exactly the neighborhoods my results already flag as underserved, since low-income and outer areas get mapped less often and less carefully. That means the real gap is likely larger than what any current model can see. This is the avenue I want to spend my PhD on.

Tools already exist that use GeoAI to map sidewalks from satellite and street images (Tile2Net, CrosswalkNet), but almost none of that work is built around equity. It mostly chases prediction accuracy. I want to close that gap: Use GeoAI to build better infrastructure data where current geospatial data falls short. Secondly, combine it with accessibility models built around equity. Finally, predict how these gaps shift as cities grow, so planners can act before inequity gets built in.

I didn't arrive at this question by accident. At CEGIS in Bangladesh, I spent two years turning satellite and drone images into landuse maps that planners and engineers used, and that work showed me how incomplete data quietly shapes real decisions. Since then, I've kept building the same skill elsewhere: multispectral analysis in Google Earth Engine, a solar-siting model for Colorado, and a CNN (ResNet-50) I trained to detect COVID-19 from chest X-rays which is a different field, but the same core task: turning raw images into usable information. I've also built geodatabases and batch-processing pipelines for large datasets, which taught me to work on a real scale, not just in a clean example.

In the end, my goal is to use GeoAI to fix the accessibility data problem, not just the accessibility numbers. Right now, the neighborhoods that need attention most are the ones that current maps and models understand the least, and I want to change that.