HYBRID DEEP LEARNING FOR FOREX PREDICTION: INTEGRATING SOCIAL MEDIA SENTIMENT AND TECHNICAL INDICATORS

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: Date: 25th June 2025

The above candidate has carried out research for the Master thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of the Supervisor: Thanuja D. Ambegoda

Signature of the Supervisor: Date: 25th June 2025

ABSTRACT

This study proposed a new way to predict currency prices in the Forex market by combining statistical indicators with social media sentiment analysis. The research classifies tweets from influential financial analysts as positive, negative, or neutral and combines sentiment analysis results with technical indicators derived from historical price behavior. This mix of methods improves pattern recognition in the market and leads to smarter trade choices that are more likely to be right.

The VADER Sentiment library, a powerful sentiment analysis tool, has been employed to analyze Forex-related tweets of the most influential market players. The study identifies the most influential tweets based on impact engagement measures (likes, replies, and retweets) and selects the most relevant technical indicators. A dataset comprising ten technical indicators, along with news tweets from influential players in USD and EURO trades, has been collected for the study.

A prediction model was built using several deep learning approaches including Gated Recurrent Units (GRU), Convolutional Neural Networks (CNN), Long Short-Term Memory (LSTM) networks, Recurrent Neural Networks (RNN), and some combined models. The LSTM-CNN-Attention model, which is a recent and specialized architecture for Forex data, was also considered in our experiment. In addition, the best-performing models were tested both with and without impact ratio - Sentiment Score of Social media Text.

To see which worked best, their performance is compared using key points like Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Squared Error (MSE), and the R-squared score. Comparative analysis reflected the weaknesses and strengths of individual models, revealing the effectiveness of the ensemble strategy.

The research also points out its limitations. It includes a detailed look at what other popular models are being used in predicting the Forex market. The results show that combining sentiment analysis with technical indicators improves how accurately it can be predicted Forex prices in this research. The hybrid GRU-LSTM model was the best among the deep learning options in this research experiment. It outperformed all of the earlier methods used by other researchers on the EUR/USD Forex data.

Keywords: Forex price prediction, Forex price forecasting, sentiment analysis, LSTM, GRU, CNN, RNN, Twitter Sentiment, Technical Indicators

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LIST OF ABBREVIATIONS

Abbreviation	Description
Forex	Foreign Exchange Market
AI	Artificial Intelligence
LSTM	Long Short-Term Memory
GRU	Gated Recurrent Unit
RNN	Recurrent Neural Network
CNN	Convolutional Neural Network
USD	United States Dollar
EUR	Euro
API	Application Programming Interface
RNN	Recurrent Neural Network
ANN	Artificial Neural Network
SVR	Support Vector Regression
MAE	Mean Absolute Error
MSE	Mean Squared Error
RMSE	Root Mean Squared Error
BPTT	Backpropagation Through Time
VADER	Valence Aware Dictionary and sentiment Reasoner
PCA	Principal Component Analysis
t-SNE	t-distributed Stochastic Neighbor Embedding