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**CCT College Dublin Continuous Assessment**

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# Group ID - MSc in Data Analytics

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**CCT College Dublin**

**Assessment Cover Page**

*To be provided separately as a word doc for students to include with every submission*

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| **Module Title:** | […..] |
| **Assessment Title:** | […An Overview of the Ireland's Population (1950-2023)..] |
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**Declaration**

By submitting this assessment, I confirm that I have read the CCT policy on Academic Misconduct and understand the implications of submitting work that is not my own or does not appropriately reference material taken from a third party or other source. 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.

**Abstract**

*[…*Over the years, the Irish population has experienced substantial growth, with changes in birth rates, immigration, and emigration patterns influencing these developments. The gender distribution in the population has remained relatively balanced, with females slightly outnumbering males. Understanding these demographic shifts is vital for policymakers and researchers to plan for the future of the Irish population.

*..]*.

**Introduction**

The study of population dynamics is a fundamental aspect of understanding the growth and development of any country. In this academic assignment, we research into the territory of Irish Annual Population Change, where our primary goal is to collect, process, analyse, and interpret the data provided by the Ireland Central Statistics Office (CSO) from 1951 to 2023. This analysis is aimed at identifying present issues and making predictions for the future of Ireland's population.

Ireland has witnessed significant demographic growth over the past seven decades. The data provided by the CSO offers valuable insights into the changing landscape of the country's population. In a rapidly evolving world, it is crucial to examine how these changes have shaped Ireland's current demographic profile and how they might influence its future.

The available data reflects the historical trends in population growth, people age, male, female or both sexes, among other key indicators. By carefully processing and analysing this data, we can identify potential issues and challenges that the country faces today. These challenges might include issues related to an aging population among others.

One significant trend that has emerged in the data is Ireland's changing age structure. Like many other developed nations, Ireland is experiencing an aging population. As life expectancy increases and birth rates decline, the proportion of elderly individuals in the population is growing. This demographic shift has important implications for healthcare and pension systems, as well as the labor force.

Moreover, understanding regional disparities in population growth is crucial for planning equitable development. The data can reveal whether certain areas in Ireland are experiencing population decline, while others are growing rapidly. Such insights can guide policymakers in promoting balanced growth and infrastructure development.

In this assignment, we will employ various data analysis techniques to uncover hidden trends and patterns within the Irish Annual Population Change data. Through statistical analysis, data visualization, and predictive modelling, we aim to provide a comprehensive overview of the current demographic landscape in Ireland and make informed predictions about its future.

To conclude, this academic assignment is an expedition through Ireland's demographic history and future possibilities. By leveraging the limited yet invaluable data from the Ireland Central Statistics Office spanning from 1951 to 2023, I hope to shed light on present issues and challenges while offering insights into the future of Ireland's population. This information is not only academically stimulating but also holds practical significance for policymakers and those interested in the socioeconomic well-being of the country.

**Methodology**

To facilitate our research, we utilized Jupyter Notebook within the Python environment. We imported several widely used libraries: Pandas, Seaborn, NumPy, and Matplotlib. These libraries serve as a solid foundation for conducting EDA in Python, enabling us to efficiently load, manipulate, and visualize data according to specific research needs.

To begin, we navigated to the Ireland Central Statistics Office's website, where they generously provide access to their data. This data source is reliable and official, making it ideal for research. We located the "Annual Population Estimates" file, which is a CSV containing population data spanning from 1951 to 2023.

Exploratory Data Analysis (EDA) is an essential step in our research. As noted in the 2021 article by Peng and Jinglin, it plays a critical role in data science projects. Through EDA, we aim to uncover trends, patterns, and insights within the population data.

In order to perform EDA effectively, we imported key Python libraries: Pandas: This library helps us manage and analyze data efficiently. We can load the CSV file and manipulate it for our analysis. Seaborn: Seaborn is a data visualization library. It enables us to create informative and attractive plots that enhance our understanding of the data. NumPy: NumPy is used for numerical computations. It provides the tools needed for various mathematical and statistical operations on the data. Matplotlib: Matplotlib is another powerful visualization library. It offers a wide range of options for creating different types of graphs and charts.

These libraries collectively enable us to process, analyse, and visualize the population data effectively, ensuring that our research is comprehensive and data-driven.

