# Stock Price Trend Prediction with LSTM

## Introduction:

Predicting stock market trends is a challenging yet crucial task in the financial industry. Accurate forecasting can help investors and traders make informed decisions, mitigate risks, and optimize returns. This project focuses on building an LSTM-based deep learning model to predict future stock prices based on historical data, integrated with moving average indicators for enhanced analysis.

## Abstract:

In this project, we collected historical stock price data using the Yahoo Finance API via the yfinance library. We applied data preprocessing and scaling techniques to prepare the time-series data, and trained a Long Short-Term Memory (LSTM) neural network using Keras. The model predicts future stock prices, which are compared against actual prices to evaluate performance. Additionally, we implemented exponential moving averages (EMA20, EMA50, EMA100, EMA200) for technical analysis, and developed an interactive web application using Flask to visualize and analyze predictions.

## Tools Used:

- Python.
- Libraries: Pandas, NumPy, yfinance, scikit-learn, Keras/TensorFlow, Matplotlib, Flask.

- Jupyter Notebook for development and experimentation.

- Visual Studio Code for app development.

- GitHub for version control and submission.

# Steps Involved in Building the Project:

1. **Data Collection:** Downloaded historical stock price data using yfinance from 2000 to 2024 for selected stocks (e.g., POWERGRID.NS).

2. **Data Preprocessing:** Rescaled closing prices with MinMaxScaler; split data into training (70%) and testing (30%) sets.

3. **Model Building:** Constructed an LSTM model using Keras with appropriate layers, activation functions, and optimizers; trained the model on processed time-series data.

4. **Model Evaluation:** Generated predictions on the test dataset; plotted predicted vs actual prices for visual validation.

5. **Technical Indicators:** Calculated EMA20, EMA50, EMA100, and EMA200 to provide additional context to the trend analysis.

6. **Web Application:** Built a Flask app enabling users to enter stock symbols, visualize EMAs, download datasets, and compare predicted and actual stock prices interactively.

7. **Visualization:** Created charts for closing prices with EMAs and a separate plot comparing predicted and actual stock price trends.

# Conclusion:

The project successfully demonstrates the application of deep learning for time-series prediction in the stock market. The LSTM model provides reasonably accurate forecasts of stock prices, supported by technical indicators for deeper analysis. The interactive Flask app offers a user-friendly interface, making the solution practical and insightful for both technical and non-technical users. This project enhances skills in financial data analysis, deep learning, and web application development — valuable competencies for pursuing a career in data science and AI.