

Low-Level Design (LLD)

◆ Components Breakdown

✓ Preprocessing

- Removed unnecessary columns
- Converted `date` to datetime
- Sorted data by `crypto_name` and `date`
- Handled `NaN`, `inf`, and normalized features using `MinMaxScaler`

✓ Feature Engineering

- `Volatility`: $(\text{high} - \text{low}) / \text{open}$
- `Volatility_7d`: 7-day rolling volatility
- `Liquidity Ratio`: $\text{volume} / \text{market cap}$
- `Bollinger Bandwidth`: measures price spread
- `ATR_14`: 14-day rolling average of $\text{high} - \text{low}$
- `MA_7`, `MA_14`: short-term moving averages
- `Price_Range`: $(\text{high} - \text{low}) / \text{open}$
- `Return`: daily price return

✓ EDA

- Line charts for price trends
- Rolling volatility graphs
- Correlation heatmaps
- Distribution plots for residuals

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✓ Model

- **Model:** `XGBRegressor`
- **Features Used:**
 - OHLC + Market Cap
 - Returns & volatility measures
 - Technical indicators (BB, ATR)
- **Target:** `Volatility_7d`

✓ Evaluation

- MAE, RMSE, R^2
- Scatter plot (actual vs predicted)
- Line plot of predicted vs actual
- Histogram of residuals

✓ Model Export

- `joblib.dump()` saves the model as `xgboost_volatility.pkl`