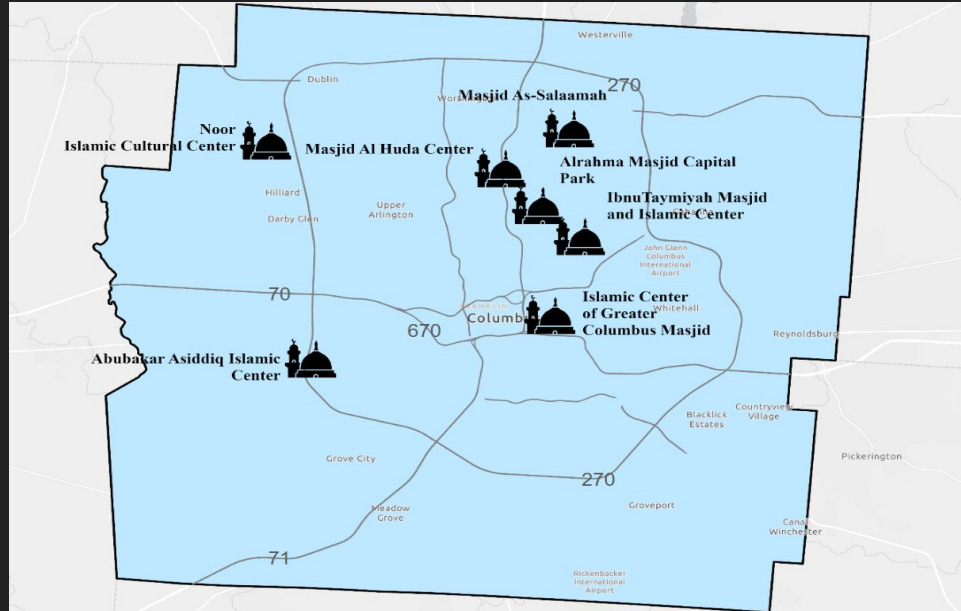


# “Mosque Accessibility in Columbus, Ohio using postGIS”

Omar Ali — GEOG 5212 Final Project



# Introduction

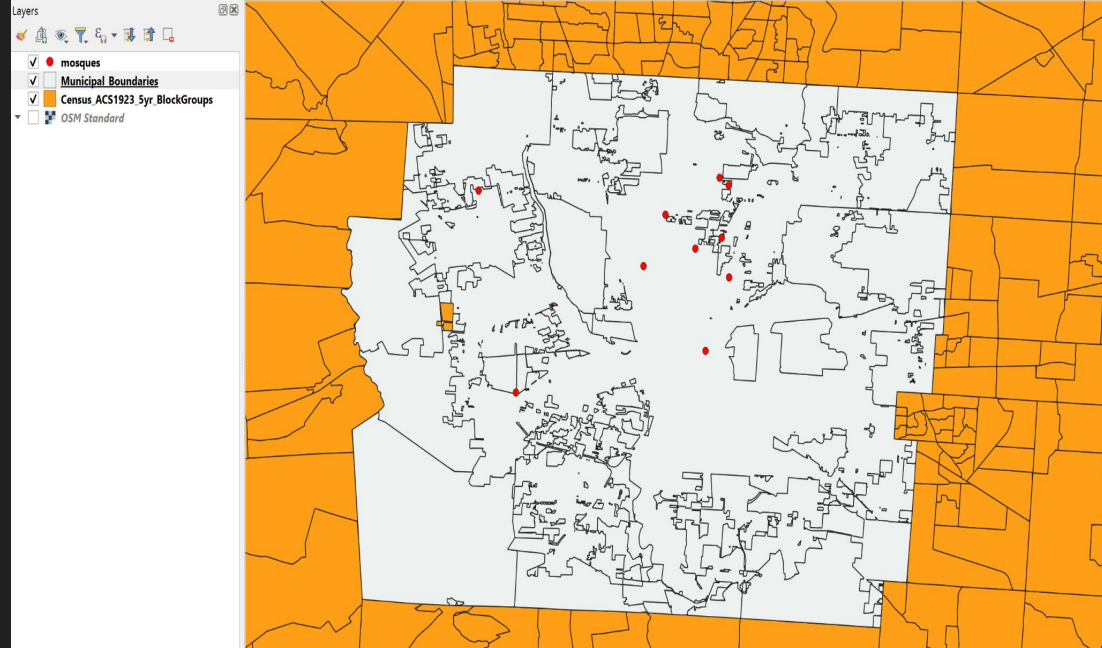
Columbus has a large and growing Muslim population

Mosques are limited and not evenly distributed

Accessibility can be difficult during Friday prayers & Ramadan

Research Questions:

- How many mosques are within 1 mile of each Census block group?
- Which areas have zero mosque access?
- Are mosques clustered or evenly spread?