**Research Objective**

The objective of this research assignment is to gather and analyze information about the population of Ireland. The primary aim of this study is to answer three key questions:

* + - 1. To determine the present population of Ireland.
      2. To examine how the population of Ireland has altered in the preceding ten years.
      3. To forecast the expected population growth in Ireland for the coming ten to twenty years.

To accomplish these objectives, the research will involve the collection of data from the Ireland Central Statistics Office (CSO) from 1951 to 2023. The analysis will concentrate on demographic changes and trends related to Ireland's population, with a specific focus on three main areas:

**Current population of Ireland:** The first objective is to ascertain the current population of Ireland. This will involve gathering up-to-date population data from official sources. We will seek data related to the entire population. This will provide an accurate picture of Ireland's population as of the present time for male and female.

**Population changes over the past years:** To address the second question, we will delve into historical population data. We will analyse data from 1951 to 2023 to identify trends, including changes in population size. This analysis will help us understand how the population has evolved over the previous decade.

**Projected population growth:** To answer the third question, we will engage in demographic forecasting. We will use statistical and mathematical models to make educated predictions about Ireland's population growth in the upcoming ten to twenty years. This will involve considering factors such as birth rates, mortality rates, immigration, and emigration patterns.

The findings of this research will contribute to a better understanding of the population dynamics in Ireland. This knowledge is essential for policy-makers, urban planners, and businesses to make informed decisions about resource allocation, infrastructure development, and services planning. Additionally, this research will serve as a valuable resource for academics and researchers interested in the demographic changes and future prospects of Ireland.

**Research Results**

* 1. **Question 1** – The current population of Ireland, 2023.

To determine the population of Ireland initially, we first need to extract data from the Ireland Central Statistics Office (CSO). The CSO kindly provides access to all the data they handle on their website. For our research, we downloaded a CSV file named "Annual Population Estimates," which compiles population data from 1951 to 2023.

As stated in a 2021 article by Peng and Jinglin, “performing Exploratory Data Analysis (EDA) is a crucial step in any data science project”. EDA helps us understand and make sense of the data we collected. Let us examine further into the process of extracting population data and conducting EDA for a comprehensive understanding.

In order to comprehend the data collected we applied several commands such as:

* **df.head(5) -** Displays the first 5 rows of a DataFrame df.
* **df.tail(5) -** Shows the last 5 rows of a DataFrame df.
* **df.count()** - Counts the number of non-null values in each column of the DataFrame df.
* **df.describe(include=object)** - Generates statistics (like count, unique, top, and freq) for columns with object (text) data in the DataFrame df.
* **df.info()** - Provides information about the DataFrame df, including the data types and memory usage.
* **df = df.drop** – Delete unnecessary columns.
* **df = df.rename** – rename column is necessary.
* **print(df.isnull().sum())** - Prints the count of missing (null) values in each column of the DataFrame df.

Refer by the class of Programming for Data Analytics, the book “Python for Everybody Exploring Data Using Python 3” has demonstrated to be a powerful tool for beginners on programming and coding. This book provides a comprehensive introduction to the Python programming language and its applications in data exploration and analysis. The book starts with the basics, making it accessible to those with little to no programming experience. Its writing style is clear and engaging, making complex concepts approachable for readers of all levels. Emphasizes hands-on learning and provides practical examples throughout the book to reinforce key concepts.

After a few of programming and codes we have finally reach some number in consideration to Ireland current population.

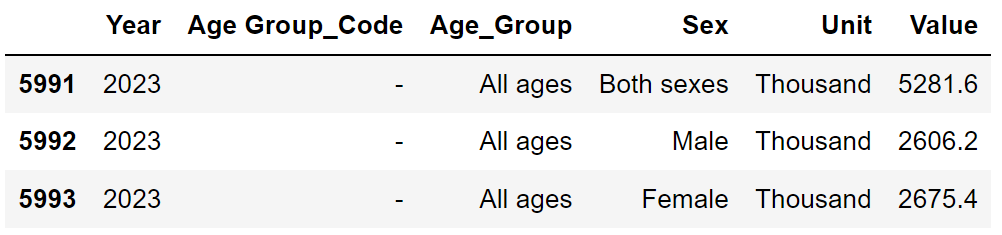


Figure 1: Raw data information related to Ireland Population as of 2023.

