# Importing packages and System configuration

```python
In [1]:  from datetime import datetime
         from os.path import join
         import math
         import time
         import json


         from tqdm.notebook import tqdm

         import pandas as pd
         import numpy as np
         import seaborn as sns


         import matplotlib.pyplot as plt
         import plotly.express as px
         import plotly.graph_objects as go
         import plotly.io as pio
         import plotly.graph_objs as go
         from IPython.display import Markdown

         from sklearn.preprocessing import StandardScaler

         import torch
         import torch.nn as nn
         import torch.optim as optim
         import torchmetrics
         from torch.utils.data import Dataset
         from torch.utils.data import DataLoader
```

## Necessary paths

```python
In [2]:  data_raw_path ='io/input/data_raw/Crypto_July_2019_2023/4H_2019'
         export_path = 'io/output/exports/'
         test_path = 'io/input/base_data/test.csv'

         predictions_path = export_path + 'predictions/'
         metrics_plot_path = export_path + 'metrics_plots/'
         results_path = export_path + 'experiments_results/'
```

## Loading data

```python
In [3]:  available_coins = ['ADA', 'BNB', 'BTC', 'DASH', 'ETH', 'LINK', 'LTC', 'XRP']
         df = pd.DataFrame({'Available coins': available_coins})
```

```
display(df)
```

|   | Available coins |
|---|---|
| **0** | ADA |
| **1** | BNB |
| **2** | BTC |
| **3** | DASH |
| **4** | ETH |
| **5** | LINK |
| **6** | LTC |
| **7** | XRP |

In [4]:
```python
def read_coin_data(coin_name: str) -> pd.DataFrame:
    data_df = pd.read_csv(f"{data_raw_path}/{coin_name}/{coin_name.lower()}_2019.cs
    return data_df
```

In [5]:
```python
coin_name = 'BTC'
coin_df = read_coin_data(coin_name=coin_name)
coin_df = coin_df.rename(columns={"Time":"Date"})
coin_df.describe()
```

Out[5]:

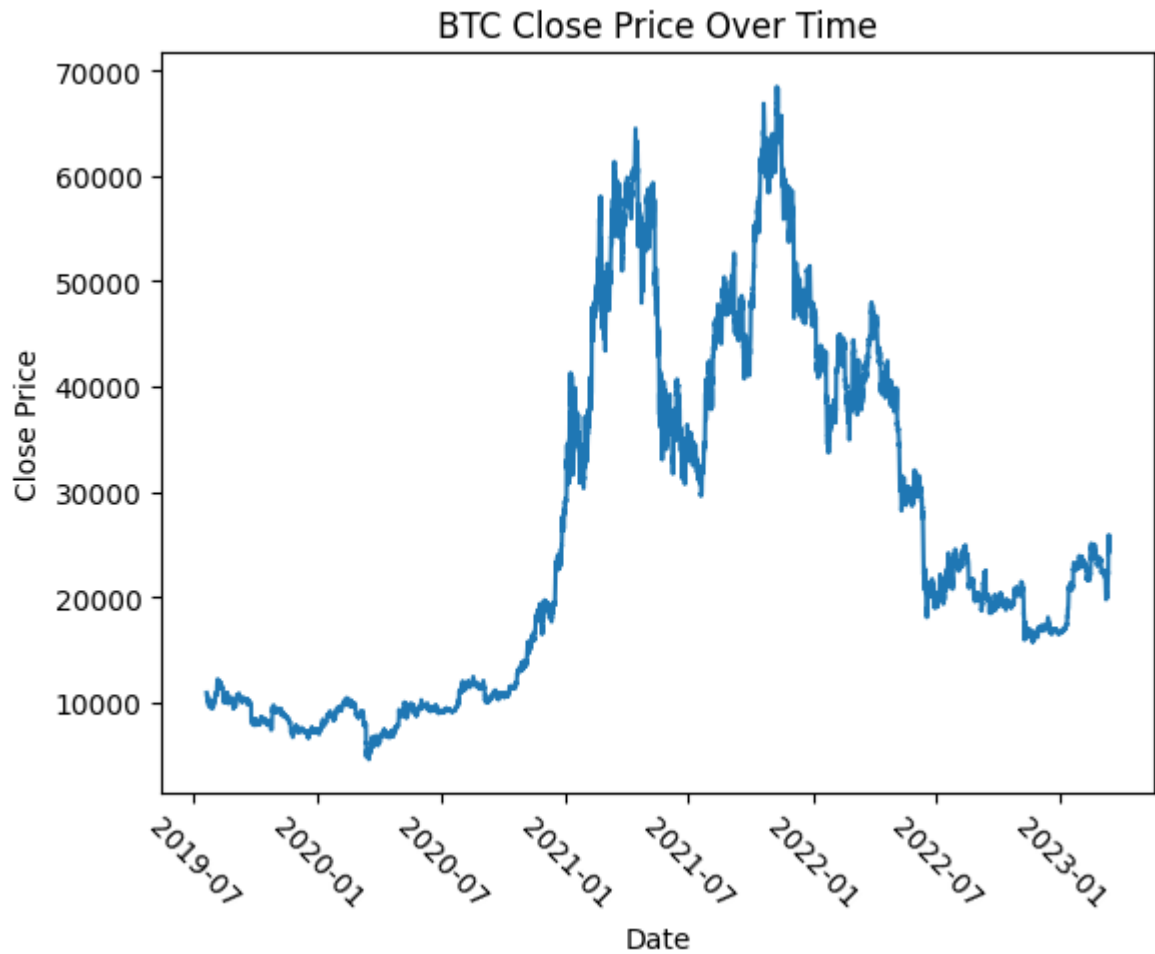|  | Open | High | Low | Close | Volume |
|---|---|---|---|---|---|
| **count** | 7998.000000 | 7998.000000 | 7998.000000 | 7998.000000 | 7998.000000 |
| **mean** | 26023.127691 | 26307.312304 | 25716.448318 | 26024.899017 | 16697.992632 |
| **std** | 16867.231647 | 17070.209181 | 16646.291835 | 16866.391290 | 18398.636632 |
| **min** | 4565.630000 | 4950.000000 | 3782.130000 | 4565.590000 | 5.887034 |
| **25%** | 10166.767500 | 10260.605000 | 10089.070000 | 10166.827500 | 6268.326870 |
| **50%** | 20661.660000 | 20856.640000 | 20453.840000 | 20670.200000 | 10222.151561 |
| **75%** | 39938.240000 | 40422.075000 | 39425.010000 | 39938.152500 | 19505.728598 |
| **max** | 68490.000000 | 69000.000000 | 67627.140000 | 68490.000000 | 284711.694213 |

# Exploratory analysis

In [6]:
```python
def plot_coin_interactive(plot_df):
    plot_df = coin_df.copy()
    plot_df['Date'] = pd.to_datetime(plot_df['Date'])
    fig = px.line(plot_df, x='Date', y='Close', title=f'{coin_name} Close Price Ove
    fig.update_layout(xaxis_title='Date', yaxis_title='Close Price', xaxis_tickangl
    fig.show()
plot_coin_interactive(plot_df=coin_df)
```

## BTC Close Price Over Time



```
In [7]: def plot_coin_static(plot_df):
            plot_df = coin_df.copy()
            plot_df['Date'] = pd.to_datetime(plot_df['Date'])

            plt.plot(plot_df['Date'], plot_df['Close'])
            plt.title(f'{coin_name} Close Price Over Time')
            plt.xlabel('Date')
            plt.xticks(rotation=-45)
            plt.ylabel('Close Price')
            plt.show()
        plot_coin_static(plot_df=coin_df)
```

BTC Close Price Over Time

# Data preprocessing

```
In [8]: coin_df.head()
```

Out[8]:

| | Date | Open | High | Low | Close | Volume |
|---|---|---|---|---|---|---|
| 0 | 2019-07-20 16:00:00 | 10613.43 | 10995.00 | 10565.01 | 10898.66 | 12428.231815 |
| 1 | 2019-07-20 20:00:00 | 10898.66 | 11068.99 | 10656.85 | 10740.23 | 8769.733781 |
| 2 | 2019-07-21 00:00:00 | 10740.27 | 10817.90 | 10550.00 | 10575.15 | 7761.008844 |
| 3 | 2019-07-21 04:00:00 | 10577.36 | 10667.33 | 10530.00 | 10582.45 | 3815.251949 |
| 4 | 2019-07-21 08:00:00 | 10581.54 | 10745.98 | 10460.01 | 10585.11 | 8175.970572 |

```
In [9]: coin_df.shape
```

Out[9]: (7998, 6)

```
In [10]: coin_df.columns
```

Out[10]: Index(['Date', 'Open', 'High', 'Low', 'Close', 'Volume'], dtype='object')

```
In [11]:  coin_df.duplicated().sum()

Out[11]:  0

In [12]:  coin_df.isna().sum()

Out[12]:  Date      0
          Open      0
          High      0
          Low       0
          Close     0
          Volume    0
          dtype: int64

In [13]:  #Outlier detection
          numerical_cols = coin_df.select_dtypes(include=['float64', 'int64']).columns

          fig, axes = plt.subplots(len(numerical_cols), 1, figsize=(8, len(numerical_cols) *
          for i, column in enumerate(numerical_cols):
              ax = axes[i]
              sns.boxplot(x=coin_df[column], ax=ax)
              ax.set_title(f'Boxplot of {column}')

          plt.tight_layout()
          plt.show()
```
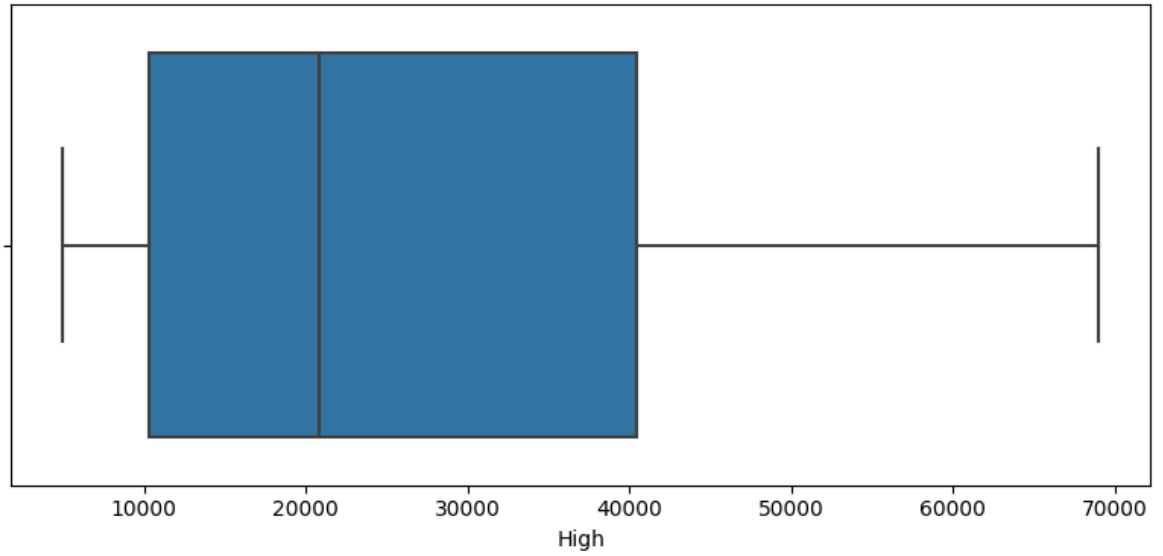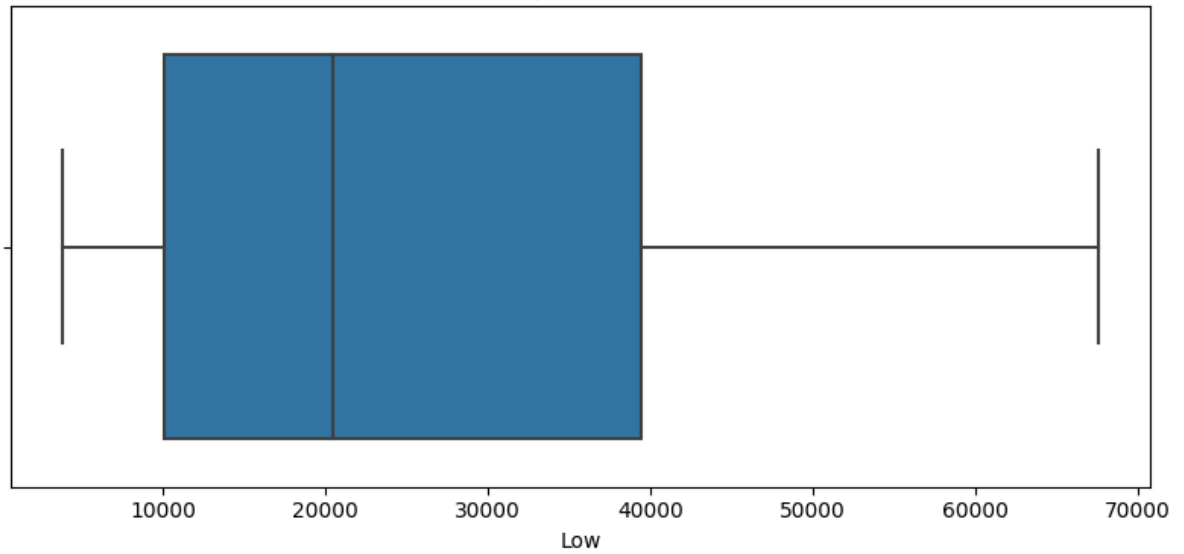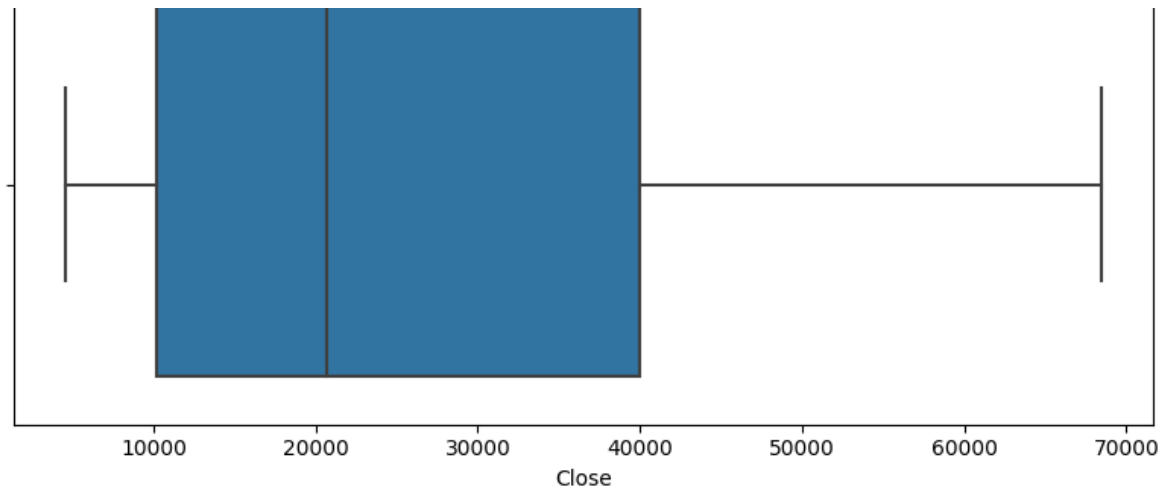
**Boxplot of Open**
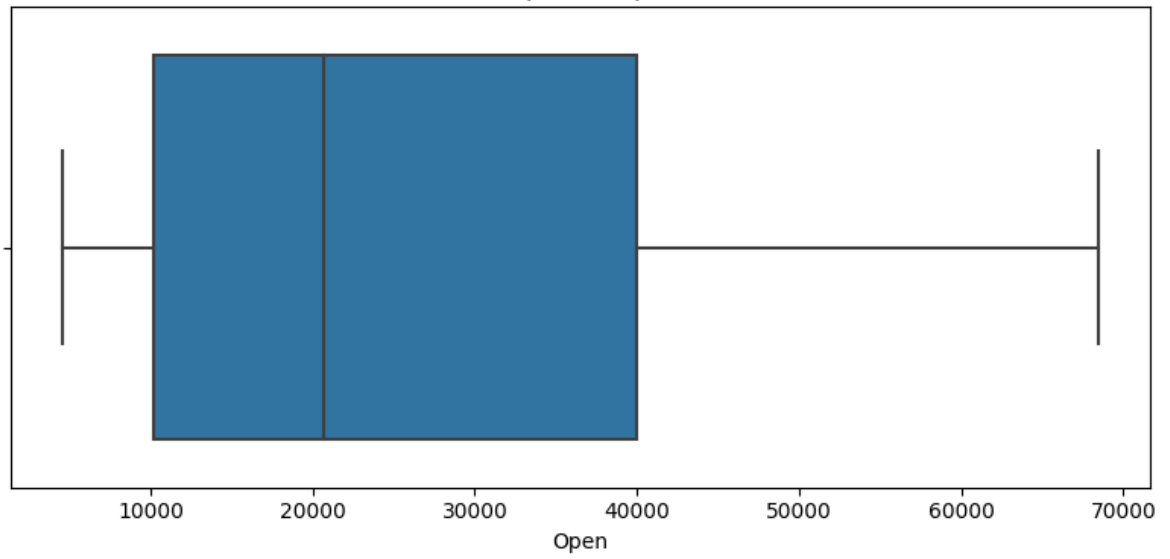
**Boxplot of High**

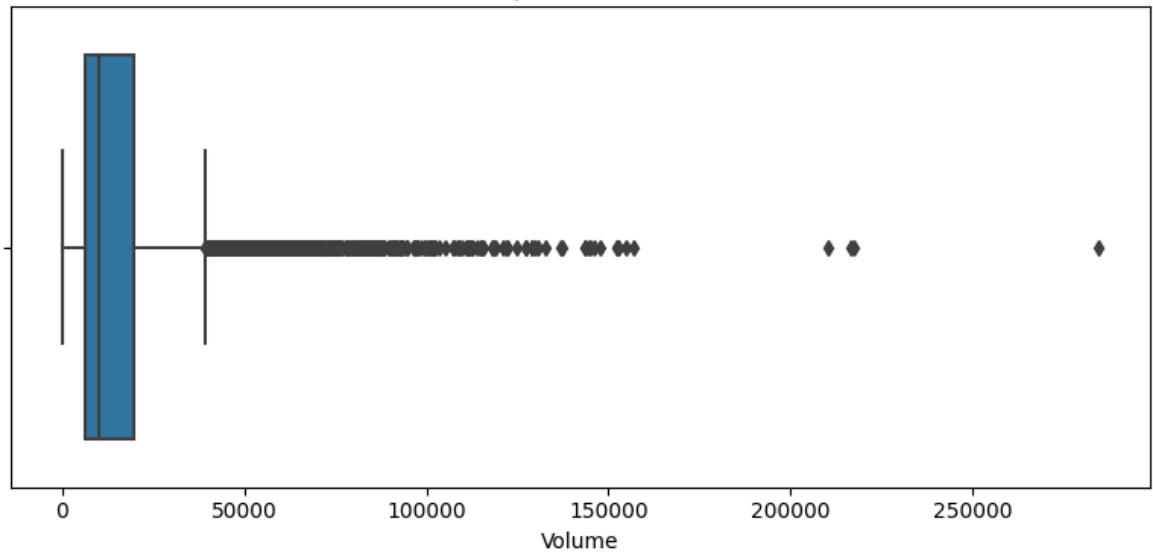**Boxplot of Low**

**Boxplot of Close**

## Boxplot of Volume



# Data visualization

```
In [14]: plt.figure(figsize=(10, 6))
         volume_sum = coin_df[['Open', 'High', 'Low', 'Close']].sum()
         colors = plt.get_cmap('tab20').colors
         explode = [0.1 if i == 0 else 0 for i in range(len(volume_sum))]
         plt.pie(volume_sum, labels=volume_sum.index, colors=colors, explode=explode, autopc
         plt.title('Proportion of Open, High, Low, and Close Prices')
         plt.show()
```

# Proportion of Open, High, Low, and Close Prices
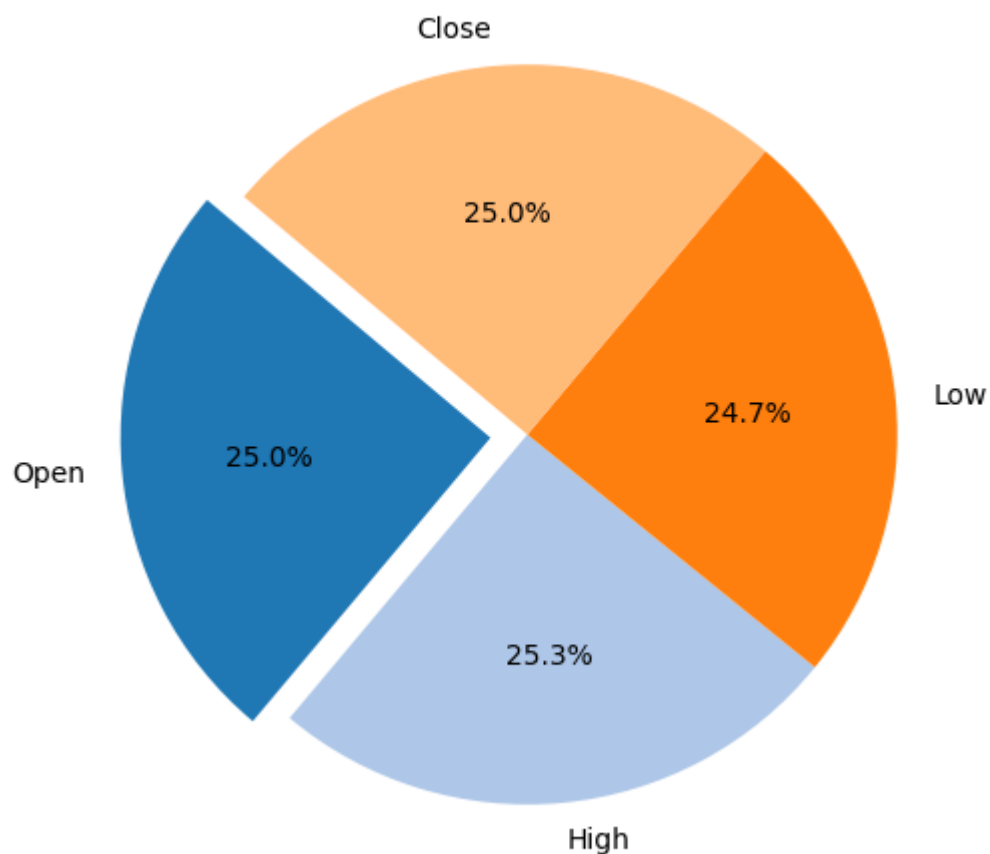


```
In [15]: plt.figure(figsize=(10, 6))
         plt.hist(coin_df['Close'], bins=30, color='skyblue', edgecolor='black')
         plt.title('Distribution of Close Prices')
         plt.xlabel('Close Price')
         plt.ylabel('Frequency')
         plt.show()
```

Distribution of Close Prices

# Create the target variable

```
In [16]: def create_target_variable(df: pd.DataFrame, forecast_lead: int = 1) -> (pd.DataFra
             target_column = "Close"
             features = list(df.columns.difference([target_column]))

             target_name = f"{target_column}_lead_{forecast_lead}"
             df[target_name] = df[target_column].shift(-forecast_lead)
             df = df.iloc[:-forecast_lead]
             return df, target_name
```

```
In [17]: coin_df, target = create_target_variable(df=coin_df)
         display("Target added to dataframe", coin_df[['Close', target]].head(), coin_df.sha
```

'Target added to dataframe'

|   | Close | Close_lead_1 |
|---|-------|--------------|
| 0 | 10898.66 | 10740.23 |
| 1 | 10740.23 | 10575.15 |
| 2 | 10575.15 | 10582.45 |
| 3 | 10582.45 | 10585.11 |
| 4 | 10585.11 | 10444.56 |

(7997, 7)

```
In [18]: features = [col for col in coin_df.columns if col != target]
         features_str = ', '.join(features)
         display(Markdown(f"<strong>Features:</strong> {features_str}<br><strong>Target:</st
```

**Features:** Date, Open, High, Low, Close, Volume

**Target:** Close_lead_1

# Feature engineering

```python
In [19]: def append_date_features(df: pd.DataFrame) -> pd.DataFrame:
             df['Date'] = pd.to_datetime(df['Date'])
             df['Year'] = df['Date'].dt.year
             df['Month'] = df['Date'].dt.month
             df['Day'] = df['Date'].dt.day
             df['Week_of_Year'] = df['Date'].dt.isocalendar().week
             return df
```

```python
In [20]: def create_trigonometric_columns(df) -> pd.DataFrame:
             df['Year_sin'] = df['Year'].apply(lambda x: math.sin(2*math.pi*x/2023))
             df['Year_cos'] = df['Year'].apply(lambda x: math.cos(2*math.pi*x/2023))
             df['Month_sin'] = df['Month'].apply(lambda x: math.sin(2*math.pi*x/12))
             df['Month_cos'] = df['Month'].apply(lambda x: math.cos(2*math.pi*x/12))
             df['Day_sin'] = df['Day'].apply(lambda x: math.sin(2*math.pi*x/31))
             df['Day_cos'] = df['Day'].apply(lambda x: math.cos(2*math.pi*x/31))
             return df
```

```python
In [21]: coin_df = append_date_features(df=coin_df)
         coin_df = create_trigonometric_columns(df=coin_df)
         coin_df.set_index('Date', inplace=True)
         coin_df.head()
```

