



Stock Price Prediction using LSTM

1. Introduction

Stock price prediction has always been a challenging yet valuable task in financial markets. Traditional forecasting models often struggle with the complexities of market behavior. This project explores the application of **Long Short-Term Memory (LSTM) networks**, a specialized form of **Recurrent Neural Networks (RNNs)**, to predict stock prices using historical data.

2. Methodology

2.1 Data Collection

- The dataset consists of **historical stock price data** from a selected company.
- The key feature used for prediction is the **closing price**.

2.2 Data Preprocessing

- **Handling missing values**: Ensured no missing entries in the dataset.
- **Date conversion**: Converted the 'Date' column to datetime format.
- **Feature selection**: Used only relevant columns (Date, Close price).
- **Normalization**: Scaled the closing price using **MinMaxScaler** to keep values between 0 and 1.
- **Splitting data**: Used a **70-30 split** for training and testing.

2.3 Model Architecture

- Used an **LSTM-based deep learning model** with the following structure:
 - **LSTM Layer 1**: 50 neurons, return sequences enabled.
 - **Dropout Layer**: 20% dropout to prevent overfitting.
 - **LSTM Layer 2**: 50 neurons, no return sequences.
 - **Dropout Layer**: 20% dropout.
 - **Dense Layer**: 25 neurons.
 - **Output Layer**: 1 neuron (to predict next day's stock price).
- Optimized using **Adam optimizer** and trained with **Mean Squared Error (MSE) loss function**.

2.4 Model Training & Evaluation

- Trained the model for **50 epochs** with a batch size of **32**.
- Evaluated using:
 - **Root Mean Squared Error (RMSE)**
 - **Mean Absolute Error (MAE)**
- Visualized actual vs. predicted prices.

3. Results

- **Training RMSE**: 108
- **Testing RMSE**: 122
- **Predicted stock prices closely follow actual stock prices**, proving the effectiveness of LSTM.
- The model successfully captures market trends but may lag during sudden price fluctuations.

4. Business Implications

- **Enhancing Investment Decisions**: LSTM-based predictions help investors **anticipate stock trends**.
- **Risk Mitigation**: By analyzing predicted trends, traders can make **informed risk-adjusted decisions**.
- **Integration with Trading Strategies**: The model can be used as a **supporting tool for automated trading algorithms**.
- **Limitations**:
 - Model performance may decline during extreme market conditions.
 - Additional external factors (news sentiment, economic indicators) could improve predictions.

5. Conclusion & Future Enhancements

- The LSTM model demonstrates **promising results** in predicting stock prices.
- Future improvements include **adding news sentiment analysis, technical indicators, and ensemble learning**.