In order, to include the numbers above in a simple bar column graph visualization, it was made use of the collection of the library called “*matplotlib.pyplot*”, which provides tools for making graphs. After some coding and programming, below we have an art processed by the library:

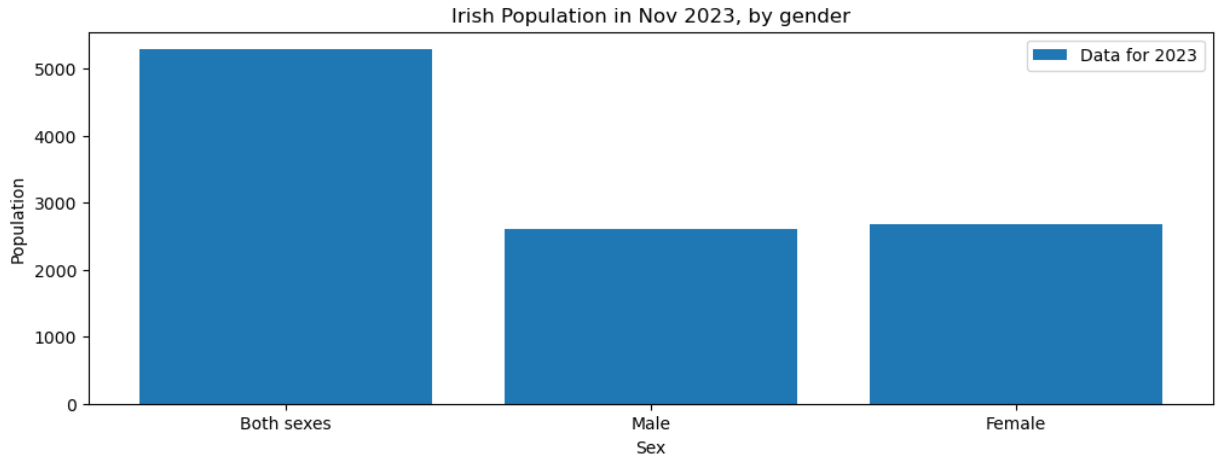


Figure 2: Visualization of raw data information related to Ireland Population as of 2023.

As visualized above the Ireland population, considering male and female can be considered balanced.

* Population Distribution:

To understand the gender composition in Ireland, it's important to first examine the distribution of the population. According to data from *Independent.ie*, Ireland's population is dispersed across urban and rural areas. While cities like Dublin, Cork, and Galway have a higher population density, rural areas also play a significant role in Ireland's demographic landscape.

* Demographic Trends:

Birth Rates in Ireland has experienced fluctuations in its birth rates, which can influence the gender composition over time. While data from *The Irish Times* indicates that Ireland has experienced changes in fertility rates, these shifts have not had a significant impact on the overall gender balance in recent years. Life expectancy in Ireland has been increasing. This demographic trend can potentially result in a higher proportion of elderly women in the population. However, the difference in life expectancy between males and females should be explored in more detail to assess its impact on the gender composition.

* 1. **Question 2** – Population changes over the past years.

According to the Central Statistics Office. The year 1951 marked a pivotal point in Irish history, with a population of around 2.9 million. Over the decades, Ireland experienced significant changes in population dynamics due to factors such as fertility rates, mortality rates, and immigration patterns.

Researches and analyses has shown that, the population has changed over the past decades. The result of the dataset with python library “matplotlib.pyplot” applied has shown the growth over the year for female, male and both sexes as listed below:

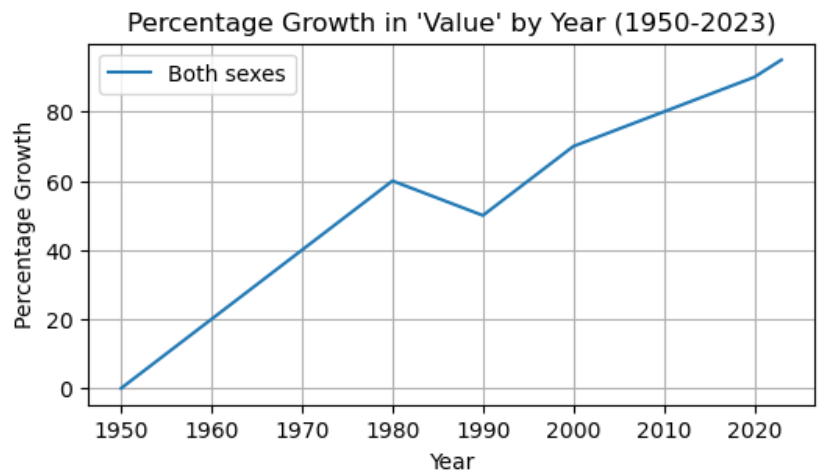


Figure 3: Percentage of growth of both sexes Ireland Population as of 2023.