Out[21]:

| Date | Open | High | Low | Close | Volume | Close_lead_1 | Year | Month | Day |
|---|---|---|---|---|---|---|---|---|---|
| 2019-07-20 16:00:00 | 10613.43 | 10995.00 | 10565.01 | 10898.66 | 12428.231815 | 10740.23 | 2019 | 7 | 20 |
| 2019-07-20 20:00:00 | 10898.66 | 11068.99 | 10656.85 | 10740.23 | 8769.733781 | 10575.15 | 2019 | 7 | 20 |
| 2019-07-21 00:00:00 | 10740.27 | 10817.90 | 10550.00 | 10575.15 | 7761.008844 | 10582.45 | 2019 | 7 | 21 |
| 2019-07-21 04:00:00 | 10577.36 | 10667.33 | 10530.00 | 10582.45 | 3815.251949 | 10585.11 | 2019 | 7 | 21 |
| 2019-07-21 08:00:00 | 10581.54 | 10745.98 | 10460.01 | 10585.11 | 8175.970572 | 10444.56 | 2019 | 7 | 21 |

# Split dataset

```python
def split_train_valid_test(data: pd.DataFrame):
    # Split the data into training and testing sets
    split_date_1 = datetime(2022, 1, 1)
    split_date_2 = datetime(2022, 12, 1)
    train_data = data.loc[data.index < split_date_1]
    valid_data = data.loc[(split_date_1<= data.index) & (data.index <= split_date_2
    test_data = data.loc[data.index > split_date_2]

    return train_data, valid_data, test_data

train_data, valid_data, test_data = split_train_valid_test(data=coin_df)
print("Train set fraction:", round((len(train_data) / len(coin_df)), 2),'%')
print("Valid set fraction:", round((len(valid_data) / len(coin_df)), 2),'%')
print("Test set fraction:", round((len(test_data) / len(coin_df)), 2),'%')
print("Train shape: ", train_data.shape)
train_data.head()
```

```
Train set fraction: 0.67 %
Valid set fraction: 0.25 %
Test set fraction: 0.08 %
Train shape:  (5370, 16)
```

Out[22]:

| Date | Open | High | Low | Close | Volume | Close_lead_1 | Year | Month | Day |
|---|---|---|---|---|---|---|---|---|---|
| 2019-07-20 16:00:00 | 10613.43 | 10995.00 | 10565.01 | 10898.66 | 12428.231815 | 10740.23 | 2019 | 7 | 20 |
| 2019-07-20 20:00:00 | 10898.66 | 11068.99 | 10656.85 | 10740.23 | 8769.733781 | 10575.15 | 2019 | 7 | 20 |
| 2019-07-21 00:00:00 | 10740.27 | 10817.90 | 10550.00 | 10575.15 | 7761.008844 | 10582.45 | 2019 | 7 | 21 |
| 2019-07-21 04:00:00 | 10577.36 | 10667.33 | 10530.00 | 10582.45 | 3815.251949 | 10585.11 | 2019 | 7 | 21 |
| 2019-07-21 08:00:00 | 10581.54 | 10745.98 | 10460.01 | 10585.11 | 8175.970572 | 10444.56 | 2019 | 7 | 21 |

# Data scaling using standardscaler for model preparation

In [23]:

```python
def apply_scaling(train_data, valid_data, test_data, target):
    # Separate the input features and target variable in each dataframe
    X_train = train_data.drop(columns=[target])
    y_train = train_data[target]

    X_val = valid_data.drop(columns=[target])
    y_val = valid_data[target]
```

```
        X_test = test_data.drop(columns=[target])
        y_test = test_data[target]

        # Define a scaler object and fit it on the training data only
        scaler = StandardScaler()
        X_train_scaled = pd.DataFrame(scaler.fit_transform(X_train), columns=X_train.co
        X_valid_scaled = pd.DataFrame(scaler.transform(X_val), columns=X_val.columns, i
        X_test_scaled = pd.DataFrame(scaler.transform(X_test), columns=X_test.columns,

        train_scaled = pd.concat([X_train_scaled, y_train],axis = 1)
        valid_scaled = pd.concat([X_valid_scaled, y_val],axis = 1)
        test_scaled = pd.concat([X_test_scaled, y_test],axis = 1)
        return train_scaled, valid_scaled, test_scaled
```

In [24]:
```
train_scaled, valid_scaled, test_scaled = apply_scaling(train_data, valid_data, tes
```

# Dataset class

In [25]:
```
class SequenceDataset(Dataset):
    def __init__(self, dataframe, target, features, sequence_length=5):
        self.features = features
        self.target = target
        self.sequence_length = sequence_length
        self.y = torch.tensor(dataframe[target].values).float()
        self.X = torch.tensor(dataframe[features].values).float()

    def __len__(self):
        return self.X.shape[0]

    def __getitem__(self, i):
        if i >= self.sequence_length - 1:
            i_start = i - self.sequence_length + 1
            x = self.X[i_start:(i + 1), :]
        else:
            padding = self.X[0].repeat(self.sequence_length - i - 1, 1)
            x = self.X[0:(i + 1), :]
            x = torch.cat((padding, x), 0)

        return x, self.y[i]
```

In [26]:
```
i = 5
sequence_length = 3
features = [col for col in train_scaled.columns if col != target]


train_dataset = SequenceDataset(
    train_scaled,
    target=target,
    features=features,
    sequence_length=sequence_length
)
```

```
X, y = train_dataset[i]
X, y
```

Out[26]: (tensor([[-0.7671, -0.7684, -0.7629, -0.7671, -0.8597, -1.6648, -0.0354,  0.5799,
                   -0.0176, -1.6648, -1.7975, -0.5432, -1.3057, -1.2474, -0.6126],
                  [-0.7668, -0.7644, -0.7665, -0.7670, -0.3267, -1.6648, -0.0354,  0.5799,
                   -0.0176, -1.6648, -1.7975, -0.5432, -1.3057, -1.2474, -0.6126],
                  [-0.7667, -0.7721, -0.7731, -0.7742, -0.2816, -1.6648, -0.0354,  0.5799,
                   -0.0176, -1.6648, -1.7975, -0.5432, -1.3057, -1.2474, -0.6126]]),
          tensor(10406.5303))

In [27]: `train_data[features].iloc[(i - sequence_length + 1): (i + 1)]`

Out[27]:

| Date | Open | High | Low | Close | Volume | Year | Month | Day | Week_of_Year |
|---|---|---|---|---|---|---|---|---|---|
| 2019-07-21 04:00:00 | 10577.36 | 10667.33 | 10530.00 | 10582.45 | 3815.251949 | 2019 | 7 | 21 | 29 |
| 2019-07-21 08:00:00 | 10581.54 | 10745.98 | 10460.01 | 10585.11 | 8175.970572 | 2019 | 7 | 21 | 29 |
| 2019-07-21 12:00:00 | 10585.11 | 10596.43 | 10334.00 | 10444.56 | 8545.374253 | 2019 | 7 | 21 | 29 |

# Creating and loading a PyTorch dataset and dataloader

In [28]:
```python
def get_dataset_obj(dataframe, features, target, sequence_length):
    sequence_dataset = SequenceDataset(
                            dataframe=dataframe,
                            target=target,
                            features=features,
                            sequence_length=sequence_length
                            )
    return sequence_dataset

def get_dataloader(dataset_obj, batch_size, do_shuffle = False):
    loader = DataLoader(dataset_obj, batch_size=batch_size, shuffle=do_shuffle)
    return loader
```

In [29]:
```python
torch.manual_seed(99)
train_loader = DataLoader(train_dataset, batch_size=3)
X, y = next(iter(train_loader))
print(X.shape)
```

```
torch.Size([3, 3, 15])
```

In [30]:
```python
sequence_length = 16
train_dataset = get_dataset_obj(train_scaled, target=target, features=features, seq
```

```python
validation_dataset = get_dataset_obj(valid_scaled, target=target, features=features
test_dataset = get_dataset_obj(test_scaled, target=target, features=features, seque

batch_size = 16
train_loader = get_dataloader(train_dataset, batch_size=batch_size, do_shuffle=True
validation_loader = get_dataloader(validation_dataset, batch_size=batch_size)
test_loader = get_dataloader(test_dataset, batch_size=batch_size)

X, y = next(iter(train_loader))
print("Features shape:", X.shape)
print("Target shape:", y.shape)
```

```
Features shape: torch.Size([16, 16, 15])
Target shape: torch.Size([16])
```

# Create dataloaders for training

In [31]:
```python
def prepare_data(coin: str, sequence_length, batch_size):
    df = read_coin_data(coin_name=coin)
    df.rename(columns={"Time":"Date"}, inplace=True)
    df = append_date_features(df=df)
    df = create_trigonometric_columns(df=df)
    df.set_index('Date', inplace=True)
    df, target = create_target_variable(df=df)
    train_df, valid_df, test_df = split_train_valid_test(data=df)
    datasets = (train_df, valid_df, test_df)
    train_scaled, valid_scaled, test_scaled = apply_scaling(train_df, valid_df, tes
    features = [col for col in train_data.columns if col != target]

    # initialize Dataset objects
    train_dataset = get_dataset_obj(train_scaled, target=target, features=features,
    validation_dataset = get_dataset_obj(valid_scaled, target=target, features=feat
    test_dataset = get_dataset_obj(test_scaled, target=target, features=features, s

    # initialize DataLoader objects
    train_loader = get_dataloader(train_dataset, batch_size=batch_size)
    validation_loader = get_dataloader(validation_dataset, batch_size=batch_size)
    test_loader = get_dataloader(test_dataset, batch_size=batch_size)
    loaders = (train_loader, validation_loader, test_loader)

    return datasets, loaders, target
```

In [32]:
```python
datasets, loaders, target = prepare_data(coin='BTC', sequence_length=16, batch_size
train_loader, validation_loader, test_loader = loaders
```

# LSTM architecture

In [33]:
```python
class DeepRegressionLSTM(nn.Module):
    def __init__(self, num_sensors, hidden_units, num_layers, dropout_prob=0.2):
        super().__init__()
        self.num_sensors = num_sensors  #number of features
        self.hidden_units = hidden_units
```

```
            self.num_layers = num_layers
            self.dropout_prob = dropout_prob

            self.lstm = nn.LSTM(
                input_size=num_sensors,
                hidden_size=hidden_units,
                batch_first=True,
                num_layers=self.num_layers
            )


            self.fc1 = nn.Linear(in_features=hidden_units, out_features=64)
            self.dropout1 = nn.Dropout(p=self.dropout_prob)
            self.bn1 = nn.BatchNorm1d(64)
            self.relu1 = nn.ReLU()

            self.fc2 = nn.Linear(in_features=64, out_features=16)
            self.dropout2 = nn.Dropout(p=self.dropout_prob)
            self.bn2 = nn.BatchNorm1d(16)
            self.relu2 = nn.ReLU()

            self.fc3 = nn.Linear(in_features=16, out_features=1)

        def forward(self, x):
            batch_size = x.shape[0]
            h0 = torch.zeros(self.num_layers, batch_size, self.hidden_units).requires_g
            c0 = torch.zeros(self.num_layers, batch_size, self.hidden_units).requires_g

            out, (hn, _) = self.lstm(x, (h0.detach(), c0.detach()))

            out = hn[-1]
            out = self.fc1(out)
#             out = self.dropout1(out)
#             out = self.bn1(out)
            out = self.relu1(out)
            out = self.fc2(out)
            out = self.dropout2(out)
#             out = self.bn2(out)
            out = self.relu2(out)
            out = self.fc3(out).squeeze()

            return out
```

In [34]:
```
num_hidden_units = 64
num_of_layers = 3
model = DeepRegressionLSTM(num_sensors=15, hidden_units=num_hidden_units, num_layer
```

# Evaluation metrics

In [35]:
```
def calculate_evaluation_metrics(y_pred, y_true, loss_fn):
    mse = loss_fn(y_pred, y_true)
    mae = torch.mean(torch.abs(y_pred - y_true))
    r2 = torchmetrics.functional.r2_score(y_pred.view(-1), y_true.view(-1))
```

```python
        rmse = torch.sqrt(torch.mean(torch.pow(y_pred - y_true, 2)))

        return mse, mae, r2, rmse
```

```python
def plot_comparison(actual, pred, coin):
    plt.plot(actual, label='actual')
    plt.plot(pred, label='prediction')
    plt.xlabel('Date')
    plt.ylabel('Close price')
    plt.legend()
    plt.title(f'{coin} Validation actual vs prediction')
    plt.show()


def train_model(data_loader, model, loss_function, optimizer, ix_epoch) -> dict:
    num_batches = len(data_loader)
    total_loss = 0
    model.train()

    mse_list, mae_list, r2_list, rmse_list = [], [], [], []

    for X, y in data_loader:
        output = model(X)
        loss = loss_function(output, y)

        optimizer.zero_grad()
        loss.backward()
        optimizer.step()

        total_loss += loss.item()

        mse, mae, r2, rmse = calculate_evaluation_metrics(y_pred=output, y_true=y,
        mse_list.append(mse.item())
        mae_list.append(mae.detach().numpy())
        r2_list.append(r2.detach().numpy())
        rmse_list.append(rmse.detach().numpy())

    mse = sum(mse_list) / num_batches
    mae = sum(mae_list) / num_batches
    r2 = sum(r2_list) / num_batches
    rmse = sum(rmse_list) / num_batches
    print("Epoch {}, Train || MSE: {:.7f}, MAE: {:.7f}, R2: {:.7f}, RMSE: {:.7f}".f
    metrics = {'mse': mse, 'mae': mae, 'r2': r2, 'rmse': rmse}
    return model, metrics

def evaluate_model(data_loader, model, loss_function, coin, ix_epoch = None) -> dic

    num_batches = len(data_loader)
    total_loss = 0

    mse_list, mae_list, r2_list, rmse_list = [], [], [], []

    model.eval()
    actual_, pred_ = [], []
    with torch.no_grad():
        for X, y in data_loader:
```

```python
            output = model(X)
            total_loss += loss_function(output, y).item()
            mse, mae, r2, rmse = calculate_evaluation_metrics(y_pred=output, y_true
            mse_list.append(mse.item())
            mae_list.append(mae.detach().numpy())
            r2_list.append(r2.detach().numpy())
            rmse_list.append(rmse.detach().numpy())

            actual_.append(y.numpy().reshape(-1))
            pred_.append(output.numpy().reshape(-1))

        actual_ = np.hstack(actual_)
        pred_ = np.hstack(pred_)


    mse = sum(mse_list) / num_batches
    mae = sum(mae_list) / num_batches
    r2 = sum(r2_list) / num_batches
    rmse = sum(rmse_list) / num_batches
    if ix_epoch is not None:
        print("Epoch {}, Evaluation || MSE: {:.7f}, MAE: {:.7f}, R2: {:.7f}, RMSE:
    metrics = {'mse': mse, 'mae': mae, 'r2': r2, 'rmse': rmse}

    if ix_epoch is not None and ix_epoch % 5 == 0:
        plot_comparison(actual=actual_, pred=pred_, coin=coin)
    return metrics

def train_and_evaluate_model(train_loader, val_loader, model, loss_function, learni

    optimizer = torch.optim.Adam(model.parameters(), lr=learning_rate)

    start = time.time()
    for ix_epoch in tqdm(range(epochs), desc=f"Training {coin} coin..."):
        print("\n---------")
        num_batches = len(train_loader)
        total_loss = 0
        model.train()

        mse_list, mae_list, r2_list, rmse_list = [], [], [], []

        for X, y in train_loader:
            output = model(X)
            loss = loss_function(output, y)

            optimizer.zero_grad()
            loss.backward()
            optimizer.step()

            total_loss += loss.item()

            mse, mae, r2, rmse = calculate_evaluation_metrics(y_pred=output, y_true
            mse_list.append(mse.item())
            mae_list.append(mae.detach().numpy())
            r2_list.append(r2.detach().numpy())
            rmse_list.append(rmse.detach().numpy())
```

```python
        mse = sum(mse_list) / num_batches
        mae = sum(mae_list) / num_batches
        r2 = sum(r2_list) / num_batches
        rmse = sum(rmse_list) / num_batches
        print("Epoch {}, Train || MSE: {:.7f}, MAE: {:.7f}, R2: {:.7f}, RMSE: {:.7f
        metrics = {'mse': mse, 'mae': mae, 'r2': r2, 'rmse': rmse}
        val_metrics = evaluate_model(val_loader, model, loss_function, coin, ix_epo
        print()

    return model


def predict(data_loader, model):

    output = torch.tensor([])
    model.eval()
    with torch.no_grad():
        for X, _ in data_loader:
            y_pred = model(X)
            output = torch.cat((output, y_pred), 0)

    return output
```

# Training model for each coin

```python
In [37]: def train_all_coins(coin_list: list, epochs, learning_rate, loss_function, num_hidd
                             num_of_layers, batch_size, sequence_length):


    model_results = {"learning_rate": learning_rate, "epochs": epochs, "batch_size"
    model_results['results'] = {}
    predictions_df = pd.DataFrame()
    actual_df = pd.DataFrame()

    for coin in tqdm(coin_list, desc="Processing coins..."):
        results = {}
        datasets, loaders, target = prepare_data(coin=coin, sequence_length=sequenc
        train_dataset, validation_dataset, test_dataset = datasets
        train_loader, validation_loader, test_loader = loaders

        features = train_dataset.shape[1]-1
        model = DeepRegressionLSTM(num_sensors=features, hidden_units=num_hidden_un

        trained_model = train_and_evaluate_model(train_loader, validation_loader, m
                                                 learning_rate, epochs, coin)
        test_metrics = evaluate_model(test_loader, trained_model, loss_function, co
        results['test_metrics'] = test_metrics
        test_predictions = predict(test_loader, trained_model).numpy()
        predictions_df[coin] = list(test_predictions)
        actual_df[coin] = test_dataset[target].tolist()
        model_results['results'][coin] = results


    predictions_df.index = test_dataset.index
```

```python
        actual_df.index = test_dataset.index
        return model_results, predictions_df, actual_df

    def append_means(predictions_df, actual_df):
        predictions_df['mean'] = predictions_df.mean(axis=1)
        actual_df['mean'] = actual_df.mean(axis=1)
        return predictions_df, actual_df

    def compute_mean_metrics(coin_results: dict):
        num_of_coins = len(coin_results)
        sum_mse, sum_mae, sum_r2, sum_rmse, sum_time = 0, 0, 0, 0, 0
        results_dict = coin_results['results']
        for coin, results in results_dict.items():
            sum_mse += results['test_metrics']['mse']
            sum_mae += results['test_metrics']['mae']
            sum_r2 += results['test_metrics']['r2']
            sum_rmse += results['test_metrics']['rmse']

        mean_results = coin_results
        mean_results['mean_mse'] = sum_mse/num_of_coins
        mean_results['mean_mae'] = sum_mae/num_of_coins
        mean_results['mean_r2'] = sum_r2/num_of_coins
        mean_results['mean_rmse'] = sum_rmse/num_of_coins

        return mean_results
```

In [38]:
```python
epochs = 50
learning_rate = 0.001
loss_function = nn.MSELoss()
num_hidden_units = 128
num_of_layers = 1
batch_size = 16
sequence_length = 16
coin_results, predictions_df, actual_df = train_all_coins(available_coins, epochs,
                                                          num_hidden_units, num_of_
```

```
Processing coins...:   0%|          | 0/8 [00:00<?, ?it/s]
Training ADA coin...:   0%|          | 0/50 [00:00<?, ?it/s]
```

---------
Epoch 1, Train || MSE: 0.1877427, MAE: 0.1947343, R2: -111.0394531, RMSE: 0.2247194

Epoch 1, Evaluation || MSE: 1.5594866, MAE: 1.2005469, R2: -26195.1533620, RMSE: 1.2051830


---------
Epoch 2, Train || MSE: 0.2495964, MAE: 0.3307748, R2: -303.9893884, RMSE: 0.3527732

Epoch 2, Evaluation || MSE: 0.2291063, MAE: 0.3568530, R2: -1658.9332118, RMSE: 0.3631776


---------
Epoch 3, Train || MSE: 0.2072822, MAE: 0.3088150, R2: -454.6905347, RMSE: 0.3346988

Epoch 3, Evaluation || MSE: 0.2055050, MAE: 0.3153419, R2: -1282.4224641, RMSE: 0.3245885


---------
Epoch 4, Train || MSE: 0.1736824, MAE: 0.2850440, R2: -456.9582213, RMSE: 0.3123543

Epoch 4, Evaluation || MSE: 0.1821254, MAE: 0.2924492, R2: -1144.9918740, RMSE: 0.3028110


---------
Epoch 5, Train || MSE: 0.1500141, MAE: 0.2507350, R2: -240.4202512, RMSE: 0.2777926

Epoch 5, Evaluation || MSE: 0.1168126, MAE: 0.2597495, R2: -893.3180782, RMSE: 0.2669344

ADA Validation actual vs prediction
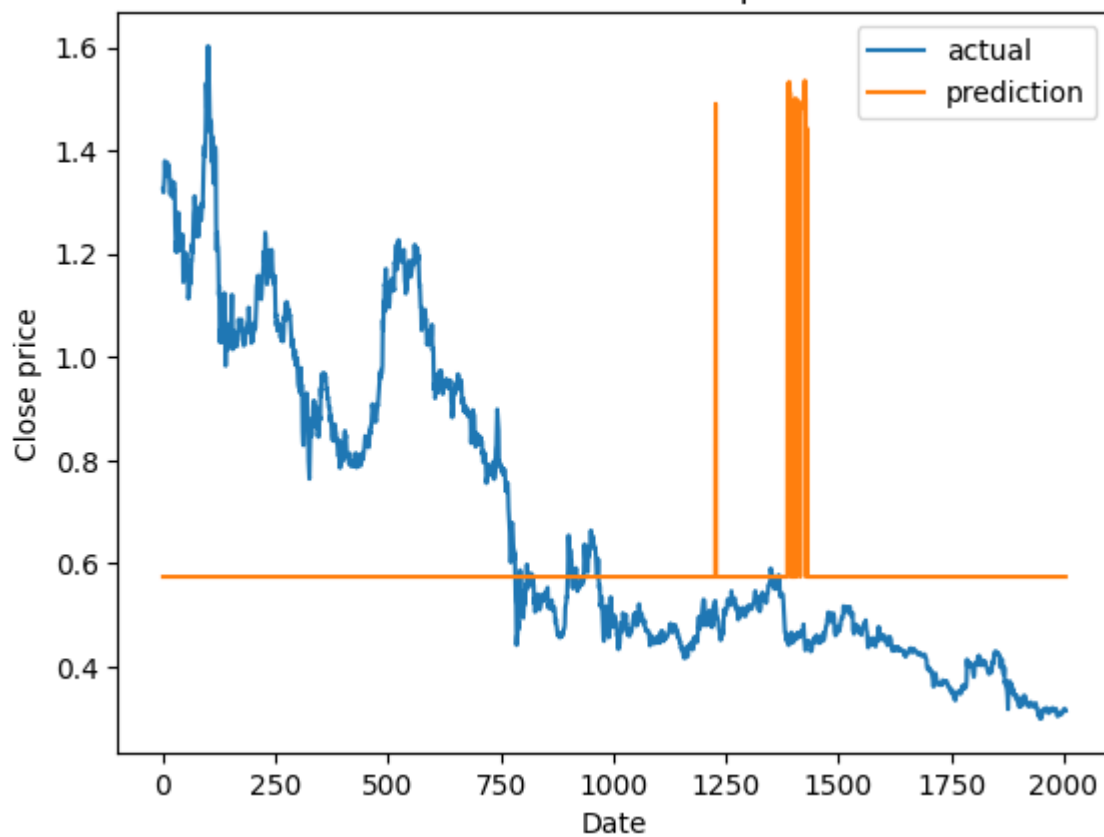
----------
Epoch 6, Train || MSE: 0.1330059, MAE: 0.2446997, R2: -300.5727816, RMSE: 0.2774358

Epoch 6, Evaluation || MSE: 0.5615277, MAE: 0.6255414, R2: -11447.0217188, RMSE: 0.6351252


----------
Epoch 7, Train || MSE: 0.1130234, MAE: 0.2261817, R2: -307.1652849, RMSE: 0.2582718

Epoch 7, Evaluation || MSE: 0.6360159, MAE: 0.7626566, R2: -11832.0941139, RMSE: 0.7636218


----------
Epoch 8, Train || MSE: 0.0932301, MAE: 0.2066378, R2: -303.0901557, RMSE: 0.2378484

Epoch 8, Evaluation || MSE: 0.6137970, MAE: 0.7511959, R2: -11188.0670498, RMSE: 0.7519542


----------
Epoch 9, Train || MSE: 0.0892048, MAE: 0.2043400, R2: -302.4645401, RMSE: 0.2359882

Epoch 9, Evaluation || MSE: 0.6749252, MAE: 0.7945487, R2: -11900.4697362, RMSE: 0.7958811


----------
Epoch 10, Train || MSE: 0.0856414, MAE: 0.1988813, R2: -297.9025915, RMSE: 0.2290881

Epoch 10, Evaluation || MSE: 0.6545296, MAE: 0.7862060, R2: -11313.1864349, RMSE: 0.7870851

