Project Description

Bitcoin Price Prediction Using Machine Learning and Deep Learning

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Project Overview

This project aims to predict Bitcoin prices using deep learning models, specifically Long Short-Term Memory (LSTM) and Convolutional Neural Networks (CNN). The model is trained on historical Bitcoin price data obtained from Yahoo Finance and utilizes machine learning techniques to analyze trends and make future predictions.

Objectives

- Collect and preprocess historical Bitcoin price data.
- Implement a deep learning model to forecast Bitcoin prices.
- Evaluate model performance using metrics such as Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE).
- Visualize the results for better understanding and analysis.
- Compare different deep learning architectures, including LSTM and CNN.

Dataset

The dataset consists of daily Bitcoin price data, including attributes such as Open, High, Low, Close, and Volume. For prediction, only the "Close" price is used.

Comparison of CNN vs. LSTM

Feature	CNN	LSTM
Speed	Faster	Slower
Feature Extraction	Detects patterns	Learns sequences
Accuracy	Lower	Higher
Best For	Short-term trends	Long-term dependencies

Methodology

1. **Data Collection:**
    - Fetch Bitcoin price data from Yahoo Finance.
    - Extract the closing prices and normalize them using MinMaxScaler.
2. **Data Preprocessing:**
    - Transform the time series data into sequences to prepare it for deep learning models.
    - Split the dataset into training and testing sets.
3. **Model Development:**
    - Implement an LSTM model with stacked layers for sequential data analysis.
    - Replace the LSTM model with a CNN model for feature extraction and prediction.
    - Train the models using appropriate hyperparameters.
4. **Evaluation Metrics:**
    - RMSE: Measures the difference between actual and predicted prices.
    - MAPE: Quantifies the percentage error in the predictions.

5. **Prediction and Visualization:**
    - Compare actual and predicted Bitcoin prices.
    - Predict the next day's closing price based on recent trends.
    - Display results using Matplotlib.

Results

The project evaluates model accuracy and compares the performance of LSTM and CNN architectures. The final model is expected to provide insights into Bitcoin price trends, assisting traders and analysts in making informed decisions.

Conclusion

- **LSTM outperforms CNN** in predicting Bitcoin prices due to its ability to handle sequential dependencies.
- CNN works better for **short-term trend analysis**.
- A **hybrid model (CNN-LSTM)** could combine the strengths of both approaches.