1.Introduction

Refugee populations have shifted dramatically over decades, influenced by conflicts, instability, and crises worldwide. The dataset used in this visualization captures the global refugee population by country of origin from 1951 to 2023. With a long temporal range and numerous countries, the dataset is complex and requires more than a single static chart to understand its trends.

The aim of this visualization is to help users explore:

- The global distribution of refugees over time (with animation).
- Historical trends for specific countries.
- Which countries rank highest as origins of refugees in selected years.
- A focused comparison of the top 3 refugee-origin countries through small multiples.

By integrating multiple visualization types (a choropleth map, a time-series line chart, a top-10 bar chart, and small multiples), plus interactivity and animation, this solution provides deep insights into a multifaceted dataset.

2. Description and Data Preparation

The dataset, originally sourced from UNHCR and processed by Our World in Data, includes attributes such as Entity (Country), Code (ISO-3 or custom), Year (1951–2023), and Population (refugee count). The dataset was last updated on July 25, 2024.
Link for the dataset:
Refugee Population Statistics Database, UNHCR, 2024 (https://www.unhcr.org/refugee-statistics/)
https://ourworldindata.org/grapher/refugee-population-by-country-or-territory-of-origin

Data Complexity:

- **Temporal Depth & Scale Variability:** Populations range from a few hundred to over a million refugees over more than 70 years.
- **Global Scope:** Hundreds of countries introduce high dimensionality and necessitate filtering and multiple perspectives.
- **Diverse Analytical Tasks:** Understanding spatial distributions, temporal patterns, and identifying top refugee-origin countries.

Minimal preprocessing was required. The Year column was converted to a numeric format, and a categorization function was introduced to break populations into brackets for clearer interpretation on the choropleth map.

3. Tasks & Objectives

This visualization supports several tasks:

- **Global Distribution (Choropleth Map):** Understand how refugee populations are geographically distributed and how this changes year by year. The animation (play/pause) and a carefully chosen subset of year marks improve interpretability.
- **Country-Level Trends (Line Chart):** Examine how refugee populations from selected countries evolve over time. A dropdown allows selecting multiple countries. (No linear/log toggle is present; the chart is always linear.)

- **Ranked Lists (Bar Chart):** Identify the top 10 refugee-origin countries in a selected year. The year slider shows fewer ticks for clarity, and the bars are rendered in a single color, removing the need for a legend.
- **Faceted Time-Series (Small Multiples):** View the top 3 countries of a selected year side-by-side for a focused comparison without clutter. The reduction from 5 to 3 countries ensures clarity and legibility.

4. Visualizations & Encodings

4.1 Global Distribution (Choropleth Map)

- **Data Types**: Year (temporal), Entity (categorical), Population (quantitative)
- **Idiom**: Choropleth map with discrete colour categories.
- **Encodings**:
  - Spatial position for countries is fixed on the world map.
  - Colour encodes population brackets.
- **Interaction**: An animated year slider (with fewer ticks) and play/pause buttons reveal temporal shifts in distribution.

4.2 Country-Level Trends (Line Chart)

- **Idiom**: Multi-line time-series chart.
- **Encodings**:
  - X-axis: Year
  - Y-axis: Population
  - Colour: Distinguishes countries
- **Interaction**: A dropdown for selecting multiple countries. The chart always uses a linear scale for simplicity.

4.3 Ranked Lists (Bar Chart)

- **Idiom**: Horizontal bar chart for the top 10 countries.
- **Encodings**:
  - Bar length: Represents population magnitude.
- **Interaction**: A year slider with fewer marks for clarity. Bars use a single color, removing the need for a legend.

4.4 Faceted Time-Series (Small Multiples)

- **Idiom**: Multiple small line charts arranged in facets for the top 3 countries (reduced from 5 for better readability).
- **Encodings**:
  - Each facet is a small time-series chart for a single country.
- **Interaction**: Selecting a year updates the facets. Showing only 3 countries ensures a cleaner, more legible layout.

5. Novelty & Complexity

Novelty:

- Multiple idioms combined: Choropleth map, time-series line chart, top-10 bar chart, and small multiples.
- Animation in the choropleth map to visualize changes over time.
- Reduced facet count (top 3) for more effective comparison.