ADA Validation actual vs prediction

---------
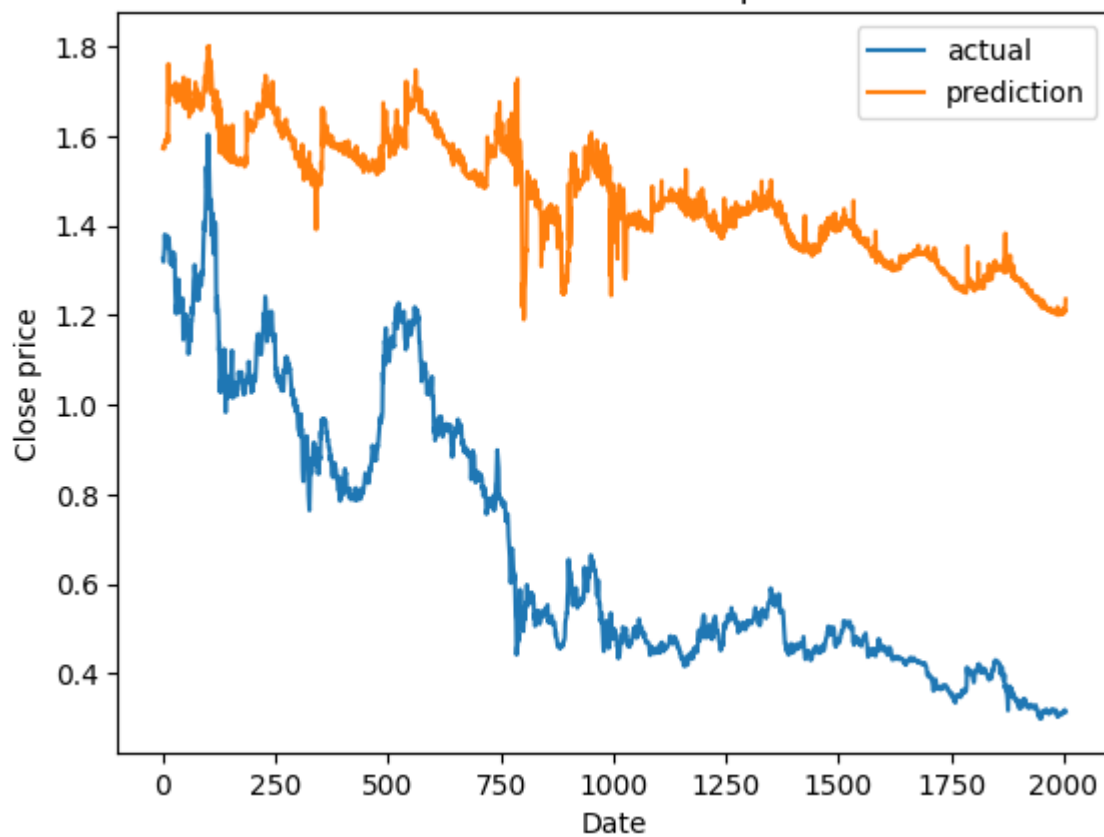
Epoch 11, Train || MSE: 0.0693190, MAE: 0.1802341, R2: -241.4250505, RMSE: 0.2110555

Epoch 11, Evaluation || MSE: 0.5168331, MAE: 0.6994301, R2: -9413.9475551, RMSE: 0.7004085


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Epoch 12, Train || MSE: 0.0600373, MAE: 0.1669840, R2: -217.0643350, RMSE: 0.1969062

Epoch 12, Evaluation || MSE: 0.3386458, MAE: 0.5628193, R2: -6178.8210226, RMSE: 0.5639101


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Epoch 13, Train || MSE: 0.0567404, MAE: 0.1623036, R2: -246.1220409, RMSE: 0.1927164

Epoch 13, Evaluation || MSE: 0.3059139, MAE: 0.5358305, R2: -5577.2892890, RMSE: 0.5372672


---------

Epoch 14, Train || MSE: 0.0434152, MAE: 0.1499250, R2: -219.5802487, RMSE: 0.1801993

Epoch 14, Evaluation || MSE: 0.2765442, MAE: 0.5124188, R2: -3906.3138878, RMSE: 0.5131716


---------

Epoch 15, Train || MSE: 0.0399408, MAE: 0.1433452, R2: -195.1534954, RMSE: 0.1728395

Epoch 15, Evaluation || MSE: 0.1601005, MAE: 0.3793202, R2: -2249.3255858, RMSE: 0.3803530

ADA Validation actual vs prediction
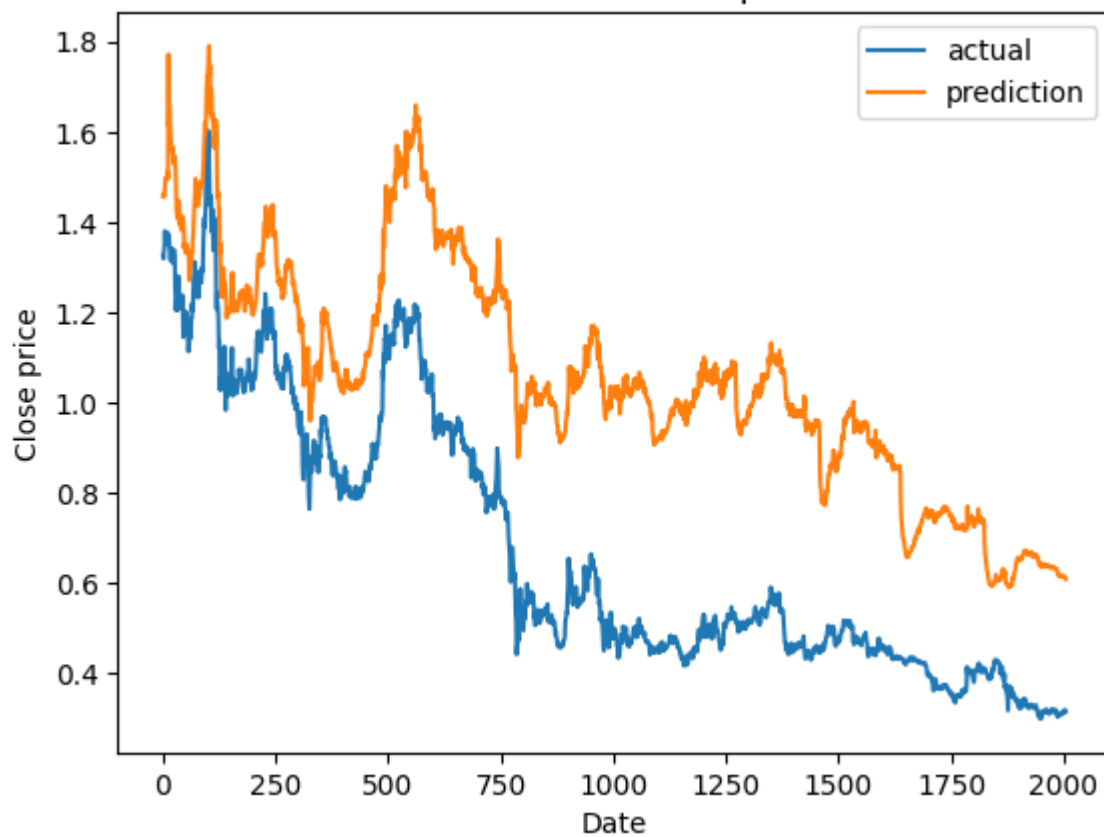
---------
Epoch 16, Train || MSE: 0.0378826, MAE: 0.1401195, R2: -238.9086697, RMSE: 0.1696545

Epoch 16, Evaluation || MSE: 0.1256122, MAE: 0.3253161, R2: -1897.8025341, RMSE: 0.3266787


---------
Epoch 17, Train || MSE: 0.0340502, MAE: 0.1354784, R2: -207.7389195, RMSE: 0.1640763

Epoch 17, Evaluation || MSE: 0.0812623, MAE: 0.2498828, R2: -1361.6801090, RMSE: 0.2516234


---------
Epoch 18, Train || MSE: 0.0353254, MAE: 0.1367255, R2: -184.1173592, RMSE: 0.1656776

Epoch 18, Evaluation || MSE: 0.1617442, MAE: 0.3789161, R2: -2466.4474494, RMSE: 0.3797777


---------
Epoch 19, Train || MSE: 0.0359316, MAE: 0.1366824, R2: -203.7489282, RMSE: 0.1647015

Epoch 19, Evaluation || MSE: 0.0619518, MAE: 0.2156892, R2: -1123.7240691, RMSE: 0.2174501


---------
Epoch 20, Train || MSE: 0.0349121, MAE: 0.1351453, R2: -184.5099144, RMSE: 0.1635724

Epoch 20, Evaluation || MSE: 0.1027918, MAE: 0.2832842, R2: -1828.7686329, RMSE: 0.2846950

ADA Validation actual vs prediction
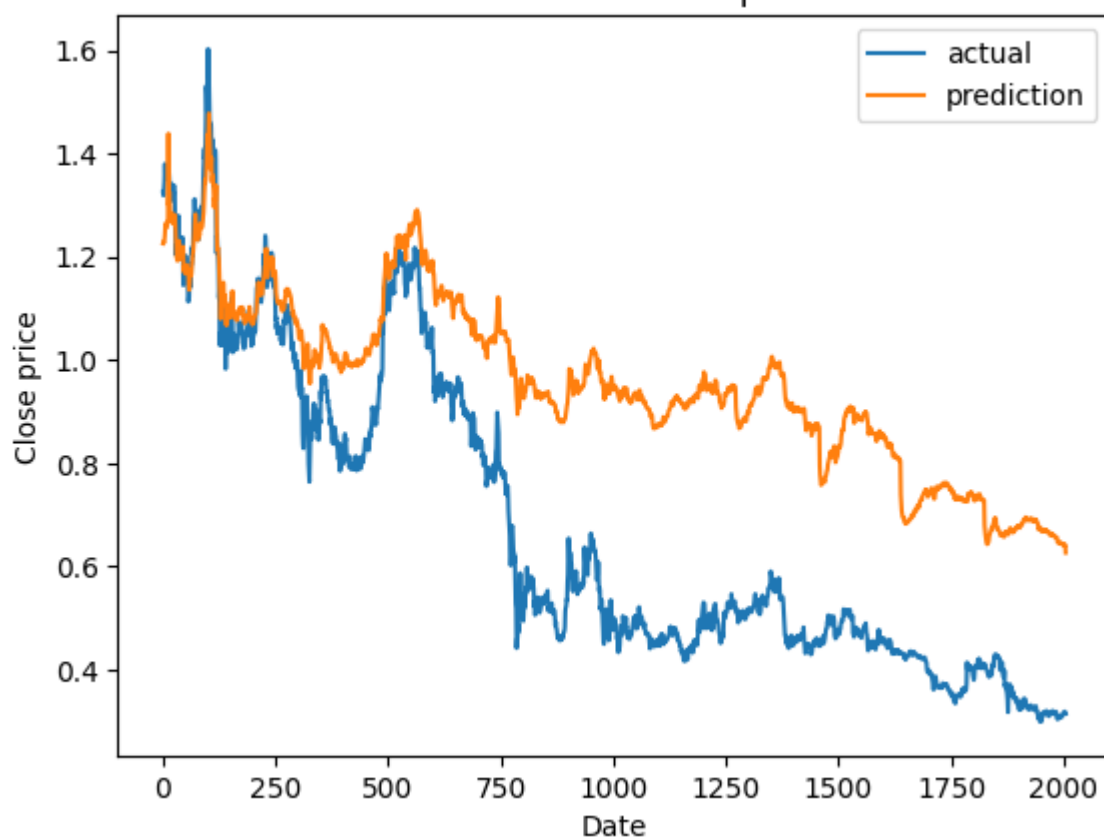
---------
Epoch 21, Train || MSE: 0.0365511, MAE: 0.1374397, R2: -195.5748027, RMSE: 0.1673928

Epoch 21, Evaluation || MSE: 0.1439686, MAE: 0.3463558, R2: -2513.7067989, RMSE: 0.3474322


---------
Epoch 22, Train || MSE: 0.0378489, MAE: 0.1387342, R2: -184.1281884, RMSE: 0.1676110

Epoch 22, Evaluation || MSE: 0.1475007, MAE: 0.3522726, R2: -2596.8468168, RMSE: 0.3532355


---------
Epoch 23, Train || MSE: 0.0371258, MAE: 0.1380689, R2: -200.9352636, RMSE: 0.1669378

Epoch 23, Evaluation || MSE: 0.1353451, MAE: 0.3378506, R2: -2239.8118662, RMSE: 0.3388347


---------
Epoch 24, Train || MSE: 0.0393802, MAE: 0.1384910, R2: -187.6429500, RMSE: 0.1684887

Epoch 24, Evaluation || MSE: 0.0889971, MAE: 0.2623375, R2: -1557.3329614, RMSE: 0.2637697


---------
Epoch 25, Train || MSE: 0.0338953, MAE: 0.1304680, R2: -161.6859869, RMSE: 0.1578861

Epoch 25, Evaluation || MSE: 0.1218337, MAE: 0.3150567, R2: -2159.7193057, RMSE: 0.3161941

ADA Validation actual vs prediction
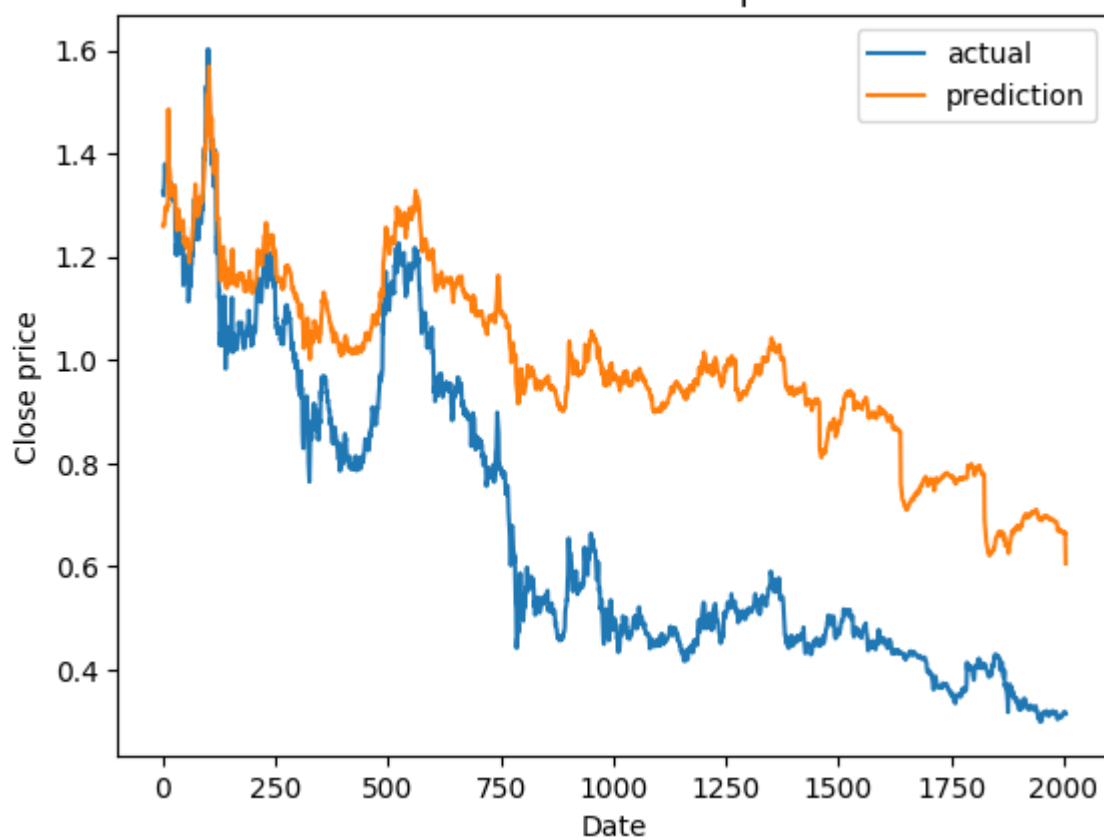
---------
Epoch 26, Train || MSE: 0.0332756, MAE: 0.1308221, R2: -170.9487384, RMSE: 0.1591055

Epoch 26, Evaluation || MSE: 0.1003065, MAE: 0.2749334, R2: -2042.6968027, RMSE: 0.2764824


---------
Epoch 27, Train || MSE: 0.0306807, MAE: 0.1262923, R2: -173.4442572, RMSE: 0.1526742

Epoch 27, Evaluation || MSE: 0.1107448, MAE: 0.2908959, R2: -2299.6940606, RMSE: 0.2922834


---------
Epoch 28, Train || MSE: 0.0356185, MAE: 0.1307156, R2: -172.4887730, RMSE: 0.1597071

Epoch 28, Evaluation || MSE: 0.1186849, MAE: 0.3096680, R2: -2330.3573651, RMSE: 0.3109270


---------
Epoch 29, Train || MSE: 0.0325118, MAE: 0.1281129, R2: -161.3818423, RMSE: 0.1553351

Epoch 29, Evaluation || MSE: 0.1111838, MAE: 0.3068683, R2: -1928.1326902, RMSE: 0.3078350


---------
Epoch 30, Train || MSE: 0.0314634, MAE: 0.1252536, R2: -141.4047460, RMSE: 0.1533747

Epoch 30, Evaluation || MSE: 0.0987440, MAE: 0.2771210, R2: -2119.7082015, RMSE: 0.2785785

ADA Validation actual vs prediction

---------
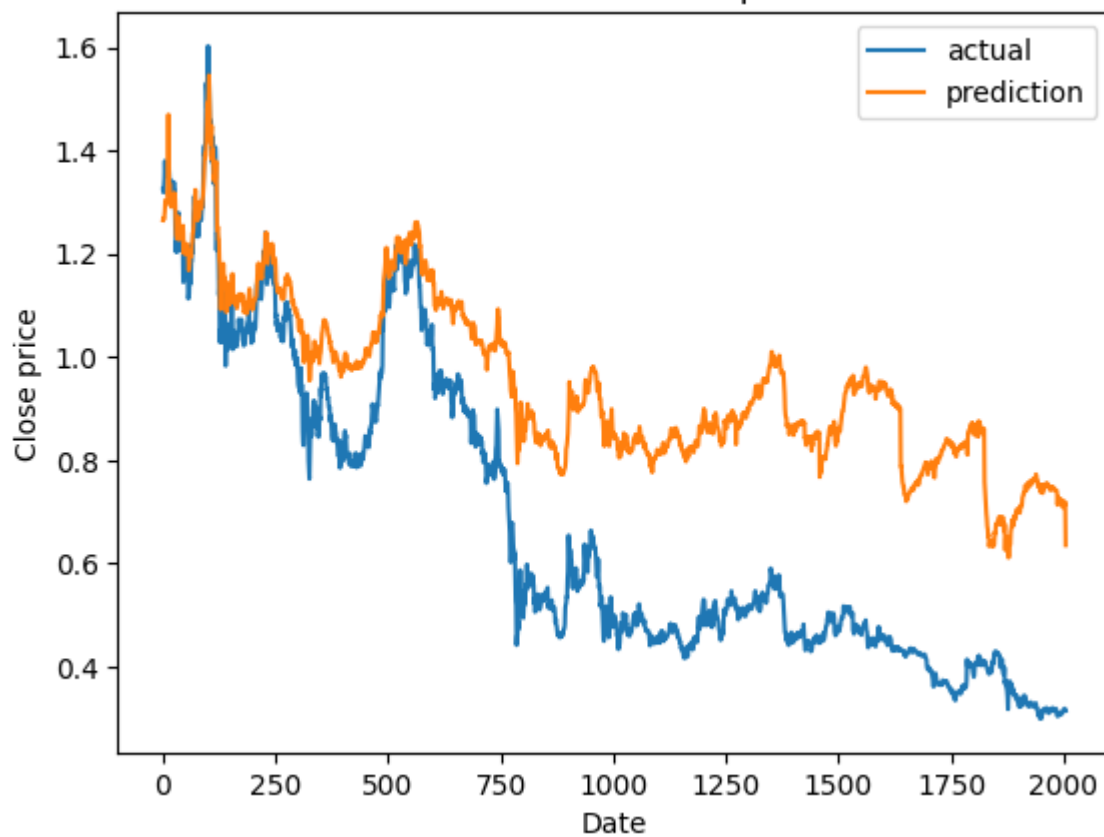
Epoch 31, Train || MSE: 0.0320183, MAE: 0.1291808, R2: -177.0041649, RMSE: 0.1565629

Epoch 31, Evaluation || MSE: 0.1509281, MAE: 0.3644649, R2: -2837.4460834, RMSE: 0.3654417


---------

Epoch 32, Train || MSE: 0.0335899, MAE: 0.1301295, R2: -144.1120305, RMSE: 0.1577903

Epoch 32, Evaluation || MSE: 0.1424601, MAE: 0.3529055, R2: -2560.2044462, RMSE: 0.3539315


---------

Epoch 33, Train || MSE: 0.0335972, MAE: 0.1316747, R2: -158.3355867, RMSE: 0.1579025

Epoch 33, Evaluation || MSE: 0.1438616, MAE: 0.3413747, R2: -2981.3741624, RMSE: 0.3424442


---------

Epoch 34, Train || MSE: 0.0309262, MAE: 0.1261045, R2: -163.1181678, RMSE: 0.1534261

Epoch 34, Evaluation || MSE: 0.1312340, MAE: 0.3277154, R2: -2695.5342406, RMSE: 0.3287527


---------

Epoch 35, Train || MSE: 0.0375227, MAE: 0.1357364, R2: -157.5317571, RMSE: 0.1631881

Epoch 35, Evaluation || MSE: 0.1239604, MAE: 0.3204442, R2: -2491.6464113, RMSE: 0.3214448

ADA Validation actual vs prediction

---------
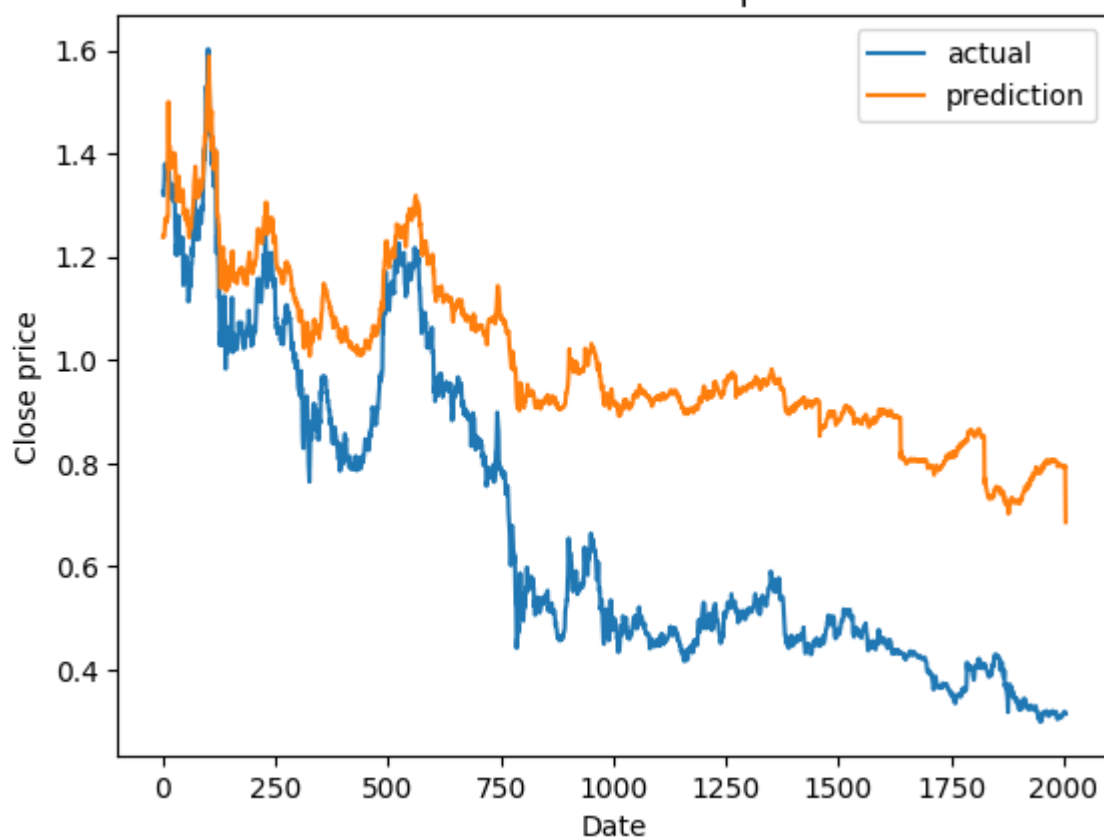
Epoch 36, Train || MSE: 0.0324682, MAE: 0.1294256, R2: -159.5374239, RMSE: 0.1566220

Epoch 36, Evaluation || MSE: 0.1313722, MAE: 0.3329308, R2: -2586.9004162, RMSE: 0.3339017


---------

Epoch 37, Train || MSE: 0.0323777, MAE: 0.1277321, R2: -156.6866803, RMSE: 0.1540195

Epoch 37, Evaluation || MSE: 0.1050205, MAE: 0.2862083, R2: -2208.4259626, RMSE: 0.2877509


---------

Epoch 38, Train || MSE: 0.0318073, MAE: 0.1265585, R2: -159.8245410, RMSE: 0.1535047

Epoch 38, Evaluation || MSE: 0.1155890, MAE: 0.3034343, R2: -2437.1645109, RMSE: 0.3047757


---------

Epoch 39, Train || MSE: 0.0320166, MAE: 0.1270998, R2: -164.0127325, RMSE: 0.1539003

Epoch 39, Evaluation || MSE: 0.1072829, MAE: 0.2940388, R2: -2346.6910510, RMSE: 0.2951797


---------

Epoch 40, Train || MSE: 0.0297662, MAE: 0.1226090, R2: -139.0574626, RMSE: 0.1499481

