A logo for college computing

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**Assessment Cover Page**

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| *Strategic Thinking* |  |
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| *Assessment Due Date : 17/05/2024* |  |
| *Submitted:* |  |

**Declaration**

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I declare it to be my own work and that all material from third parties has been appropriately referenced.

I further confirm that this work has not previously been submitted for assessment by myself or someone else in CCT College Dublin or any other higher education institution.

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# Business Understanding

An examination of the “The movement of people” using the UN Data sources

The International Organisation for Migration has been gathering and collating relevant data on the movement of people since 2017 and this data is available through the Demographic Yearbook data collection (unstats.un.org, n.d.).

We need to import all the necessary libraries to go through the whole project management process.

**“CRISP-DM stands for cross-industry process for data mining. The CRISP-DM methodology provides a structured approach to planning a data mining project. It is a robust and well-proven methodology.”** (Smart Vision Europe, 2017)

The Data collected is regarded as accurate and reliable and is the work of the United Nations Statistics Division (UNSD). There are four key impacts of the statistics produced by UNSD:

* Collects and disseminates official national data on international migrant flows and stocks through Demographic Yearbook data collection
* Produces international standards and methods related to international migration statistics.
* Assists countries in enhancing their capacity on migration statistics.
* Coordinates statistical programmes and activities through the United Nations Expert Group on Migration Statistics

Of specific interest in this project are the statistics relevant to The United Nations High Commissioner for Refugees (UNHCR) (www.unhcr.org, n.d.) who also collects and compiles data on asylum seekers and refugees more specifically on asylum applications, refugee status determination, recognition rates, refugee populations and movements, demographic characteristics (age and sex) as well as major refugee locations (camps, centres, urban areas, etc.).

This research project aims to address these following objectives:

1. How can data science be used to analyse the growing number of asylum seekers around the world.
2. Examination of available data may help to predict the future applications for asylum seekers across the world – not just the number of applications but also the routes and preferred destinations of people on the move.
3. To develop a machine learning model to estimate the number of asylum applications.
4. Compare the estimates of applications both supervised and unsupervised and a description of exactly what this entails.
5. To take a deeper look into the global figures to allow for some examination of the movement of peoples with in Europe, America, Asia and Oceania (Australia)Business Understanding

This project is following the CRISP DM project management methodologies.

This capstone project is going to span two semesters and by the end all the objectives listed above will have been examined.

To start the project off I plan on examining one of these main objectives from the original proposal.

1. To develop a machine learning models to estimate the number of asylum seeker applications.

For now looking first at the total number of asylum application around Europe over the past five years and make predictions for future years. In the next semester I plan on comparing this to the number of applications globally and form educated comparisons.

Data Understanding

In this particular stage of CRISP DM we need to try and understand the data in front of us from the very start as the understanding of this data is imperative to processing the data as needed, creating a machine learning algorithm for the said data

This data has come from the official UN website data finder. The data is regarding asylum seeker application around the EU but specifically between the years 2018-2023 which is 5 years all together.

The UN data finder website provides a data dictionary. This is a comprehensive dictionary.

[unhcr.org/refugee-statistics/methodology/data-content/](https://www.unhcr.org/refugee-statistics/methodology/data-content/)

By using the .head() we can see the first few rows of the data so we can get a introduction to the dataset and try and understand it more. We can see that there are 10 columns which equates to 10 features.

