Customer Risk Profiling System

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I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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DECLARATION

I hereby declare that this thesis, entitled “Customer Risk Profiling System for the Insurance Industry”, is the result of my own independent research and work, except where specific references are made and duly acknowledged. This work has not been submitted in whole or in part, in any form, to the Sri Lanka Institute of Information Technology or to any other institution of higher education for the purpose of academic assessment, qualification, or award. All sources of information, data, and ideas have been properly cited and acknowledged according to academic standards.

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ABSTRACT

Development of a Customer Risk Profiling Framework for the Insurance Industry Using Machine Learning and Centralized Insurance GRIB

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This thesis addresses the critical need for advanced, ethical risk quantification in the motor insurance sector, currently hampered by fragmented data and limited cross-company fraud visibility. The primary objective was to design and validate a **Customer Risk Profiling System (CRPS)** that integrates heterogeneous data sources and utilizes Machine Learning (ML) for dynamic risk scoring. The methodology involved aggregating data streams including claims, premiums, policy history, and external **PEP/AML compliance scores** and employing **Gradient Boosted Trees (GBTs)** to achieve a high classification **Accuracy of 0.7561** and a **ROC-AUC of 0.8982**. Empirical findings confirmed the predictive power of **behavioral features** over linear demographic metrics, validating the choice of non-linear ensemble models. The CRPS successfully segments customers into Low, Medium, and High-Risk tiers, enabling targeted intervention. Crucially, the system embeds **Explainable AI (XAI)** using SHAP values and a continuous **Feedback Loop** to maintain accuracy against concept drift, ensuring **auditability and ethical governance** against potential bias. The study concludes by proposing the **Insurance National Grid (NIG)**, a centralized platform designed to connect all insurers to the regulator. The NIG would enforce **data standardization** and enable **cross-company fraud detection**, magnifying the CRPS's impact from a firm-specific tool to a national strategic asset, thereby promoting market efficiency, compliance, and sustained sector resilience.

Keywords: Machine Learning, Risk Profiling, Ensemble Methods, Explainable AI (XAI), Fraud Detection, Data Governance, Insurance National Grid (NIG), Motor Insurance, Regulatory Compliance.

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His advice on analytics not only improved the accuracy of my models but also enhanced my understanding on how data science can be applied ethically in sensitive industries such as insurance.

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Table of Contents

List of Figures

List of Tables