

AsylumLoupe: EU Asylum Demographics and Movement Information Visualization

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Introduction

The war in the Middle East, the oil crisis, and geopolitical issues have all caused many people to be displaced. Despite continued COVID-19 measures, the number of arrivals to Europe's external borders increased in 2021, returning to pre-pandemic levels. As a result of the political landscape, arrivals from Afghanistan, Belarus, and Ukraine spiked. Adapting quickly, EU+ countries facilitated asylum application lodgings, rearranged reception facilities, and used arrival centers for various stages of asylum procedures in response to the waves of arrivals (EUAA 2022). These developments have also highlighted the need for structural reforms of the EU's asylum and migration system to address both crises and longer-term trends (Hurwitz 2010, 9-44). The existing asylum procedure has been developed from each stage, and the process has been digitized recently as well, including procedures for first and second applications, special procedures, the Dublin procedure, reception conditions, detention during the asylum procedure, access to the asylum procedure and to information, legal assistance, interpretation services, country of origin information, the content of protection, the return of former applicants and resettlement. Identifying and monitoring trends in asylum applicants and country of origin countries can be accomplished through the key indicators presented (EUAA 2022). The EU has always been welcoming to refugees, and even before the 2015 refugee crisis, the EU asked its members to submit a series of refugee-related data, which can be found on the Eurostat. This database details the number of refugee applicants, temporary asylum seekers, and long-term asylum seekers by age, gender, and nationality since 2012 and earlier. We will use this data to develop Vis to show and analyze many issues.

The primary objective of this project is to provide an overview of the refugee intake trends across 27 EU member countries. We also want to present the different distribution of asylum applications, temporary asylum, and long-term asylum across EU member states, and the differences between countries of origin, gender, and age of asylum seekers as detailed information. In that case, we propose an explorer tool to support users to figure out the refugee movement trends within the EU as time progresses. It should also be a helpful analysis tool for users to acquire detailed information introduced above and compare them by specific years.

Related Work

In terms of presenting the EU asylum demographic data, there was effort given by the Eurostat using a range of published charts with pre-defined data types derived from the dataset of asylum demographics. Eurostat provides a data visualization tool that is integrated into its powerful Eurostat Data Browser (Eurostat 2020). For each new dataset published, Eurostat presents the data in the information visualization idioms of tables, graphs, and maps on its web page. The Eurostat also integrates the Data Explorer tool, a feature that presents the charts as a search tree. Users can click on a search tree branch to display different charts. The new data browser, while supporting all the existing total provided, also adds additional functionality when viewing data and metadata: users can filter data dimensions and adjust the way graphical data is displayed (line, bar, and map charts), which makes it easy to compare indicators and geographical areas (Eurostat 2022). We want to build visualization idioms showing asylum seekers' demographics and movements. There were a few solutions provided by tableau to create an origin-destination map or spider map. The origin-destination map is an excellent way to present the path between an origin and one or more destination locations (Tableau 2022), which fits with our idea of showing the movement trends of asylum seekers. Choropleth map utilizes the colour channel in corresponding to an aggregated summary of geographic characteristics within spatial enumeration units (Dent 1990), it can visualize how an attribute from our dataset varies across a geographic area which in our case can contribute to showing the changing trends of asylum seekers' demographic across the EMEA region.

Data and Task Abstraction

Domain

This information visualization project focuses on illustrating the movement and demographic data of asylum seekers across Europe, the Middle East, and North Africa (EMEA) in recent years. We want to combine credible and rich data in an interactive format to dynamically show the movement of asylum seekers, short and long-term asylum seekers from EU countries since 2015. Based on this, we will also explore different trends in combination with their demographic data. Asylum refers to the international protection offered by a country on its territory. It is provided for people who cannot seek protection in their own country of citizenship and/or residence, especially those who fear persecution based on race, religion, nationality, wars, membership in a particular social group, or political opinion (The United Nations High Commissioner for Refugees 2012). To regulate and control the high levels of migration resulting from the 2015 migration crisis, the EU devotes its efforts each year to developing an effective European migration policy. Our project The establishment of the migration policy and its operation is based on the collection of data on the status quo, in particular on the number of legal and illegal migrants crossing the EU borders (European Council 2022). Our project helps EU policymakers to understand the movement of asylum applicants, explore the changing trends of asylum seekers over time, to develop corresponding policies on asylum seekers or refugees, and predict the future increase or decrease of asylum seekers in the EU. People in each EU country can also use our project to learn about the demographics of asylum receivers in their own country, such as age, gender, religion, and original nationality. Therefore they can learn about asylum receivers with real data, which helps society to eliminate prejudice against asylum receivers and refugees.