# Data

## Mosque Locations

- Manually collected from Google Maps + IslamicFinder
- Created my own point dataset

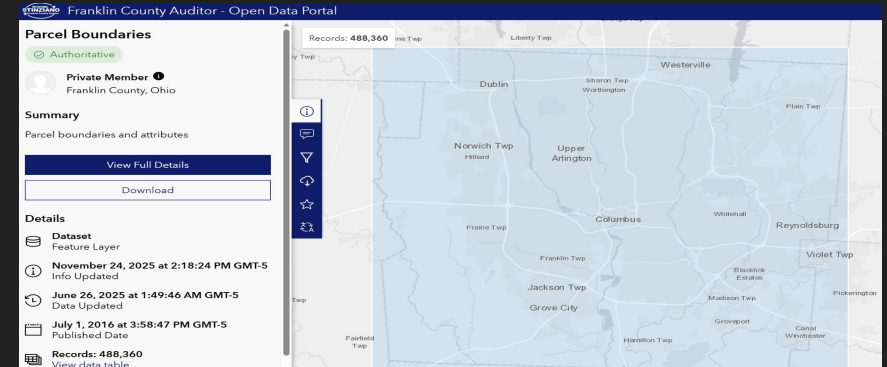
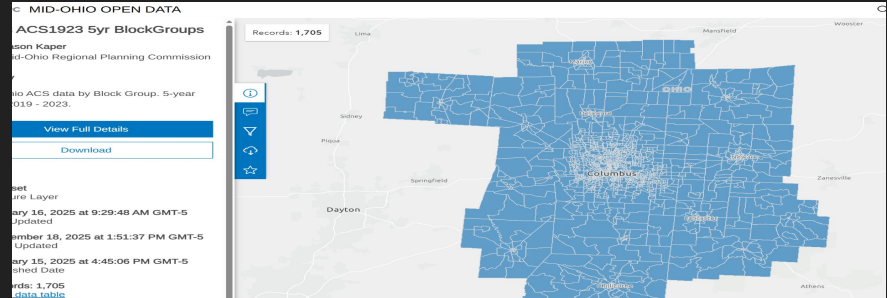
## ACS 5-Year Data

- MORPC (Mid-Ohio Regional Planning Commission)

## Franklin County Boundary

- Franklin County Auditor (ArcGIS Online)

|    | name                                      | address                                    | latitude | longitude |
|----|---|--|----------|-----------|
| 1  | Masjid As-Salaamah                        | 5259 Cleveland Ave, Columbus, OH 43231     | 40.0735  | -82.9542  |
| 2  | IbnuTaymiyah Masjid and Islamic Center    | 2334 Mock Rd, Columbus, OH 43219           | 40.0116  | -82.9467  |
| 3  | Omar Ibn El-Khattab Masjid                | 580 Riverview Dr, Columbus, OH 43202       | 40.0186  | -83.0159  |
| 4  | Islamic Center of Greater Columbus Masjid | 1428 E Broad St, Columbus, OH 43205        | 39.9663  | -82.9656  |
| 5  | Alrahma Masjid Capital Park               | 2205 Albert Ave Columbus, OH 43224         | 40.0294  | -82.9739  |
| 6  | Masjid Al Huda Center                     | 1156 E Cooke Rd, Columbus, OH 43224        | 40.0505  | -82.9981  |
| 7  | Abubakar Asiddiq Islamic Center           | 591 Industrial Mile Rd, Columbus, OH 43228 | 39.9405  | -83.1194  |
| 8  | Noor Islamic Cultural Center              | 5001 Wilcox Rd, Dublin, OH 43016           | 40.0655  | -83.1494  |
| 9  | Masjid Abu Hurairah                       | 3296 Westerville Rd, Columbus, OH 43224    | 40.0362  | -82.9527  |
| 10 | Columbus Amer Muslim Society              | 4615 Northtowne Blvd, Columbus, OH 43229   | 40.0685  | -82.947   |



