Machine Learning for Bitcoin

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Agenda

DATA COLLECTION

- Downloading Bitcoin historical data
- Using yFinance to get Open, High, Low, Close, Volume
- Adding technical indicators (SMA, EMA, RSI, MACD)

MODEL DESIGN (LSTM)

- Building an LSTM neural network
- Layers: LSTM, Dropout, Dense

MODEL TRAINING

- Splitting into training & testing sets
- Training the model for 60 epochs
- Using EarlyStopping & ModelCheckpoint

PREDICTIONS

- Predicting test prices
- Inverse-transforming predictions back to USD
- Saving predictions to CSV
- Plotting Real vs Predicted prices

Libraries Used in the Project

1

NUMPY

- Used for fast numerical calculations.
- Helps the model handle large arrays of data.

2

PANDAS

- Used to load and organize Bitcoin price data.
- Makes it easy to work with tables, dates, and indicators.

3

YFINANCE

- Downloads real Bitcoin historical prices from Yahoo Finance.
- Provides: Open, High, Low, Close, Volume.

4

MATPLOTLIB

- Used to draw charts:
- Real vs Predicted prices
- Visualizing the model's performance

5

SCIKIT-LEARN

- Provides tools for:
- Scaling data (MinMaxScaler)
- Measuring accuracy (MAE, RMSE, R^2)

6

TENSORFLOW / KERAS

- The "brain" of the project.
- Used to build and train the LSTM neural network.

7

OS & MATH

- OS: file saving & detecting files
- Math: calculating RMSE and other metrics

How the AI Model Learns (Training Process)

1) TRAINING DATA

- The model receives 90 days of Bitcoin prices + indicators as input.
- It learns to predict the next day's Close price.
- This repeats for every day in the dataset.

2) LSTM LEARNING PROCESS

- LSTM looks for patterns over time, such as:
- Upward or downward trends
- Price momentum
- Repeated behaviors in the market
- It adjusts its internal weights every time it sees an error.

3) REDUCING ERROR

- The model makes a prediction.
- It compares prediction vs actual price.
- It calculates loss (error).
- It adjusts itself to reduce this error next time.
- This happens for 60 epochs (60 full training cycles).

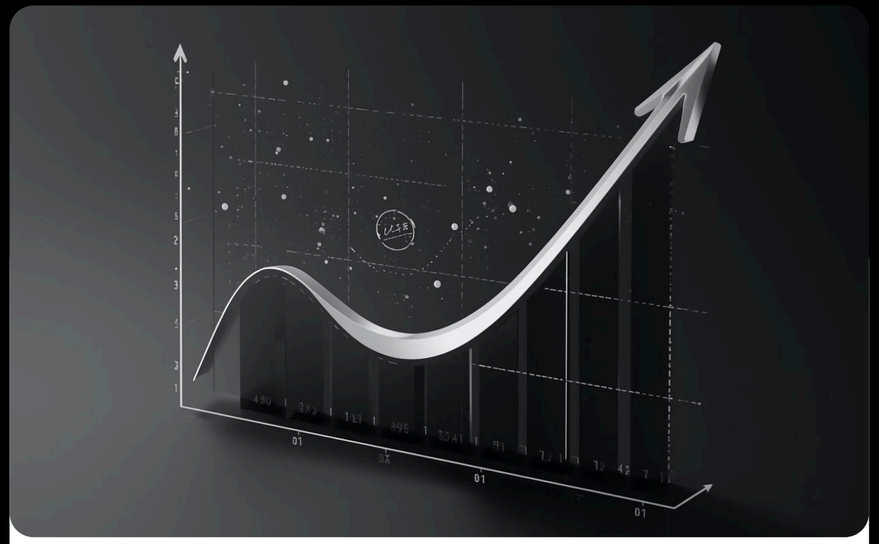
4) VALIDATION

- Part of the data (20%) is used only for testing.
- This ensures the model doesn't "memorize" data but actually learns patterns.

Data Source — Yahoo Finance

THE PROJECT USES REAL BITCOIN HISTORICAL DATA DOWNLOADED DIRECTLY FROM THE YAHOO FINANCE WEBSITE USING THE YFINANCE PYTHON LIBRARY.
THE DATA INCLUDES DAILY PRICE INFORMATION SUCH AS:

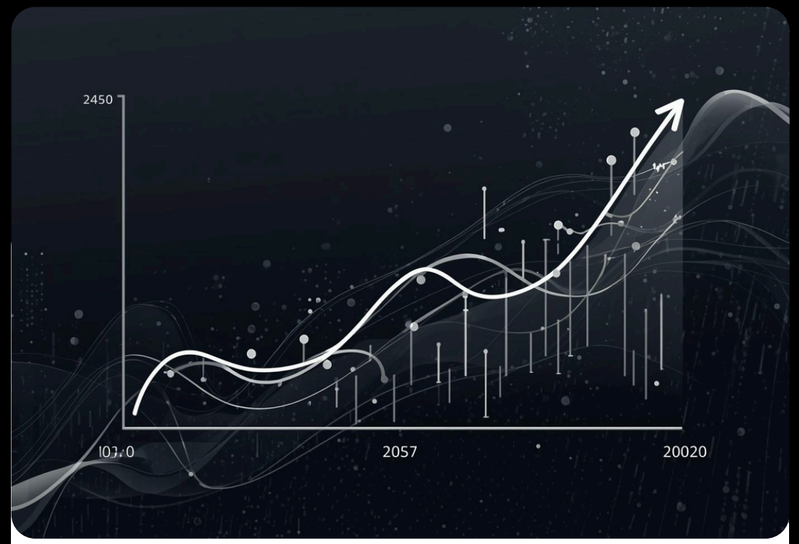
- OPEN: THE PRICE AT THE START OF THE DAY
- HIGH: HIGHEST PRICE OF THE DAY
- LOW: LOWEST PRICE OF THE DAY
- CLOSE: THE FINAL PRICE OF THE DAY
- VOLUME: TOTAL TRADED BITCOIN THAT DAY
- THIS DATA IS USED AS THE FOUNDATION FOR TRAINING THE MACHINE LEARNING MODEL AND MAKING PREDICTIONS.



MAE (Mean Absolute Error)

• Measures how much the predicted prices differ from the real prices on average.

• Lower MAE = better predictions.



RMSE (Root Mean Square Error)

• Measures prediction error but gives extra weight to larger mistakes.

• Used widely in financial forecasting.

• Lower RMSE = better accuracy.

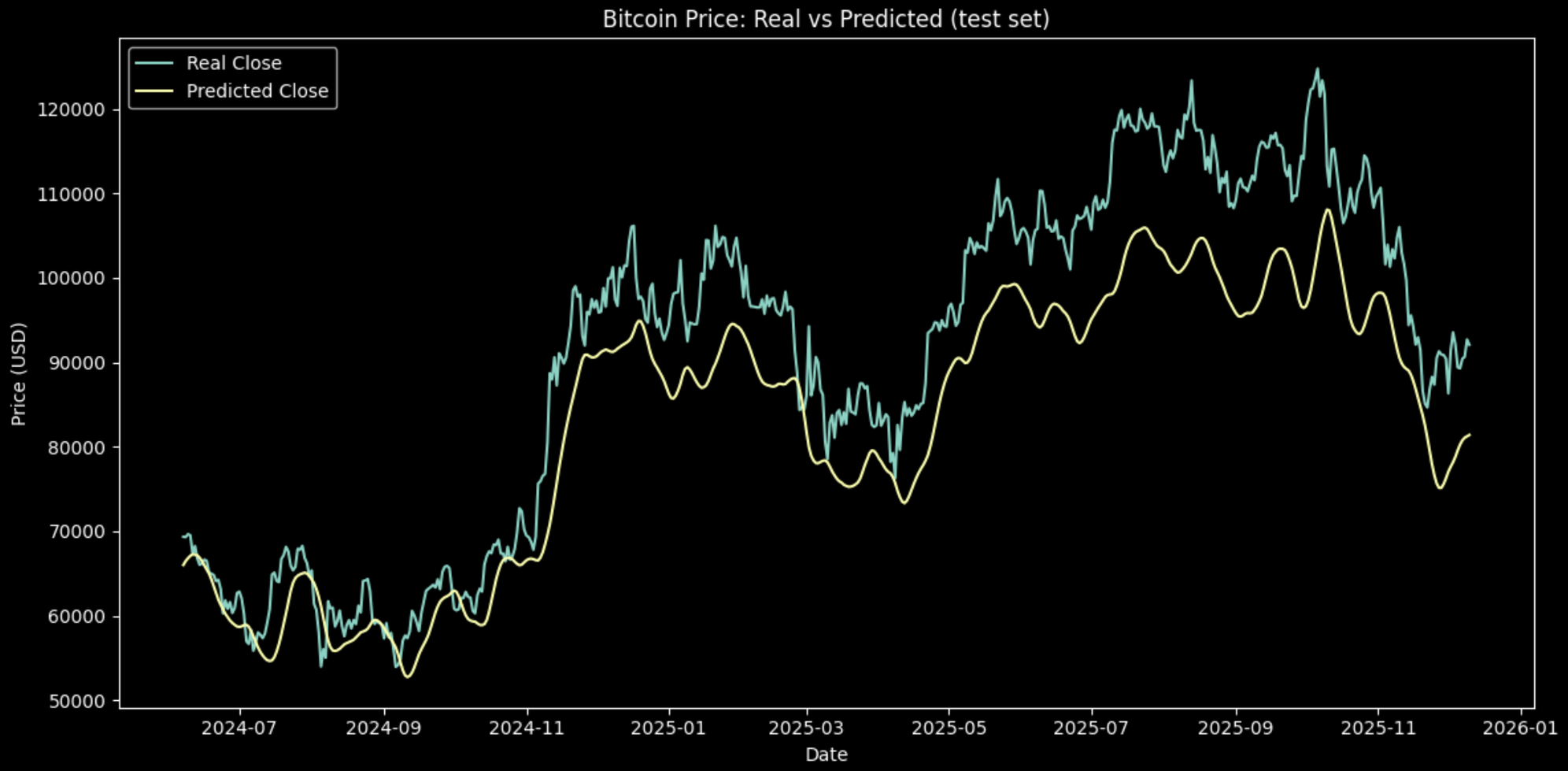
R^2 Score (Coefficient of Determination):

• Shows how well the model explains the variation in real Bitcoin prices.