Epoch 40, Evaluation || MSE: 0.0802383, MAE: 0.2400967, R2: -2003.1386330, RMSE: 0.2417114
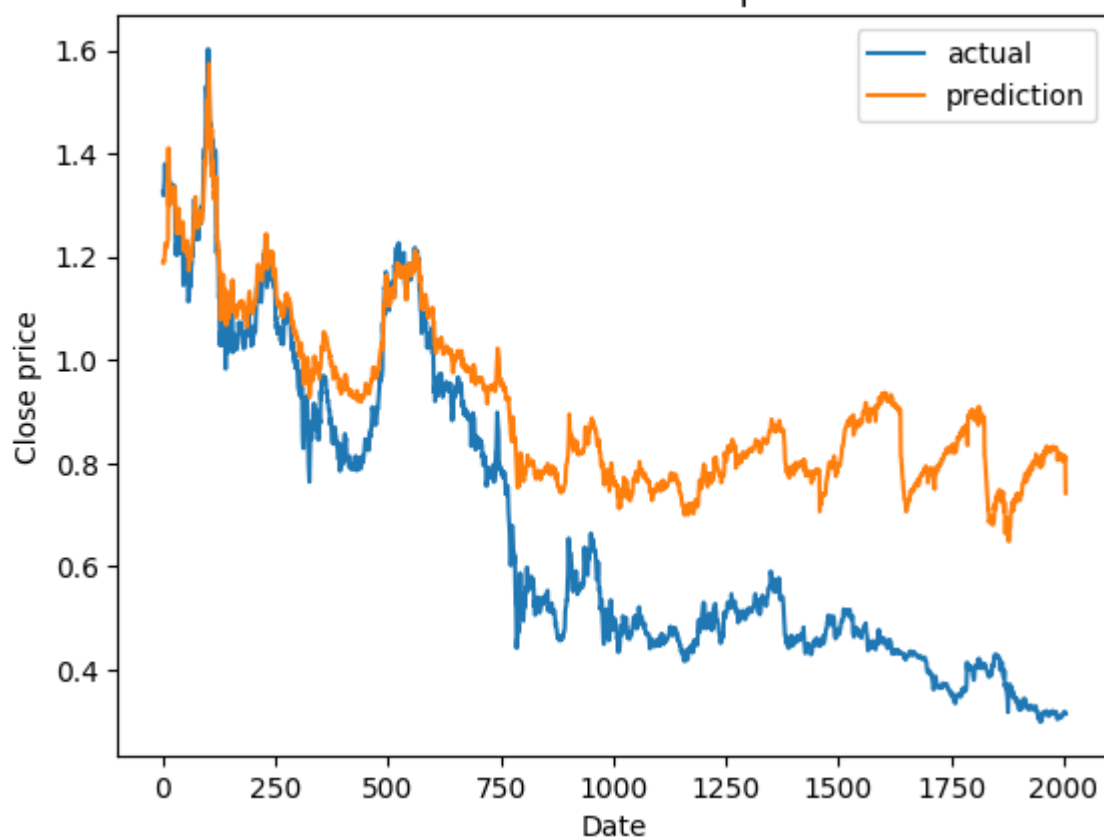
```
---------
Epoch 41, Train || MSE: 0.0300239, MAE: 0.1225525, R2: -129.2429746, RMSE: 0.14979
40
Epoch 41, Evaluation || MSE: 0.0947525, MAE: 0.2668158, R2: -2271.3412078, RMSE:
0.2683673


---------
Epoch 42, Train || MSE: 0.0327558, MAE: 0.1262450, R2: -137.2179127, RMSE: 0.15524
15
Epoch 42, Evaluation || MSE: 0.1224890, MAE: 0.3268458, R2: -2517.7986407, RMSE:
0.3276837


---------
Epoch 43, Train || MSE: 0.0304807, MAE: 0.1239812, R2: -130.4222775, RMSE: 0.15035
41
Epoch 43, Evaluation || MSE: 0.1019158, MAE: 0.2922878, R2: -2220.4976973, RMSE:
0.2932237


---------
Epoch 44, Train || MSE: 0.0315334, MAE: 0.1246885, R2: -144.1213911, RMSE: 0.15104
84
Epoch 44, Evaluation || MSE: 0.1269079, MAE: 0.3398574, R2: -2408.0005622, RMSE:
0.3406550


---------
Epoch 45, Train || MSE: 0.0320874, MAE: 0.1256693, R2: -142.8582059, RMSE: 0.15284
22
Epoch 45, Evaluation || MSE: 0.0558587, MAE: 0.2287017, R2: -882.4936161, RMSE: 0.
2296065
```

ADA Validation actual vs prediction
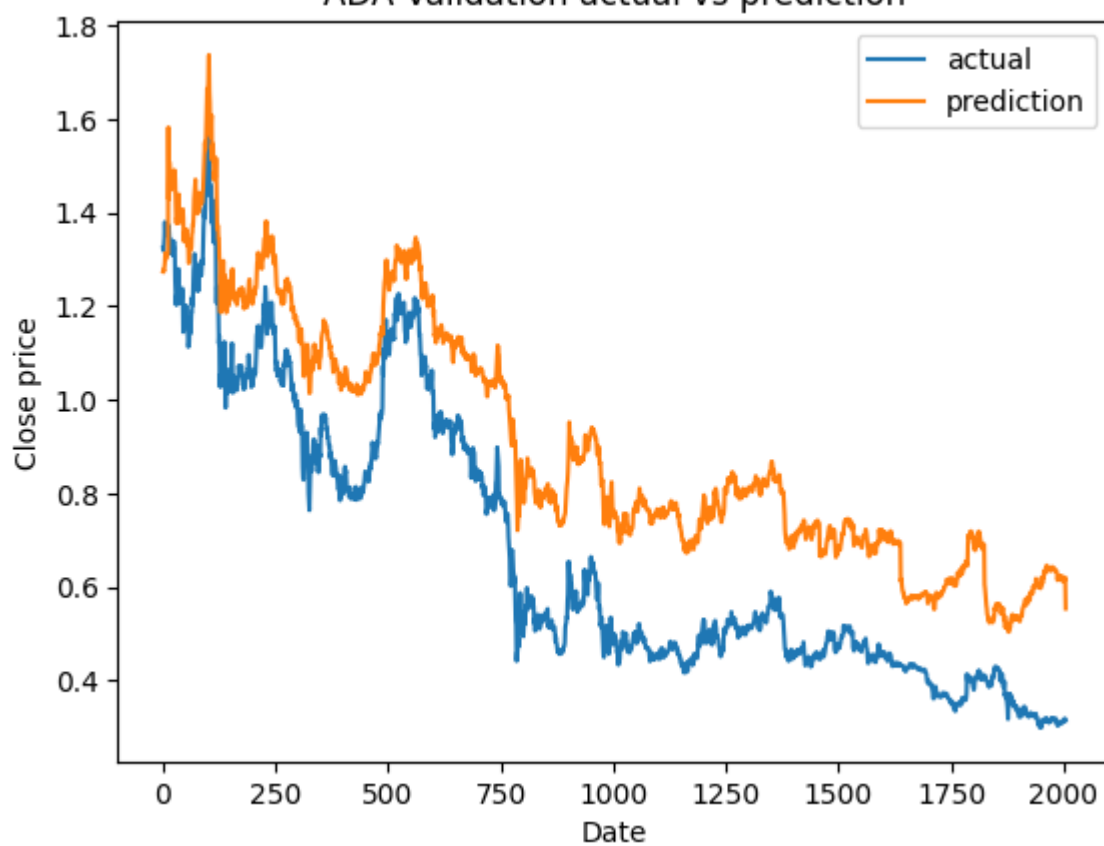
```
---------
Epoch 46, Train || MSE: 0.0311805, MAE: 0.1254074, R2: -137.8572764, RMSE: 0.15198
07
Epoch 46, Evaluation || MSE: 0.0951850, MAE: 0.2972254, R2: -1736.9050377, RMSE:
0.2981786


---------
Epoch 47, Train || MSE: 0.0331225, MAE: 0.1286710, R2: -144.1147539, RMSE: 0.15654
18
Epoch 47, Evaluation || MSE: 0.0929512, MAE: 0.2918679, R2: -1754.3883081, RMSE:
0.2926475


---------
Epoch 48, Train || MSE: 0.0317318, MAE: 0.1245434, R2: -137.6549416, RMSE: 0.15137
63
Epoch 48, Evaluation || MSE: 0.0712919, MAE: 0.2494921, R2: -1503.2401166, RMSE:
0.2504616


---------
Epoch 49, Train || MSE: 0.0308528, MAE: 0.1244751, R2: -137.3611139, RMSE: 0.15144
49
Epoch 49, Evaluation || MSE: 0.1041903, MAE: 0.3084097, R2: -2001.8547122, RMSE:
0.3093737


---------
Epoch 50, Train || MSE: 0.0313246, MAE: 0.1257282, R2: -148.3405870, RMSE: 0.15357
66
Epoch 50, Evaluation || MSE: 0.0262725, MAE: 0.1494961, R2: -514.4963273, RMSE: 0.
1508576
```

ADA Validation actual vs prediction
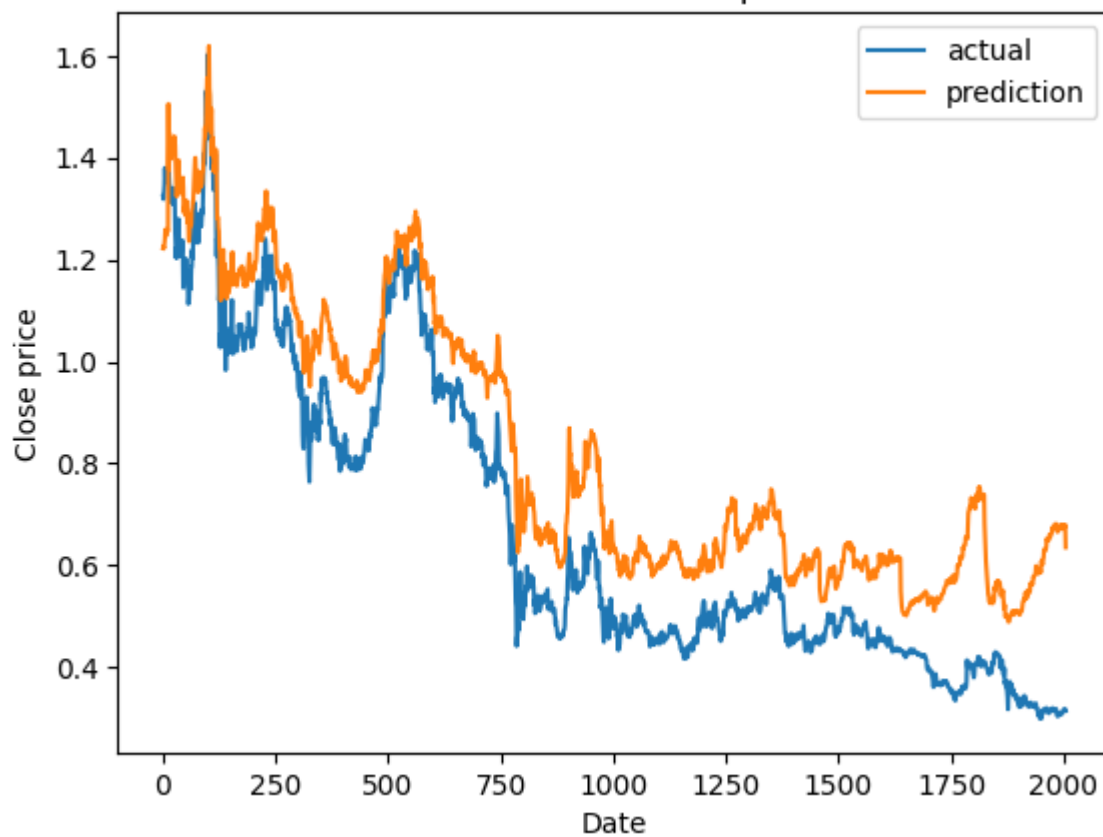
Training BNB coin...:   0%|          | 0/50 [00:00<?, ?it/s]

---------
Epoch 1, Train || MSE: 15592.5055119, MAE: 62.8705255, R2: -820.3324932, RMSE: 67.0252144
Epoch 1, Evaluation || MSE: 70577.9812864, MAE: 255.7163516, R2: -5782.9505617, RMSE: 255.8872203


---------
Epoch 2, Train || MSE: 28182.3521263, MAE: 98.3321735, R2: -143950.1517297, RMSE: 103.2916623
Epoch 2, Evaluation || MSE: 40586.0789293, MAE: 188.2425966, R2: -3450.3920535, RMSE: 188.5564234


---------
Epoch 3, Train || MSE: 25139.9554240, MAE: 88.3924582, R2: -122504.0443388, RMSE: 95.1655402
Epoch 3, Evaluation || MSE: 36889.1326896, MAE: 178.4095431, R2: -3154.8814514, RMSE: 178.7455494


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Epoch 4, Train || MSE: 26772.8381539, MAE: 95.0062708, R2: -110418.5333652, RMSE: 100.8168478
Epoch 4, Evaluation || MSE: 35571.2319543, MAE: 174.7080195, R2: -3050.9406384, RMSE: 175.0360700


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Epoch 5, Train || MSE: 20802.6445945, MAE: 82.3157941, R2: -104709.2629630, RMSE: 87.3021598
Epoch 5, Evaluation || MSE: 36834.4945835, MAE: 178.3075188, R2: -3147.8586081, RMSE: 178.6426258

BNB Validation actual vs prediction
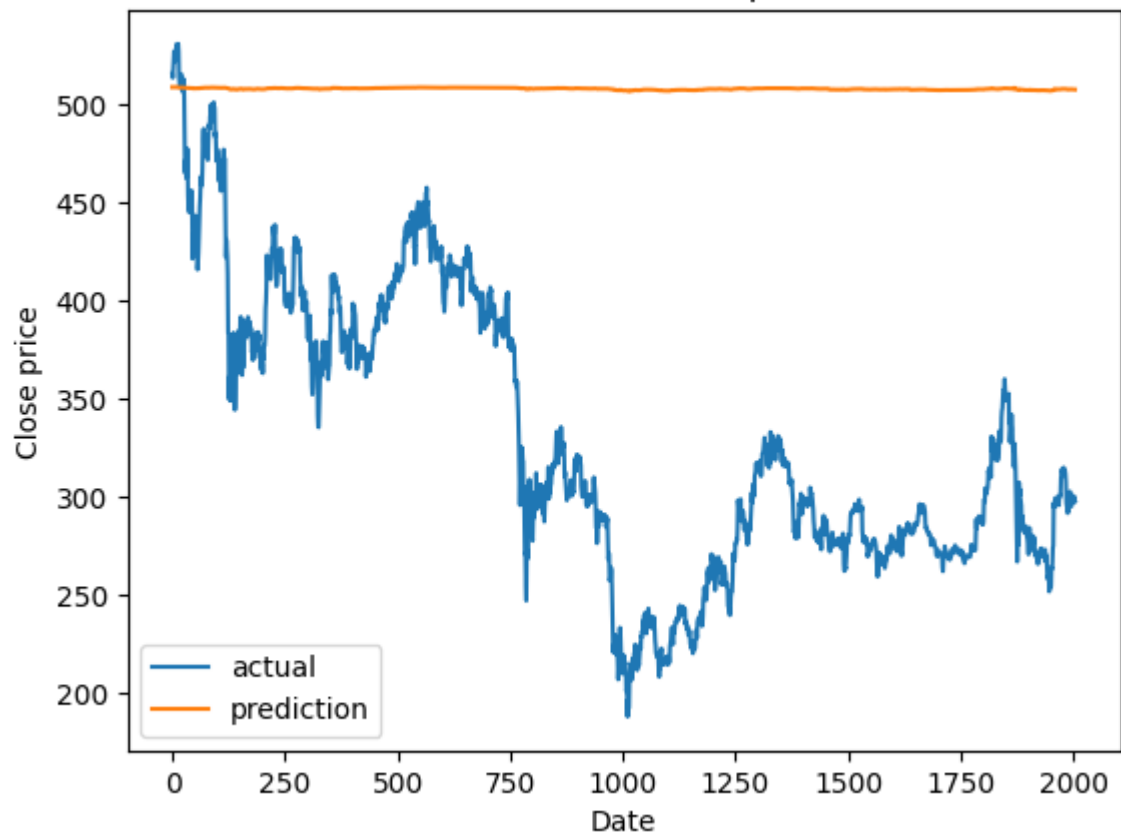
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Epoch 6, Train || MSE: 4517.6206505, MAE: 35.8092321, R2: -12554.6095957, RMSE: 41.6004209

Epoch 6, Evaluation || MSE: 17001.8791276, MAE: 122.2416121, R2: -1397.3618022, RMSE: 122.7514032


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Epoch 7, Train || MSE: 2762.1136376, MAE: 28.7219375, R2: -376.4968762, RMSE: 34.2755838

Epoch 7, Evaluation || MSE: 28169.5189170, MAE: 157.8721029, R2: -2463.2853416, RMSE: 158.0512607


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Epoch 8, Train || MSE: 2212.6275803, MAE: 24.7054307, R2: -217.5945041, RMSE: 30.2594658

Epoch 8, Evaluation || MSE: 10438.5118924, MAE: 88.8927408, R2: -985.2315182, RMSE: 89.3162901


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Epoch 9, Train || MSE: 2350.4900413, MAE: 25.5356511, R2: -215.2212384, RMSE: 30.7109357

Epoch 9, Evaluation || MSE: 16466.0701720, MAE: 118.5114848, R2: -1499.7762064, RMSE: 118.7599651


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Epoch 10, Train || MSE: 2200.8703493, MAE: 24.9177254, R2: -229.3189044, RMSE: 30.3196309

Epoch 10, Evaluation || MSE: 12399.6763901, MAE: 101.9057316, R2: -1156.3528671, RMSE: 102.1867807

BNB Validation actual vs prediction
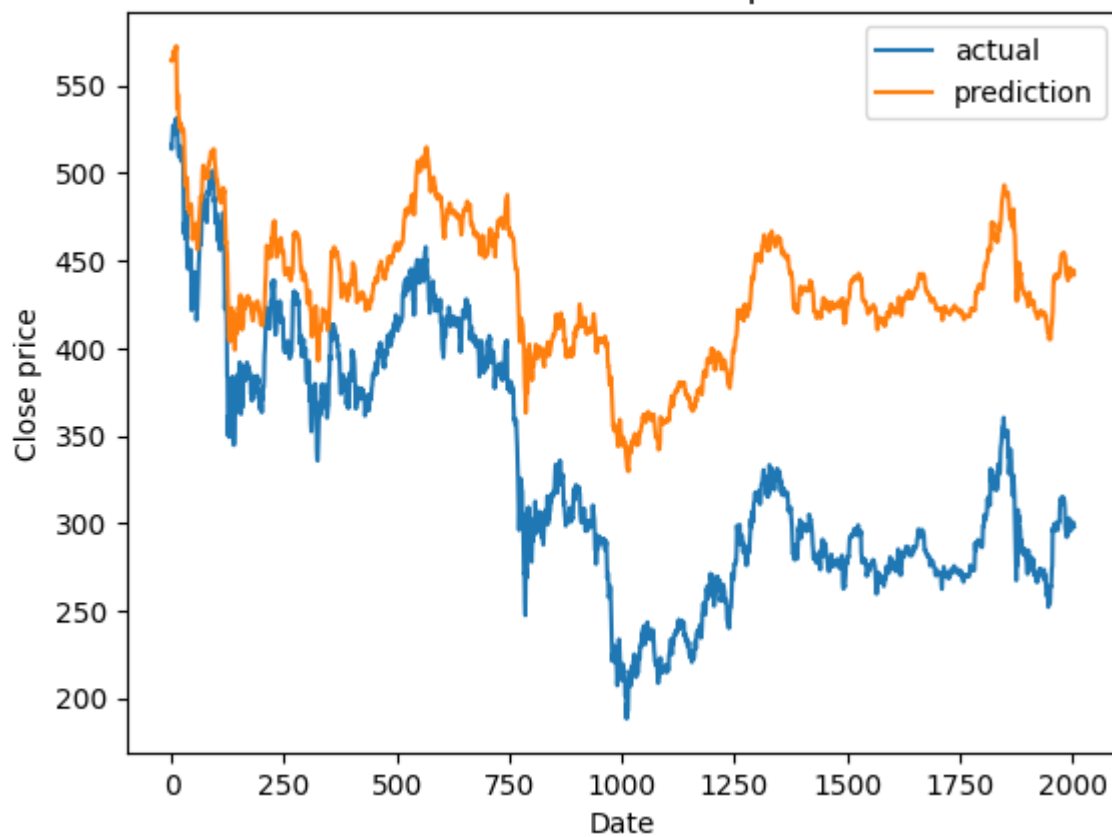
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Epoch 11, Train || MSE: 2005.8432862, MAE: 23.5722986, R2: -283.6671020, RMSE: 28.7648169
Epoch 11, Evaluation || MSE: 12639.6417292, MAE: 103.4359574, R2: -1186.1468581, RMSE: 103.6929963


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Epoch 12, Train || MSE: 1995.4856102, MAE: 23.2670751, R2: -231.3890030, RMSE: 28.6219562
Epoch 12, Evaluation || MSE: 15645.1436642, MAE: 118.2063846, R2: -1418.6636069, RMSE: 118.3930386


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Epoch 13, Train || MSE: 2004.0800609, MAE: 23.3089400, R2: -207.6415966, RMSE: 28.5463212
Epoch 13, Evaluation || MSE: 7661.0820103, MAE: 78.5028607, R2: -741.9137161, RMSE: 78.8686001


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Epoch 14, Train || MSE: 1872.4094975, MAE: 22.3442166, R2: -208.6811487, RMSE: 27.3479410
Epoch 14, Evaluation || MSE: 10483.2492540, MAE: 95.0865758, R2: -986.9792249, RMSE: 95.3340164


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Epoch 15, Train || MSE: 2085.8224366, MAE: 23.7106927, R2: -237.3637197, RMSE: 29.0000406
Epoch 15, Evaluation || MSE: 12713.2189166, MAE: 108.4545363, R2: -1115.8634383, RMSE: 108.6293080

BNB Validation actual vs prediction

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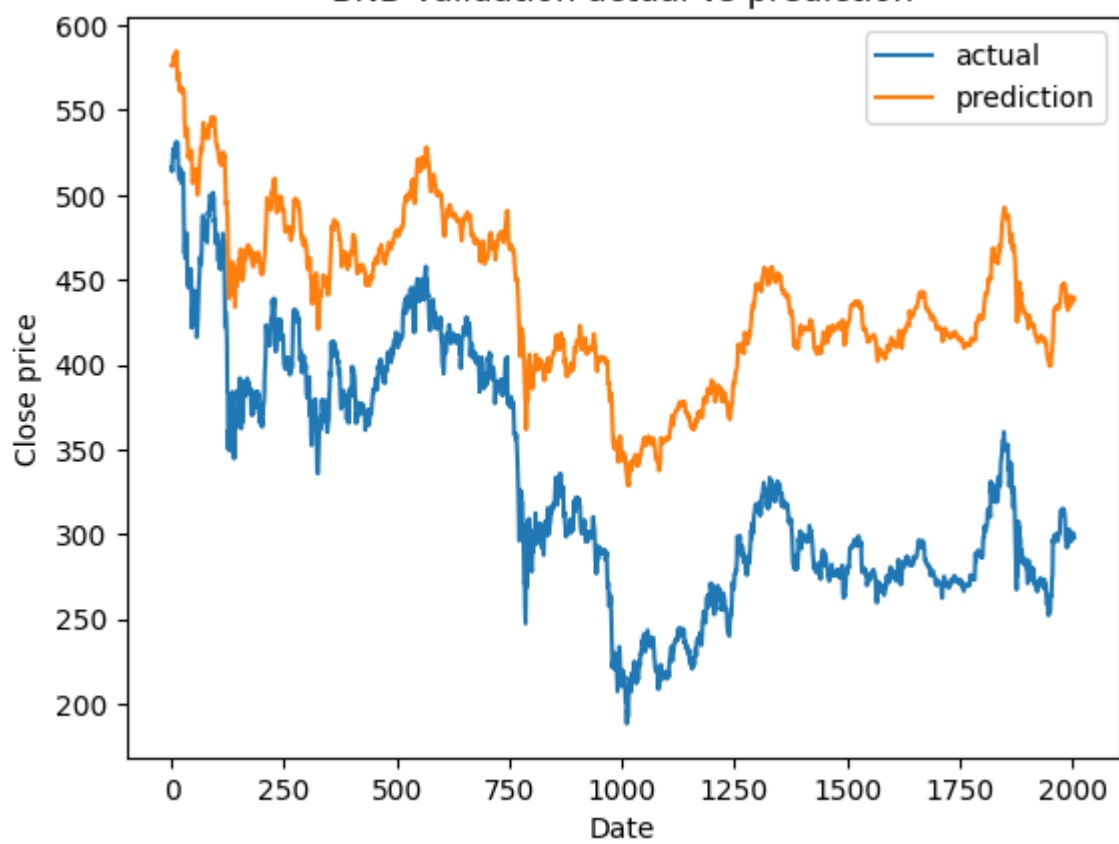
Epoch 16, Train || MSE: 2090.7081355, MAE: 23.7360717, R2: -217.5291422, RMSE: 28.8096198
Epoch 16, Evaluation || MSE: 10930.3666837, MAE: 100.8763299, R2: -950.5023799, RMSE: 101.0549516


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Epoch 17, Train || MSE: 1968.5025171, MAE: 22.8970525, R2: -214.4104977, RMSE: 28.0219900
Epoch 17, Evaluation || MSE: 10522.0894523, MAE: 99.7411223, R2: -889.8636875, RMSE: 99.9134555


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Epoch 18, Train || MSE: 1819.8652724, MAE: 22.4061045, R2: -206.3969473, RMSE: 27.2974225
Epoch 18, Evaluation || MSE: 10169.4782521, MAE: 97.7004702, R2: -859.4349755, RMSE: 97.8834119


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Epoch 19, Train || MSE: 2061.7027072, MAE: 23.2171902, R2: -213.9570908, RMSE: 28.8142669
Epoch 19, Evaluation || MSE: 9509.2770628, MAE: 95.0719292, R2: -792.3765472, RMSE: 95.2510904


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Epoch 20, Train || MSE: 1939.4515953, MAE: 22.4222175, R2: -192.2953586, RMSE: 27.6849236
Epoch 20, Evaluation || MSE: 11474.4315980, MAE: 105.8065587, R2: -895.6803013, RMSE: 105.9582866

