Team Name: Steel City Mobility
Team Members: Reem Kensouh, Hiba Hamad, Eunice Lee

Dashboard Link:
https://github.com/eunilee2/steel-city-mobility-final-project

Project Architecture (Tool Selection & Justification, Dataset List)

For our project we used a mix of different tools that we learned and utilized throughout the course. This includes ArcGIS, Tableau, and Observable, each which serves a different purpose for our dashboard. We chose ArcGIS for its ease of use and map layer styling to best showcase our data spatially in choropleth maps. Tableau was used for showcasing more basic visualizations (such as bar graphs, line charts, scatterplots) but also for its ability to aggregate several visualizations and charts into a singular view/dashboard. Lastly, Observable was used to host the overall dashboard but to also store written text, separate the dashboard into several components via tabs, and allow for custom visualizations if needed. Originally the team wanted to use ArcGIS StoryMaps, but found that collaboration via that tool was difficult to feasibly work together on. Thus, Observable is used in place of StoryMaps for the narrative component of our final project.

We also selected a variety of datasets, which come from either the Western Pennsylvania Regional Data Center or Esri's built-in Living Atlas maps (which are based on data sources such as the U.S. Census). We know that these main two dataset repositories are **credible** because they come from government agencies or other institutions that are invested in accurate datasets.

For our current visualizations, we used a bus stop dataset (source) and ACS Median Household Income Variables - Boundaries dataset (sourced from Esri's Living Atlas). The way in which these two datasets are connected to the dashboards is in the way we showcase them in different ways/visualizations to uncover findings for our project. For example, the first visualization is on ArcGIS and uses both of the mentioned datasets. It showcases a choropleth map with a gradient colorway showcasing the different levels of median income in each census tract (which users can click on the tract to see the distribution of median income by age group). Bus stop locations are overlaid on top of the choropleth map to showcase which neighborhoods and tracts bus stops fall under. Another visualization is built on Observable (and mainly uses just the bus stop dataset), which showcases the top 10 most used bus stops (pre-pandemic and pandemic era usage) by totalling the average ons an average offs to gain total average usage. This visualization in the dashboard also relies on the ACS Median Household Income in order to portray relevant statistics about the top 10 bus stops (such as what is the highest median income within the census tracts of the top 10 bus stops). The last visualization was done in Tableau and uses mainly the first mentioned bus stop dataset in order to showcase which bus routes are the most served (in terms of bus stops), which will be helpful in helping us uncover if certain bus routes are also not serving certain populations in Pittsburgh.

However, given the scope of our project questions and the feedback given to us from meeting with the instructors, we also will be looking at a variety of other datasets from the same two dataset repositories mentioned prior. Some datasets of interest include Monthly Average Ridership by Route, Make My Trip Count (a dataset of survey responses which explores the primary commute vehicle, number of times commuting in a week, and home zip codes of Pittsburghers), and Port Authority Monthly On Time Performance. All of these datasets can be further explored as they focus on the transit riders background/commute behavior and performance of Pittsburgh transit (which is still important for transit equity). Additional datasets could also include demographic data (race, income, gender, etc) which can be sourced from Esri's Living Atlas (which we know is credible just like the Pittsburgh datasets from Western Pennsylvania Regional Data Center).

A revised and clearer version of our original proposal

Public transit is a critical issue in Pittsburgh. Low-income neighborhoods in different areas in the world face issues regarding public transport such as fewer bus stops, longer wait times, and less reliable service compared to other areas. These disparities limit the residents' access to jobs, education, and essential services. This makes public transport not only a mobility concern but also a matter of social and economic justice. We plan on exploring and understanding the issue in the Pittsburgh area.

Three Goals
Goal 1: Demonstrating the current layout of bus stops, routes, and car usage in Pittsburgh.
Goal 2: Portraying the correlation between low income and bus accessibility. Exploring whether bus accessibility is reliable (in terms of bus stop frequency and bus performance) in low income neighborhoods.
Goal 3: Demonstrating the difference in accessibility between various demographics.

Explanation on how each planned dashboard supports one or more of our goals.

Dashboard 1: Transit Landscape of Pittsburgh

This dashboard introduces the overall transportation landscape and sets context for the rest of the story. It supports Goal #1.