Complexity Management:

- Multiple coordinated views present both broad overviews (map, top 10) and detailed subsets (line chart, facets).
- Animation and strategic reduction of chart elements (fewer ticks, top 3 facets) improve clarity.

6. Strengths & Weaknesses

Strengths:

- Users can visually track changes over decades and quickly identify major trends.
- The top 3 facets reduce clutter and make direct comparisons easier.
- The simpler top 10 bar chart and fewer slider ticks improve readability and reduce cognitive load.

Weaknesses:

- Some population brackets share similar colours at the upper ranges, potentially making subtle differences less distinct.
- Due to the large number of years, only some intervals are shown as marks, relying on the user to animate or drag through the timeline.

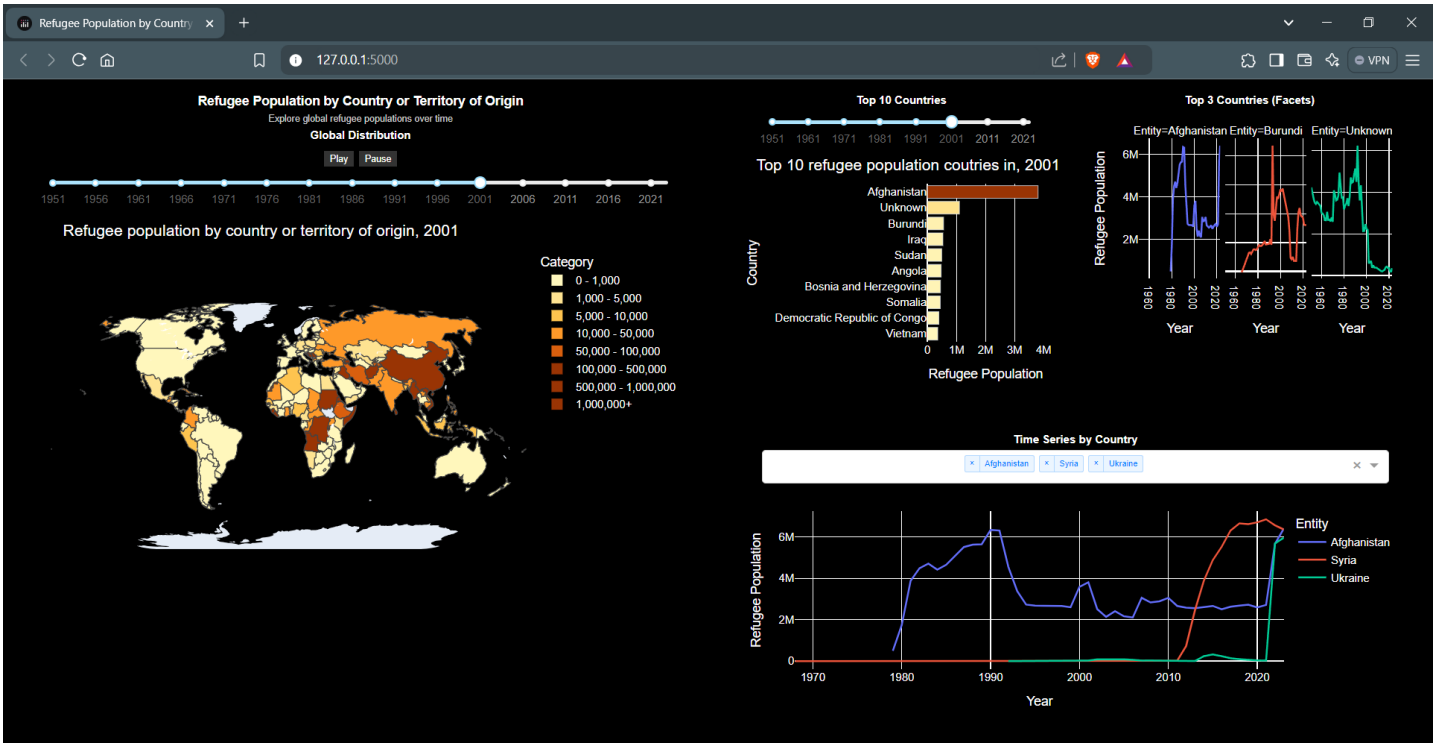
7. References

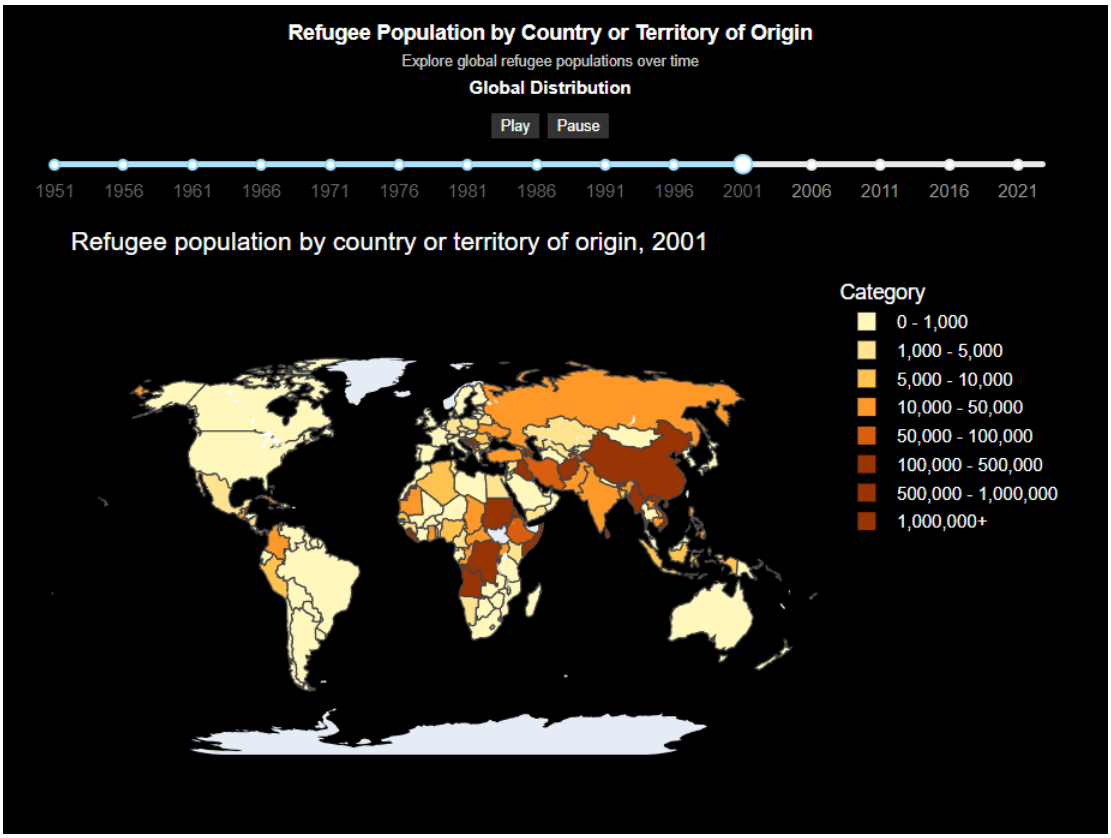
1. UNHCR (2024) – with processing by Our World in Data. “Refugee population by country or territory of origin” dataset.
2. Plotly and Dash for Python: https://plotly.com/python/
3. Colour scales: https://plotly.com/python/builtin-colorscales/