BNB Validation actual vs prediction
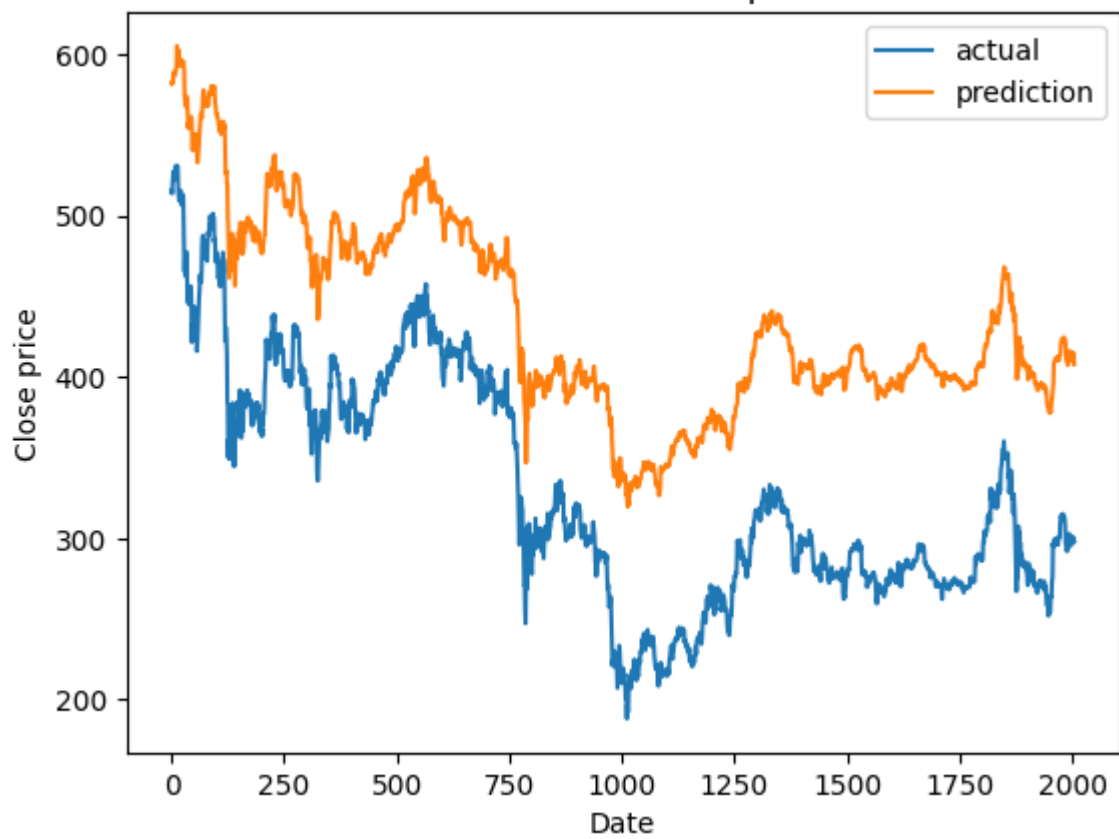
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Epoch 21, Train || MSE: 1889.7194262, MAE: 22.3360872, R2: -182.0165474, RMSE: 27.4548302
Epoch 21, Evaluation || MSE: 7384.9629032, MAE: 83.8880098, R2: -596.9138230, RMSE: 84.0925941


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Epoch 22, Train || MSE: 1953.3493689, MAE: 22.8304178, R2: -171.7837542, RMSE: 27.9563244
Epoch 22, Evaluation || MSE: 12560.4682695, MAE: 110.9846280, R2: -958.4276858, RMSE: 111.1307822


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Epoch 23, Train || MSE: 1679.3651493, MAE: 21.6965256, R2: -179.7810457, RMSE: 26.5714376
Epoch 23, Evaluation || MSE: 12011.2774561, MAE: 108.6178133, R2: -908.2314245, RMSE: 108.7657281


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Epoch 24, Train || MSE: 1660.6331488, MAE: 21.1290026, R2: -164.2948569, RMSE: 25.9261765
Epoch 24, Evaluation || MSE: 8363.5649957, MAE: 89.8896998, R2: -666.2972674, RMSE: 90.0729334


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Epoch 25, Train || MSE: 1760.7148853, MAE: 21.8303827, R2: -149.4698612, RMSE: 26.6766489
Epoch 25, Evaluation || MSE: 7666.3325757, MAE: 86.1888112, R2: -587.8644116, RMSE: 86.3768547

BNB Validation actual vs prediction
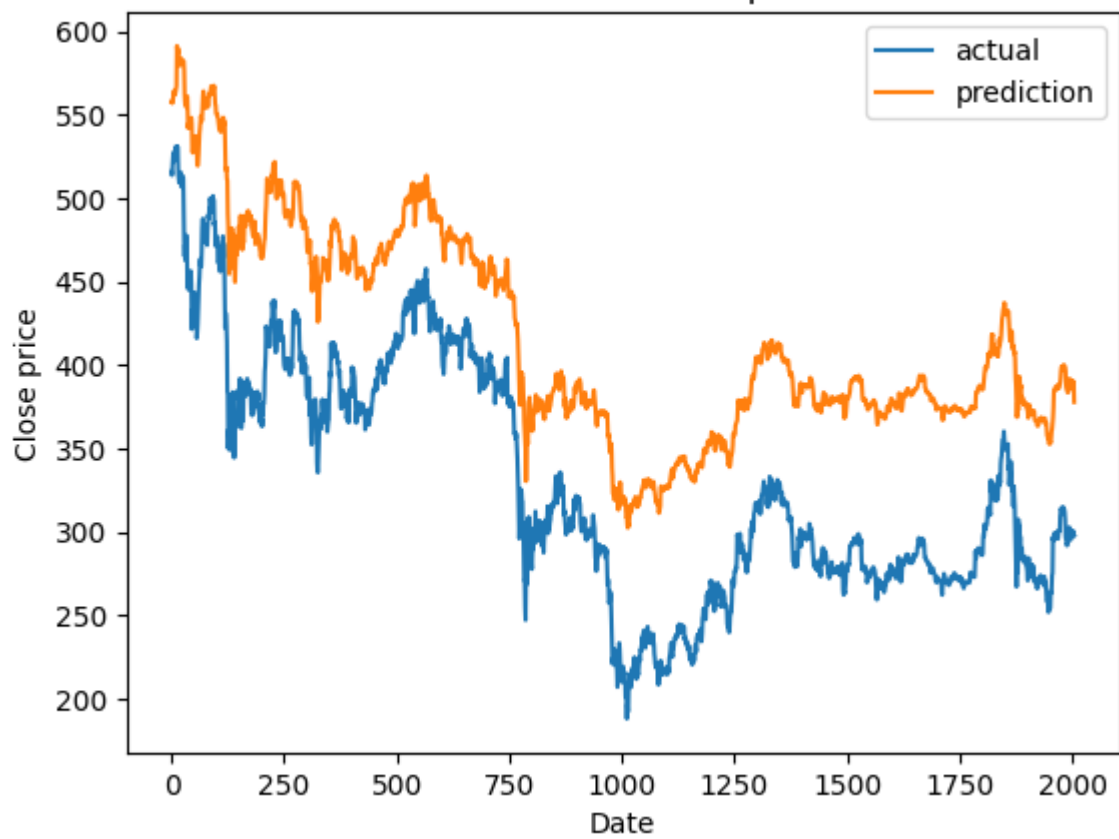
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Epoch 26, Train || MSE: 1728.0135286, MAE: 21.6873162, R2: -160.3057440, RMSE: 26.7481712
Epoch 26, Evaluation || MSE: 7434.8714629, MAE: 84.6967411, R2: -572.0145307, RMSE: 84.8923490


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Epoch 27, Train || MSE: 1776.8614993, MAE: 21.4441302, R2: -164.7030515, RMSE: 26.6139121
Epoch 27, Evaluation || MSE: 13069.1417139, MAE: 113.4744460, R2: -965.8741256, RMSE: 113.6160352


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Epoch 28, Train || MSE: 1728.1142465, MAE: 21.3057551, R2: -158.5463670, RMSE: 26.1194873
Epoch 28, Evaluation || MSE: 5878.0934284, MAE: 74.8129793, R2: -470.2905840, RMSE: 75.0417830


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Epoch 29, Train || MSE: 1771.3158701, MAE: 21.4071208, R2: -152.7467098, RMSE: 26.3854093
Epoch 29, Evaluation || MSE: 6475.3065844, MAE: 78.8078781, R2: -482.9045547, RMSE: 79.0156437


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Epoch 30, Train || MSE: 1759.0362848, MAE: 21.4212122, R2: -169.5014914, RMSE: 26.4900924
Epoch 30, Evaluation || MSE: 6508.1858385, MAE: 78.7443428, R2: -486.0656708, RMSE: 78.9556166

BNB Validation actual vs prediction
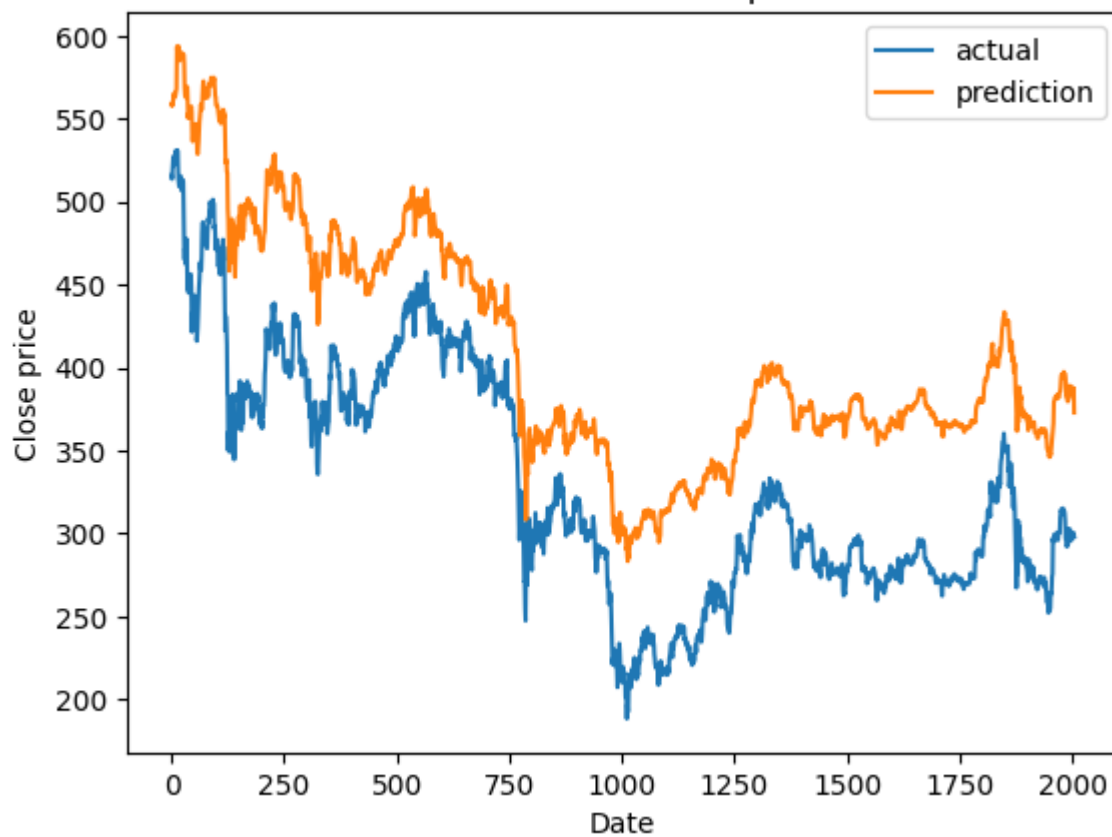
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Epoch 31, Train || MSE: 1604.8328764, MAE: 20.6747372, R2: -142.0566179, RMSE: 25.2284393
Epoch 31, Evaluation || MSE: 6256.8861113, MAE: 77.2846646, R2: -457.9046351, RMSE: 77.5002347


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Epoch 32, Train || MSE: 1763.1851636, MAE: 21.6448092, R2: -148.1504716, RMSE: 26.5180371
Epoch 32, Evaluation || MSE: 10412.0830466, MAE: 100.3948412, R2: -701.8310737, RMSE: 100.5548776


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Epoch 33, Train || MSE: 1671.7159893, MAE: 21.0928117, R2: -150.2615829, RMSE: 25.9668362
Epoch 33, Evaluation || MSE: 7022.0057373, MAE: 81.8001685, R2: -500.2856864, RMSE: 82.0100187


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Epoch 34, Train || MSE: 1709.4576489, MAE: 20.8694232, R2: -140.4290258, RMSE: 25.9234009
Epoch 34, Evaluation || MSE: 7820.6975776, MAE: 86.7419349, R2: -574.4698528, RMSE: 86.9366834


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Epoch 35, Train || MSE: 1754.8371183, MAE: 21.2760253, R2: -135.7435892, RMSE: 26.2148308
Epoch 35, Evaluation || MSE: 5492.0783837, MAE: 71.9459045, R2: -403.2427045, RMSE: 72.1861483

BNB Validation actual vs prediction
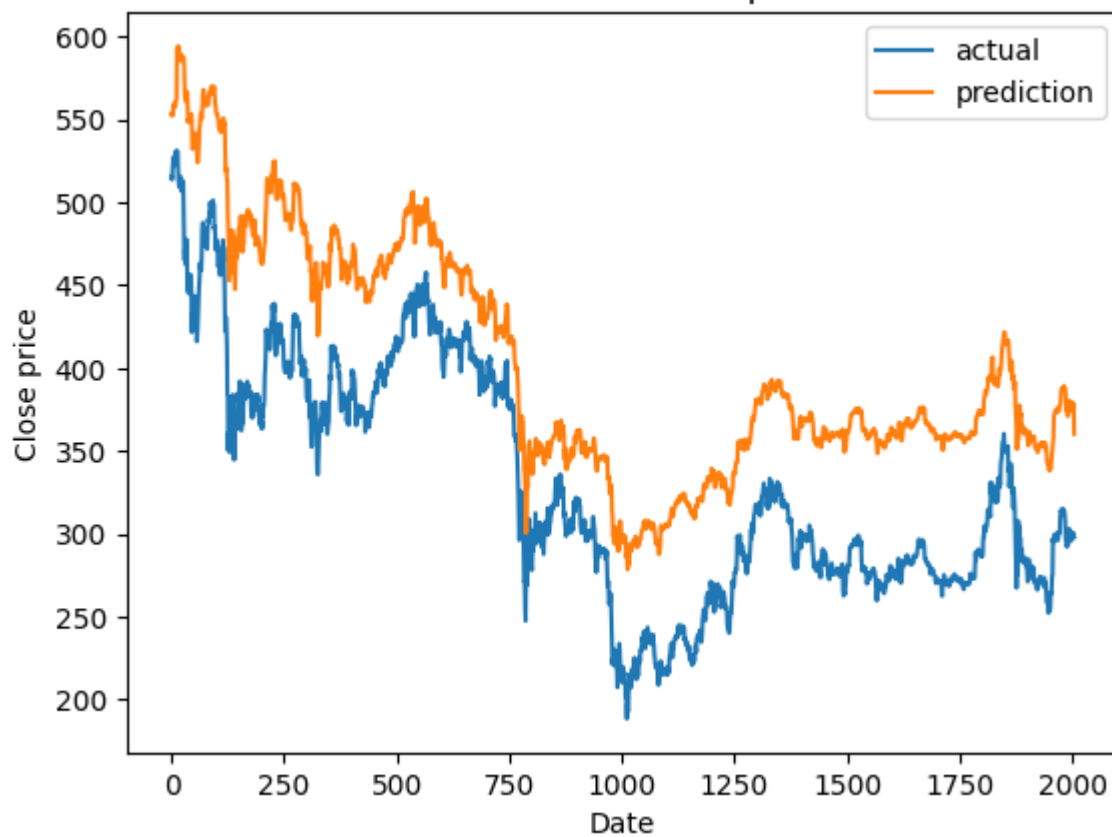
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Epoch 36, Train || MSE: 1839.7645342, MAE: 21.8140511, R2: -138.3539338, RMSE: 26.7225844
Epoch 36, Evaluation || MSE: 10127.2774290, MAE: 98.2821763, R2: -685.7230025, RMSE: 98.4567126


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Epoch 37, Train || MSE: 1878.2310170, MAE: 22.0449745, R2: -140.9305622, RMSE: 27.2302259
Epoch 37, Evaluation || MSE: 8001.2485758, MAE: 87.7537733, R2: -587.7131507, RMSE: 87.9523333


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Epoch 38, Train || MSE: 1759.2949273, MAE: 21.7263233, R2: -138.6652845, RMSE: 26.4764080
Epoch 38, Evaluation || MSE: 12666.9105477, MAE: 110.7101473, R2: -854.7465233, RMSE: 110.8637200


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Epoch 39, Train || MSE: 1778.4764804, MAE: 22.0062222, R2: -155.8747086, RMSE: 26.8736278
Epoch 39, Evaluation || MSE: 7113.1030467, MAE: 81.8838899, R2: -461.4973895, RMSE: 82.1004000


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Epoch 40, Train || MSE: 1817.2221607, MAE: 21.3787413, R2: -128.5042042, RMSE: 26.3715860
Epoch 40, Evaluation || MSE: 12917.7471401, MAE: 110.6784849, R2: -795.8523267, RMSE: 110.8407566

BNB Validation actual vs prediction
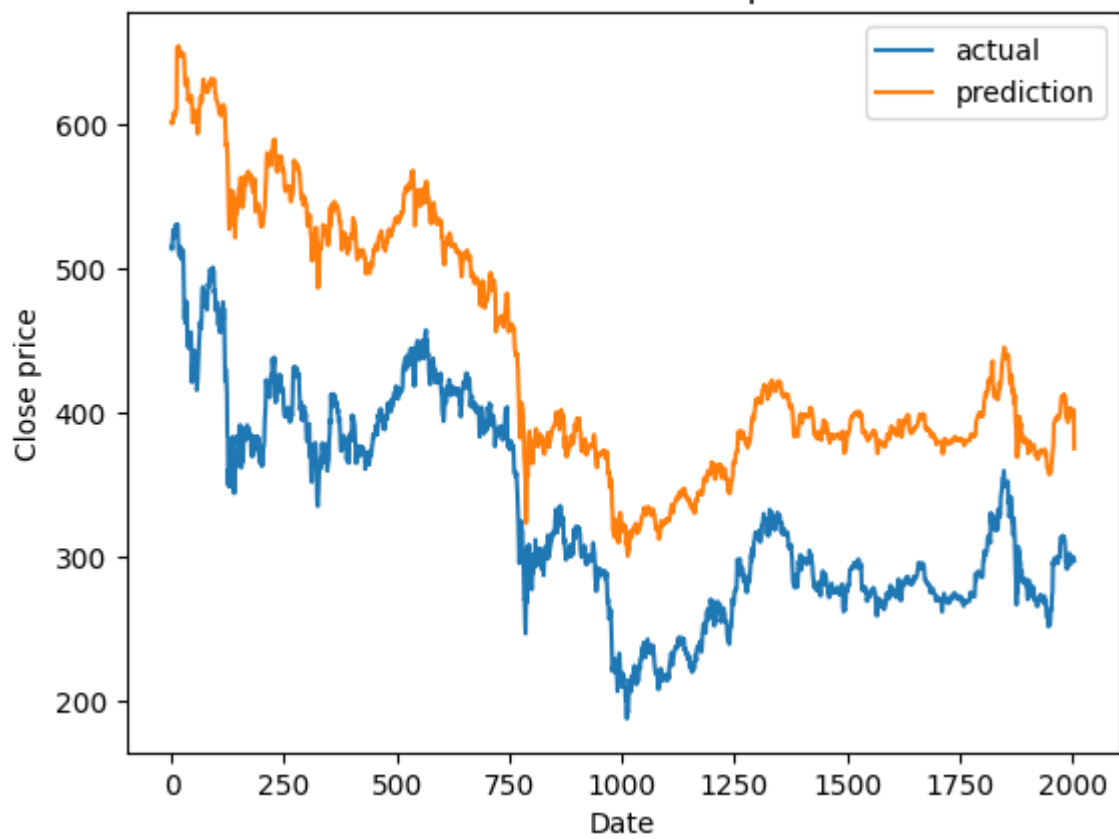
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Epoch 41, Train || MSE: 1627.6113245, MAE: 20.5546492, R2: -125.6917485, RMSE: 25.4752471
Epoch 41, Evaluation || MSE: 8745.0963425, MAE: 87.6332501, R2: -478.5490888, RMSE: 87.8499364


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Epoch 42, Train || MSE: 1652.5181932, MAE: 20.5621482, R2: -124.4686279, RMSE: 25.5017256
Epoch 42, Evaluation || MSE: 11641.4759386, MAE: 102.9213655, R2: -615.4879675, RMSE: 103.0857202


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Epoch 43, Train || MSE: 1549.0476367, MAE: 19.8680309, R2: -127.8972065, RMSE: 24.5898824
Epoch 43, Evaluation || MSE: 13164.6560136, MAE: 109.1519795, R2: -694.6194599, RMSE: 109.3153769


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Epoch 44, Train || MSE: 1604.2004596, MAE: 20.5800238, R2: -115.8417177, RMSE: 25.1534076
Epoch 44, Evaluation || MSE: 11191.8605163, MAE: 99.3941045, R2: -585.4902861, RMSE: 99.5825962


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Epoch 45, Train || MSE: 1720.3591615, MAE: 20.8299982, R2: -120.9637499, RMSE: 25.7392703
Epoch 45, Evaluation || MSE: 8657.3290996, MAE: 84.5842271, R2: -407.1141512, RMSE: 84.8039306

BNB Validation actual vs prediction
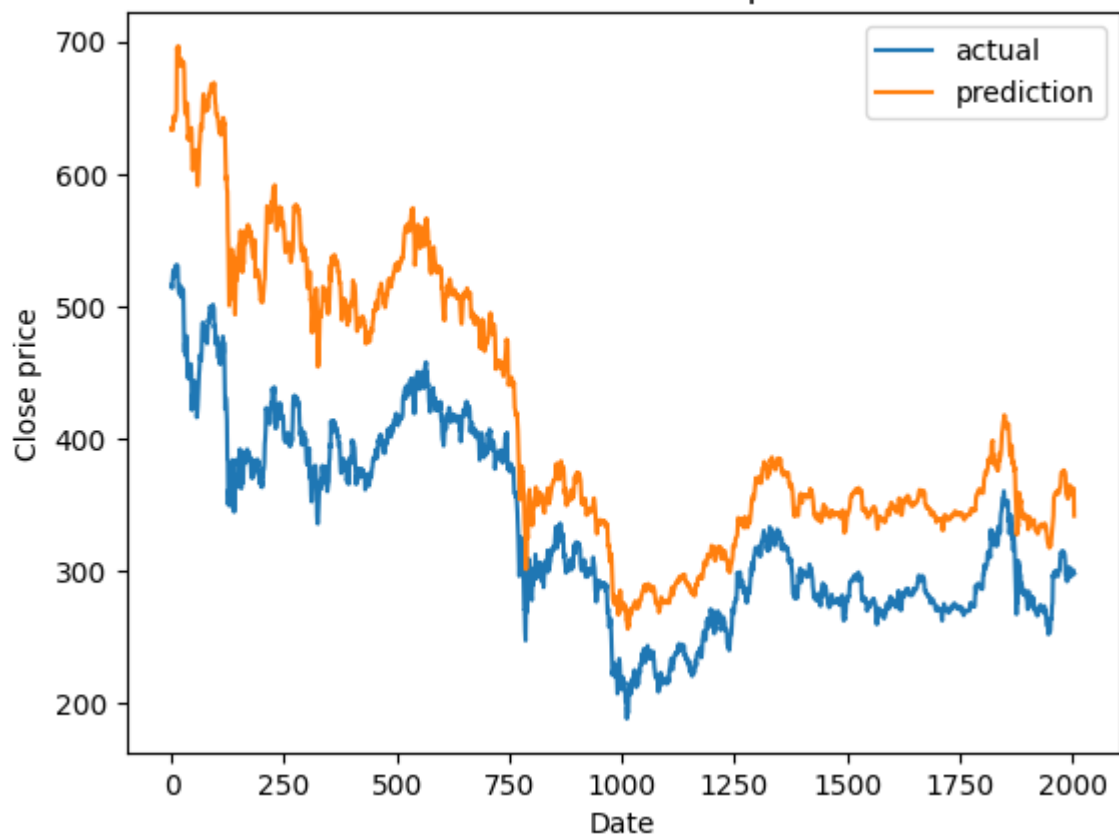
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Epoch 46, Train || MSE: 1705.4853352, MAE: 20.8852495, R2: -119.9034515, RMSE: 25.8094223
Epoch 46, Evaluation || MSE: 12783.8398438, MAE: 107.4117694, R2: -677.1771576, RMSE: 107.5765421


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Epoch 47, Train || MSE: 1661.9994692, MAE: 20.2816471, R2: -122.5045511, RMSE: 25.2663097
Epoch 47, Evaluation || MSE: 8450.9960841, MAE: 85.3323158, R2: -429.5003256, RMSE: 85.5453876


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Epoch 48, Train || MSE: 1627.7343927, MAE: 20.3387241, R2: -126.4538236, RMSE: 25.2339910
Epoch 48, Evaluation || MSE: 7649.2281872, MAE: 82.9914835, R2: -424.4056863, RMSE: 83.1979803


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Epoch 49, Train || MSE: 1696.5966285, MAE: 21.0709988, R2: -121.9464073, RMSE: 25.8245288
Epoch 49, Evaluation || MSE: 6399.8668077, MAE: 75.2554876, R2: -345.9156216, RMSE: 75.4747854


