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Stock Prices Prediction Using Generative Adversarial Networks (GAN) Method

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ABSTRACT

Financial markets are essential due to constantly changing economic conditions and global interactions. Accurately predicting stock prices is crucial for investors and financial analysts. This study aims to conduct an empirical analysis using deep learning methods such as LSTM (Long Short-Term Memory), GRU (Gated Recurrent Unit), GAN (Generative Adversarial Networks), and WGAN-GP (Wasserstein Generative Adversarial Networks with Gradient Penalty) to forecast stock prices. The objective of the study is to evaluate the performance and limitations of these methods and determine their applicability in financial forecasting by comparing them with the existing literature. The study contributes to the existing literature and presents new approaches in this context. Google stock is used in the study, and it includes daily closing price data between 22.03.2018 and 21.03.2023. This dataset is used for deep learning models, with 70% for training and 30% for testing. The study conducts stock price forecasts using LSTM, GRU, GAN, and WGAN-GP deep learning models. According to the findings, the LSTM model demonstrates the best performance, while the GAN model exhibits the second-best performance. The GRU model shows performance after LSTM and GAN, whereas the WGAN-GP model has the lowest performance. In these models, significant gaps started to form between the actual prices and predictions in 2020 due to an unexpected event caused by COVID-19. This indicates that such models may struggle to cope with unexpected events. The study reveals that it is possible to make accurate predictions using deep learning models for stock price forecasting; however, their sensitivity to unexpected events needs improvement. In conclusion, the study specifically found that LSTM and GAN models are applicable for short-term and medium-term forecasts. The study recommends testing deep learning models on broader financial datasets and different stock markets and conducting more comprehensive trials for sensitivity analysis and hyperparameter optimization. Furthermore, it emphasizes the need for research on integrating fundamental and technical analysis data, macroeconomic factors, and market sentiment analysis into deep learning models. In this way, future studies aim to contribute to developing more effective and reliable financial forecasting models.

KEYWORDS Deep Learning; LSTM; GRU; GAN; WGAN; Stock Price Prediction

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