**Homework #5: Neighborhood Factors and Subway Access in New York City**

**Objective:**

The goal of this assignment is to explore the spatial relationship between transit access and neighborhood characteristics in New York City. You will study how subway locations relate to demographic and socioeconomic factors within NYC neighborhoods, and you will also select one additional variable of interest for deeper analysis. This exercise will involve working with point data (subway stations), polygon data (census tracts), creating buffer zones, and analyzing areas without transit access.

**Data Sources:**

* **NYC Subway Stations (Points Data):** Located in HW 5 folder.
* **Census Tracts Data:** Available as a ZIP file in the Lab 3 folder. This data includes population, median household income, racial/ethnic composition, and other key demographic variables. New York State is State 36 and the New York City counties are 005, 047, 061, 081, and 085.

The goal of this homework exercise is to get you to examine point patterns, as well as the relationship between multiple map layers, points and polygons.   We use relations to transit here, but note that the skills you use here are useful for all kinds of data manipulation and creation that will be helpful for different social science research projects. Here is the scenario.  You are interested in studying the relationship to transit in New York City to other social and demographic factors.

Import the NYC Subway Stations dataset (points) and the Census Tract dataset (polygons) into QGIS. Ensure that both layers use the same coordinate system (NAD83 or WGS84).

**1. Examine the Subway Station Distribution:**

* Visualize the subway stations and census tracts on the same map.
* Join the demographic and socioeconomic variables from the Census dataset to the Census Tracts shapefile. You can use ACS data or other relevant data sources.
* Identify the key variables for analysis, such as:
  + **Population Density**
  + **Median Household Income**
  + **Racial/Ethnic Composition**
  + **+ One additional variable of your choice** (e.g., food access, housing tenure, education levels, unemployment rates, access to healthcare, etc.).

**2. Buffer Creation:**

* Create a 0.5-mile buffer around each subway station to represent the area within walking distance of the station.
* Create an additional 1-mile buffer around each subway station for the next part of the analysis.

**3. Transit Deserts:**

* Use the 1-mile buffer to identify census tracts that do **not** have a subway station within 1 mile. These tracts represent areas with low access to transit.
* Analyze the demographic and socioeconomic characteristics of these "transit deserts" by comparing the variables you studied in these tracts to those with access to transit.

**4. Visualize Your Results:**

* Create at least **four maps**:
  + **Map 1:** Subway stations, census tracts, and the buffers you created.
  + **Map 2 and 3:** A thematic map showing one of the key demographic variables above (e.g., median household income or population density) and another map on your key variables of choice with the location of subway stations/buffers.
  + **Map 4:** A map showing census tracts that do not have a subway station within 1 mile. Highlight these "transit deserts" and describe their characteristics.
* Include legends, titles, and a brief explanation of what each map is showing.

**5. Report:**

Write a brief report (2-3 pages doubled spaced) summarizing your findings. Discuss:

* Describe the spatial pattern of subway stations. Are they evenly distributed across the city? Do certain boroughs or areas have more or fewer subway stations?
* The spatial relationship between subway access and neighborhood demographics.
* Insights from the additional variable of interest.
* Do certain demographic groups (e.g., racial/ethnic minorities, low-income households) have more or less access to transit?
* How do neighborhoods with subway access differ from those without in terms of income, population density, and racial/ethnic composition?
* Patterns or trends you observed in the analysis of transit deserts.
* How does the additional variable of your choice (e.g., housing, education, health) vary between neighborhoods with and without subway access?
* What insights can be drawn from this variable about transit equity in NYC?
* Any limitations of the data or analysis methods, and how these might impact your conclusions.

**6. Submission:**

* Submit the final map visualizations (PDF or image format).
* Submit your report as a Word or PDF document.
* Upload your QGIS project file and any geospatial data layers used.