The content will include the following:

a. Conclusions Paragraph
b. Chlorapleth map (ArcGIS) with short description: Displays car usage rates by census tract. The purpose is to show where public transit dependence is greatest.
c. Bus Routes + Bus Stops Layer (ArcGIS) with short description: All bus stops (as dots sized by daily ridership or frequency). All bus routes (colored by frequency or category)
d. Car Ownership Line or Bar Chart (Tableau) with short description: Car-ownership vs no-car ownership (using number of vehicles dataset) against/or transit ridership across different areas.

Dashboard 2: Bus Accessibility & Income Inequality
This dashboard examines how bus accessibility differs across income levels and reveals whether lower-income neighborhoods face unequal transit service. It supports Goal #2.

This dashboard shows and demonstrates how bus accessibility varies across different income levels in Pittsburgh. The purpose of this dashboard is to highlight whether low-income neighborhoods experience reduced access to bus stops, lower service frequency, or less reliable service compared to higher-income areas.

The content will include the following:

a. Conclusions Paragraph
b. Choropleth Map (ArcGIS): Median Household Income by Census Tract. This graph will show the distribution of income levels across Pittsburgh and identifies low-income regions that may be vulnerable to transit inequities.
c. Service Frequency Bar Chart (Tableau): Daily Trips or Average Wait Times by Neighborhood Income Group. This bar chart compares how often buses serve high- vs. low-income areas, highlighting frequency disparities.
d. On-Time Performance Scatterplot (Tableau): Income Level vs. Route Reliability. In this scatterplot each point represents a neighborhood or route, showing whether routes serving low-income areas tend to have worse on-time performance.
e. Accessibility Box Plot (Tableau): Walking Distance to Nearest Stop by Income Level. This box plot shows the median, quartiles, and outliers for how far residents must walk depending on neighborhood income group.

Dashboard 3: Demographics & Mobility Equity

This dashboard focuses on whether different populations (e.g., age, race, disability status) experience different levels of transit access. It supports Goal #3.

The content will include the following:

a. Conclusions Paragraph
b. Bar Graph/Line Chart showcasing the overall Pittsburgh demographic breakdown of the groups we are interested in. This could be a distribution of people by race, gender, age groups, etc depending on what we choose.
c. Choropleth Maps (ArcGIS) with short description: Shows where vulnerable populations are concentrated. They will include 2-3 demographic variables such as age, disability, race.
d. Transit Access Overlay on Maps: Demonstrates bus stop walkability and route frequency overlays. This shows if vulnerable groups live in areas with adequate service.
e. Accessibility bar plot (Tableau) with short description: Includes accessibility scores (e.g., number of stops, mean route frequency) broken down by demographic group quartiles. The purpose is to turn spatial inequities into quantifiable metrics for key stakeholders including policy makers.

f. Car Ownership by Demographics Treemap or Stacked Bar (Tableau): The purpose is to show mobility dependence across groups.

Dashboard 4: Demographics & Mobility Equity

This dashboard uses a storytelling, human-centered approach to compare two fictional but data-grounded personas in Pittsburgh:

(1) a resident from an advantaged, transit-rich neighborhood, and
(2) a resident from a disadvantaged, low-access neighborhood.

The comparison translates your spatial and quantitative findings into lived experiences.

Supports Goals 2 & 3: Understanding how transit access shapes daily life and highlighting inequities between demographic groups.

The content will include the following:

a. **Persona Cards (Observable)**
   Two side-by-side panels summarizing each person:
   - Age, demographic background
   - Neighborhood & census-tract stats (e.g., median income, % households w/ no car, transit frequency score)
   - Daily responsibilities (work, school, errands)

b. **Route Journey Visual (Tableau or Custom Observable Viz)**
   A simple timeline visualization for each persona:
   - Commute start time
   - Walking distance to nearest bus stop
   - Average wait time based on route frequency
   - Ride duration + number of transfers
   - Return trip differences (night safety, lower frequency, etc.)

c. **Neighborhood-Level Visual Snapshot (ArcGIS Embedded Map)**
   Two side-by-side mini-maps:
   - Map A: Advantaged neighborhood (dense bus stops, frequent routes, shorter walking distances)
   - Map B: Disadvantaged neighborhood (few stops, irregular service, longer walks, limited safety features)

d. **Summary Comparison Table**
   - Cross comparison across both personas with factors like: Walk to nearest stop, Avg wait time, Commute total time, Transfers, Route reliability, Accessibility.