National College of Ireland

Project Submission Sheet

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Student ID:	X18197051		
Programme:	PGDip in DA	**Year:**	2023
Module:	Data Governance and Ethics (H9DGE)		
Lecturer:	Gary Monaghan		
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Project Title:	FATE		
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I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
ALL internet material must be referenced in the references section. Students are encouraged to use the Harvard Referencing Standard supplied by the Library. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action. Students may be required to undergo a viva (oral examination) if there is suspicion about the validity of their submitted work.

Signature:	Stamatios Karvounis
Date:	17/12/2023

PLEASE READ THE FOLLOWING INSTRUCTIONS:

1. Please attach a completed copy of this sheet to each project (including multiple copies).
2. Projects should be submitted to your Programme Coordinator.
3. **You must ensure that you retain a HARD COPY of ALL projects**, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer. Please do not bind projects or place in covers unless specifically requested.
4. You must ensure that all projects are submitted to your Programme Coordinator on or before the required submission date. **Late submissions will incur penalties.**
5. All projects must be submitted and passed in order to successfully complete the year. **Any project/assignment not submitted will be marked as a fail.**

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AI Acknowledgement Supplement

Data Governance and Ethics (H9DGE)

Amazon Case Study

Your Name/Student Number	Course	Date
Stamatios Karvounis	Data Governance and Ethics	17/12/2023

This section is a supplement to the main assignment, to be used if AI was used in any capacity in the creation of your assignment; if you have queries about how to do this, please contact your lecturer. For an example of how to fill these sections out, please click here.

AI Acknowledgment

This section acknowledges the AI tools that were utilized in the process of completing this assignment.

Tool Name	Brief Description	Link to tool

Description of AI Usage

This section provides a more detailed description of how the AI tools were used in the assignment. It includes information about the prompts given to the AI tool, the responses received, and how these responses were utilized or modified in the assignment. **One table should be used for each tool used**.

[Insert Tool Name]	
[Insert Description of use]	
[Insert Sample prompt]	[Insert Sample response]

Evidence of AI Usage

This section includes evidence of significant prompts and responses used or generated through the AI tool. It should provide a clear understanding of the extent to which the AI tool was used in the assignment. Evidence may be attached via screenshots or text.

Contributions of each member of the Group

Describe the contribution or tasks of each member of the group

StudentID	StudentName	Tasks
X18197051	Stamatios Karvounis	All tasks completed by me

FATE

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***Abstract*— In the project that I conducted for Domain Applications of Predictive Analytics, complexities and unique challenges posed by insurance fraud were explored. This critical issue, with its heavy financial and societal impacts, is important for research given the immense annual estimates of fraudulent claims worldwide. Using advanced machine learning techniques and comprehensive data analysis, the project aimed to enhance the accuracy and efficiency of fraud detection systems, while making significant contributions to the practical applications and business value in the insurance sector. In this current project, a detailed discussion will be presented on the Fairness, Accountability, Transparency, and Ethics (FATE) principles, drawing insights and evaluations based on the vehicle insurance fraud detection study.**

Keywords*— *Ethics, Accountability, Fairness, Transparency

I. Introduction

The project addresses the critical and growing issue of insurance fraud, specifically in the vehicle insurance sector. With the financial implications of fraudulent claims estimated to be substantial[1][2][3], the project explores advanced machine learning techniques to enhance fraud detection systems. The research involves utilizing various data sources, including transaction logs, user profiles, and historical data, to develop predictive models that accurately and efficiently identify fraudulent activities. Key machine learning techniques employed include Logistic Regression, Decision Trees, Random Forests, Support Vector Machines (SVM), and Gradient Boosting. The primary objectives of the research are the improvement of the accuracy and efficiency of fraud detection in vehicle insurance, the interpretation of quantitative metrics and the analysis of the direct impact of these models on reducing fraudulent claims and enhancing decision-making in the insurance sector.

