

European Migration Crisis

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More than a million migrants and refugees crossed into Europe in 2015, sparking a crisis as countries struggled to cope with the influx, and creating division in the EU over how best to deal with resettling people. Since the migration to Europe has become a huge problem, we wanted to Explore the major sources of these migrants and and the reasons behind them.

1.Description of Data

Dataset 1 - Data was obtained from [United Nations High Commissioner for Refugees](#), which is an agency mandated to lead and coordinate international action to protect refugees and resolve refugee problems worldwide. We collected data for the period 2010-2016. We found that the available data was very huge to analyze, and hence did some pre-processing on it.

Dataset 2 - Data for the GDP, Inflation Rate and Unemployment rate was obtained from <http://data.worldbank.org/country>.

Pre-Processing:

The original complete UN data is a csv file include five variables:

- Euro, the European countries which take in refugees;
- Origin, the source countries where refugees come from;
- Year;
- Month;
- Number, the total asylum seeker in that month.

In this part, we used Python as our main tool. First, we cleaned the data and eliminated special characters in the original file. Then we summed up the total asylum seekers in each year since 2010 from all over the world to Europe. This is the data for the **first visualization**.

The initial data had origins in the entire world and it was too big for our needs. Hence, we decided to clean up the data and sum the number of asylum seekers from each country from all over the world over the years to Europe. We found that **Afghanistan, Iraq and Syria** were the top 3 from this list. Hence, we decided to analyse data for these countries for our **second visualization and third visualization**. Also, we had to transform the data in multiple ways for this visualization which is explained in detail in the next section. We decided to include only

such countries for the map visualization where the **number of asylum applicants per month is at least 300**.

Also, we obtained information about inflation rate, GDP, unemployment rate from the World Bank site and combined it with the total asylum seekers from each of the above countries mentioned for our **third visualization**. The original complete WB data is a csv file include five variable: Country; Year; Unemployment, the unemployment rate; GDP, the GDP annual growth rate; Inflation, the inflation rate. We used MS Excel to transform and rotate the data, and added another column called Migration which represented the total migration population for that country in certain year. The migration data came from the UN data. We use the integrated data files for each countries for this part.

2. Data Visualization

Our data visualization follows the following logic:

- Show the general status of migration to Europe since 2010 from all over the world.
- Present the migration flow of major three countries.
- Explore the relationship between the sudden growth of asylum seekers and the economy of these countries.

Visualization 1:

For first part, the background is a picture about European Refugee Crisis obtained from the network. The scale used is a linear scale, which divided the total 14600000 refugees evenly and represent by 30 people icons. Each icon represents around 4000 people. When you click the button which represents the year, the corresponding number of people symbols will fly in. This represents the total asylum seekers to Europe in that year. The objective of this graph is to show the intensity at which the crisis is growing.

Visualization 2:

Interactive Line Plot

Purpose: To depict the number of asylum seekers per month from Syria, Afghanistan and Iraq to the European union for the period 2010-2016.

Data used: For this visualization, we had to pre-process the data and sum the total number of asylum seekers per month from Syria, Afghanistan and Iraq to any destination the European union. The data was obtained from the first Dataset.

Description: The x-axis is the time (actually the single time unit is month) and the y-axis is the migration population to Europe. Both axes use a linear scale, with (x, y) in the svg

corresponding to (time, migration population). There is a button to control the animation, with function to start and reset.

Style: Blue represents Syria, green represents Afghanistan and red represents Iraq. The interactive plot follows a curtain approach and plots gradually with time.

Interaction: Hover along the line to see the data for a particular month.

Interactive Map:

Purpose: **Interaction:** To depict the actual routes or the destinations taken by these migrants and the intensity of the migration.

Data used: For this visualization, we had to pre-process the data and sum total number of asylum seekers per month from Syria, Afghanistan and Iraq to each of the destinations. Only destinations with number of asylum applicants with at least 300 are shown.

Description: An European map with a slider which steps along each month. This map and the line plot are updated simultaneously. Each white dot represents 300 people. The accumulated sum of the asylum seekers to that country will be displayed on the relevant location in the map.

