Low-Level Design (LLD)

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Project Name: Cryptocurrency Liquidity Prediction for Market Stability

1. Data Ingestion

- **Files Used:**
    - coin_gecko_2022-03-16.csv
    - coin_gecko_2022-03-17.csv
- **Steps:**
    - Load both CSVs using pandas.read_csv()
    - Merge datasets into a single DataFrame using pd.concat()

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2. Data Cleaning

- Drop missing values using dropna()
- Remove duplicate rows using drop_duplicates()
- Convert columns to appropriate types (e.g., date to datetime, numeric conversions)

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3. Feature Engineering

- **Price Moving Average (2-period):**
- df['price_MA_2d'] = df['price'].rolling(window=2).mean()
- **Market Cap Moving Average (2-period):**
- df['market_cap_MA_2d'] = df['mkt_cap'].rolling(window=2).mean()
- **Volatility:**
- df['volatility'] = (df['24h'] - df['1h']).abs()
- **Liquidity Ratio:**
- df['liquidity_ratio'] = df['24h_volume'] / df['mkt_cap']

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4. Exploratory Data Analysis (EDA)

- Plot **Ethereum price trends over time** using matplotlib
- Generate a **correlation heatmap** using seaborn.heatmap() • Summarize data using df.describe(), info(), etc.

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5. Model Building

- **Train-Test Split:** ○ Use train_test_split() from sklearn.model_selection
- **Models Used:**
  - Linear Regression (LinearRegression) ○ Random Forest Regressor (RandomForestRegressor)
- **(Optional)**: Hyperparameter tuning using GridSearchCV or RandomizedSearchCV

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6. Model Evaluation

- **Metrics:**
  - Root Mean Squared Error (RMSE) ○ Mean Absolute Error (MAE) ○ R^2 Score from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score

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7. Model Saving

- Save the trained model using Joblib:

```
import joblib

joblib.dump(model, 'models/ crypto_liquidity_rf_model.pkl')
```

8. Local Deployment

- Build a **Streamlit** web application
- Load the .pkl model
- Accept user inputs (price, volume, market cap)
- Display predicted liquidity ratio

LLD Flow Diagram

[Start]

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[Load CSV Files]

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[Clean Missing / Duplicate Data]

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[Feature Engineering: MA, Volatility, Liquidity Ratio]

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[Perform EDA: Plots & Stats]

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[Train/Test Split]

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[Train Linear Regression (Basic)]

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[Train Random Forest (Final)]

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[Evaluate Model (RMSE, MAE, R^2)]

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[Save Final Model as .pkl]

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[Build Web App for Predictions]

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[End]