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Stock Market and Cryptocurrency Price Prediction

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Abstract: Financial market prediction has profound impacts on trading, investing, and risk management strategies. However, accurate forecasting of asset prices like stocks, cryptocurrencies, forex, and commodities remains challenging due to the complexity, noise, and non-stationarity in financial time series data. This project leverages machine learning to develop data-driven predictive models that can capture intricate patterns and provide actionable insights.

Three distinct algorithms are explored - Moving Average Convergence Divergence (MACD) for next-day price forecasting, linear regression for next-day forecasting, and Long Short-Term Memory (LSTM) recurrent neural networks for predicting prices over a 1-week (7-day) horizon. Extensive historical data from major stock indices like S&P 500, NIFTY 50, top cryptocurrencies, forex currency pairs, and commodities are utilized for training and evaluation.

The models incorporate both technical indicators derived from price/volume data as well as fundamental factors and news sentiment obtained from sources like Alpha Vantage API. A rigorous methodology involving data preprocessing, feature engineering, model training, hyperparameter optimization, and backtesting on unseen data is employed to ensure the models' robustness and generalization capabilities. Appropriate error metrics like mean squared error and directional accuracy are used for quantitative performance assessment.

Additionally, interpretability techniques are applied to the LSTM models to uncover non-linear patterns and understand the key drivers influencing the forecasts. The overarching goal is to develop accurate predictive systems that financial institutions, quantitative funds, and individual investors can leverage for applications like algorithmic trading, portfolio optimization, and data-driven investment decision support across different asset classes and market conditions

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396