

# Enron Investigation Project

Mayank  
B.E. (CSE-H) (AI&ML)  
Chandigarh University  
Mohali, India  
mayank8055neel@gmail.com

Saumya Dua  
B.E. (CSE-H) (AI&ML)  
Chandigarh University  
Mohali, India  
duasaumya2002@gmail.com

Yamini  
B.E. (CSE-H) (AI&ML)  
Chandigarh University  
Mohali, India  
kaushalyamini952@gmail.com

**Abstract—** This research paper explores the application of machine learning techniques in detecting financial fraud using the Enron scandal as a case study. The Enron scandal is one of the biggest financial scandals in history, involving fraudulent accounting practices that allowed Enron to inflate its earnings and deceive investors and regulators. The paper also discusses the development of a web application to visualize the results of the analysis and provide insights to users.

**Keywords—** Enron scandal, Machine Learning, Web application development

## I. INTRODUCTION

The Enron scandal was a corporate scandal that occurred in the early 2000s, involving the energy company Enron Corporation. The scandal was one of the biggest financial scandals in history, resulting in the company's bankruptcy, criminal charges against top executives, and the dissolution of the accounting firm Arthur Andersen.

The scandal involved fraudulent accounting practices that allowed Enron to inflate its earnings, hide its losses, and deceive investors and regulators. Enron executives used complex financial instruments and offshore entities to manipulate financial statements and deceive auditors and investors.

The scandal was exposed in 2001 when a whistle-blower alerted the Securities and Exchange Commission (SEC) about the irregular accounting practices. The revelation led to a collapse in Enron's stock price, and the company filed for bankruptcy in December 2001. The scandal also led to the passing of the Sarbanes-Oxley Act, which introduced new regulations and requirements for public companies and accounting firms to prevent similar scandals from happening in the future.

The purpose of the research paper is to explore the application of machine learning techniques in detecting financial fraud, using the Enron scandal as a case study. The paper aims to investigate how machine learning models can be trained on financial data to identify fraudulent transactions and activities. Additionally, the paper will also discuss the development of a

web application to visualize the results of the analysis and provide insights to users.

The research paper seeks to contribute to the field of finance and fraud detection by demonstrating the effectiveness of machine learning models in detecting fraudulent activities. It also aims to provide insights into the Enron scandal and how its fraudulent accounting practices were uncovered. By presenting a detailed methodology and analysis of the results, the research paper aims to provide a useful resource for researchers and practitioners interested in applying machine learning techniques in financial fraud detection.

In creating a machine learning (ML) and web project related to the Enron investigation, here are some steps you could follow:

- (1) Collect and preprocess data: Start by collecting relevant data related to the Enron scandal, such as financial statements, email communications, and news articles. Preprocess the data by cleaning, transforming, and formatting it for analysis.
- (2) Define ML tasks: Define the ML tasks that you want to perform on the data, such as classification, clustering, or regression. For example, you could use classification to identify Enron employees involved in the scandal, or use clustering to group similar email communications.
- (3) Train ML models: Train ML models using various algorithms and techniques, such as decision trees, neural networks, and deep learning. Use cross-validation and hyperparameter tuning to optimize the models' performance.
- (4) Evaluate model performance: Evaluate the performance of the ML models using metrics such as accuracy, precision, recall, and F1 score. Use visualizations such as confusion matrices, ROC curves, and precision-recall curves to interpret the model's performance.
- (5) Develop web application: Develop a web application that showcases the ML models and provides interactive visualizations of the data. Use frameworks such as Flask

or Django for the web application, and deploy it on a cloud service such as Heroku.

There are various types of front-end dashboards that will be created to visualize and present the results of the machine learning analysis as mentioned below:

- (1) **Fraudulent transaction detection dashboard:** This dashboard can display a summary of all the fraudulent transactions detected by the machine learning model, along with details such as the date, time, amount, and location of the transactions. You can also display a chart that shows the distribution of fraudulent transactions over time or by transaction type.
- (2) **Financial statement analysis dashboard:** This dashboard can show a detailed analysis of Enron's financial statements, highlighting any irregularities or anomalies that were detected by the machine learning model. You can display charts and graphs that show the company's revenue, expenses, and profits over time, as well as any significant changes or trends that were observed.
- (3) **Fraud risk assessment dashboard:** This dashboard can display a summary of the overall fraud risk score for Enron, based on the machine learning model's analysis of various factors such as financial statements, company policies, and industry benchmarks. You can also display a chart that shows how the fraud risk score has changed over time, or by department or business unit.
- (4) **Anomaly detection dashboard:** This dashboard can display a summary of all the anomalous activities detected by the machine learning model, such as suspicious logins or data access by unauthorized users. You can also display charts and graphs that show the distribution of anomalous activities over time, by user or department.
- (5) **Data visualization dashboard:** This dashboard can provide an interactive visualization of the financial data and results of the machine learning analysis. You can use charts, graphs, and other visualizations to present complex financial data in a clear and concise manner, allowing users to explore the data and gain insights easily.