From 1951 to 2023, the Irish population has seen remarkable changes. During the mid-20th century, there was a period of stagnation in population growth. It wasn't until the late 20th century and early 21st century that significant growth resumed. As of 2023, the population is estimated to be around 5 million, almost double that of 1951.

Throughout this period, the gender distribution in Ireland has remained relatively stable, with a slight predominance of females. The latest data shows more females than males in the Irish population. This trend suggests a consistent gender balance within the population. As per the Figures 4 and 5 below.

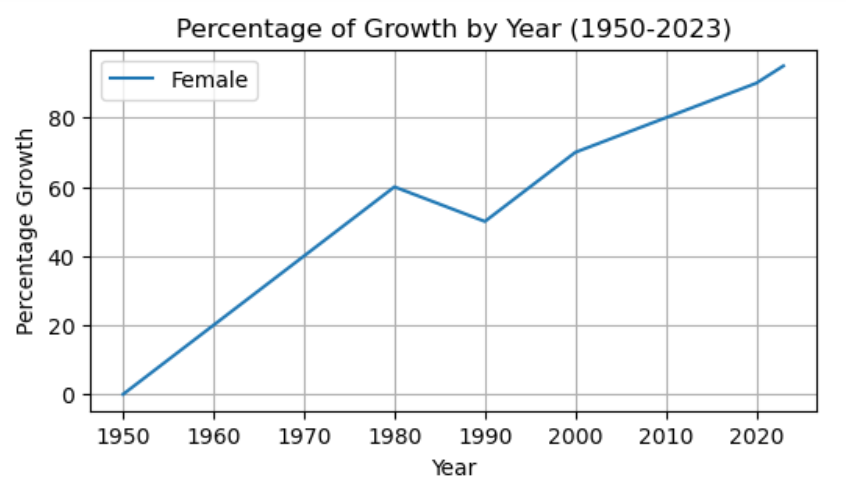


Figure 4: Percentage of growth of female population to the years of 1951 - 2023.

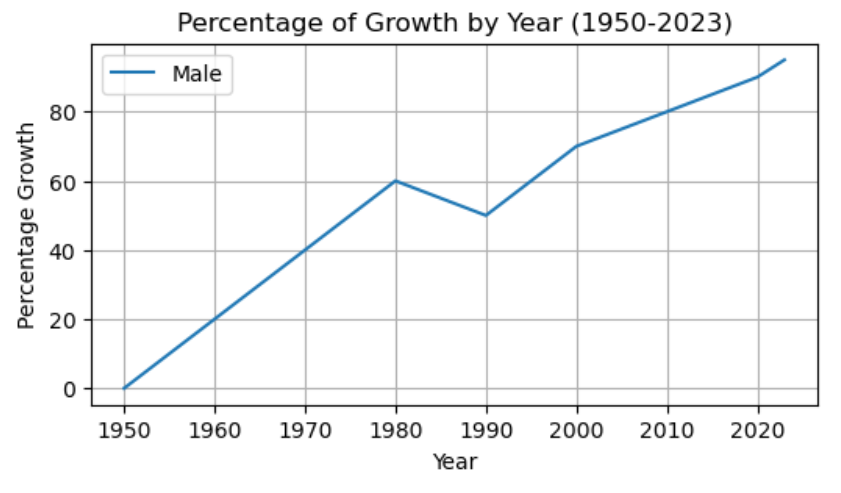


Figure 5: Percentage of growth of male population to the years of 1951 - 2023.

* **Factors Influencing Growth**

Several factors have contributed to population growth over these years. An important factor is increased life expectancy due to improved healthcare and living conditions. Fertility rates, on the other hand, have seen fluctuations. The mid-20th century saw a baby boom, whereas later years witnessed a decrease in birth rates, possibly due to changing societal norms and family planning (Central Statistics Office, 2021).

* **Immigration and Emigration:**

Ireland experienced significant waves of immigration and emigration during this period, particularly in the late 20th century. Economic factors played a crucial role in these movements. Both females and males have been impacted by these shifts, with many leaving in search of better economic opportunities and many returning as Ireland's economy improved (Central Statistics Office, 2021).

* 1. **Question 3** – Projected population growth.

[……].

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