

Chapter 7

Hybridized Deep Learning Models and Federated Learning Techniques to Forecast Stock Market Movement

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ABSTRACT

Traditional stock market prediction methods often rely on assumptions and conventional approaches, but the emergence of deep learning techniques offers a transformative opportunity. This study evaluates the effectiveness of several deep learning architectures, including LSTM networks, CNNs, GRU, and Bi-directional GRU and Federated Learning in forecasting stock prices. Through rigorous experimentation and assessment using key metrics such as Loss, MAE, MSE, MAPE, and RMSE, deep learning models, particularly LSTM networks and CNNs, demonstrate notable

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improvements in accuracy compared to traditional methods. Additionally, the study explores the interpretability of these models, providing insights into the complex dynamics influencing stock price fluctuations. The study aims to predict future stock prices of Cipla by integrating various financial indicators from annual reports to offer investors reliable insights for informed decision-making in navigating the intricacies of the stock market.

1. INTRODUCTION

The realm of stock market prediction has historically relied upon traditional assumptions and methodologies, drawing from a rich tapestry of economic theories, technical analysis, and fundamental indicators. However, with the advent of deep learning techniques, the landscape of financial forecasting has undergone a profound transformation. Nandhini and Anitha (2023) suggested a seasonal-wise occupational accident analysis using deep learning techniques. These advanced computational methods have not only challenged the status quo but have also opened up transformative avenues for predicting stock prices with unprecedented levels of accuracy and reliability. In this comprehensive study, we embark on an exploration of the effectiveness of cutting-edge deep learning models within the dynamic realm of stock market prediction. Our focus encompasses a spectrum of state-of-the-art algorithms, including Long Short-Term Memory (LSTM) networks by Manna and Anitha, (2023), Convolution Neural Networks (CNN), Federated Learning, Gated Recurrent Unit (GRU), and Bi-directional Gated Recurrent Unit (BiGRU) by Manna and Anitha (2023) . By leveraging these sophisticated neural network architectures, we aim to unearth the latent patterns and intricate relationships hidden within vast volumes of financial data. Central to the investigation is a rigorous methodology grounded in meticulous experimentation and thorough assessment. In the paper, a comprehensive suite of key metrics, including Loss, Mean Absolute Error (MAE), Mean Square Error (MSE), Mean Absolute Percentage Error (MAPE), and Root Mean Squared Error (RMSE), is employed. These metrics serve as indispensable benchmarks for gauging the performance and accuracy enhancements facilitated by deep learning algorithms, particularly in comparison to traditional forecasting methods. Moreover, the study extends beyond the realm of mere quantitative evaluation to delve into the interpretability of deep learning models. While the predictive capabilities of these algorithms are undeniably impressive, their inner workings often remain opaque and inscrutable. Thus, we endeavor to unravel the intricate dynamics that govern stock price fluctuations, shedding light on the underlying mechanisms driving market trends and investor behavior. Through this multifaceted approach, the paper seeks to provide not only empirical evidence of the superior predictive

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