**Abstract**

This seminar introduces an advanced credit card fraud detection system that combines supervised and unsupervised machine learning techniques to accurately identify anomalous transaction patterns, mitigating significant financial risks to users and the global financial system. The solution meticulously preprocesses and analyzes credit card transaction data, incorporating temporal patterns and distribution analysis, to distinguish fraudulent from legitimate transactions. A comparative analysis of XGBoost, Logistic Regression, Decision Tree, and Random Forest algorithms is conducted, targeting common fraud types such as card-not-present fraud (unauthorized transactions conducted over the phone), card-present fraud (transactions using cloned or stolen physical cards), and account takeover fraud (where fraudsters gain unauthorized access to an account to make transactions). These algorithms are evaluated based on accuracy, sensitivity, specificity, F1-score, and ROC-AUC, aiming to enhance fraud detection and provide a more secure banking environment at scale.

**Keywords:** Machine learning ,XGBoost, Logistic Regression, Decision Tree, Random Forest, Financial transactions security, Banking sector.

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