Task

The biggest task of this project in terms of information visualization is to show the movement of asylum applicants, temporary asylum recipients, and long-term protection recipients in the EMEA region from 2015 to 2021, including their countries of origin and destination. On top of this, the project will also link the demographic data with these asylum seekers. In selected cases,

the distribution of age, gender, original nationality, and family relationship will be presented to allow the reader to identify different patterns and trends, as well as the relationship between these data and the different countries in the EMEA region. As a result, we will highlight the obvious trends and patterns. For instance, once the reader has specified a country in the EMEA region, we will highlight the most obvious trends of asylum seekers' inflows or outflows and present them in the form of an origin-destination map. Once the reader has selected the origin and destination countries, we will present the distribution of their demographic data in a table, graph, or more diverse format, highlighting the most prominent data.

Data

Data for this project are sourced from Eurostat. The Eurostat - European Statistical office is a Directorate-General of the European Commission, whose main responsibility is to provide statistical information to the EU. We selected the data series on asylum applications containing statistical information (European Union Law 2007) based on Article 4 of the Council Regulation (EC) No 862/2007. Our final dataset will be obtained by concatenating multiple related datasets, such as the dataset for asylum seekers in the EU who gained temporary protection, datasets of asylum decisions, and resettlement for asylum seekers across EU countries. In this way, the various attributes in the original dataset will be fully extended. As of today, we will be working with more than 640000 items. Each item represents the status of one Asylum application with reference to different application statuses by age sex and citizenship. The national Ministries of Interior and related official agencies provide these data to Eurostat. Data is presented by country and for groups of countries: the European Member States and the European Free Trade Association (EFTA) (European Commission 2021). The attributes we intend to use in our analysis are both categorical (gender, citizenship, asylum, application_type, geo_political_entity) and ordered (age_class, number_of_applicants_per_year, year_range). Dataset is updated two times per week, every Tuesday and Thursday morning at 11.00 a.m CEST (European Commission 2021). We will select the newest dataset by the time we start the implementation. Specifically, the levels of categorical attributes are as follows:

Attributes Name	Levels	Note
Gender	4	F/M/Total/Unkown
Citizenship	208	Countries and regions around the world
Asylum Application Type	5	
Geo-Political Entity	34	Geo-political entities which received asylum applicants that defined by the European Commission

Table 1 Level of Categorical Attributes for EU Asylum Application Dataset - Annual Aggregated Data

The ranges for ordered attributes are:

Attributes Name	Range	Note
Age Class	less than 14 ~ 65 years or over	Age of the applicants are distributed into 8 classes.
Number of applicants/year	0 ~ 1216860	
Year range	2021 ~ 2021	

Table 2 Range of Ordered Attributes for EU Asylum Application Dataset - Annual Aggregated Data

One example item/data entry is shown in the table below:

citizen	sex	unit	age	asyl_app	geo	TIME_PERIOD						
						2008	2009	2010	2011	2012	2013	2014
STLS	M	PER	Y_GE65	ASY_APP	SE	10	10	5	15	35	60	80
						75	20	15	10	35	5	10

Table 3 Example Data Entry for EU Asylum Application Dataset - Annual Aggregated Data

