

FINANCIAL FRAUD DETECTION IN FINANCIAL INSTITUTIONS USING TWO-LAYER-DEEP LEARNING AND SELF-IMPROVED HONEY BADGER ALGORITHM

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ABSTRACT

The financial industry, dealing with extensive data on individuals' health and finances, is particularly vulnerable to credit card theft and online financial fraud. To mitigate financial losses resulting from fraudulent activity, it is crucial to continuously enhance fraud detection systems as electronic payments become more prevalent. In this study, we propose a novel hybrid deep learning-based model for detecting online financial fraud in financial institutions. The proposed model consists of three main steps: pre-processing, feature extraction and selection, and a deep learning-based online financial fraud detection model. In the pre-processing stage, a data cleaning approach is employed to rectify or remove inaccurate, corrupted, improperly formatted, duplicate, or incomplete data from the collected raw dataset. During the feature extraction stage, various features are extracted from the pre-processed data, including measures of central tendency, degree of dispersion, Principal Component Analysis (PCA), and Mutual Information-based features. A score-level fusion strategy is utilized to combine these features into a comprehensive feature set for the fraud detection model. To select the set of optimal features, an optimized Self-Improved Honey Badger Algorithm (SI-HBA) is employed. Subsequently, the optimal feature set is used to train the Two-Layer Deep Learning Technique-based online financial fraud detection model, which learns patterns and traits of fraudulent behaviour. The hybrid classifier incorporates an optimized Convolutional Neural Network (CNN) and Radial Basis Function Networks (RBFNs) to identify probable frauds in the financial industry. The proposed method yields promising results, performing better than most current models used, and has the potential to enhance financial fraud detection systems. By leveraging a hybrid deep learning model and incorporating feature selection techniques, our approach offers an effective solution for detecting online financial fraud in financial institutions, contributing to the mitigation of financial losses and ensuring greater security in electronic payment systems.

Keywords: Financial fraud, Financial Institutions, SI-HBA, two-layer deep learning, RBFN, Central tendency.

1. INTRODUCTION

Financial organisations around the world are affected by financial fraud, which causes financial losses and legal issues. Due to the sensitive nature of financial data and intricate billing systems, financial organisations have become a target for fraud [1] (Kumaraswamy, N., Markey, M.K., et al., 2022). Financial fraud is a complicated problem that affects many people and can take many different forms. Service providers, beneficiaries, and financial providers are the three primary categories that can be used to group the parties involved in financial fraud [2] (Ekin, T., Ieva, F., Ruggeri, F. and Soyer, R., 2018). The complexity of financial systems and the vast amount of sensitive data involved make these institutions attractive targets for fraudulent activities. Financial fraud can manifest in various forms, such as identity theft, credit card fraud, money laundering, and fraudulent transactions.

The impact of financial fraud extends beyond immediate financial losses. It erodes customer trust, disrupts business operations, and can have far-reaching consequences for the stability of the financial system as a whole. Detecting and preventing financial fraud has thus become a top priority for financial