Problem Statement

Credit card fraud is a significant challenge in the financial sector, resulting in billions of dollars in global losses each year. With the rapid rise of online transactions and e-commerce, fraudulent activities have become more sophisticated, making traditional rule-based fraud detection systems inadequate.

The primary problem addressed in this project is to **develop a machine learning-based system capable of detecting fraudulent credit card transactions in real time**. The task is challenging because:

- **Imbalanced Dataset**: Fraudulent transactions represent less than 1% of total transactions, making accurate classification difficult.
- **High Accuracy Requirements**: The model must achieve **high recall** (detecting all fraudulent cases) while maintaining **high precision** (minimizing false positives).
- **Evolving Fraud Patterns**: Fraudsters frequently change strategies, requiring adaptive models.
- **Real-Time Detection**: The system must analyze large volumes of transactions efficiently to prevent fraud before completion.

Therefore, the project aims to design and implement a robust fraud detection model using historical transaction data, resampling techniques to handle imbalance, and machine learning algorithms (Logistic Regression, Random Forest, XGBoost). The goal is to build a system that reliably detects fraud while reducing disruptions to genuine customers.