

## Low-Level Design (LLD)

### Project Title: Cryptocurrency Liquidity Forecasting for Market Stability

#### Data Acquisition

- Imported two CSV files using `pandas.read_csv()`.
- Combined both datasets for comprehensive analysis.

#### Data Preprocessing

- Eliminated rows containing missing values using `dropna()`.
- Identified and removed duplicate entries.
- Ensured proper column data types by converting where necessary.

#### Feature Engineering

- Generated moving averages to smooth fluctuations:
- Computed volatility as a measure of price variation:
- Derived liquidity ratio to assess market fluidity:
  - $\text{liquidity\_ratio} = \text{volume\_24h} / \text{market\_cap}$

#### Exploratory Data Analysis (EDA)

- Visualized Bitcoin price trends over time using Matplotlib.
- Generated a heatmap to illustrate feature correlations with Seaborn.
- Summarized dataset statistics using `df.describe()`.

#### Model Development

- Partitioned data into training and testing sets using `train_test_split()`.
- Implemented multiple regressor models and identified XGB as the best performing.
- Developed a **XGBoost model** as the final model.
- Conducted hyperparameter tuning to enhance model performance if required.

#### Model Evaluation

- Assessed model effectiveness using key metrics:
  - **Root Mean Squared Error (RMSE)**
  - **Mean Absolute Error (MAE)**
  - **R<sup>2</sup> Score**

#### Model Persistence

- Save the pickle file in `.pkl` format

#### Local Deployment (Optional)

- Developed a simple interactive web application using **Streamlit**
- Enabled real-time liquidity prediction for new cryptocurrency inputs.