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Epoch 50, Train || MSE: 1603.4392564, MAE: 20.1948732, R2: -117.0208729, RMSE: 24.9957736
Epoch 50, Evaluation || MSE: 6817.2375052, MAE: 78.6793704, R2: -381.9680015, RMSE: 78.8901868

BNB Validation actual vs prediction
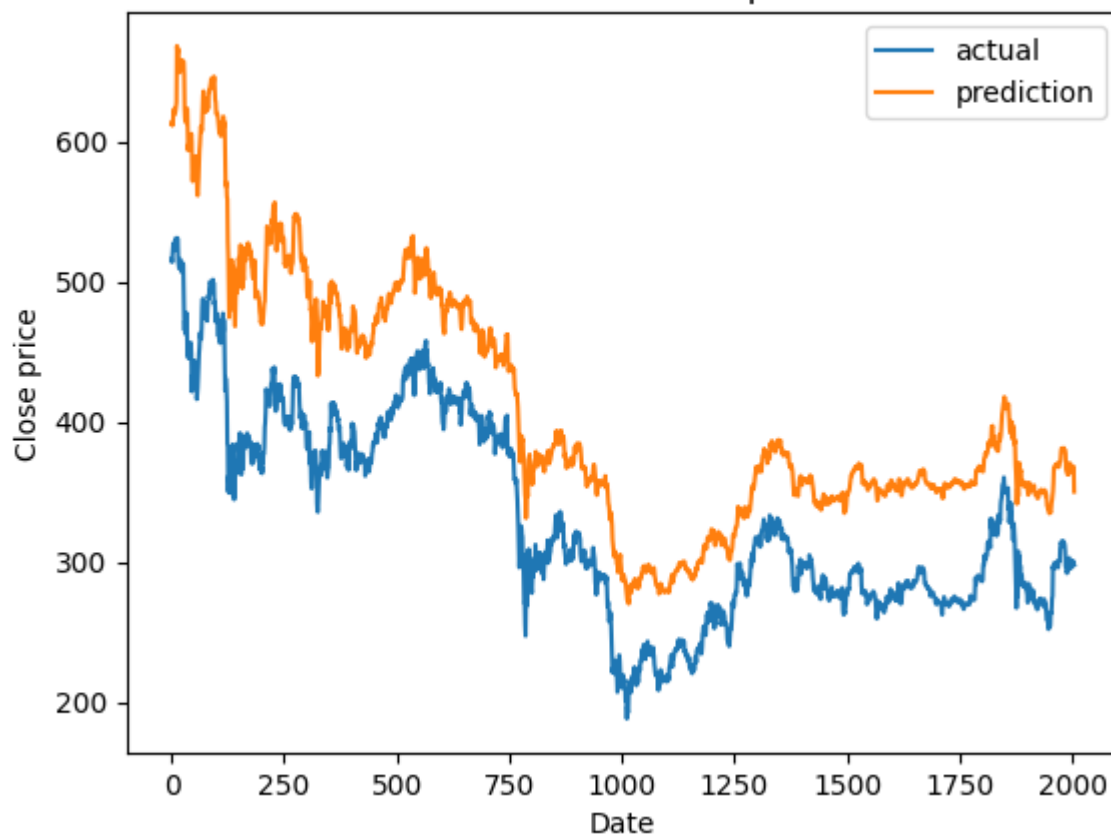
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Epoch 1, Train || MSE: 1006034467.0595238, MAE: 25147.5170448, R2: -8646.4166232, RMSE: 25156.8872782
Epoch 1, Evaluation || MSE: 873004299.8095238, MAE: 27790.1681625, R2: -9096.1684472, RMSE: 27797.2378007


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Epoch 2, Train || MSE: 798644669.2994791, MAE: 20555.4025136, R2: -3155.6595587, RMSE: 20659.9893970
Epoch 2, Evaluation || MSE: 478187862.6984127, MAE: 19434.1159900, R2: -3775.1665840, RMSE: 19446.3204171


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Epoch 3, Train || MSE: 421140351.7172619, MAE: 13732.6599543, R2: -996.7272470, RMSE: 14068.3864034
Epoch 3, Evaluation || MSE: 114522509.8561508, MAE: 9080.4166938, R2: -1441.6358504, RMSE: 9107.5697981


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Epoch 4, Train || MSE: 149873115.4077381, MAE: 7831.6611234, R2: -753.1604292, RMSE: 8587.0140606
Epoch 4, Evaluation || MSE: 214341858.0657242, MAE: 12132.3677145, R2: -8096.6991237, RMSE: 12183.2636961


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Epoch 5, Train || MSE: 92329655.3258929, MAE: 6604.4373031, R2: -936.8508560, RMSE: 7580.3408465
Epoch 5, Evaluation || MSE: 341011308.2929068, MAE: 15683.1266354, R2: -12270.5286247, RMSE: 15722.2504590

BTC Validation actual vs prediction
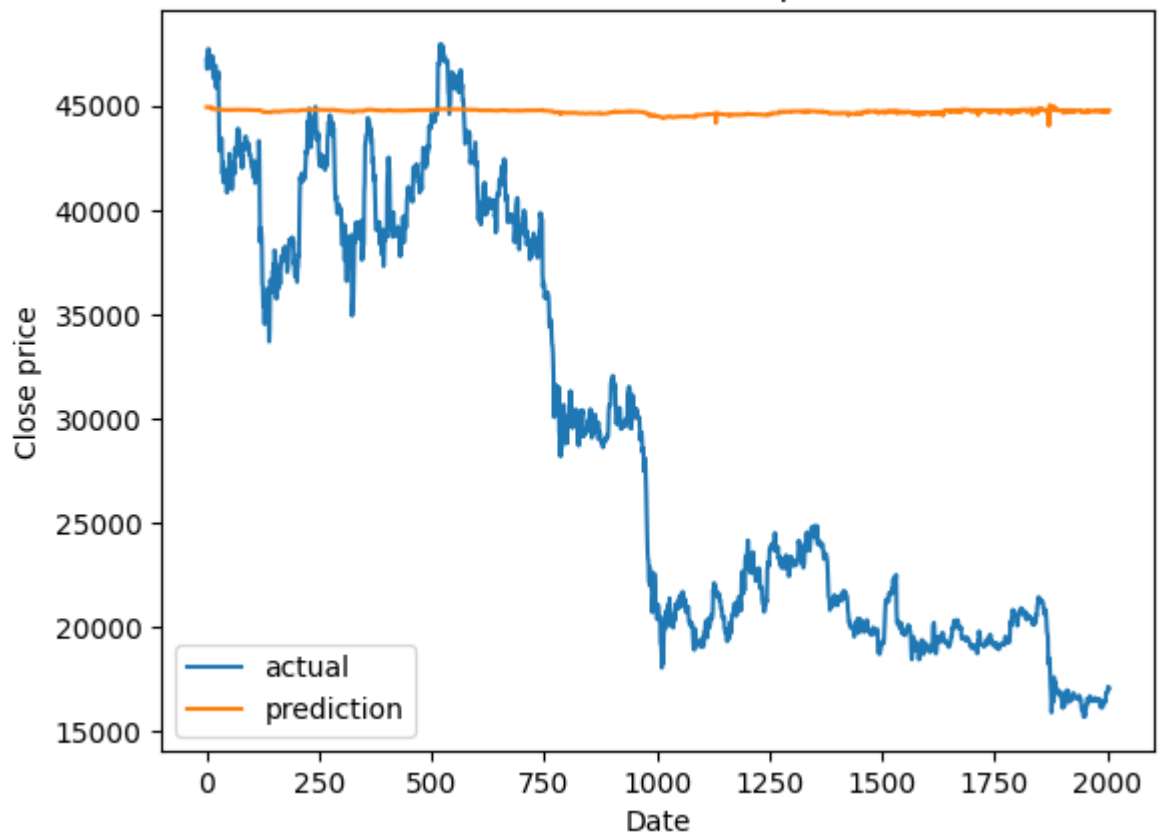
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Epoch 6, Train || MSE: 82098088.4082961, MAE: 6045.4391465, R2: -633.2057393, RMSE: 7072.7032554
Epoch 6, Evaluation || MSE: 254928652.1533978, MAE: 13641.5775883, R2: -7214.8894602, RMSE: 13983.0167086


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Epoch 7, Train || MSE: 70846687.7788318, MAE: 5424.2264838, R2: -474.2937840, RMSE: 6479.0541006
Epoch 7, Evaluation || MSE: 254765692.5396825, MAE: 14382.3546685, R2: -6438.9040945, RMSE: 14562.5847846


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Epoch 8, Train || MSE: 226283352.5016741, MAE: 9000.0755561, R2: -730.6270060, RMSE: 9851.7477517
Epoch 8, Evaluation || MSE: 49589458.4409722, MAE: 6097.1645333, R2: -2562.9357825, RMSE: 6242.3208395


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Epoch 9, Train || MSE: 60958824.0273438, MAE: 4874.6759740, R2: -416.2158237, RMSE: 5867.6245477
Epoch 9, Evaluation || MSE: 228804583.2301587, MAE: 14061.0198897, R2: -8621.9274743, RMSE: 14196.7716064


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Epoch 10, Train || MSE: 48242620.7336310, MAE: 4420.2627781, R2: -423.3016510, RMSE: 5473.1669439
Epoch 10, Evaluation || MSE: 101665474.9365079, MAE: 9412.3845137, R2: -3743.4449875, RMSE: 9485.2327794

BTC Validation actual vs prediction
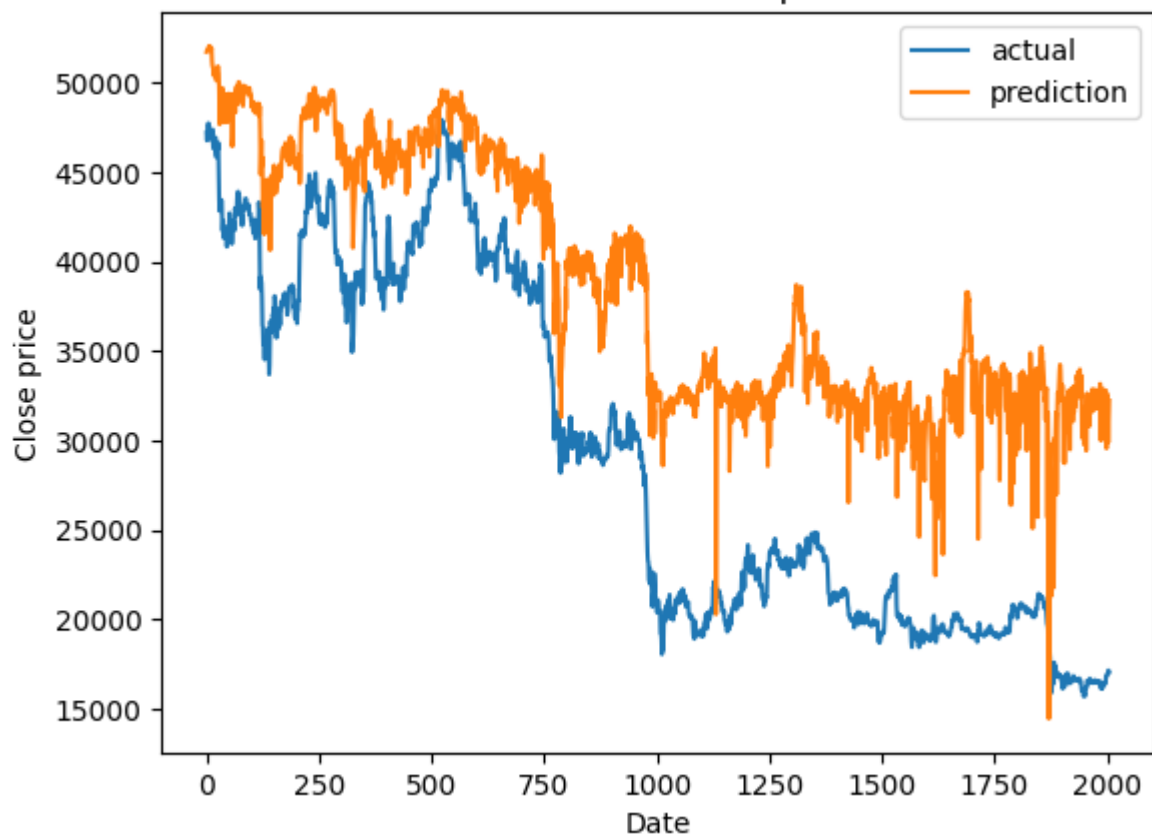
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Epoch 11, Evaluation || MSE: 116953391.2103175, MAE: 9878.1565755, R2: -4781.8796329, RMSE: 9976.6871735


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Epoch 12, Train || MSE: 46606317.3048735, MAE: 4356.1536331, R2: -404.4109638, RMSE: 5353.2665360
Epoch 12, Evaluation || MSE: 84592364.4978919, MAE: 7954.9278778, R2: -3636.8265878, RMSE: 8051.2030029


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Epoch 13, Train || MSE: 42521857.3350074, MAE: 4222.4451174, R2: -377.4047787, RMSE: 5186.9237842
Epoch 13, Evaluation || MSE: 70901463.2388393, MAE: 6981.3185880, R2: -3238.1272998, RMSE: 7084.3091479


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Epoch 14, Train || MSE: 41177028.6203497, MAE: 4138.2964516, R2: -391.9933201, RMSE: 5087.8572251
Epoch 14, Evaluation || MSE: 55748837.5152530, MAE: 6451.4875159, R2: -2632.6341276, RMSE: 6556.3631216


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Epoch 15, Train || MSE: 40638237.1903832, MAE: 4132.0058534, R2: -393.3706944, RMSE: 5080.5974012
Epoch 15, Evaluation || MSE: 63774257.1686508, MAE: 7249.2290310, R2: -2710.3435995, RMSE: 7323.3036005

BTC Validation actual vs prediction
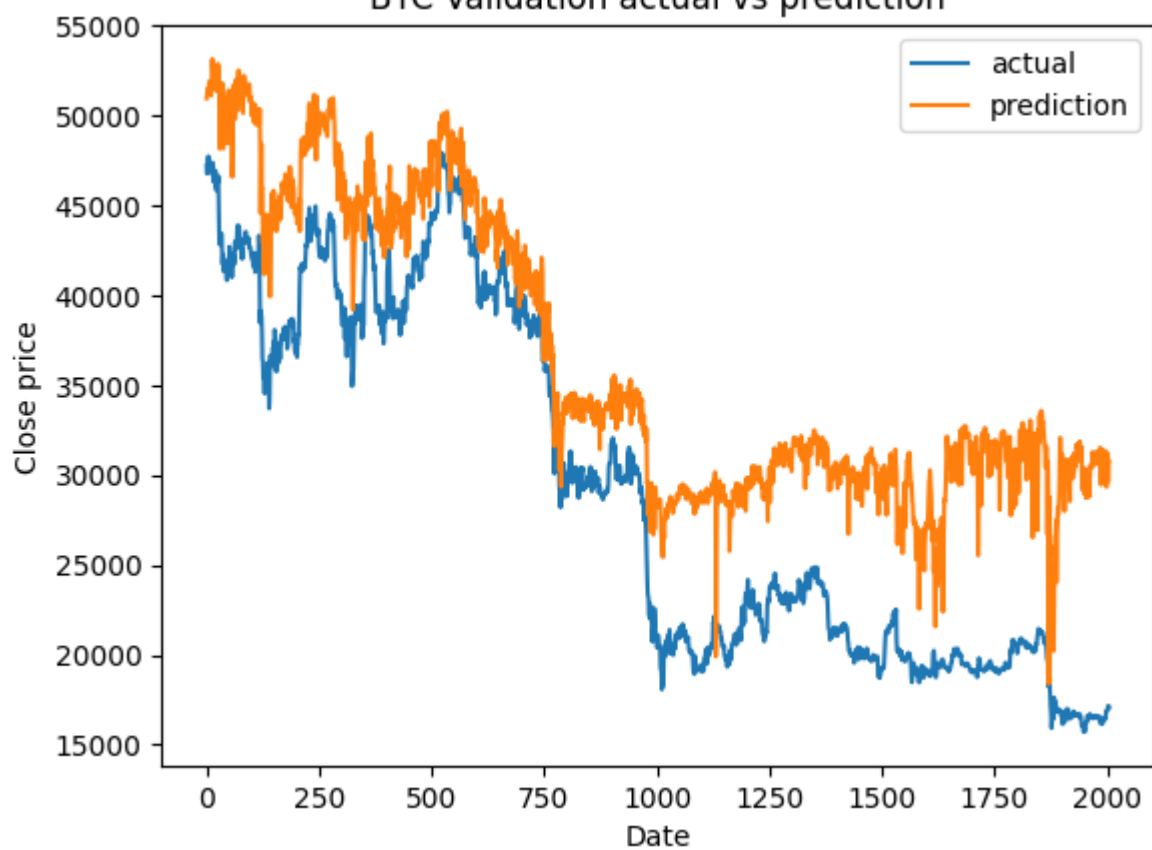
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Epoch 16, Train || MSE: 38055671.5349702, MAE: 3925.4611373, R2: -376.1432774, RMSE: 4885.4832775
Epoch 16, Evaluation || MSE: 56402828.0793651, MAE: 6765.4317075, R2: -2351.6522969, RMSE: 6818.5902642


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Epoch 17, Train || MSE: 37208691.1540179, MAE: 3915.5525513, R2: -381.9540548, RMSE: 4868.9652688
Epoch 17, Evaluation || MSE: 59468958.7361111, MAE: 7143.2959963, R2: -2033.1463123, RMSE: 7180.8651423


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Epoch 18, Train || MSE: 38231614.0273438, MAE: 3931.0616448, R2: -352.0394941, RMSE: 4886.5061464
Epoch 18, Evaluation || MSE: 70830619.2023810, MAE: 7929.3863990, R2: -2081.3618941, RMSE: 7956.5433873


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Epoch 19, Train || MSE: 36876059.4452195, MAE: 3928.1020263, R2: -412.4575392, RMSE: 4877.7726795
Epoch 19, Evaluation || MSE: 67196999.7857143, MAE: 7729.9756693, R2: -1947.6310417, RMSE: 7766.8965638


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Epoch 20, Train || MSE: 37988284.4319196, MAE: 3930.5081682, R2: -359.7458984, RMSE: 4873.9830079
Epoch 20, Evaluation || MSE: 62138844.3571429, MAE: 7509.3951455, R2: -1855.4618499, RMSE: 7550.7015962

BTC Validation actual vs prediction
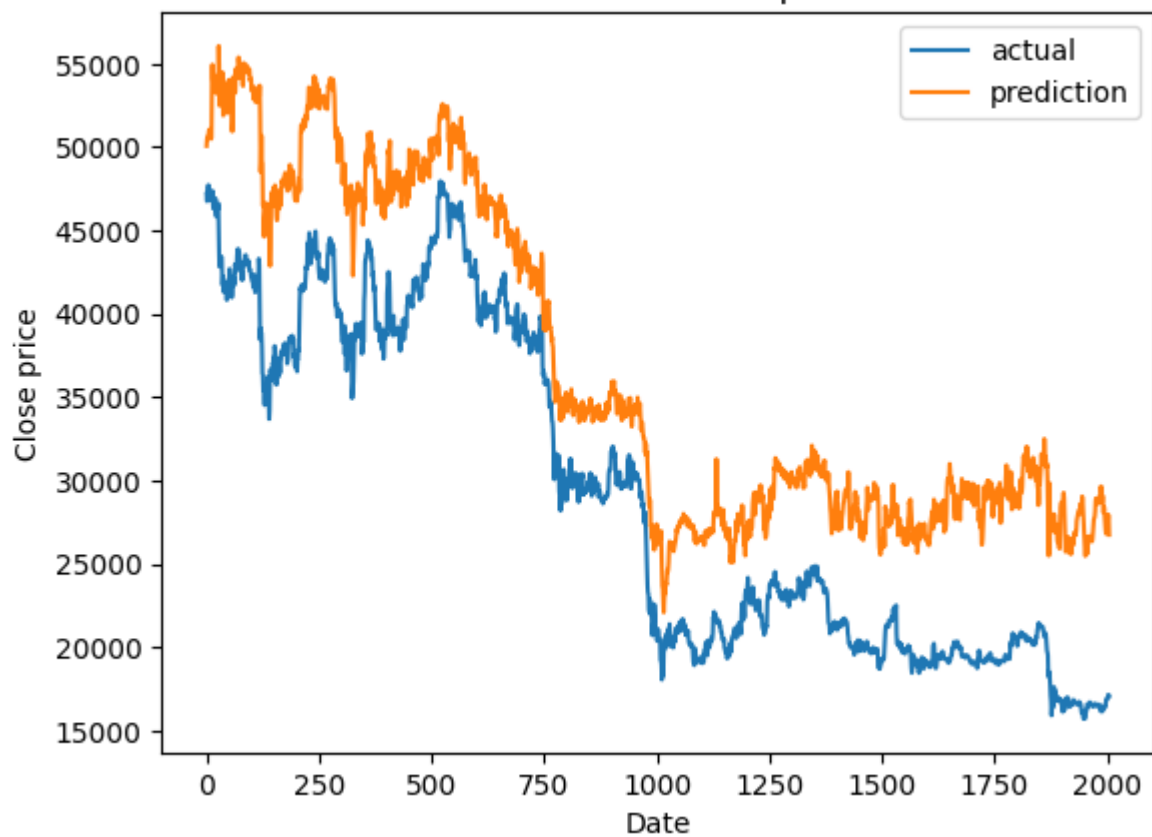
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Epoch 21, Train || MSE: 38372439.3119420, MAE: 3912.1579286, R2: -348.8436377, RMSE: 4873.5100468
Epoch 21, Evaluation || MSE: 83622987.7301587, MAE: 8836.9363684, R2: -2027.2959977, RMSE: 8864.9357988


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Epoch 22, Train || MSE: 37956390.7579985, MAE: 3890.4098738, R2: -305.0942902, RMSE: 4824.3981732
Epoch 22, Evaluation || MSE: 45521980.4027778, MAE: 6183.0250719, R2: -1157.7652414, RMSE: 6231.5495092


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Epoch 23, Train || MSE: 38744222.8296131, MAE: 3938.0041404, R2: -366.2850823, RMSE: 4907.8774910
Epoch 23, Evaluation || MSE: 56318807.3492064, MAE: 7099.5843525, R2: -1785.3454033, RMSE: 7141.7501259


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Epoch 24, Train || MSE: 38189768.3517485, MAE: 3888.8711197, R2: -360.4765478, RMSE: 4846.8102312
Epoch 24, Evaluation || MSE: 76022145.9841270, MAE: 8425.3200412, R2: -2054.5220523, RMSE: 8464.5607949


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Epoch 25, Train || MSE: 35581059.7414435, MAE: 3813.3580126, R2: -330.5976715, RMSE: 4739.1788841
Epoch 25, Evaluation || MSE: 37636312.6468254, MAE: 5850.6398538, R2: -1090.7926054, RMSE: 5909.7452528

BTC Validation actual vs prediction
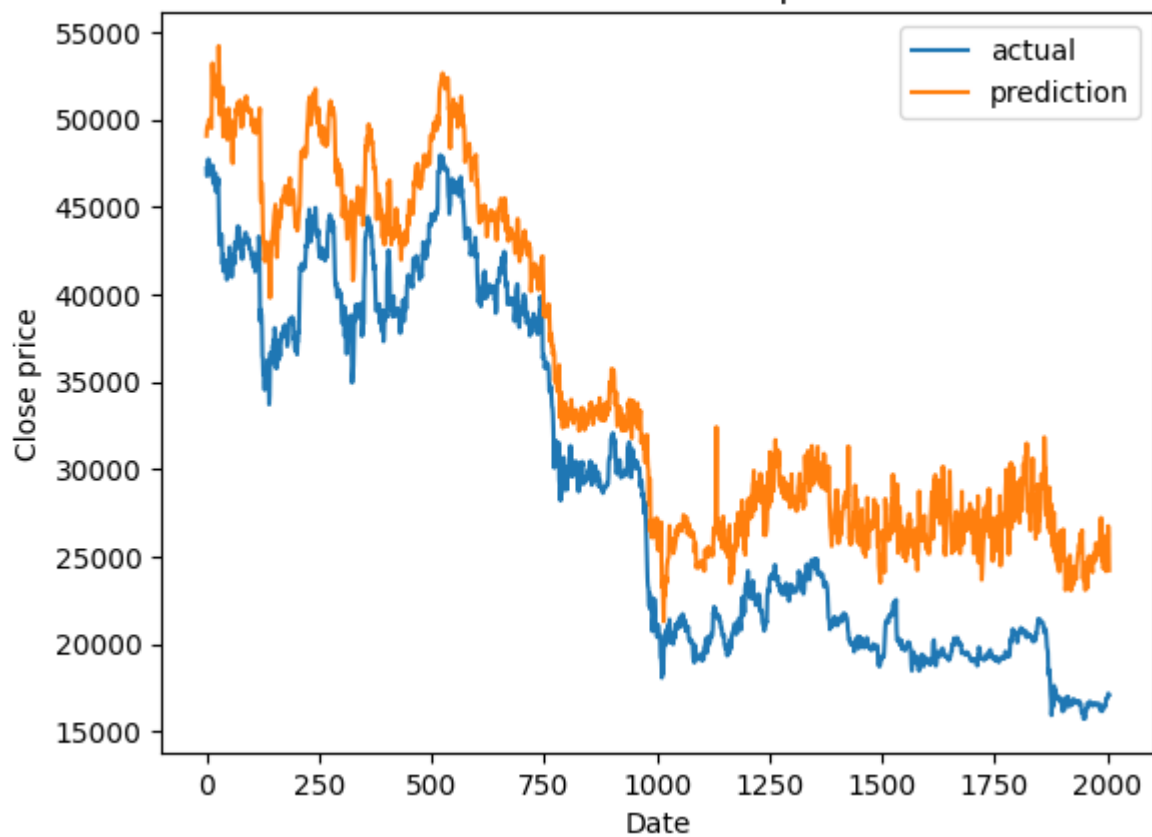
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Epoch 26, Train || MSE: 36692429.6646205, MAE: 3838.3738309, R2: -365.4598326, RMSE: 4768.3751838
Epoch 26, Evaluation || MSE: 38722933.5669643, MAE: 5651.7288266, R2: -1014.5428565, RMSE: 5720.0222090