# Methods Overview

## Download Data

- MOSQUES (manual CSV)
- ACS Block Groups (MORPC)
- Franklin County Boundary



## QGIS Import

- Import Shapefiles to PostGIS
- Import Mosque CSV into pgAdmin



## Fix Geometry/SRID

- ST\_SetSRID
- ST\_Transform



## Clean Data

- Rename columns
- Validate geometry
- Normalize tables



## Run Queries

- Spatial Query (1-mile buffer)
- Non-spatial Query (0 mosques)

Imported shapefiles into PostGIS using QGIS (Lab 6 method)

Imported mosque CSV in pgAdmin

Fixed SRIDs using ST\_SetSRID and ST\_Transform

Cleaned columns and normalized table names

Validated geometry

Ran spatial and non-spatial SQL queries

# Methods

Load from the staging table with lat/long

```
INSERT INTO public.mosques (name, address, geom)
SELECT
    name,
    address,
    ST_SetSRID(ST_MakePoint(longitude, latitude), 4326)
FROM public.mosques_staging;
```

Projecting Mosques to Ohio South (3735)

```
ALTER TABLE public.mosques
ADD COLUMN geom_3735 geometry(Point, 3735);

UPDATE public.mosques
SET geom_3735 = ST_Transform(geom, 3735);
```

Joining Mosques to ACS Block Groups

```
CREATE VIEW public.mosques_with_acs AS
SELECT
    m.id                AS mosque_id,
    m.name              AS mosque_name,
    m.address           AS mosque_address,
    m.geom_3735        AS mosque_geom,

    b."GEOID",
    b."NAME"           AS bg_name,

    -- a few key ACS fields
    b."POP_UNI",
    b."PCT_MIN",
    b."PCT_POV_20",
    b."PCT_65UP",

    b.geom              AS bg_geom
FROM public.mosques m
JOIN public."Census_ACS1923_5yr_BlockGroups" b
ON ST_Intersects(m.geom_3735, b.geom)
```

# Spatial Query

```
SELECT
    bg."GEOID",
    bg."NAME",
    COUNT(m.*) AS mosques_within_1mile
FROM public."Census_ACS1923_5yr_BlockGroups" AS bg
LEFT JOIN public.mosques AS m
    ON ST_DWithin(
        ST_Transform(bg.geom, 3735), -- convert block group to feet
        ST_Transform(m.geom, 3735),  -- convert mosques to feet
        5280                          -- 1 mile
    )
GROUP BY bg."GEOID", bg."NAME"
ORDER BY mosques_within_1mile DESC;
```

Counts the number of mosques within 1 mile of each block group using ST\_DWithin.  
Uses EPSG 3735 for distance measurement.

# Non spatial Query

```
WITH bg_mosque_counts AS (  
  SELECT  
    bg."GEOID",  
    bg."NAME",  
    COUNT(m.*) AS mosques_within_1mile  
  FROM public."Census_ACS1923_5yr_BlockGroups" AS bg  
  LEFT JOIN public.mosques AS m  
    ON ST_DWithin(  
      ST_Transform(bg.geom, 3735), -- block groups to Ohio South  
      ST_Transform(m.geom, 3735), -- mosques to Ohio South  
      5280 -- 1 mile in feet  
    )  
  GROUP BY bg."GEOID", bg."NAME"  
)  
  
-- summarize  
SELECT  
  SUM(CASE WHEN mosques_within_1mile = 0 THEN 1 ELSE 0 END) AS blockgroups_with_0_mosques,  
  SUM(CASE WHEN mosques_within_1mile BETWEEN 1 AND 2 THEN 1 ELSE 0 END) AS blockgroups_with_1_2_mosques,  
  SUM(CASE WHEN mosques_within_1mile >= 3 THEN 1 ELSE 0 END) AS blockgroups_with_3plus_mosques  
FROM bg_mosque_counts;
```

Summarizes block groups by  
how many mosques fall within 1  
mile:

0 mosques = 1524 block groups

1–2 mosques = 151 block  
groups

3+ mosques = 30 block groups

- Some block groups had 2–3 mosques within 1 mile
- Many block groups had zero mosques
- Shows uneven mosque accessibility
- Useful for identifying underserved areas