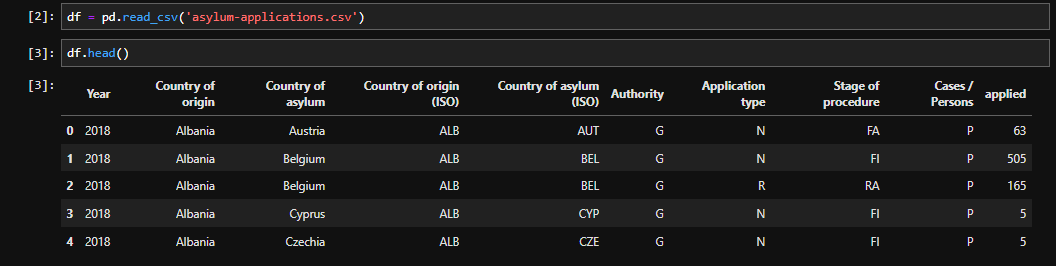


Figure 1. .head() function on the dataset

We want to find out how many observations and features we have so we use the function .shape and we can get more basic information on the dataset by using .info() function. We can see that we have 1 numerical value as an integer and 9 objects which are categorical data. Due to this dataset having so many categorical value features I am going to use Label Encoder.

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Figure 2. .shape and .info function on the dataset

By using the .describe function we can establish the basic statistics for the dataset on asylum seekers applications. It tells us the mean I, standard deviation, minimum and maximum values in the dataset.

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Figure 3. Describe function to get the descriptive statistics on the given dataset.

To allow me understand the data further I am going to populate some visuals of the dataset to get more insight to the given dataset for this particular business objective for the capstone project.

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Figure 4. Bar Chart for feature Stage of Procedure

This feature on stage of procedure is heavily skewed to the left especially on the FI step of the application process. FI stands for First instance decisions

A graph with a blue rectangular bar

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Data Preparation

Data preparation is a crucial step in the CRISP DM protocol. Before we put the dataset through machine learning models the data needs to be cleaned, no matter what we do we will never have 100% cleaned data.

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Figure 4. Dealing with missing data in the dataset.

We are firstly checking for is the any null values in the dataset and we can see that Stage of procedure has 65 null values. To help this we can make a list of missing value formats and remove from dataset if any of the missing formats are found.

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Computers only under stand numerical value and not categorical values, in order to preform any machine learning models on this data we need to deal with the categorical and encode it. Due to the amount of categorical data present it was decided to use the LabelEncoder.

Modelling

There are several machine learning models that could be used on this dataset. For now I have used a decision tree on the target variable for the number of asylum applications in Europe for the past 5 years.

A decision tree is a non-parametric supervised learning algorithm, which is utilized for both classification and regression tasks. It has a hierarchical, tree structure, which consists of a root node, branches, internal nodes and leaf nodes.

In this particular case we could use decision trees and clustering algorithms due to the values on country of origin, country of aslym being sought in.

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Figure. Modelling the feature applied by using a decision tree.

For the train test split we drop the column first and the column applied for X and then add the response to y. I use 30% with a random state of 99.

The decision tree classifier is then created and fitted. We can see the precision and recall is 1 and the support is 19.

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Figure . Confusion matrix and accuracy score on the specified feature applied.

Evaluation

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Figure . Evaluating the decision tree.

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Figure . Plotting the tree on the gini

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To be perfectly honest this is quite difficult to interpret so I need to revisit what would be the best machine learning models for this particular context of predicting the number of asylum seeker applications around the EU. Only by experimenting did I discover this .

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For semester two I intend to work further on the following:

* Look at different models such as clustering as this would work better with the given data and context as there is a set application process for applying to become an asylum seeker. When encountering an unsupervised learning problem initially, confusion may arise as you aren’t seeking specific insights but rather identifying data structures. This process, known as clustering or cluster analysis, identifies similar groups within a dataset.

Deployment and Conclusions

Github repository: https://github.com/RodneyWardle2023/CapstoneProjectCA2RodneyWardle-SBS23057/

# 

# References

unstats.un.org. (n.d.). UNSD — Demographic and Social Statistics. [online] Available at: https://unstats.un.org/unsd/demographic-social/sconcerns/migration/.

Smart Vision Europe (2017). Building and Applying Predictive Models in IBM SPSS Modeler training webinar. [online] Smart Vision - Europe. Available at: https://www.sv-europe.com/crisp-dm-methodology/.