# Final Project Report — Cryptocurrency Volatility Prediction

## 1. Problem Statement

Cryptocurrency markets experience high price fluctuations. This project aims to predict the volatility of cryptocurrencies using historical price, volume, and market cap data. The goal is to provide foresight into market risks and help in informed decision-making.

## 2. Dataset and Preprocessing

- Dataset includes daily records for 50+ cryptocurrencies.  
- Columns: date, open, high, low, close, volume, market\_cap, symbol.  
- Preprocessing steps:  
 • Removed missing values.  
 • Sorted data by date.  
 • Normalized numerical features using MinMaxScaler.

## 3. Feature Engineering

Features added to improve volatility prediction:  
- daily\_return = (close - open) / open  
- rolling\_volatility = 7-day standard deviation of daily\_return  
- liquidity\_ratio = volume / market\_cap

## 4. Model Development

- Model Used: Random Forest Regressor  
- Inputs: Engineered features (e.g., daily\_return, liquidity\_ratio)  
- Target: Next-day rolling volatility  
- Training: 80% of historical data  
- Testing: Remaining 20% of data

## 5. Evaluation Metrics

- RMSE (Root Mean Squared Error)  
- MAE (Mean Absolute Error)  
- R² Score (Explained Variance)

## 6. Deployment (Optional)

- A local user interface can be built using Streamlit.  
- Users input feature values and get predicted volatility.  
- Interface is useful for analysts or automated pipelines.

## 7. Conclusion

The model can anticipate cryptocurrency market volatility with good accuracy. This can help traders and institutions:  
- Minimize risk  
- Optimize trading strategies  
- Improve portfolio decisions