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Bitcoin Price Prediction Project Report

1. Introduction

The goal of this project is to develop a predictive model for Bitcoin prices using historical data. The approach involves implementing a Long Short-Term Memory (LSTM) neural network, a type of recurrent neural network (RNN), to capture temporal dependencies in the data and make accurate price predictions.

2. Data Loading and Preprocessing

- **Data Source:** Bitcoin price data is loaded from the provided CSV file ('BTC-USD.csv'). The dataset includes two columns: 'Date' and 'Close' prices.
- **Data Preprocessing:**
    - The 'Date' column is converted to datetime format, and the data is sorted by date.
    - Only 'Close' prices are kept for analysis.
    - The data is normalized using Min-Max scaling to bring values within the range of 0 to 1.

3. Sequence Generation

- Sequences of historical prices are created for training the LSTM model.
- A sequence length of 10 days is chosen, meaning the model is trained to predict the next day's price based on the previous 10 days.

4. Model Architecture

- The LSTM model architecture is designed as follows:
    - Two LSTM layers with 50 units each.
    - The final layer is a Dense layer with a single unit for regression.
- The model is compiled using the Adam optimizer and mean squared error as the loss function.

5. Model Training

- The data is split into training and testing sets (80% training, 20% testing).
- The model is trained for 20 epochs with a batch size of 32.
- Training and validation loss are monitored to evaluate model performance.

6. Model Evaluation

- The model is evaluated on the test set to assess its generalization performance.
- Mean Squared Error (MSE) is used as the evaluation metric.

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7. Results and Visualization

- Training loss and validation loss are plotted over epochs to visualize model performance during training.
- Predictions are made on the entire dataset, and the results are plotted against the actual prices.

8. Conclusion

- The LSTM model demonstrates the ability to capture temporal patterns in Bitcoin prices.
- Evaluation metrics such as MSE provide insights into model accuracy.
- The visualizations help in understanding the model's predictive performance.

9. Future Improvements

- Experiment with different hyperparameters to optimize model performance.
- Explore alternative neural network architectures.
- Consider incorporating additional features or external factors for more comprehensive predictions.

10. References

- Data: - https://finance.yahoo.com/quote/BTC-USD?p=BTC-USD&.tsrc=fin-srch