Assignment 2: Cryptocurrency Price Prediction

Objective:

In this assignment, your goal is to predict the highest and lowest daily trading prices of a specific cryptocurrency, Crypto A, in a designated fiat currency, referred to as FIAT X currency. You will be provided with 4 years of daily crypto trading pair data for Crypto A and FIAT X, including daily opening and closing prices, the highest and lowest prices, and trading volume in that chosen fiat currency. You will also provide another trading pair data between this Crypto A and another popular cryptocurrency, Crypto B. The use of the Crypto A/Crypto B trading data in this assignment is optional.

Your goal is to create a predictive model that accurately forecasts the daily highest and lowest prices of Crypto A traded in the currency "FIAT X" within the next 10-day period. To develop your predictive model, you are encouraged to explore different methods, such as traditional statistical approaches, modern machine learning algorithms, and neural networks.

The ultimate objective is to have a predictive model to estimate what the highest and lowest daily trading prices for Crypto A in the next 10 days quoted in the FIAT A currency unit will be. Your evaluation will focus on the accuracy of your forecasts for the highest and lowest prices of Crypto A within the specified timeframe without needing to pinpoint the exact day within these 10 days on which these extreme prices will occur.

Note that cryptocurrency trading pairs let you exchange one asset (Crypto A) for another without exchanging for a particular fiat currency first such as US dollars.

Given:

1. 51 months of data (2019-10-01 to 2024-02-29), with total of 1,613 observations
2. Low, High, Open, Close, Volume and Trading Volume traded at FIAT currency as well as Low, High, Open, Close, Volume, Trading Volume traded at Crypto Currency B as shown below.

obs	low (fiat)	high (fiat)	open (fiat)	close (fiat)	vol (fiat)	trade_vol (fiat)	low (crypto)	high (crypto)	open (crypto)	close (crypto)	vol (crypto)	trade_vol (crypto)
1	69.103	72.883	71.188	70.718	3671.0942	259612.44	0.0083546	0.0086479	0.0085664	0.0084501	635.04779	5.3662427
2	69.012	70.998	70.691	70.969	1455.867	103321.42	0.0083829	0.0085203	0.0084468	0.008459	348.84702	2.95089
3	68.006	71.232	71.109	69.297	2087.605	144664.76	0.0083679	0.0085483	0.0084442	0.0084394	458.12754	3.8662987
4	68.002	70.573	69.328	69.864	1770.264	123677.72	0.0084149	0.0085649	0.008452	0.0085619	239.3343	2.0491515
5	68.341	70.35	69.846	70.214	1541.6269	108243.79	0.0085005	0.008616	0.00855	0.0085751	209.17933	1.7937358
6	68	71.405	70.215	69.537	2260.4091	157182.07	0.0085645	0.008911	0.0085787	0.0087997	749.71269	6.5972242
7	68.002	72.429	69.156	71.007	2564.5726	182102.61	0.0085855	0.0088807	0.0088196	0.0086221	456.30715	3.9343395
8	69.902	104.036	71.26	71.058	23120.583	1642902.4	0.0085855	0.01289	0.0086328	0.0086535	5007.4635	43.332085
9	70.308	74.752	70.669	73.698	11059.781	815083.73	0.008535	0.0087627	0.0086312	0.0086257	2649.5974	22.854659
10	70.701	74.99	74.373	72.603	4254.4196	308883.63	0.008334	0.0087133	0.0086689	0.0085037	712.81436	6.0615808
11	69.5	73.959	72.811	69.5	3990.7741	277358.8	0.0083801	0.0086814	0.0084778	0.0084318	426.4678	3.5958784
12	69.487	73.871	69.681	70.627	2882.4111	203576.05	0.0083802	0.00875	0.0084186	0.0085103	291.81026	2.4833987
13	70.01	72.051	70.611	70.279	1725.9401	121297.34	0.0083899	0.0086329	0.0085	0.0084775	933.12048	7.9105569
14	70.004	71.81	70.279	71.3	2811.9552	200492.41	0.0084613	0.0086195	0.0084871	0.0085285	289.85202	2.4720029

What you have to submit:

1. CryptoA_10Day.csv: Daily High/Low price "Close" of the Crypto A for the next 10 days (i.e. observation 1614 to 1623)

obs	high_fiat	low_fiat
1614		
1615		
1616		
1617		
1618		
1619		
1620		
1621		
1622		
1623		

2. High_Low.csv: with only values of the highest and the lowest daily predicted prices extracted from the "high_fiat" and "low_fiat" columns in your CryptoA_10Day.csv. The name of this submitted CSV has to be **High_Low.csv**. The content should follow the format below.

high_fiat	low_fiat

3. Python Code (ipynb) with steps of developing your predictive models and generating the output csv file (CryptoA_10Day.csv) in it. These include:
   - Data Preparation: Clean and pre-process the provided data to remove any inconsistencies or missing values
   - Feature Engineering: Create new features set
   - Model Development: Algorithms and hyperparameters used, model training and testing process
   - Model Scoring: Forecast the daily high/low price of Crypto A traded in Fiat Currency, FIAT A. Generate the resulting data in a dataset named "**CryptoA_10Day.csv**" with three columns in it. The three column names have to be **"obs", "high_fiat", "low_fiat".**

Assessment Criteria:

The value from the "**high_fiat**" column and the "**low_fiat**" column in your submitted **" High_Low.csv"** dataset will be extracted. These values will be compared against the actual highest and lowest daily prices of the cryptocurrency happened in the predicted 10-day period. To evaluate the precision of your predictive model, we will employ summation of the absolute error as the performance metric.

Data Definition:

- obs: Sequence of observations
- low(fiat): Lowest daily trading price of Crypto A in FIAT X currency
- high(fiat): Highest daily trading price of Crypto A in FIAT X currency
- open(fiat): Opening daily trading price of Crypto A in FIAT X currency
- close(fiat): Closing daily trading price of Crypto A in FIAT X currency
- vol (fiat): Trading volume of Crypto A in FIAT X currency
- trade_vol(fiat): Computed as the closing price multiplied by the trading volume of Crypto A in FIAT X (close(fiat) * vol (fiat))
- low(crypto): Lowest daily trading price of Crypto A in Crypto B currency
- high(crypto): Highest daily trading price of Crypto A in Crypto B currency
- open(crypto): Opening daily trading price of Crypto A in Crypto B currency
- close(crypto): Closing daily trading price of Crypto A in Crypto B currency
- vol(crypto): Trading volume of Crypto A in Crypto B
- trade_vol(crypto): Calculated as the closing price times the trading volume of Crypto A in Crypto B currency (close(crypto) * vol (crypto))