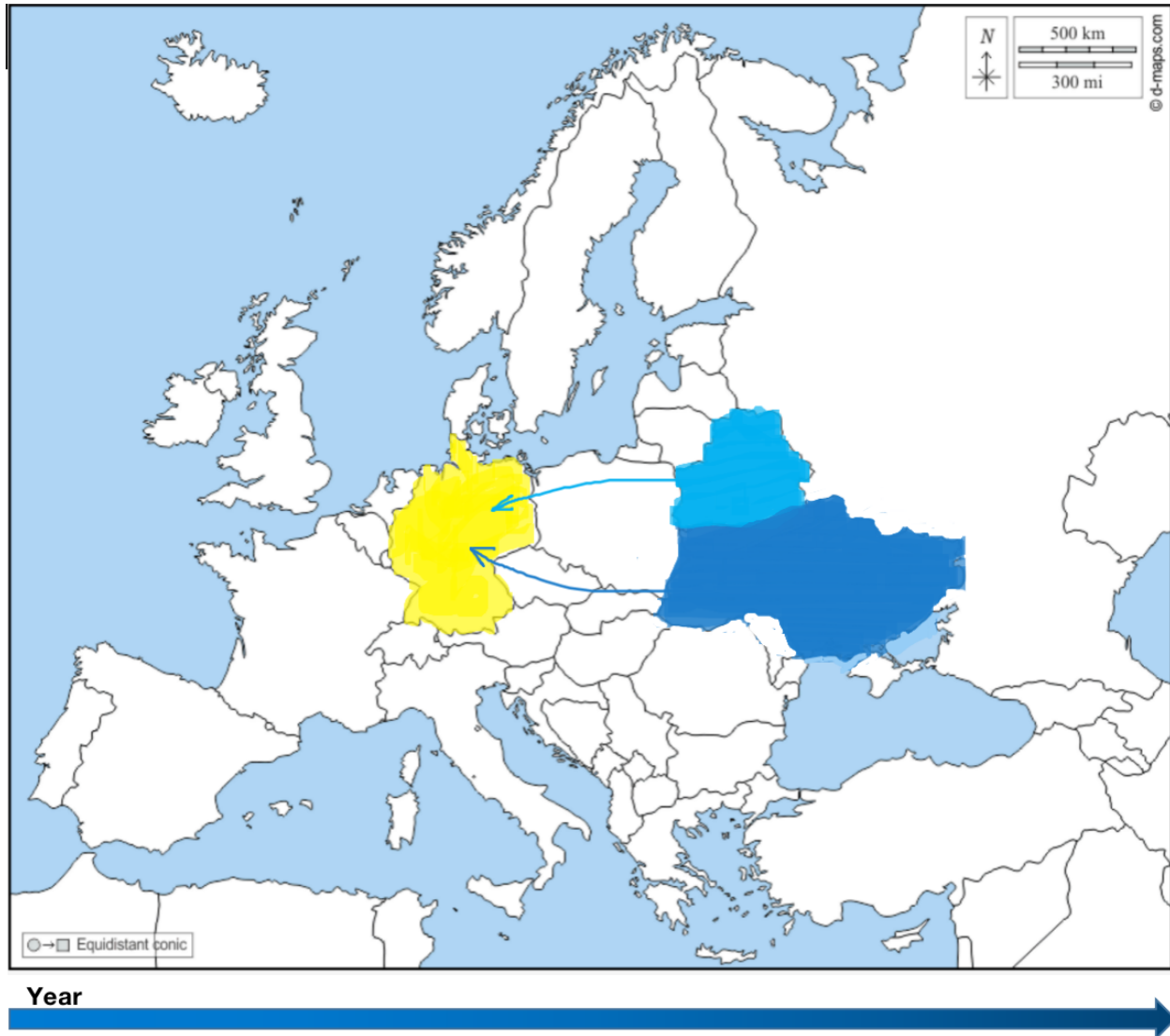
Solution

This section depicts the potential scenarios for this project and the possible solutions associated with them. The scenarios combined with solutions will be introduced from two aspects, overview and detail. We will use React.js along with D3.js to implement the visualization and interaction functions. We will acquire data directly from local CSV files. We will also use redux to enhance the interaction speed if it is needed. We aim to host our visualization tool on a website that can be easily accessed by prospective users.

Overview

To facilitate better planning resources for future asylum seekers, this project may provide a more intuitive and easier way for a user working for specific institutions to explore the movement of asylum applicants compared to searching and analyzing huge amounts of data from data tables and trees layer by layer as described in section 3. To better represent the geographical data, we choose the origin-destination map to illustrate the movement and demographic data of asylum seekers across Europe, the Middle East, and North Africa (EMEA) in recent years. To be more specific, we would like to show the flow of people between the origin country refugees come from and the targeted destination country the same refugees arrived. Each destination country may accept refugees from one or more source countries.

As the picture below shows, take Germany as an example. Assuming we would like to know the movement between the origin countries refugees come from and our targeted destination country Germany, we can select the destination country Germany by clicking inside the country area in the EU map. The area of Germany, the destination country, becomes yellow on the map as we click, while the origin country, where the refugees come from, becomes blue. Assuming there are only two origin countries, Ukraine and Belarus, as shown in the same picture. We would like to use the saturation of blue to depict the different levels of the number of arrived refugees. The higher the saturation level is, the more refugees arrived at the destination country from this origin country. To show the flow of refugees more clearly, we may also choose to use a motion map to better show the direction. It will depend on the actual representation effect. Additionally, we have included a time axis for users to select different years in order to determine the trend of refugee movements within the EU over time.

