

Revolutionizing Financial Forecasts: Enhancing Predictions with Graph Convolutional Networks (GCN) - Long Short-Term Memory (LSTM) Fusion

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Abstract : Those within the volatile and interconnected international economic markets, appropriately predicting market trends, hold substantial fees for traders and financial establishments. Traditional device mastering strategies have made full-size strides in forecasting marketplace movements; however, monetary data's complicated and networked nature calls for extra sophisticated processes. This observation offers a groundbreaking method for monetary marketplace prediction that leverages the synergistic capability of Graph Convolutional Networks (GCNs) and Long Short-Term Memory (LSTM) networks. Our suggested algorithm is meticulously designed to forecast the traits of inventory market indices and cryptocurrency costs, utilizing a comprehensive dataset spanning from January 1, 2015, to December 31, 2023. This era, marked by sizable volatility and transformation in financial markets, affords a solid basis for schooling and checking out our predictive version. Our algorithm integrates diverse facts to construct a dynamic economic graph that correctly reflects market intricacies. We meticulously collect opening, closing, and high and low costs daily for key inventory marketplace indices (e.g., S&P 500, NASDAQ) and widespread cryptocurrencies (e.g., Bitcoin, Ethereum), ensuring a holistic view of marketplace traits. Daily trading volumes are also incorporated to seize marketplace pastime and liquidity, providing critical insights into the market's shopping for and selling dynamics. Furthermore, recognizing the profound influence of the monetary surroundings on financial markets, we integrate critical macroeconomic signs with hobby fees, inflation rates, GDP increase, and unemployment costs into our model. Our GCN algorithm is adept at learning the relational patterns amongst specific financial devices represented as nodes in a comprehensive market graph. Edges in this graph encapsulate the relationships based totally on co-movement styles and sentiment correlations, enabling our version to grasp the complicated community of influences governing marketplace moves. Complementing this, our LSTM algorithm is trained on sequences of the spatial-temporal illustration discovered through the GCN, enriched with historic fee and extent records. This lets the LSTM seize and expect temporal marketplace developments accurately. Inside the complete assessment of our GCN-LSTM algorithm across the inventory marketplace and cryptocurrency datasets, the version confirmed advanced predictive accuracy and profitability compared to conventional and opportunity machine learning to know benchmarks. Specifically, the model performed a Mean Absolute Error (MAE) of 0.85%, indicating high precision in predicting day-by-day charge movements. The RMSE was recorded at 1.2%, underscoring the model's effectiveness in minimizing tremendous prediction mistakes, which is vital in volatile markets. Furthermore, when assessing the model's predictive performance on directional market movements, it achieved an accuracy rate of 78%, significantly outperforming the benchmark models, averaging an accuracy of 65%. This high degree of accuracy is instrumental for techniques that predict the course of price moves. This study showcases the efficacy of mixing graph-based totally and sequential deep learning knowledge in economic marketplace prediction and highlights the fee of a comprehensive, records-pushed evaluation framework. Our findings promise to revolutionize investment techniques and hazard management practices, offering investors and economic analysts a powerful device to navigate the complexities of cutting-edge economic markets.

Keywords : financial market prediction, graph convolutional networks (GCNs), long short-term memory (LSTM), cryptocurrency forecasting

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