Style: Countries which accept refugees are highlighted in gray, whereas the other countries are in black.

Interaction: On hovering over a country which accepts refugees, a line plot is shown which displays the breakdown of the number of refugees from Syria, Afghanistan and Iraq.

Visualization 3:

For third part, it is a line plot. Red represents unemployment rate, green represents GDP annual growth, blue represents inflation rate and yellow represents migration population for each country. The bottom x-axis is based on ordinal scale on Year variable. There are two y-axis, left one is percentage for rate and right one is population for absolute number. Both y-axes use a linear scale. The percentage axis ranges from -20 to 70, based on the minimum and maximum of three rate. The population axis ranges from 0 to 400000, based on the minimum and maximum of the migration population. The data in the form (year, value) are mapped to the svg location in the form (x-axis, y-axis). Each data point is represented with a circle centered in the corresponding location. The circles are linked with solid lines. When you move your mouse on the circles, a tip with label and a value will show up. There are three buttons on the below the line plot, each button represents a country. When you click the button, the corresponding country's name will show up in the label box and the line and circles will change correspondingly.

3. Storyline

European Migration crisis is one of the worst and the biggest humanitarian crisis the world has ever seen. Our story was to depict the situation of the Europe refugee crisis and analyze the flow of migrants and refugees. We wanted to particularly analyze those countries which have had the highest number of asylum seekers during the period of 2010-2016. So the countries we analyzed are Afghanistan, Iraq and Syria.

Our main goal of the project was to :

- Depict the fact that the number of refugees and asylum seekers to Europe has been increasing dramatically over the past few years. We wanted to show the intensity of the crisis.
- Visualize the flow routes from Syria, Afghanistan and Iraq to Europe to see where do these refugees ultimately move.
- To understand the reasons behind such a dramatic inflow of people into Europe. Analyzing the economic conditions in these affected countries.

From part 1, it is obvious that there is a boost in 2015, not only because the war in mid-east escalates, but also because Europe relaxes its immigration policy. From part 2, it can be inferred that most asylum seekers before 2015 headed to rich countries which also have high social welfare and some countries did not take any asylum seekers because their strict policy. In the selected three countries, there might be some economic reasons for the refugees to flee out of their homeland. So here comes the part 3. After comparing the statistics in part 3 and integrating them, we made a conclusion: the number of asylum seekers is in perfect correlation with the economic and political crisis that these countries are suffering. People are moving to find a better life, jobs and safety.

There something that we find surprising. First, Turkey is near the Syria but most Syrian refugees did not head there while Afghanistan is far from Turkey, but most refugees made Turkey their dream country. With digging in, we infer their may be due to two reasons. The Syrian one is because border and racism conflict between Turks, Kurds and Syrian. The Afghanistan one is because religion, since Republic of Turkey and Islamic Republic of Afghanistan share the same mainstream belief among their citizen. Second, large scale of migration occurred after one or two years when the economics gone bad, so there maybe a reaction time in people's tolerance to economic recession. Since inertia which is the resistance of any physical object to any change in its state of motion is a principal rule classic physics, so human beings are. People are refused to change until the situation is bad enough. This is a social and psychological problem.

4. Outlook:

For the data visualization 1, the information contained is quite limited even we tried to make up with designed background and animation. We admitted this as a reason that we follow a way from shallow to deep. We try to guide the viewers in a logic in the order of discovery, filter and zoom, which we were taught in the lecture.

For the line plot animation in data visualization 2, our initial idea is to set up a button with a pause function, but after significant trials, we had give up due to technical difficulties. We may want to fix it when we master enough knowledge in the future. Due to the time limit this time, we have to make our choice to simplify the problem.

For the third data visualization, for the deep reason for the difference migration situation between Syria and Afghanistan, since this is a bit beyond the interested field in the scope of INFO 5100. We may dig in in the future, but now we just concluded that as a social problem.

5. Acknowledgements:

- Extensively referred to Mike Bostock's d3 documentation
- <http://www.lucify.com/the-flow-towards-europe/>
- <http://www.bbc.com/news/world-europe-34131911>
- Stack Overflow for debugging