**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:** | Data preparation and visualization, Machine Learning, Statistics and Programming |
| **Assessment Title:** | Foreign Nationals in Employment |
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| **Assessment Due Date:** | 10/11/2023 |
| **Date of Submission:** | 10/11/2023 |

**Declaration**

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| 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. |

**Introduction**

In today's data-driven world, the application of machine learning models, statistical knowledge, and my coding skills in Python using Jupyter notebooks has become central to my work in the field of data analytics and machine learning. The objective of this CA aligns perfectly with my professional interests, as it entails predicting the weekly salaries of employees within the industrial sector. To accomplish this task, I'll be using a robust and informative dataset from the Central Statistics Office (CSO) of Ireland, which contains a wealth of information about employees, their characteristics, and their earnings.

You can explore the code and documentation related to this project in my GitHub repository: <https://github.com/FernandoDataAnalitycs> .

The ability to predict weekly salaries within the industrial sector is of great importance to a wide range of stakeholders, including policymakers, businesses, and employees themselves. Accurately forecasting salaries is not just a statistical exercise; it holds the potential to uncover valuable insights into wage determination, wage disparities, and labour market dynamics.

In this first CA, I will delve into data preprocessing and visualization techniques to clean and explore the dataset, making it ready for machine learning model development.

The role of data preparation and visualization is fundamental in uncovering patterns and relationships within the dataset. Visualization tools will enable me to gain a deeper understanding of the data's underlying structures and correlations, thereby informing feature selection and model creation. In addition, I will look for the best way to execute coding using python libraries or methods that can help me to type less and do more.

This CA not only serves as a practical exercise but is closely aligned with the work I do in my professional capacity. By the end of this project, I aim to create a machine learning model capable of predicting weekly salaries with a high degree of accuracy. This will contribute to a deeper understanding of the labour market in Ireland and serve as a powerful tool for informing labour market policies and guiding organizations in making data-driven decisions regarding employee compensation.

Throughout this assignment, I will apply various machine learning algorithms, statistical techniques, and my coding skills to develop and fine-tune our predictive model. The ultimate goal is to leverage data-driven insights to make a tangible impact in the field of labour market analysis.

**Machine Learning part:**

**1)**

In this first part, I think CRISP-DM (Cross-Industry Standard Process for Data Mining) is better than KDD (Knowledge Discovery in Databases) or SEMMMA (Sample, Explore, Modify, Model, and Assess) for a data science project.I will justify with some explanation and examples:

First of all, CRISP-DM is considered an industry standard and is widely adopted in the field of data science. It provides a structured approach that is recognized and accepted across industries. In contrast, KDD lacks the practical guidelines and widespread acceptance that CRISP-DM offers. SEMMA, developed by SAS for its software products, is less known outside of SAS-centric environments, limiting its applicability in organizations using various tools. For example, consider that a huge corporation wants to adopt a standardized data science approach across various departments. In such a case, CRISP-DM's industry-wide recognition and acceptance make it the preferred choice.

Secondly, CRISP-DM is a flexible methodology that can be adapted to different types of data science projects and is not tied to specific tools or techniques. KDD, is more theoretical and less prescriptive in terms of specific project phases and techniques. SEMMA is being closely integrated with SAS tools, may not be easily adaptable for organizations using alternative data science platforms. For instance, a startup with limited resources that seeks agility in adopting different data science techniques based on project requirements. CRISP-DM's flexibility allows them to do so seamlessly.

Thirdly, CRISP-DM places strong emphasis on an iterative process, encouraging revisiting and refining earlier stages as new insights and data become available. KDD does not explicitly emphasize iteration and lacks detailed guidance on revisiting stages. SEMMA also lacks a strong focus on iteration, which may be less suitable for projects requiring continuous improvement. For example, in the healthcare industry, where new patient data continually becomes available, a data science project aimed at improving patient outcomes benefits from CRISP-DM's iterative approach.

Finally, CRISP-DM places a strong emphasis on understanding the business problem and aligning data science goals with business objectives. This is crucial for the success of a data science project. KDD, on the other hand, focuses more on data mining techniques and may not provide as strong a link to business understanding. SEMMA does include elements of business understanding but is not as comprehensive as CRISP-DM in this regard. For instance, In the retail industry, where understanding customer behaviour is essential for improving sales and marketing strategies, CRISP-DM's focus on business understanding proves advantageous.

To continue with this first part, I would choose the supervised machine learning as technique for my dataset. It is important to remark the differences between supervised, unsupervised, and semi-supervised learning as I list below:

Supervised Learning:

- Trained on labeled data.

- Learns a mapping from input to output.

- Used for classification and regression tasks.

Unsupervised Learning:

- Works with unlabeled data.

- Identifies patterns or clusters in the data.

- Used for clustering and dimensionality reduction.

Semi-Supervised Learning:

- Uses both labeled and unlabeled data.

- Leverages labeled data to guide learning on unlabeled data.

- Balances supervised and unsupervised learning principles.

According to the differences, the dataset match well with labeled data like “**Type of Employee**”, when there are different categories of employees. The purpose of using supervised machine learning is that is useful for regression in the current dataset.

**2)hngh**

Question to ask when I want to predict :

How many foreign nationals will be working next year ?

***x***: attribute, predictor, independent variable, input

*y*: class, response, dependent variable, output

why I don’t need to nomalize :

It is a good practice to normalize your data as it brings all the samples in the same scale and range. Normalizing the data is crucial when the data you have is not consistent. We can check for inconsistency by using the describe() function that you studied above which will give usmax and min values. If the max and min values of one feature are significantly larger than the other feature then normalizing both the features to the same scale is very important.