Cryptocurrency Liquidity Forecasting Framework for Market Stability

To ensure accurate and actionable insights into cryptocurrency liquidity, this structured pipeline facilitates data-driven predictions through rigorous preprocessing, analysis, and modeling techniques.

1. Data Acquisition

- Load historical cryptocurrency datasets (March 16 & 17, 2022) into Pandas DataFrames.
- Establish a reliable ingestion mechanism for structured financial data.

2. Data Preprocessing

- Identify and eliminate missing values to maintain data integrity.
- Remove redundant entries to ensure uniqueness.
- Standardize data types for seamless downstream processing.

3. Feature Engineering

- Construct derived metrics to enrich predictive capabilities:
    - Assess **volatility** using the 2-day price standard deviation.
    - Calculate **liquidity ratio** as volume-to-market capitalization.

4. Exploratory Data Analysis (EDA)

- Visualize trends in Bitcoin price over time to uncover patterns.
- Generate a correlation heatmap to analyze relationships among numerical variables.
- Perform descriptive statistical analysis to summarize data distributions.

5. Model Development

- Train a **baseline predictive model** using Linear Regression.
- Optimize forecasting accuracy by employing **Random Forest Regressor** as the final model.

6. Model Assessment

- Evaluate predictive performance using:
    - **Root Mean Square Error (RMSE)** for deviation measurement.
    - **Mean Absolute Error (MAE)** for overall prediction accuracy.
    - **R^2 Score** to gauge model fit.
- Select the optimal model based on empirical results.

7. Model Preservation

- Persist the trained model using **Joblib**, enabling future inference on new data.

8. Deployment

- Develop a user-friendly interface via **Streamlit**, facilitating real-time liquidity predictions for market participants.

This framework establishes a robust methodology to anticipate cryptocurrency liquidity fluctuations, fostering informed decision-making and enhanced market stability.