# Parallel Structure of RNN and LSTM Autoencoder for Financial Transaction Detection

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**Abstract**

The digital transformation of the financial industry provides customized financial services that can be conveniently used anytime, anywhere, but has also created new types of problems that did not exist before. To solve this problem, research on Fraud detection system(FDS) using machine learning technology is being actively conducted. However, conventional FDS cannot detect new patterns of abnormal financial transactions. In this paper, we proposed a new FDS system linking Recurrent neural network(RNN) and Long short-term memory(LSTM) autoencoder, improving accuracy by 3% and reducing latency to 28.5% compared to the conventional model.

***Keywords***— RNN, LSTM autoencoder, Financial transaction detection

## 1 Introduction

As new fraud methods exploit security vulnerabilities in electronic financial transactions, the scale of damage caused by intelligent financial fraud is increasing [1]. To solve these problems, research is being actively conducted to build a machine learning-based FDS. However, the conventional machine learning-based FDS utilizes a supervised learning-based algorithm, so it is difficult to respond to unknown patterns. There are limits. In this paper, we would like to propose an abnormal transaction behavior detection system using RNN-LSTM autoencoder linkage.

## 2 Linking RNN and LSTM Autoencoder in Parallel Structure

The structure of the abnormal financial transaction detection system proposed in the paper, which connects the RNN and LSTM autoencoder in a parallel structure, is shown in Figure 1. Each model inputs a sequence dataset at the same time. As a sequential model, RNN demonstrates fast learning and judgment capabilities, and performs immediate monitoring and analysis when financial transactions occur. LSTM Autoencoder is an unsupervised learning model that applies a recurrent neural network model and can effectively classify longer time series data than RNN. When rapid classification is achieved through the RNN model, primary measures such as warning or pausing are taken on data classified as abnormal transactions. Afterwards, when the operation of the LSTM Autoencoder is completed, data classified as abnormal transactions that overlap with the primary classification results are judged to be abnormal transactions and secondary measures such as blocking are taken.

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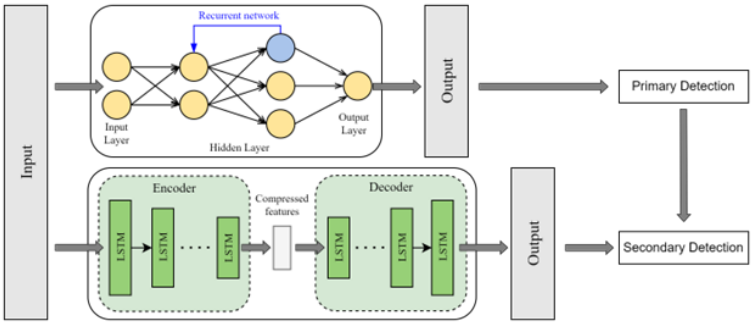


Figure 1: RNN-LSTM Autoencoder interworking structure

# 3 Results and Conclusions

Through experiments, the performance of the proposed method was compared with a conventional method [2] that used RNN and LSTM autoencoder as a single model. In the case of the conventional method, the RNN model showed an accuracy of about 0.92, and the LSTM autoencoder model showed an accuracy of about 0.95. In terms of recall, the RNN model was 0.86 and the LSTM Autoencoder model was 0.92. The proposed method showed higher detection performance than the conventional method, with Accuracy of 0.96 and Recall of 0.95. In terms of latency, the proposed method was 0.4 seconds and the conventional method was 1.4 seconds, proving the low latency of the proposed method. According to the experimental results, the method proposed in this paper proved to be superior to the conventional single model method in terms of both abnormal financial transaction data detection performance and real-time compared to the conventional method.

| | Conventional Method | | Proposed |
|---|---|---|---|
| | RNN | LSTM Autoencoder | Method |
| Accuracy | 0.92 | 0.95 | 0.96 |
| Recall | 0.86 | 0.92 | 0.95 |
| Latency | 0.29 | 1.4 | 0.40 |

Table 1: Comparison of conventional and proposed method

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