Data Output

Messages

Notifications

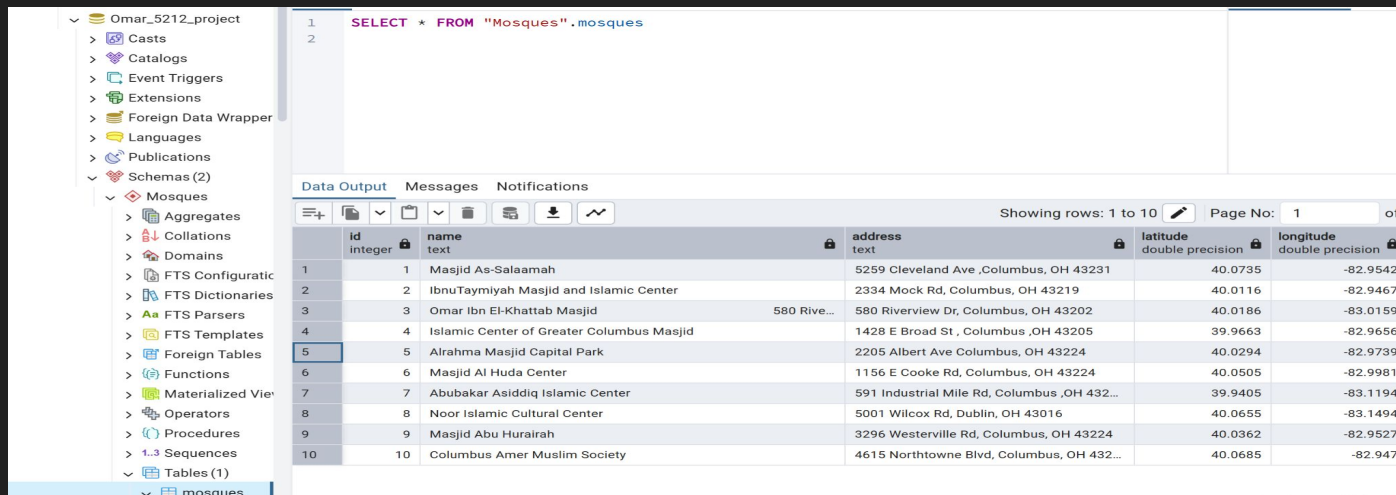
SQL

Showing row

|   | blockgroups_with_0_mosques<br>bigint | blockgroups_with_1_2_mosques<br>bigint | blockgroups_with_3plus_mosques<br>bigint |
|---|--------------------------------------|--|--|
| 1 | 1524                                 | 151                                    | 30                                       |

# Learnings

- Learned full workflow of building a spatial DB
- Had to fix SRIDs, geometry errors, and table normalization
- Spatial SQL became much easier with practice



The screenshot shows a database management interface. On the left is a tree view of the database structure, including schemas, casts, catalogs, event triggers, extensions, foreign data wrappers, languages, publications, and schemas. The 'Mosques' schema is expanded, showing various objects like aggregates, collations, domains, FTS configurations, dictionaries, parsers, templates, foreign tables, functions, materialized views, operators, procedures, sequences, and tables. The 'mosques' table is selected. The main area displays a SQL query: `SELECT * FROM "Mosques".mosques`. Below the query, there are tabs for 'Data Output', 'Messages', and 'Notifications'. The 'Data Output' tab is active, showing a table with 10 rows and 5 columns: 'id', 'name', 'address', 'latitude', and 'longitude'. The table contains data for various mosques, including Masjid As-Salaamah, Ibnu Taymiyah Masjid and Islamic Center, Omar Ibn El-Khattab Masjid, Islamic Center of Greater Columbus Masjid, Alrahma Masjid Capital Park, Masjid Al Huda Center, Abubakar Asiddiq Islamic Center, Noor Islamic Cultural Center, Masjid Abu Hurairah, and Columbus Amer Muslim Society.

|    | id | name                                      | address                                     | latitude | longitude |
|----|----|---|---|----------|-----------|
| 1  | 1  | Masjid As-Salaamah                        | 5259 Cleveland Ave ,Columbus, OH 43231      | 40.0735  | -82.9542  |
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# Challenges

- Hardest part: finding accurate mosque data
- Some places on Google Maps were closed or outdated
- SRID mismatch errors in PostGIS
- Manual data cleanup took time



Missing Data

# Future Work

- Add drive time analysis (real travel distance)
- Include bus routes + walkability
- Compare mosque access with poverty or income
- Track population growth over time for planning

