**Artificial-Neural-Networks-for-Fraud-Detection-in-Supply-Chain-Analytics**

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| **Hithen Sai Chavva** | **Sai Ram Reddy** | **Bolneni Alekya** |
| 21P61A0549 | 21P61A0554 | 21P61A0534 |
| chavvahithensai@gmail.com | sairamreddy2208@gmail.com | alekyarao14@gmail.com |

**OBJECTIVE**

To detect fraudulent activities in the supply chain by developing machine learning models using neural networks. The goal is to enhance fraud detection accuracy, minimize financial losses, and improve operational efficiency for organizations by utilizing the MLPClassifier algorithm from scikit-learn and a custom neural network built with Keras. These models are trained on the DataCo Supply Chain dataset to identify fraudulent transactions.

**ABSTRACT**

The integration of Artificial Neural Networks (ANNs) represents a transformative advancement in detecting fraud within supply chain analytics.

This study introduces a novel framework leveraging historical transaction data to identify anomalies associated with fraudulent activities.

It evaluates two machine learning models: an MLPClassifier from scikit-learn and a custom neural network built with Keras. Both models were trained and tested using the DataCo Supply Chain dataset. The findings highlight the superior performance of the ANN-based approach over traditional methods, offering significant improvements in accuracy, speed, and overall effectiveness in fraud detection and supply chain security.

**INTRODUCTION**

Neural networks have become crucial in supply chain analytics, helping organizations enhance decision-making and optimize operations. One key application is fraud detection before shipments are processed, which is vital for preventing financial losses. In this study, we developed two models to address this challenge: one using the MLPClassifier from Scikit-learn and another using a custom neural network built with Keras. Both models leveraged open-source tools such as NumPy, Pandas, Seaborn, Matplotlib, along with machine learning frameworks Scikit-learn, Keras, and TensorFlow. While the MLPClassifier is recognized for its effective classification capabilities, the custom Keras model offers greater control over the architecture and training process, aiming to detect fraudulent activities early and reduce financial risks.

**HARDWARE & SOFTWARE REQUIREMENTS**

Processor: Multi-core processor (e.g., Intel i5 or higher).

RAM: 8 GB or higher for smooth data processing.

Storage: 100 GB of free space to store datasets and project files.

GPU (optional): If using TensorFlow for neural networks, a dedicated GPU with CUDA support will speed up model training.

Operating System: Windows 10, macOS, or Linux.

Python 3.6+: Minimum version for compatibility with modern libraries like Keras, scikit-learn, and TensorFlow.

Keras: For building and training neural networks.scikit-learn: For implementing the MLPClassifier and other machine learning models.

Pandas and NumPy: For data manipulation and numerical computations.Jupyter Notebook: For writing, running, and documenting the code.

**EXISTING SYSTEM**

Utilizes rule-based systems and statistical models for fraud detection.Relies on manually set thresholds or predefined rules for identifying suspicious transactions.Limited scalability, struggling to manage large datasets typical in global supply chains.Unable to detect complex, evolving fraud patterns and adaptive fraudsters.Lacks the ability to learn from new data or adapt to emerging fraud schemes.

**PROPOSED SYSTEM**

Implements Artificial Neural Networks (ANNs) for fraud detection, offering a data-driven approach.Develops two models: MLPClassifier from scikit-learn and a custom neural network built with Keras.Capable of learning from historical and real-time data, improving adaptability to fraud patterns.Highly scalable, designed to handle large and complex datasets within global supply chains.Provides higher accuracy in detecting fraudulent transactions (97.67% for the custom model), reducing manual intervention and financial losses.

**CONCLUSION**

The focus of our study was to investigate the feasibility of using neural networks for detecting fraud in DataCo Global's supply chain. Two models were developed as part of this study: the MLPClassifier from the scikit-learn library and a custom neural network built with the Keras library in Python. The results showed that both models demonstrated high accuracy and a strong F1 score. In conclusion, the results of this study highlights the potential for neural nerworks to play a key role in the detection of fraud in the supply chain, and serves as a stepping stone for further research in these are

**References**

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**Guide Name:** Dr.

**Guide Designation:** Associate Professor, Dept. of CSE

**Guide Signature:**

**Project Coordinator Signature:**

**HOD Signature:**