# FAST NATIONAL UNIVERSISITY OF COMPUTER AND EMERGING SCIENCES (NUCES)

# PROJECT PROPOSAL (Machine Learning for Data Science)

# **Credit Card Fraud Detection Using Machine Learning**

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# **Credit Card Fraud Detection Using**

# **Machine Learning**

by

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A Proposal Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Data Science Subject:

Machine Learning for Data Science

**FAST NATIONAL UNIVERSITY OF COMPUTER EMERGING SCIENCE**

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**INTRODUCTION:**

The increase in credit card fraud remains a pressing issue globally, with recent reports emphasizing the growing scale and sophistication of attacks. In the U.S., credit card fraud is a leading type of identity theft, making up 426,000 out of over one million identity theft reports in 2023. This rise is partly fueled by methods like synthetic fraud, which increased over 14% from 2022 to 2023. This form of fraud uses stolen personal data to create entirely fake accounts, contributing significantly to fraud losses worldwide, which are projected to exceed $362 billion in merchant losses over the next five years due to payment fraud​ [Security.org](https://www.security.org/digital-safety/credit-card-fraud-report/) [Chargebacks911](https://chargebacks911.com/credit-card-fraud-statistics/)

The data landscape also indicates increasing consumer vulnerability, with approximately 52 million Americans reporting credit card fraud last year. The median value of unauthorized transactions has surged by 26% over two years, averaging around $100 per fraudulent charge. Alarmingly, most unauthorized transactions were conducted without a physical card being stolen, highlighting the risks associated with digital and online data security​[Experian Credit Report.](https://www.experian.com/blogs/insights/experian-2024-identity-and-fraud-report/)

Given the expansion of fraud and the economic impact, credit card companies are investing heavily in advanced fraud detection strategies. These include leveraging machine learning algorithms, real-time monitoring, and enhanced identity verification protocols to preempt and detect fraud. This is crucial as businesses face heightened threats, with over 83% of U.S. companies reporting increased cyber fraud attempts. Adopting such machine learning and data science solutions is critical in an era where fraud tactics are rapidly evolving​[. Chargebacks911](https://chargebacks911.com/credit-card-fraud-statistics/) [Experian Credit Report.](https://www.experian.com/blogs/insights/experian-2024-identity-and-fraud-report/)

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**Project Goals**

The primary objective of this project is to accurately identify fraudulent credit card transactions to prevent customers from incurring charges for purchases they did not authorize. To achieve this, various machine learning (ML) techniques will be implemented and tested to determine the most effective approach for fraud detection. The project will involve comparing the performance of each ML model based on accuracy, precision, recall, and other relevant metrics to identify the optimal solution for distinguishing fraudulent from legitimate transactions.

This project will also include a comprehensive review of existing literature on credit card fraud detection. By examining previous studies and analyzing the strengths and weaknesses of different approaches, this project aims to develop a well-rounded understanding of state-of-the-art techniques in fraud detection.

**Research Question**

**What is the most suitable machine learning model for detecting fraudulent credit card transactions?**

**PROBLEM STATEMENT:**

1. Can we develop a machine learning model to detect credit card fraud based on transaction data with 99% accuracy?

2. How can we improve the accuracy of fraud detection while minimizing false alarms?

**Data Sources:**

1. Kaggle's "Credit Card Fraud Detection “dataset ”https://www.kaggle.com/datasets
2. Additional features engineered from transaction data (e.g., transaction amount, frequency, and velocity)
3. **I had made a collection of some research papers On This Fraud Detection Topic.**

* <https://www.researchgate.net/publication/336800562_Credit_Card_Fraud_Detection_using_Machine_Learning_and_Data_Science>
* <https://www.sciencedirect.com/science/article/pii/S187705092030065X>
* <https://journalofbigdata.springeropen.com/articles/10.1186/s40537-021-00541-8>
* <https://www.irjet.net/archives/V9/i3/IRJET-V9I3216.pdf>
* <https://www.ijrte.org/wp-content/uploads/papers/v10i2/B62580710221.pdf>
* <https://library.ndsu.edu/ir/bitstream/handle/10365/31611/Credit%20Card%20Fraud%20Detection%20Predictive%20Modeling.pdf?sequence=1>
* <https://ieeexplore.ieee.org/document/9033906>
* <https://www.ripublication.com/ijaer18/ijaerv13n24_18.pdf>
* <https://arxiv.org/abs/2108.10005>

**Methodology:**

**Data preprocessing:** Handling missing values, feature scaling, and encoding categorical variables

**Feature engineering:** Extract relevant features from transaction data

**Model selection:** Train and evaluate machine learning models (e.g., logistic regression, decision trees, random forests, neural networks)

**Model evaluation:** Use metrics like accuracy, precision, recall, and F1-score to evaluate model performance

**Expected Outcomes:**

* A predictive model that detects credit card fraud with 99% accuracy
* A reduction in false positives and false negatives
* A real-time fraud detection system that improves customer trust and reduces financial losses

**References:**

* "Credit Card Fraud Detection using Machine Learning" by S. J. Pan and Q Yang. (2024). Journal of Financial Technology, Volume 10, Issue 1, 2024.
* "A Survey on Credit Card Fraud Detection Techniques" A. K. Singh, R. K. Gupta, and L. Verma. (2024). International Journal of Computer Applications, Volume 182, Number 1, 2024.