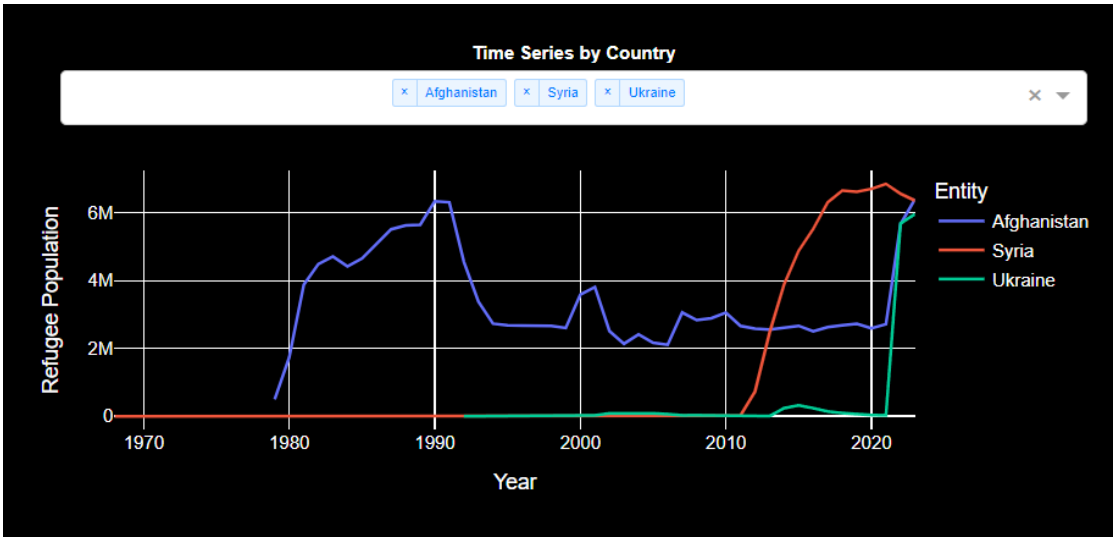
8. Presentation

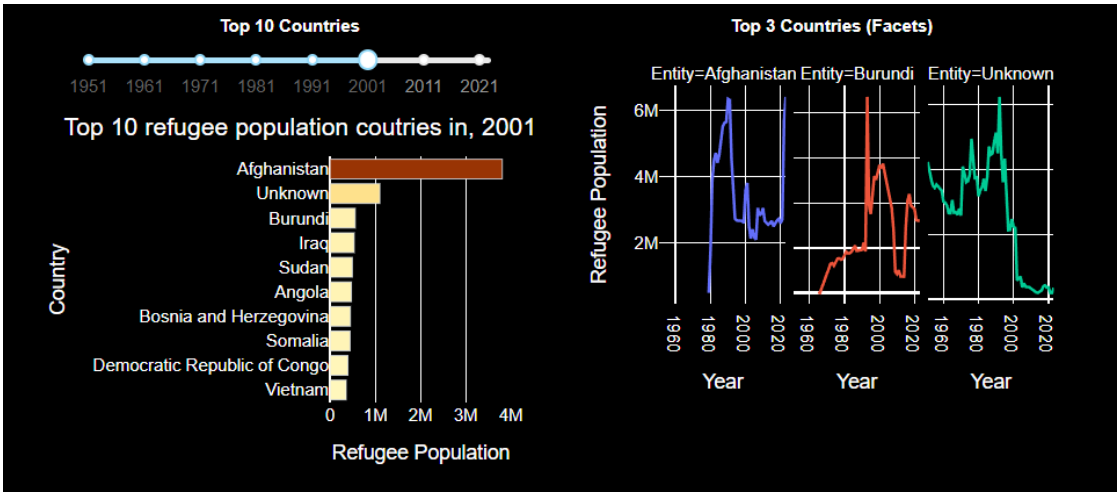
The demonstration video link is https://youtu.be/YtyJxhI57rs

The code repository link is https://github.com/sarashaikh1701/Refugee-Population-by-Country-or-Territory-of-Origin.git




Refugee Population by Country or Territory of Origin
Explore global refugee populations over time
Global Distribution
Play
Pause
1951 1956 1961 1966 1971 1976 1981 1986 1991 1996 2001 2006 2011 2016 2021
Refugee population by country or territory of origin, 2001
Category
0 - 1,000
1,000 - 5,000
5,000 - 10,000
10,000 - 50,000
50,000 - 100,000
100,000 - 500,000
500,000 - 1,000,000
1,000,000+


Time Series by Country
Afghanistan
Syria
Ukraine
Refugee Population
6M
4M
2M
0
1970 1980 1990 2000 2010 2020
Year
Entity
Afghanistan
Syria
Ukraine


Top 10 Countries
1951 1961 1971 1981 1991 2001 2011 2021
Top 10 refugee population coutries in, 2001
Afghanistan
Unknown
Burundi
Iraq
Sudan
Angola
Bosnia and Herzegovina
Somalia
Democratic Republic of Congo
Vietnam
Country
0 1M 2M 3M 4M
Refugee Population
Top 3 Countries (Facets)
Entity=Afghanistan
Entity=Burundi
Entity=Unknown
Refugee Population
6M
4M
2M
1960 1980 2000 2020
Year