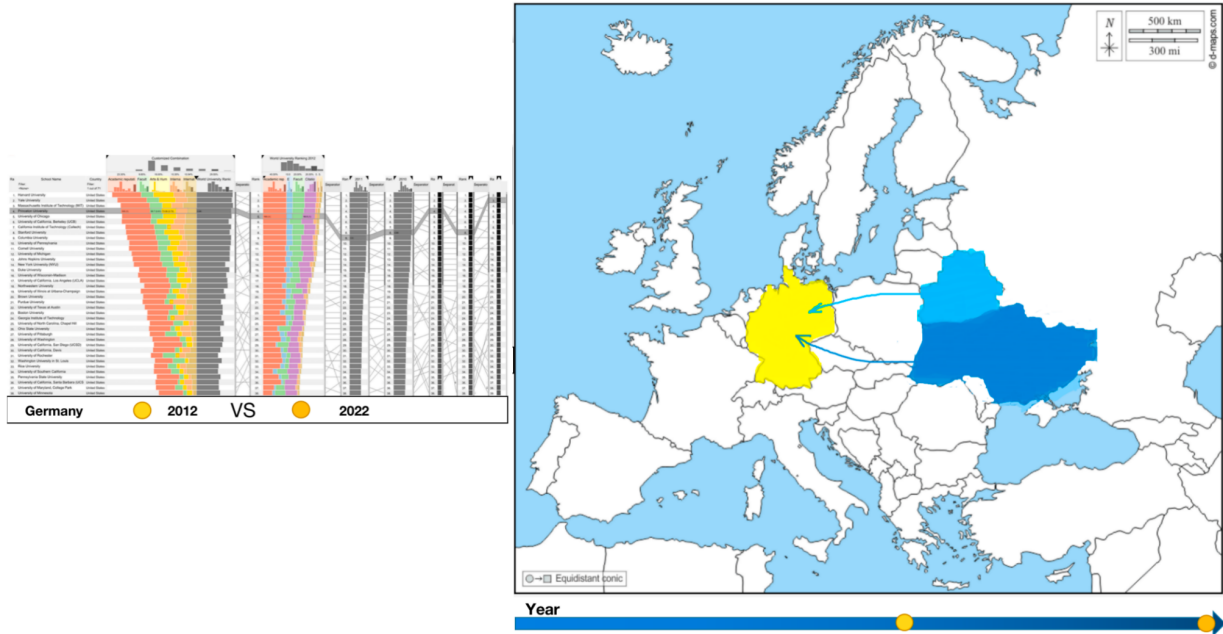


Picture 1 Project overview schematic diagram

Detail

In order to solve the refugee crisis at its root, the user may need to understand changes in asylum seekers' demographic data, and distribute resources to help the countries in crisis that may result in more asylum seekers and refugees. In that case, we need to represent detailed refugee information for a specific destination country. We use the LineUp method (Gratzl et al. 2013, 2277) learned from this course as a way to convey detailed information. Users can choose a target country by clicking its area on the map for the first step. By clicking the time axis, the yellow spot representing a specific year will be generated, they can choose two specific years to compare by dragging the yellow spots. The detailed demographic data for a specific country of

asylum applicants, temporary asylum and long-term asylum including gender, age, and so on for two different years will be represented on the side window on the left-hand side of the original orient-destination map as the picture below shows.



Picture 2 Project detail schematic diagram

Milestones

October 14: Preliminary Work

- (4 hours, All) Prepare project pitches, idea presentation and write short summarizing text for pitches
- (5 hours, All) Meetings to discuss project direction, exchange of project ideas
- (1 hour, All) Office hour with the professor to discuss feedback of new pitch idea and retrospectives

October 21: Project proposal

- (5 hours, All) Data Set discovery and interaction with existing information visualization tools provided by Eurostat to gather feedback
- (15 hours, All) Split the sections, research and write project proposal

November 11: Preliminary data exploration, data preparation, and vis finalization

- (15 hours, Xin) Clean current data and link relevant datasets in Eurostat, select relevant attributes and create the final dataset as the data source for our project
- (15 hours, Han) Further exploration of vis options, research for existing Vis option, test and deploy vis project to local and think of adaption to our project. Create project Vis sketches.
- (2 hours All) Group discussion of prototypes and design finalization

November 18: Update - Create the first version of vis software using finalized idioms

- (4 hours, All) Implement the first version of the Vis using finalized idioms
- (8 hours, All) Finalise related works section for the final paper
- (10 hours, All) Write update report for peer review

November 25: Visualisation design

- (15 hours, Xin) Design 2 idioms on asylum movement with an emphasis on the dynamic movement of the asylum seekers
- (20 hours, Han) Design 4 idioms on presenting the asylum demographic data with an emphasis on the interactivities of the vis and creative ideas

December 2: Finalize vis dashboard

- (20 hours, All) Final refinements and bug fixes with discussion
- (20 hours, All) Developing other features of the vis and final dashboard (multiple views together with chosen idioms, interactivity to support selection/filtering)

December 14: Final presentation

- (8 hours, All) Making and revising slides
- (3 hours, All) presentation

December 16: Final paper

- (20 hours, All) Documenting and reporting the results, finalization of the paper, formatting and citation check

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