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Epoch 27, Train || MSE: 35224084.4425223, MAE: 3761.2169665, R2: -347.2496784, RMSE: 4698.7157293
Epoch 27, Evaluation || MSE: 46214299.7242064, MAE: 6367.5090477, R2: -1445.6786779, RMSE: 6425.7871733


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Epoch 28, Train || MSE: 38824585.8182664, MAE: 3950.5824787, R2: -325.9109321, RMSE: 4899.3347955
Epoch 28, Evaluation || MSE: 41760995.6289683, MAE: 6082.9858272, R2: -1240.7808600, RMSE: 6138.8815366


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Epoch 29, Train || MSE: 38609894.8773251, MAE: 3907.9333254, R2: -328.3056813, RMSE: 4852.3007240
Epoch 29, Evaluation || MSE: 44816647.0317460, MAE: 6333.2030223, R2: -1474.1190527, RMSE: 6382.4339852


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Epoch 30, Train || MSE: 36278624.5513393, MAE: 3752.6811647, R2: -322.8027154, RMSE: 4721.3462147
Epoch 30, Evaluation || MSE: 48479568.9285714, MAE: 6722.4090828, R2: -1367.3840388, RMSE: 6765.1396930

BTC Validation actual vs prediction
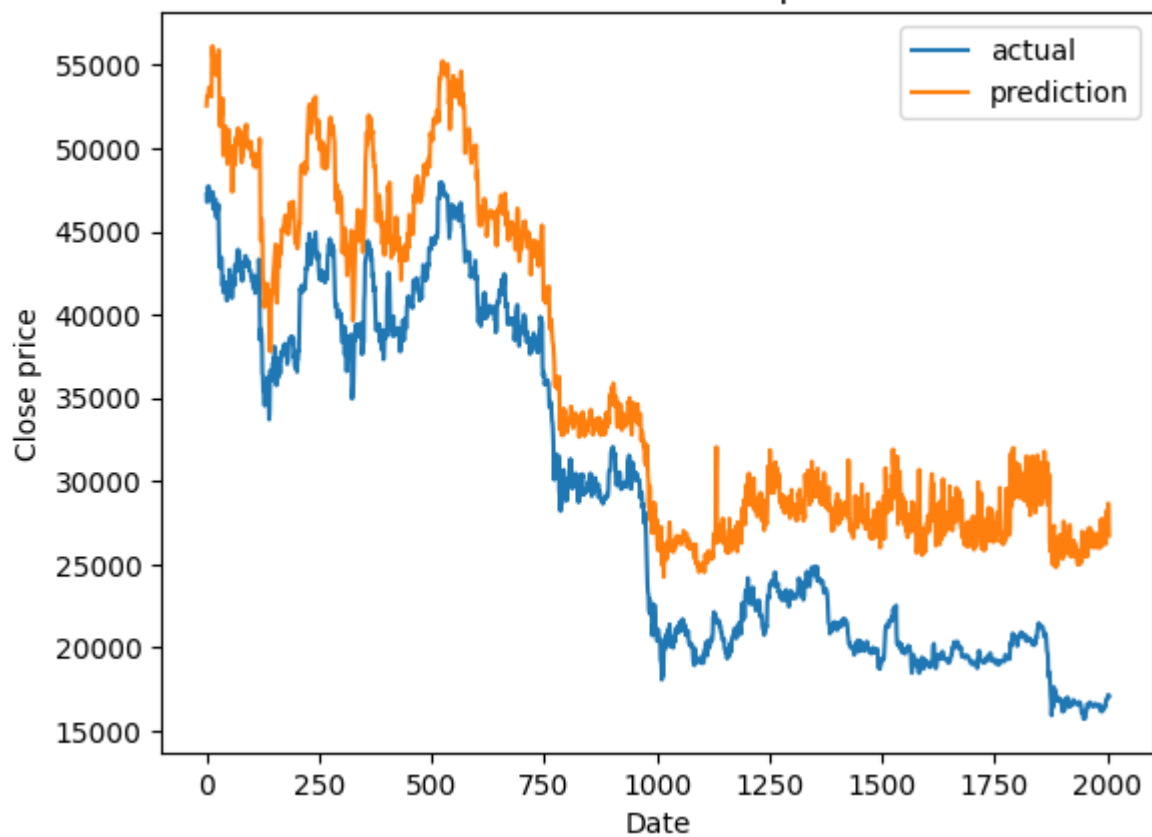
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Epoch 31, Train || MSE: 34876609.2909226, MAE: 3761.5954412, R2: -348.8941830, RMSE: 4686.1859220
Epoch 31, Evaluation || MSE: 42801713.8253968, MAE: 6110.5164020, R2: -1492.0596439, RMSE: 6152.4646209


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Epoch 32, Train || MSE: 36203877.2366071, MAE: 3797.0378211, R2: -326.7426697, RMSE: 4734.2276719
Epoch 32, Evaluation || MSE: 66961877.4444444, MAE: 7619.5131293, R2: -2253.8933127, RMSE: 7653.0219475


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Epoch 33, Train || MSE: 38900608.4925595, MAE: 3898.5888585, R2: -326.4350729, RMSE: 4882.0297668
Epoch 33, Evaluation || MSE: 35591404.5952381, MAE: 5530.1500380, R2: -1241.4349919, RMSE: 5577.2279615


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Epoch 34, Train || MSE: 37747144.2894345, MAE: 3829.5832400, R2: -330.7127975, RMSE: 4839.6817638
Epoch 34, Evaluation || MSE: 57097198.9920635, MAE: 7163.3011048, R2: -1914.2970297, RMSE: 7197.3659435


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Epoch 35, Train || MSE: 32483556.7704613, MAE: 3696.5443749, R2: -327.2087582, RMSE: 4562.2016883
Epoch 35, Evaluation || MSE: 43233031.0119048, MAE: 6197.0750422, R2: -1459.4517115, RMSE: 6236.1824835

BTC Validation actual vs prediction
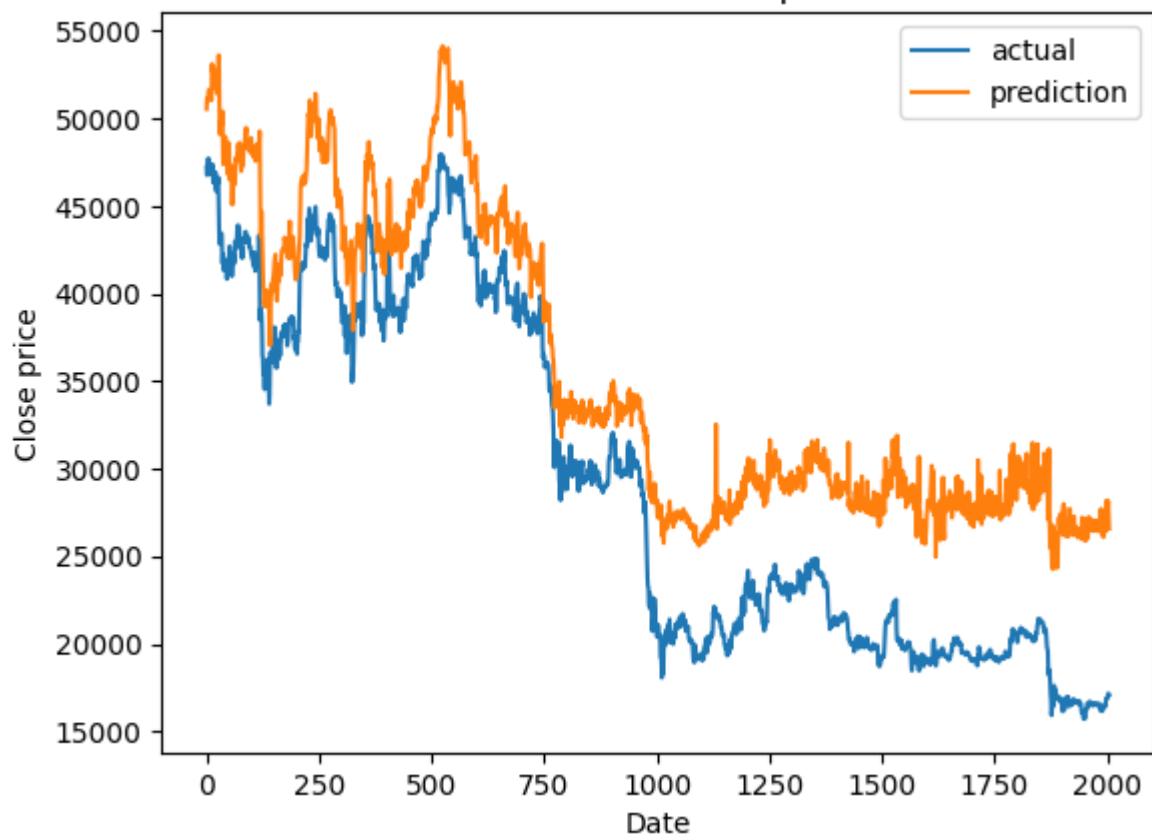
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Epoch 36, Train || MSE: 37241976.0957961, MAE: 3861.3407420, R2: -341.2322984, RMS
E: 4820.5831758
Epoch 36, Evaluation || MSE: 28044647.4739273, MAE: 4132.5703939, R2: -1118.811124
3, RMSE: 4213.3370564


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Epoch 37, Train || MSE: 39046075.4815848, MAE: 3933.7109609, R2: -359.5387943, RMS
E: 4910.5840776
Epoch 37, Evaluation || MSE: 55272472.7182540, MAE: 6540.5217789, R2: -2094.245272
2, RMSE: 6582.8517756


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Epoch 38, Train || MSE: 36303559.0753348, MAE: 3810.0021609, R2: -351.3634485, RMS
E: 4737.6263215
Epoch 38, Evaluation || MSE: 36158686.5634921, MAE: 5693.6649344, R2: -1208.119604
8, RMSE: 5737.7693724


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Epoch 39, Train || MSE: 35711827.3443080, MAE: 3819.2733897, R2: -315.2624127, RMS
E: 4709.7765192
Epoch 39, Evaluation || MSE: 26276522.3872148, MAE: 3860.1123560, R2: -1095.134659
5, RMSE: 3949.3960411


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Epoch 40, Train || MSE: 36426993.6954985, MAE: 3817.1835899, R2: -352.5010356, RMS
E: 4727.1979875
Epoch 40, Evaluation || MSE: 25984427.9749504, MAE: 3949.9381772, R2: -1108.016620
1, RMSE: 4030.8532327

BTC Validation actual vs prediction
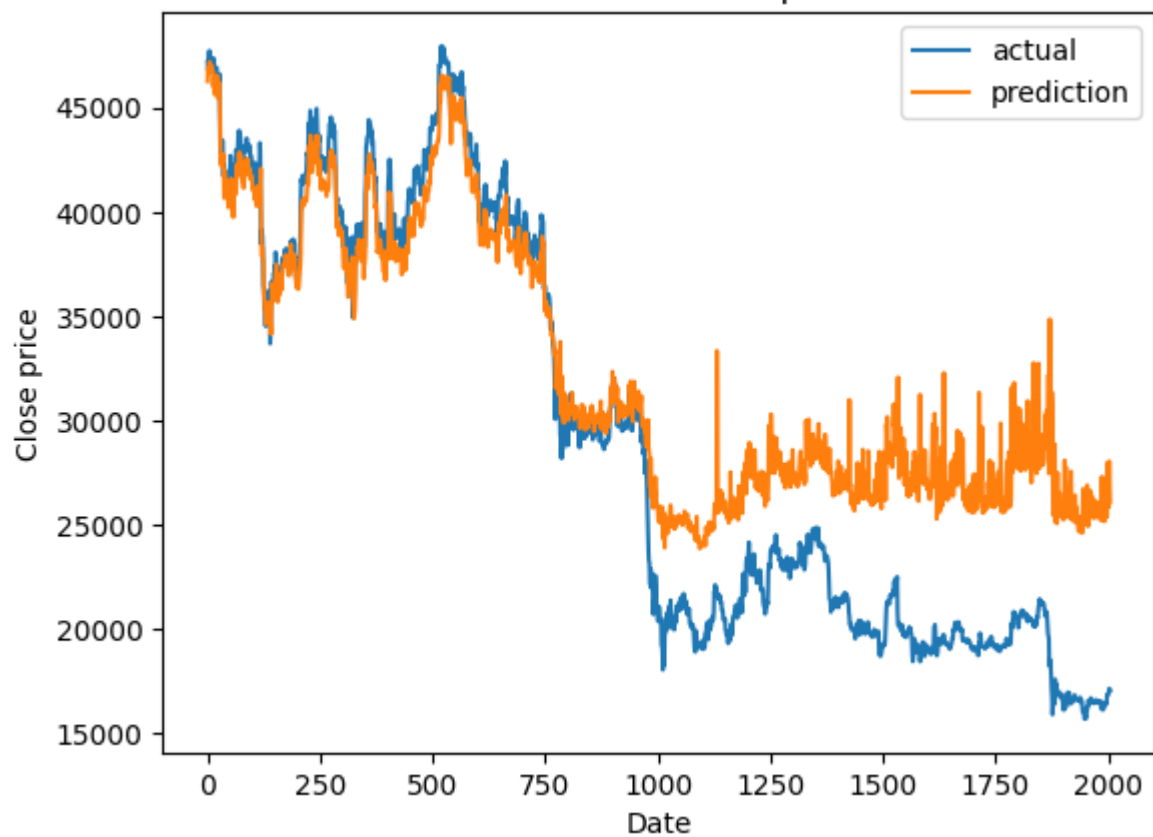
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Epoch 41, Train || MSE: 36332750.9421503, MAE: 3822.8616983, R2: -322.8853231, RMSE: 4744.4310390
Epoch 41, Evaluation || MSE: 28603433.6495536, MAE: 4087.1935958, R2: -1213.1865705, RMSE: 4171.2380671


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Epoch 42, Train || MSE: 36019653.8203125, MAE: 3748.6169490, R2: -316.2780035, RMSE: 4685.0924354
Epoch 42, Evaluation || MSE: 57762359.2440476, MAE: 6728.0785280, R2: -2120.4415973, RMSE: 6765.0552591


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Epoch 43, Train || MSE: 35228011.1047247, MAE: 3776.8800841, R2: -331.9873485, RMSE: 4700.3590873
Epoch 43, Evaluation || MSE: 43004827.1904762, MAE: 6029.1549576, R2: -1488.2233898, RMSE: 6066.5654781


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Epoch 44, Train || MSE: 37547545.3344494, MAE: 3833.5546381, R2: -311.9138146, RMSE: 4799.7470107
Epoch 44, Evaluation || MSE: 20188641.1267361, MAE: 3780.4966208, R2: -808.5215635, RMSE: 3850.4327644


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Epoch 45, Train || MSE: 37497391.2561384, MAE: 3877.4025234, R2: -331.6026257, RMSE: 4794.3071712
Epoch 45, Evaluation || MSE: 31970848.0379464, MAE: 4698.3431048, R2: -1277.1762103, RMSE: 4761.2128010

BTC Validation actual vs prediction
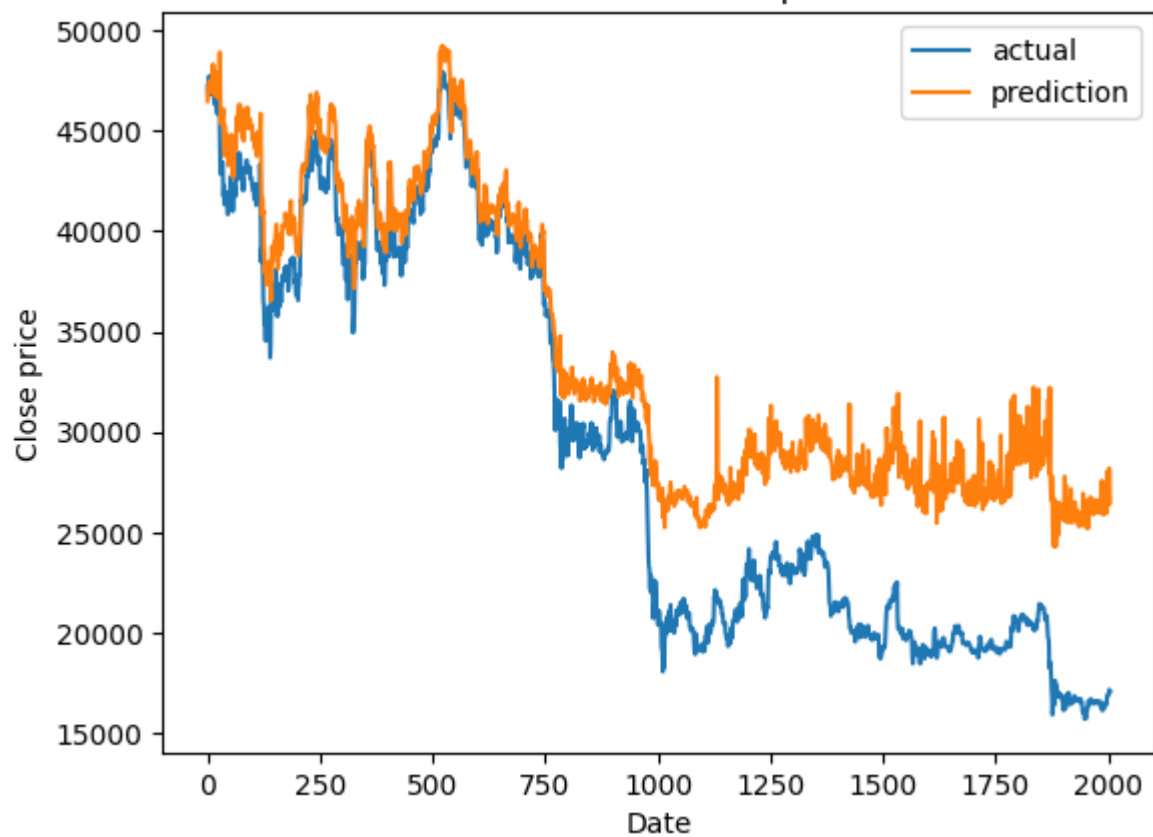
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Epoch 46, Train || MSE: 37999833.8265439, MAE: 3830.5278693, R2: -330.0929783, RMSE: 4778.0006469
Epoch 46, Evaluation || MSE: 33229776.1289683, MAE: 5184.8210953, R2: -1262.6176376, RMSE: 5224.2248274


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Epoch 47, Train || MSE: 37958033.7027530, MAE: 3913.2663990, R2: -356.7490005, RMSE: 4882.1660454
Epoch 47, Evaluation || MSE: 19470802.9130084, MAE: 3449.6143934, R2: -890.0744080, RMSE: 3524.8218186


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Epoch 48, Train || MSE: 35034594.0534784, MAE: 3740.5050986, R2: -354.2602150, RMSE: 4667.9424188
Epoch 48, Evaluation || MSE: 18252021.2891865, MAE: 3446.9545085, R2: -828.9903450, RMSE: 3517.1138262


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Epoch 49, Train || MSE: 36195150.8943452, MAE: 3775.3162622, R2: -356.5490971, RMSE: 4729.2994169
Epoch 49, Evaluation || MSE: 30012093.3035714, MAE: 4418.5948302, R2: -1241.6019289, RMSE: 4490.6001017


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Epoch 50, Train || MSE: 36975992.4570312, MAE: 3839.0836757, R2: -326.2619203, RMSE: 4772.4305669
Epoch 50, Evaluation || MSE: 44813416.3452381, MAE: 6170.9253182, R2: -1601.4497650, RMSE: 6210.7768748

BTC Validation actual vs prediction
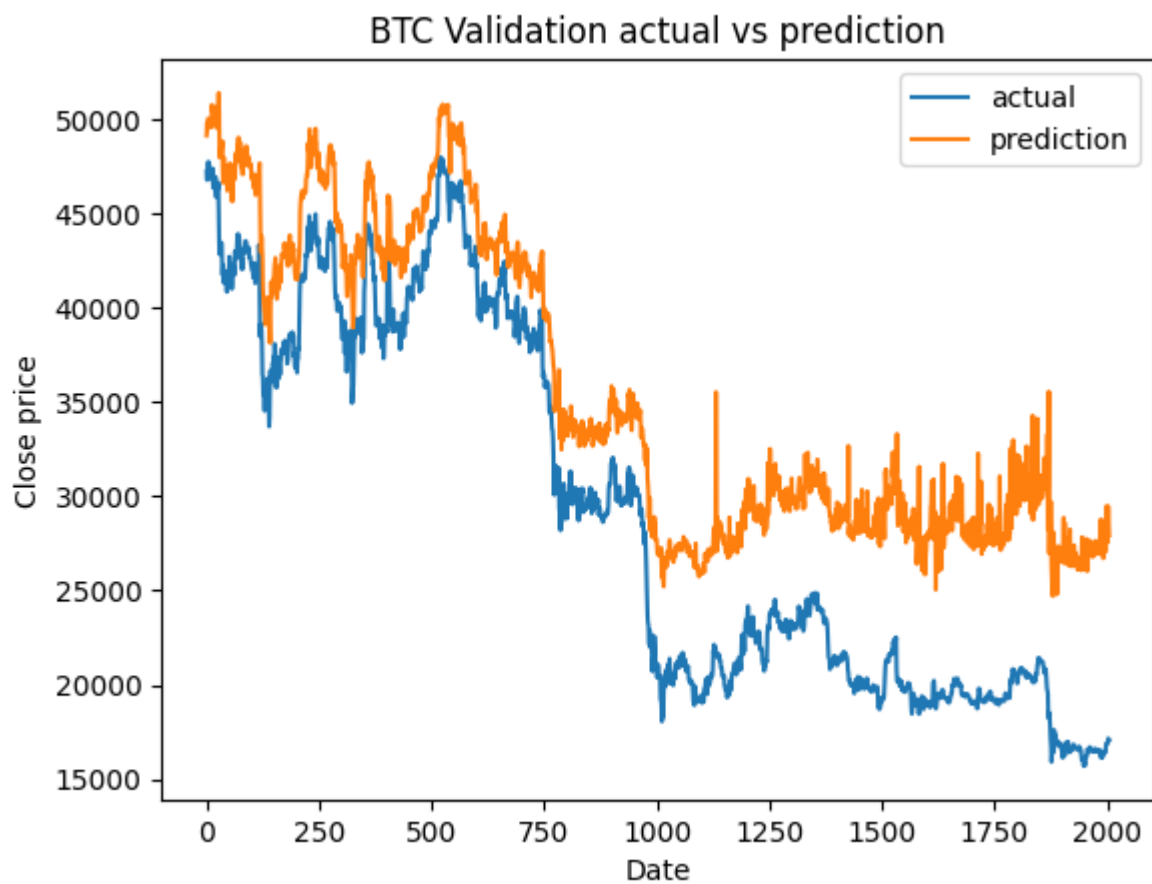
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Epoch 1, Train || MSE: 5099.1869105, MAE: 51.8382442, R2: -1189.8744454, RMSE: 56.4458169
Epoch 1, Evaluation || MSE: 11232.3558258, MAE: 100.8810191, R2: -20599.5878760, RMSE: 100.9399292


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Epoch 2, Train || MSE: 4276.1306546, MAE: 46.6388692, R2: -763.6614947, RMSE: 51.3720170
Epoch 2, Evaluation || MSE: 11075.0566707, MAE: 100.0827920, R2: -20343.8749427, RMSE: 100.1426534


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Epoch 3, Train || MSE: 4375.8141249, MAE: 46.7801927, R2: -773.8510494, RMSE: 51.4897101
Epoch 3, Evaluation || MSE: 11323.7637605, MAE: 101.3156169, R2: -20743.6677782, RMSE: 101.3740831


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Epoch 4, Train || MSE: 4395.8675054, MAE: 46.8865968, R2: -788.9748271, RMSE: 51.4934640
Epoch 4, Evaluation || MSE: 11510.7611316, MAE: 102.2355129, R2: -21044.6908960, RMSE: 102.2929753


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Epoch 5, Train || MSE: 4335.8509779, MAE: 46.4380586, R2: -764.4214959, RMSE: 51.2803873
Epoch 5, Evaluation || MSE: 11893.0237122, MAE: 104.0968220, R2: -21657.2585732, RMSE: 104.1523089

