

# SI507 Final Project: Pharmacy Proximity Network

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## Project Overview

This project explores pharmacy accessibility in Michigan using network analysis. Each pharmacy is modeled as a node, and connections (edges) are drawn between pharmacies that are located within 2 miles of each other. The purpose is to understand which pharmacies are well connected and which are isolated, providing insights into geographic clustering and potential gaps in access to medication services.

## Dataset Description

The dataset was sourced from Kaggle and includes the names, addresses, GPS coordinates, and basic information for pharmacies across the U.S. For this project, I filtered to only include pharmacies located in Michigan. After cleaning, I retained 2,259 entries. To improve performance and clarity of visualization, I used a sample of the first 200 pharmacies.

## Network Construction

I constructed a network using NetworkX in Python. Each pharmacy is a node, and an edge connects two pharmacies if they are within 2 miles of each other, using geodesic distance. This allowed us to simulate geographic proximity as a network structure and explore connectivity patterns among pharmacies.

## User Interactions

The user can interact with the network through a command-line interface that supports:

- Viewing all pharmacies within 2 miles of a selected pharmacy (neighbors)
- Finding the shortest path between two pharmacies
- Identifying the most connected pharmacy (highest degree)
- Viewing pharmacy info and Google Maps link
- Searching for pharmacies in a specific ZIP code

## Key Finding

One of the most connected clusters is in southeast Michigan, where a pharmacy is linked to 12 others. In contrast, many pharmacies in the upper peninsula had no neighbors, highlighting gaps in close-proximity access. This insight can help policymakers identify areas of oversupply and undersupply.

## Network Visualization

The network was visualized using two layouts:

- A Map Layout, which uses latitude and longitude for realistic pharmacy locations
- A Spring Layout, which clearly displays the structure and connectivity of the graph

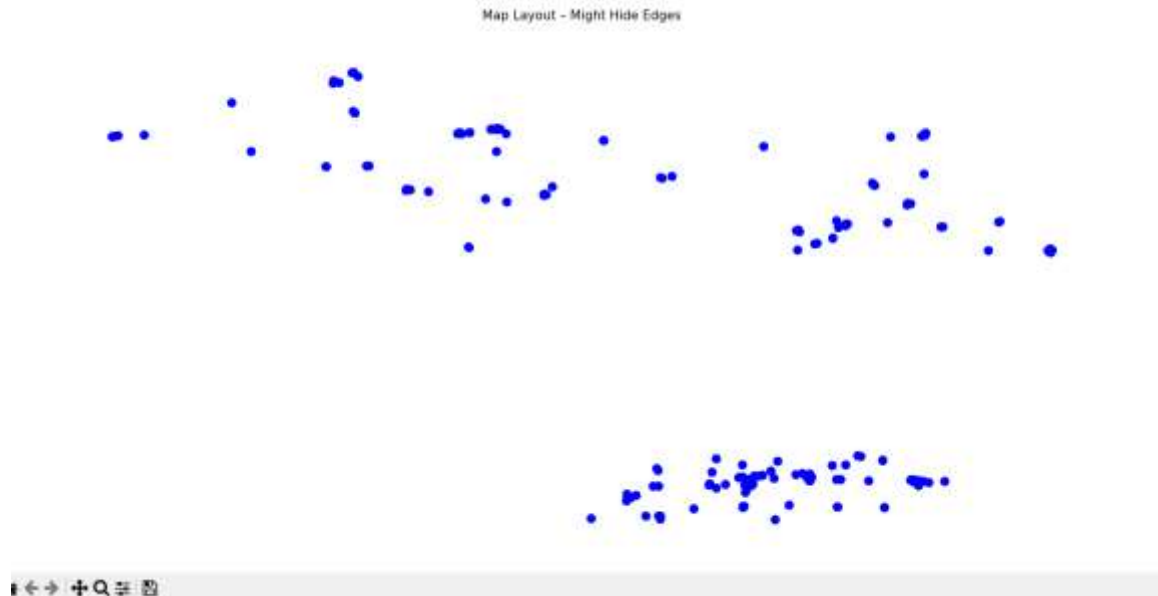


Figure 1: Geographic layout of pharmacies (map view).

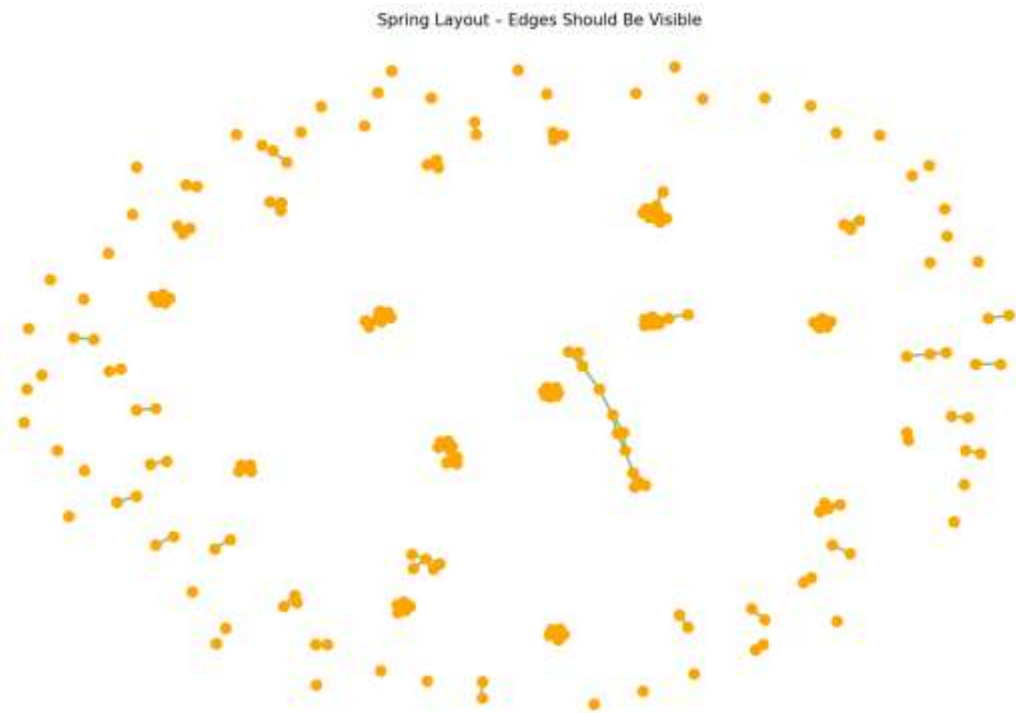


Figure 2: Network layout showing edges more clearly (spring layout).