• R^2 ranges from 0 to 1, where:
• 1 = perfect prediction,
• 0 = model learned nothing.

• Higher R^2 means the model fits the data better.

pictures of the model



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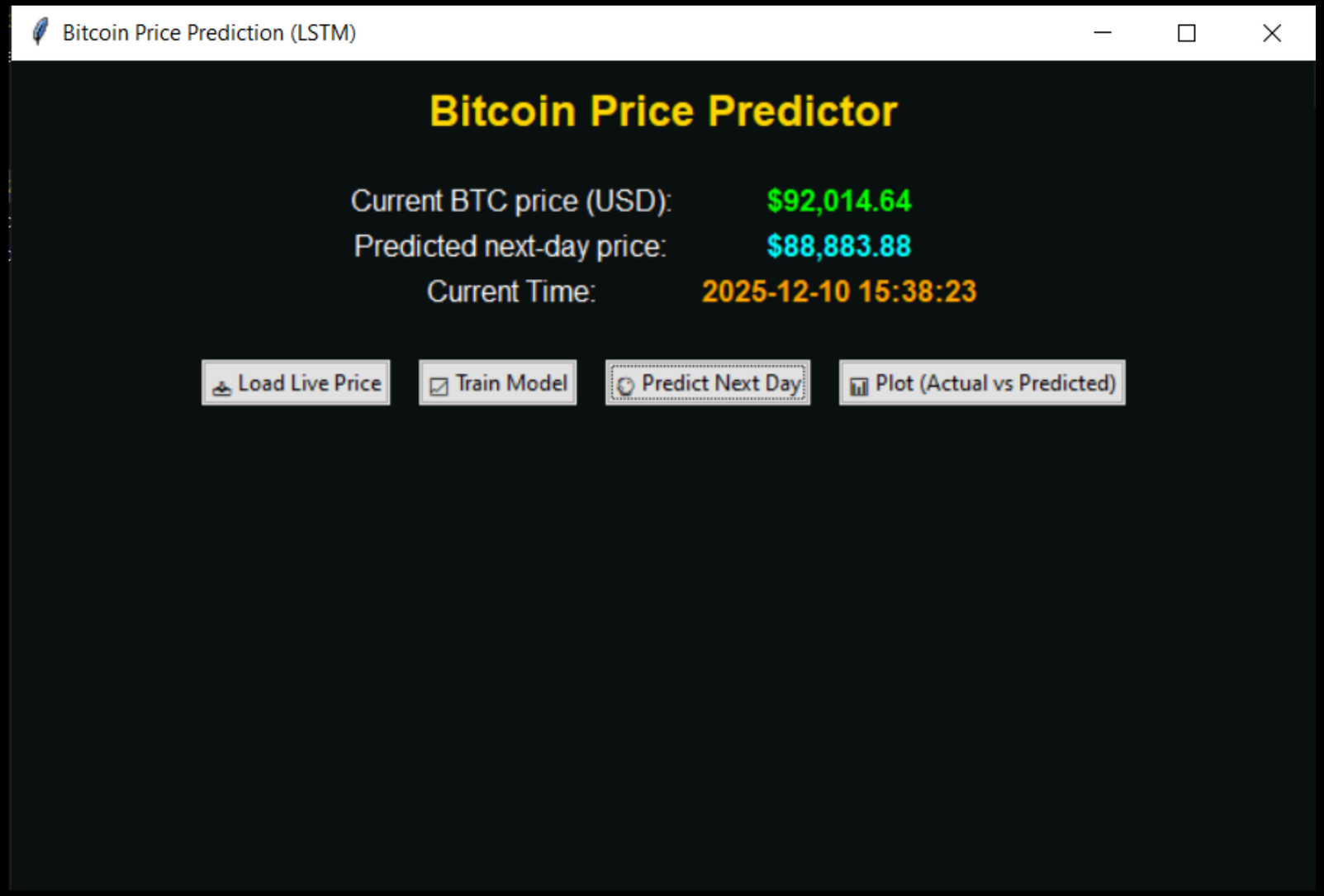

Challenges

1

COLLECTING AND CLEANING DATA

- The website data may be incomplete, messy, or blocked.
- We must clean and prepare the data before using it.

2

TRAINING THE MACHINE LEARNING MODEL

- **Choosing the right model and getting a good R^2 score is difficult.**
- **The model may learn too much or too little, giving weak predictions.**

Future Improvements

1

USE A MORE ADVANCED MACHINE LEARNING MODEL

• Replace Linear Regression with models like Random Forest or XGBoost
to improve accuracy and get a higher R^2 score.

2

DEPLOY THE MODEL AS A WEB APP

• Create an online dashboard
where users can enter values
and instantly get predictions from
the model.

Thank You