The findings showed that each model possesses unique strengths and limitations in accurately identifying fraudulent and non-fraudulent claims. While some models demonstrated high accuracy in filtering legitimate claims, thereby minimizing unnecessary investigations, others showed a better ability to detect fraudulent activities. The difference in the performance of the models selected suggests the necessity for a balanced approach in fraud detection. The key finding is the importance of selecting or combining models in a way that aligns with an insurance company's operational priorities, achieving a balance between maximizing accuracy, reducing false positives, and effectively identifying fraud.

In the fraud detection project, careful steps were taken to integrate Fairness, Accountability, Transparency, and Ethics principles. These efforts show that it is important to be committed to responsibly developing machine learning models in the insurance sector. The project's approach to FATE shows my consideration of these principles, ensuring that the technological solutions developed are not only effective but also align with key ethical and responsible guidelines. In the next section, "Evaluation," I will discuss in more detail the Fairness, Accountability, Transparency, and Ethics (FATE) principles, before, during and after the research.

II. Evaluation

A. Before

The project was designed with a focus on quantitative results. Detailed metrics for each predictive model, such as accuracy, precision, recall, and F1-score, were planned to provide a clear basis for accountability. These metrics were intended to showcase the effectiveness and areas of improvement for the models, ensuring that the outcomes align with the insurance industry's needs.

A detailed research methodology was prepared, including the choice of algorithms (like Logistic Regression, Decision Trees, Random Forests, SVM, and Gradient Boosting) and data processing steps. This documentation was aimed at enhancing the transparency of the project, allowing for the models' operations to be understandable by all the different stakeholders.

The dataset was acquired from Kaggle [4] and is from the public domain which often implies that issues related to privacy and individual consent are less prominent. However, during the research I tried to handle the personal data with respect to the policy holder’s personal information.

Diverse data sources, including transaction logs, user profiles, and historical data, were utilized to mitigate biases and ensure a broad representation of scenarios in fraud detection. The Synthetic Minority Over-sampling Technique (SMOTE) was employed to address data imbalance, emphasizing fairness by adequately representing minority classes like actual fraud cases.

B. During

During the modeling process, continuous testing was conducted to ensure that the predictive models remained fair for all different variable groups. The impact of data preprocessing and feature selection on the fairness of the models was carefully evaluated to avoid introducing bias.

Detailed performance metrics for each model were analyzed. This allowed real-time accountability, enabling adjustments and improvements in model performance to be made promptly. I maintained responsibility for the outcomes of the models, ensuring that decisions made by the algorithms could be traced back and justified.

In addition, during all stages, I documented clearly using graphs and plots the exploratory data analysis, model training, and evaluation of the different models. This ensured that the process was transparent and could be reviewed by all stakeholders that could study my research.

The ethical responsibility of protecting individual privacy was also a key feature in my study. By removing personal information, the project adheres to ethical standards of data usage. This practice aligns also with GDPR regulations and ethical guidelines for research, emphasizing the importance of confidentiality and respect for individuals' private information.

C. After

Since the models for the project did not progress to the deployment and maintenance stages, some aspects of the Fairness, Accountability, Transparency, and Ethics principles were not applicable. However, it is valuable to consider what measures could have been implemented if the project had advanced to these stages.

If the project was deployed, ongoing monitoring and updating of the models would be important to ensure that they continued to operate fairly over time.

A framework for post-deployment about accountability could have been established as well. This would involve regular audits of the models' performance, as well as creating mechanisms for stakeholders to report issues or concerns.

In addition, commitment to providing updates and explanations for any significant changes or updates to the models would be crucial. Making the results of ongoing monitoring, audits, and modifications available to relevant parties would maintain a high level of transparency.

Lastly, ethical implications of the models in real-world applications would continue to be a priority. Regular ethical reviews of the models' impacts could be conducted to identify and address any unintended consequences. For example, engagement with stakeholders, including policyholders and insurance industry professionals, would be important to gather feedback and insights, ensuring that the models remain aligned with ethical and societal values.

REFERENCES

[1] Viaene, S., Dedene, G., & Derrig, R. A. (2005). Auto claim fraud detection using Bayesian learning neural networks. Expert systems with applications, 29(3), 653-666.

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[4] Kaggle. (2021). Kaggle. Retrieved from https://www.kaggle.com/datasets/shivamb/vehicle-claim-fraud-detection