Machine Learning Project Cryptocurrency Liquidity Prediction for Market Stability

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HLD & LLD Document

**🧩 High-Level Design (HLD) – *Overview of the System***

**1. Objective:**  
To build a machine learning model that predicts cryptocurrency liquidity using historical market data to ensure market stability.

**2. Components:**

* **Data Source**: CSV files with market data (price, volume, etc.)
* **Preprocessing Module**: Cleans, fills missing data, normalizes features
* **Feature Engineering Module**: Creates features like liquidity ratio, volatility
* **Model Training Module**: Trains ML model (RandomForestRegressor)
* **Evaluation Module**: Calculates RMSE, MAE, R²
* **Prediction Module**: Outputs liquidity predictions
* **Deployment Layer (Optional)**: Flask or Streamlit interface

**3. Technologies:**

* Language: Python
* Libraries: Pandas, Sklearn, Matplotlib, Seaborn
* Deployment: Flask or Streamlit

**⚙️ Low-Level Design (LLD) – *Detailed Component Implementation***

**1. Data Preprocessing**

* fillna(): Fills missing values with column median
* StandardScaler: Normalizes numeric columns

**2. Feature Engineering**

* liquidity\_ratio = 24h\_volume / mkt\_cap
* volatility\_7d = abs(7d) — proxy for market volatility

**3. Model Training**

* RandomForestRegressor: n\_estimators=100, random\_state=42
* train\_test\_split: 80% train, 20% test

**4. Evaluation**

* mean\_absolute\_error, mean\_squared\_error, r2\_score: assess model

**5. Output**

* Liquidity prediction values
* Performance metrics: MAE, RMSE, R²

**6. Logs**

* Logs included at each step for easier debugging and tracing