# Fraud Detection System Project

This project demonstrates how to build a Fraud Detection System using Python and Machine Learning techniques. It is beginner-friendly and explains essential concepts in a simplified way.

## Introduction to Machine Learning

Machine Learning (ML) allows computers to learn patterns from data and make predictions. Supervised Learning, which this project uses, involves training a model on labeled data, where we provide inputs and their corresponding outputs.

## Overview of the Fraud Detection System

The goal of this project is to identify fraudulent transactions in a dataset. The dataset contains labeled data, where each transaction is marked as fraud or not fraud.

## Key Steps in the Project

1. Data Preprocessing: Clean and prepare the data for analysis.
2. Resampling with SMOTE: Address data imbalance by oversampling the minority class.
3. Model Training: Train a Random Forest classifier using GridSearchCV for hyperparameter tuning.
4. Evaluation: Assess the model's performance using accuracy, precision, recall, and F1-score.

## Basic Python Concepts Used

- Functions: Reusable blocks of code defined using 'def'.
- Libraries: External packages like pandas, scikit-learn, and imbalanced-learn are imported for use.
- File Handling: Reading and writing files using Python.
- Joblib: Used for saving and loading trained models.

## How to Run the Project

1. Ensure all required libraries are installed: pandas, scikit-learn, imbalanced-learn, and joblib.
2. Prepare the dataset and place it in the project directory.
3. Execute the following scripts in order:
   a. data_preprocessing.py
   b. model_training.py
   c. main.py
4. Review the output metrics and evaluate the model's performance.

## Key Results

The model achieved impressive results with an accuracy of 99.99%, indicating its effectiveness in detecting fraudulent transactions.

## Conclusion

This project showcases the power of Machine Learning in tackling real-world problems like fraud detection. By following the steps and explanations provided, you can understand the fundamentals of ML and Python.