DASH Validation actual vs prediction
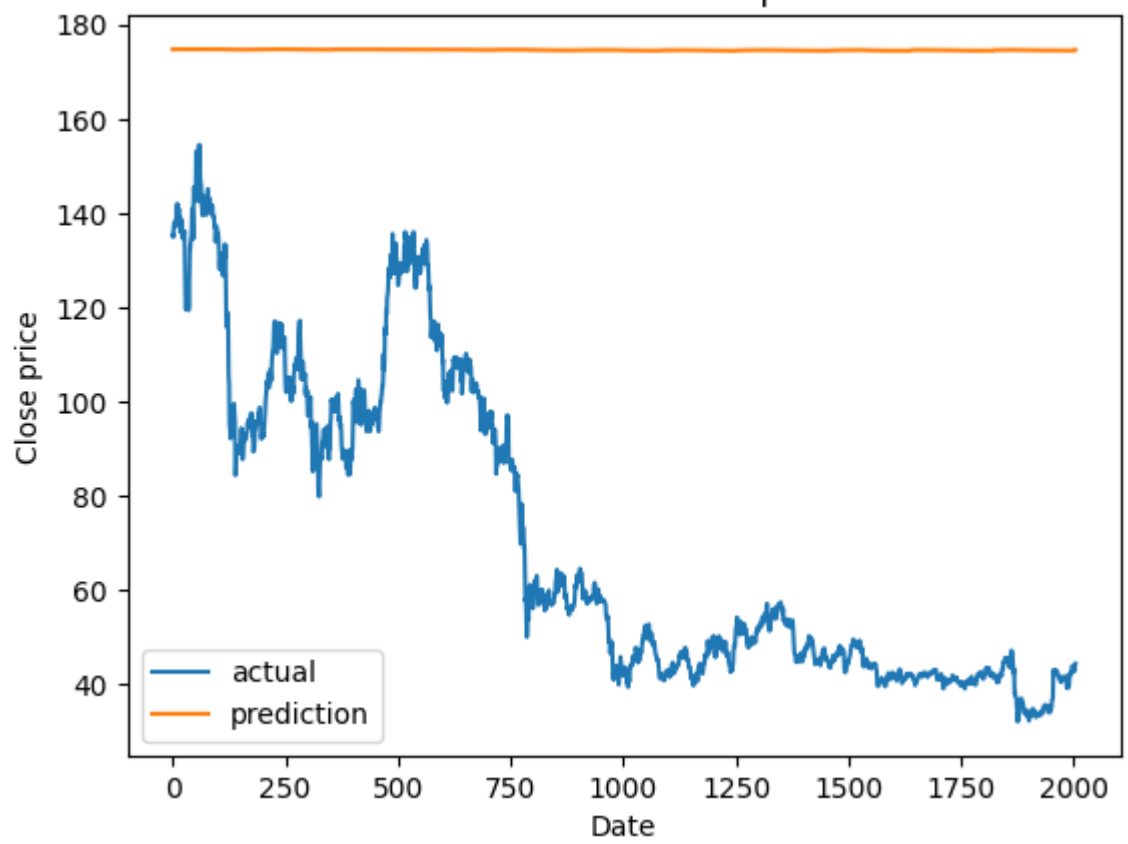
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Epoch 6, Train || MSE: 4333.9250001, MAE: 46.4968747, R2: -821.3257496, RMSE: 51.1
867522
Epoch 6, Evaluation || MSE: 11307.4453406, MAE: 101.2528918, R2: -20703.9998288, R
MSE: 101.3113063


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Epoch 7, Train || MSE: 4299.9565544, MAE: 46.0562265, R2: -774.5407226, RMSE: 50.8
285388
Epoch 7, Evaluation || MSE: 11241.3999120, MAE: 101.0171643, R2: -20548.3445759, R
MSE: 101.0750284


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Epoch 8, Train || MSE: 4227.0710251, MAE: 45.8675819, R2: -769.4075015, RMSE: 50.6
462462
Epoch 8, Evaluation || MSE: 11095.8757881, MAE: 100.3203452, R2: -20292.8797855, R
MSE: 100.3788364


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Epoch 9, Train || MSE: 4325.5993081, MAE: 46.2705790, R2: -763.2401560, RMSE: 50.9
719392
Epoch 9, Evaluation || MSE: 11178.3836694, MAE: 100.7454991, R2: -20416.7592613, R
MSE: 100.8035558


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Epoch 10, Train || MSE: 4455.8956269, MAE: 46.8266640, R2: -776.2717294, RMSE: 51.
6449645
Epoch 10, Evaluation || MSE: 11882.6070096, MAE: 104.1282595, R2: -21588.9655988,
RMSE: 104.1831412

DASH Validation actual vs prediction
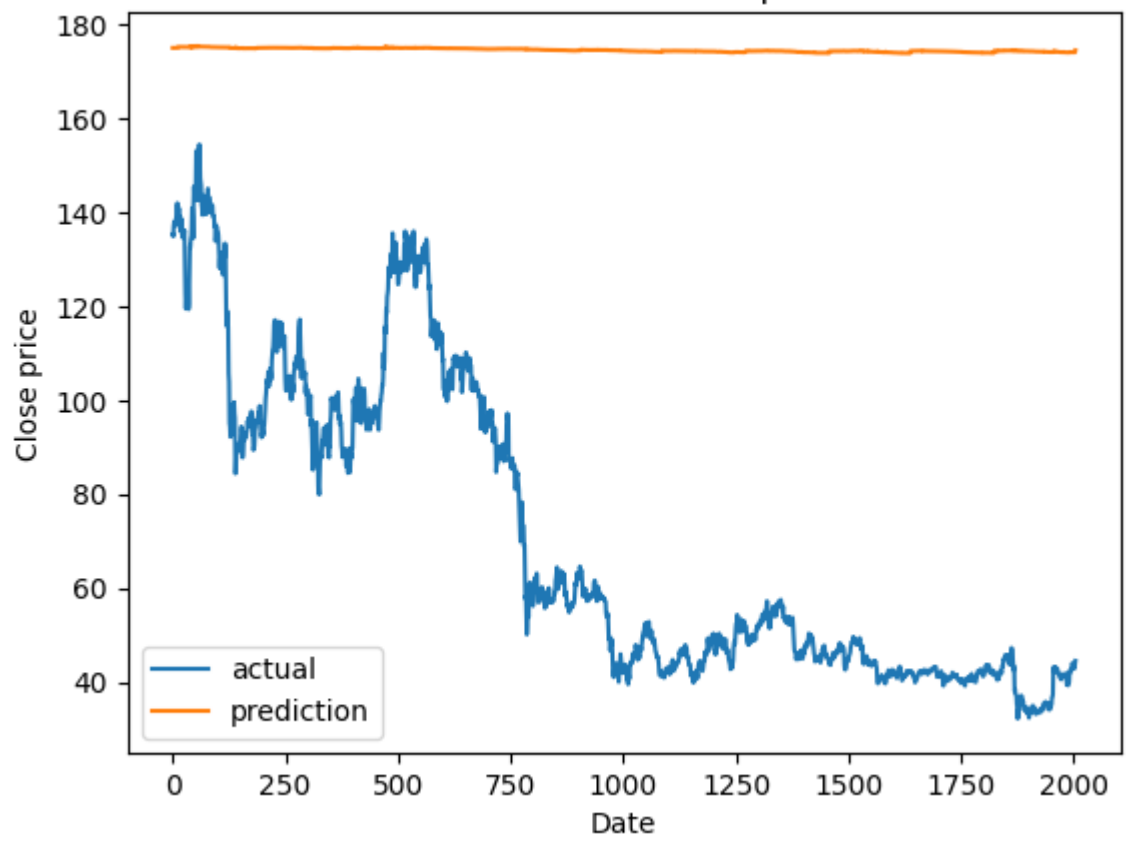
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Epoch 11, Train || MSE: 4246.5207736, MAE: 46.2604328, R2: -810.3237488, RMSE: 50.9030720
Epoch 11, Evaluation || MSE: 11294.3005652, MAE: 101.3774092, R2: -20604.4016961, RMSE: 101.4332788


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Epoch 12, Train || MSE: 4055.8949350, MAE: 44.9302705, R2: -779.8923603, RMSE: 49.7818965
Epoch 12, Evaluation || MSE: 11625.0593145, MAE: 102.9904804, R2: -21114.0572857, RMSE: 103.0453696


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Epoch 13, Train || MSE: 4086.2932739, MAE: 45.5634667, R2: -769.0802310, RMSE: 50.3402455
Epoch 13, Evaluation || MSE: 11351.4373213, MAE: 101.7253874, R2: -20632.7397319, RMSE: 101.7808266


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Epoch 14, Train || MSE: 4011.8515431, MAE: 45.1006538, R2: -726.1448798, RMSE: 49.7017792
Epoch 14, Evaluation || MSE: 12091.7974369, MAE: 104.8995519, R2: -22104.1908037, RMSE: 104.9525766


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Epoch 15, Train || MSE: 3930.5899823, MAE: 44.9185668, R2: -752.7308860, RMSE: 49.4667072
Epoch 15, Evaluation || MSE: 11273.3786950, MAE: 101.3492119, R2: -20541.0791097, RMSE: 101.4037319

DASH Validation actual vs prediction
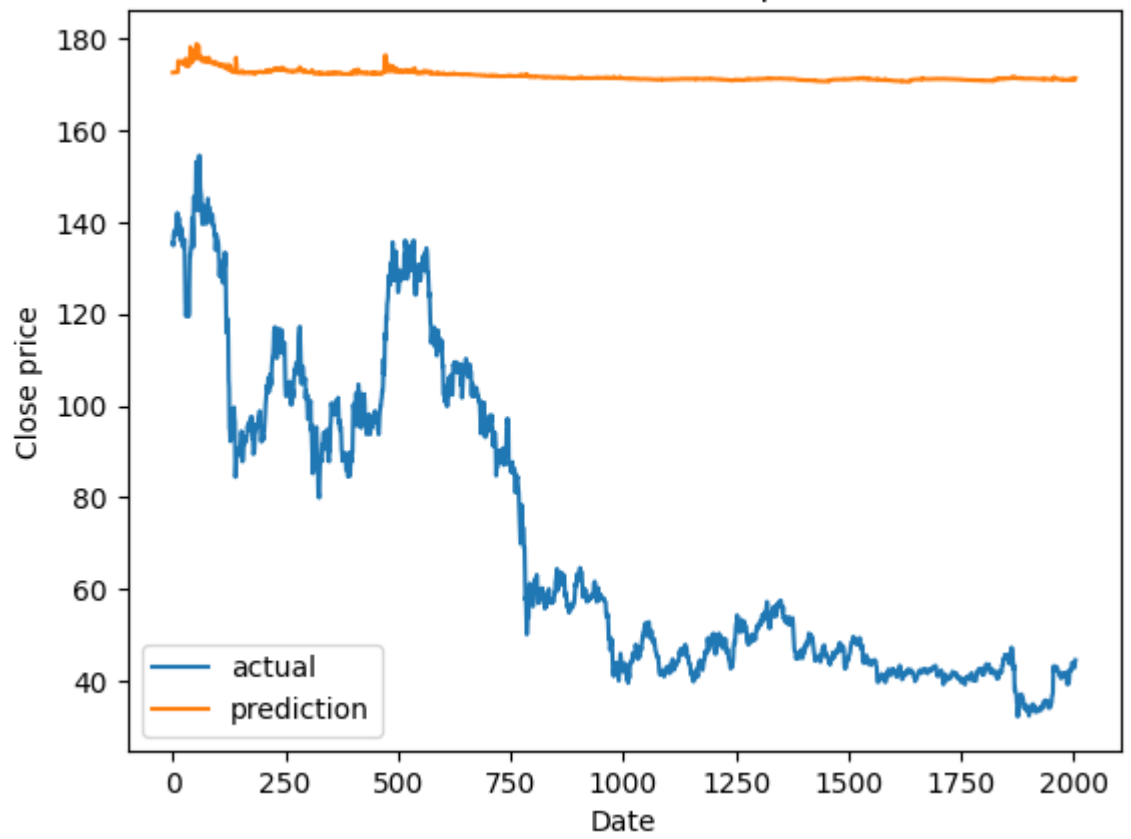
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Epoch 16, Train || MSE: 3741.3121551, MAE: 43.6411678, R2: -717.5661304, RMSE: 48.
5094753
Epoch 16, Evaluation || MSE: 11588.5643252, MAE: 103.2430914, R2: -20886.3527321,
RMSE: 103.2926685


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Epoch 17, Train || MSE: 3296.2318445, MAE: 41.4973380, R2: -733.0132792, RMSE: 46.
4661762
Epoch 17, Evaluation || MSE: 11231.5470009, MAE: 101.6563722, R2: -20443.1490003,
RMSE: 101.7084792


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Epoch 18, Train || MSE: 3274.0098095, MAE: 41.1256642, R2: -655.2648442, RMSE: 45.
9663227
Epoch 18, Evaluation || MSE: 12336.7224731, MAE: 106.0118930, R2: -22868.0695688,
RMSE: 106.0609940


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Epoch 19, Train || MSE: 2862.6568852, MAE: 38.2984206, R2: -671.2668125, RMSE: 43.
4804212
Epoch 19, Evaluation || MSE: 11960.3566662, MAE: 104.1579480, R2: -22335.6625726,
RMSE: 104.2127147


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Epoch 20, Train || MSE: 2305.8264646, MAE: 33.6928833, R2: -482.5283226, RMSE: 38.
9175003
Epoch 20, Evaluation || MSE: 9537.2329760, MAE: 94.7391575, R2: -16662.4454276, RM
SE: 94.8120715

DASH Validation actual vs prediction
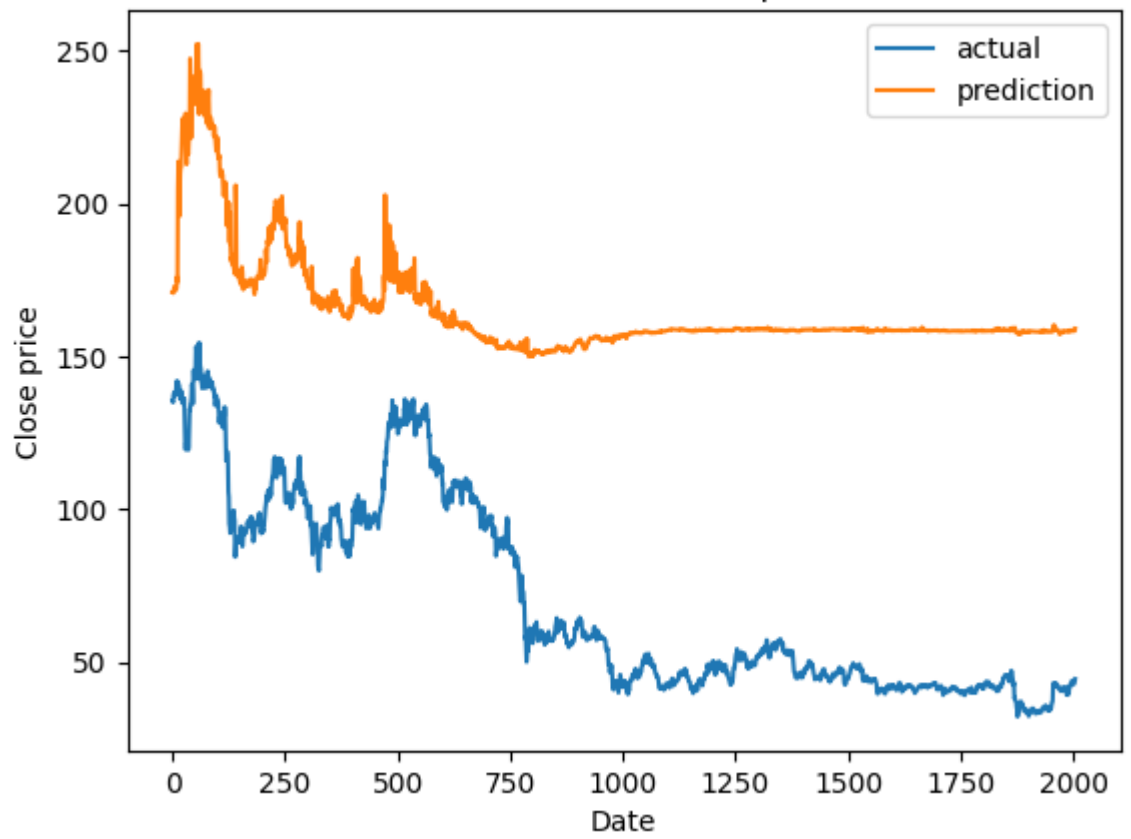
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Epoch 21, Train || MSE: 1689.6931446, MAE: 29.8159302, R2: -518.9203947, RMSE: 35.2073090
Epoch 21, Evaluation || MSE: 7408.6735104, MAE: 84.6418545, R2: -11519.5991280, RMSE: 84.7362869


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Epoch 22, Train || MSE: 1519.8687108, MAE: 27.8831023, R2: -323.1947736, RMSE: 33.2408966
Epoch 22, Evaluation || MSE: 5625.4703757, MAE: 73.7399687, R2: -8760.1468353, RMSE: 73.8166108


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Epoch 23, Train || MSE: 1191.8699575, MAE: 23.9952221, R2: -240.9622701, RMSE: 29.5995152
Epoch 23, Evaluation || MSE: 5190.8069613, MAE: 70.8209362, R2: -7793.2262967, RMSE: 70.9191124


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Epoch 24, Train || MSE: 1017.2309829, MAE: 22.5027981, R2: -234.4262791, RMSE: 27.7974204
Epoch 24, Evaluation || MSE: 4102.7411770, MAE: 63.3987102, R2: -5264.7276822, RMSE: 63.4757316


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Epoch 25, Train || MSE: 1055.2269902, MAE: 22.1535653, R2: -200.6206611, RMSE: 27.7511435
Epoch 25, Evaluation || MSE: 3800.5995038, MAE: 61.0171249, R2: -5053.0378680, RMSE: 61.0937852

DASH Validation actual vs prediction
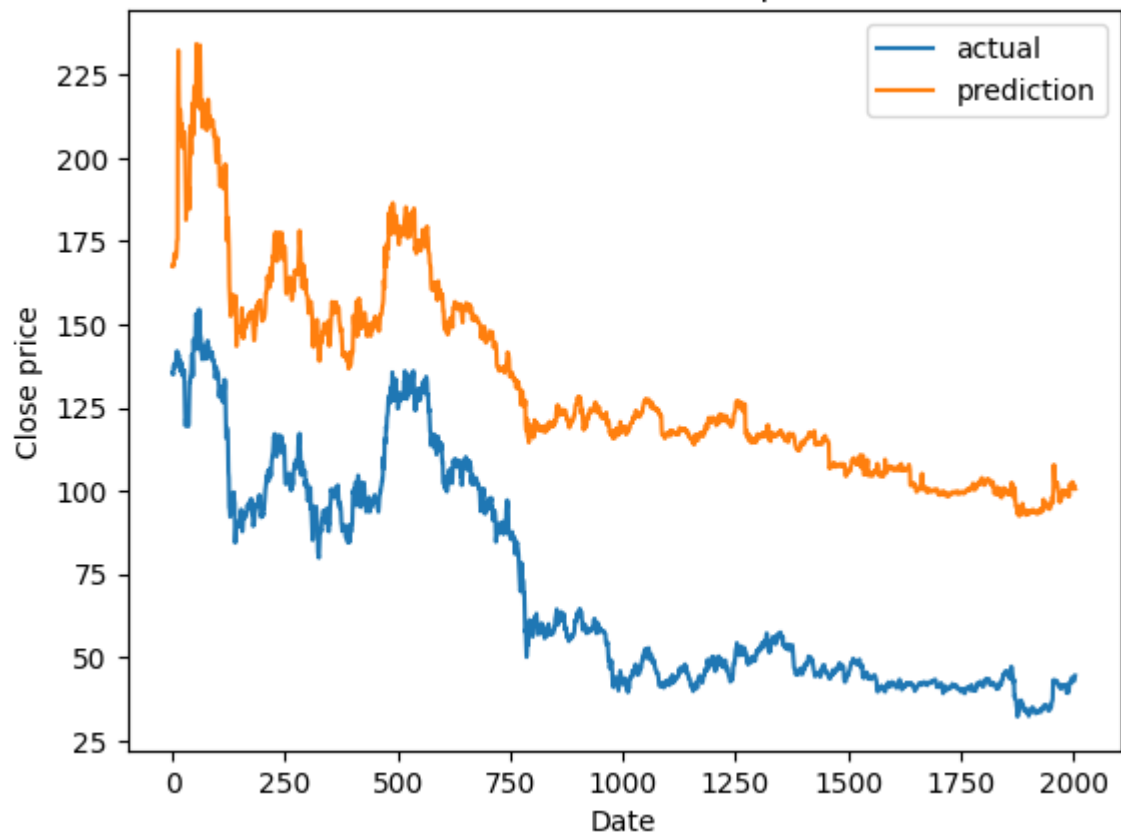
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Epoch 26, Train || MSE: 963.8684862, MAE: 21.4390763, R2: -199.1104222, RMSE: 26.7
416800
Epoch 26, Evaluation || MSE: 3780.1267400, MAE: 60.3204904, R2: -5308.2637498, RMS
E: 60.3914284


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Epoch 27, Train || MSE: 1010.7291771, MAE: 21.7382511, R2: -180.8950386, RMSE: 27.
1226090
Epoch 27, Evaluation || MSE: 3644.8917973, MAE: 58.8174797, R2: -5179.1587288, RMS
E: 58.8857254


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Epoch 28, Train || MSE: 957.0885958, MAE: 21.3616640, R2: -173.7602555, RMSE: 26.4
281105
Epoch 28, Evaluation || MSE: 3058.8205261, MAE: 52.1478659, R2: -4880.2681782, RMS
E: 52.2348379


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Epoch 29, Train || MSE: 878.4244985, MAE: 20.7721186, R2: -167.0547087, RMSE: 25.5
858291
Epoch 29, Evaluation || MSE: 2858.4626818, MAE: 50.1032507, R2: -4993.0572056, RMS
E: 50.1951263


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Epoch 30, Train || MSE: 869.2969053, MAE: 20.6009098, R2: -153.7510008, RMSE: 25.4
865477
Epoch 30, Evaluation || MSE: 2679.6640445, MAE: 45.2466642, R2: -5210.3838485, RMS
E: 45.3955375

DASH Validation actual vs prediction

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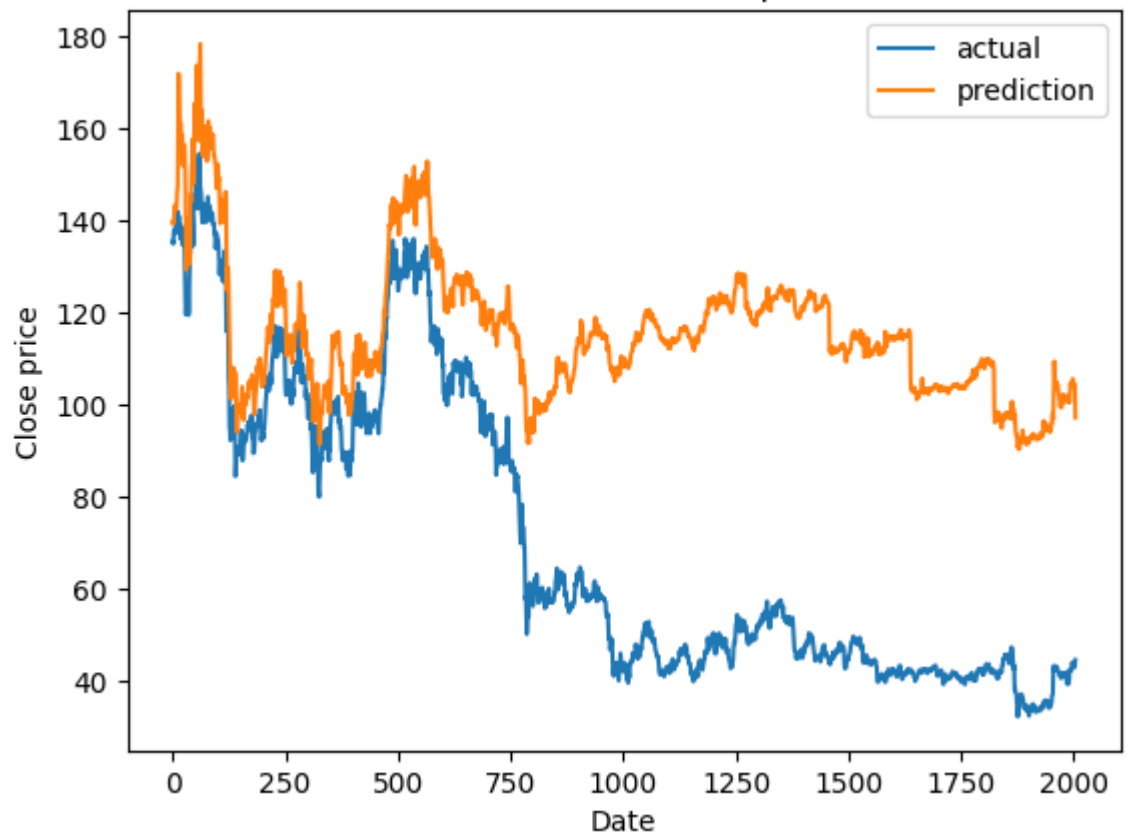
Epoch 31, Train || MSE: 933.7890115, MAE: 20.8604611, R2: -160.0685501, RMSE: 25.9
472798

Epoch 31, Evaluation || MSE: 2335.3046873, MAE: 44.8294263, R2: -4347.6738354, RMS
E: 44.9240040


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Epoch 32, Train || MSE: 886.1045708, MAE: 20.3647613, R2: -159.8977334, RMSE: 25.3
566599

Epoch 32, Evaluation || MSE: 2261.7743545, MAE: 43.9131466, R2: -4288.0498506, RMS
E: 44.0018294


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Epoch 33, Train || MSE: 950.1121384, MAE: 20.8180056, R2: -151.5914487, RMSE: 26.0
159622

Epoch 33, Evaluation || MSE: 851.9606758, MAE: 25.9735293, R2: -1621.7679634, RMS
E: 26.1363550


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Epoch 34, Train || MSE: 866.3058317, MAE: 20.5497002, R2: -168.5126433, RMSE: 25.6
674010

Epoch 34, Evaluation || MSE: 1369.0045923, MAE: 33.5346781, R2: -2615.2197861, RMS
E: 33.6497262


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Epoch 35, Train || MSE: 1001.7758048, MAE: 20.3448043, R2: -143.0522857, RMSE: 25.
5961746

Epoch 35, Evaluation || MSE: 1110.9365599, MAE: 30.7496376, R2: -1980.2082398, RMS
E: 30.8767061

DASH Validation actual vs prediction
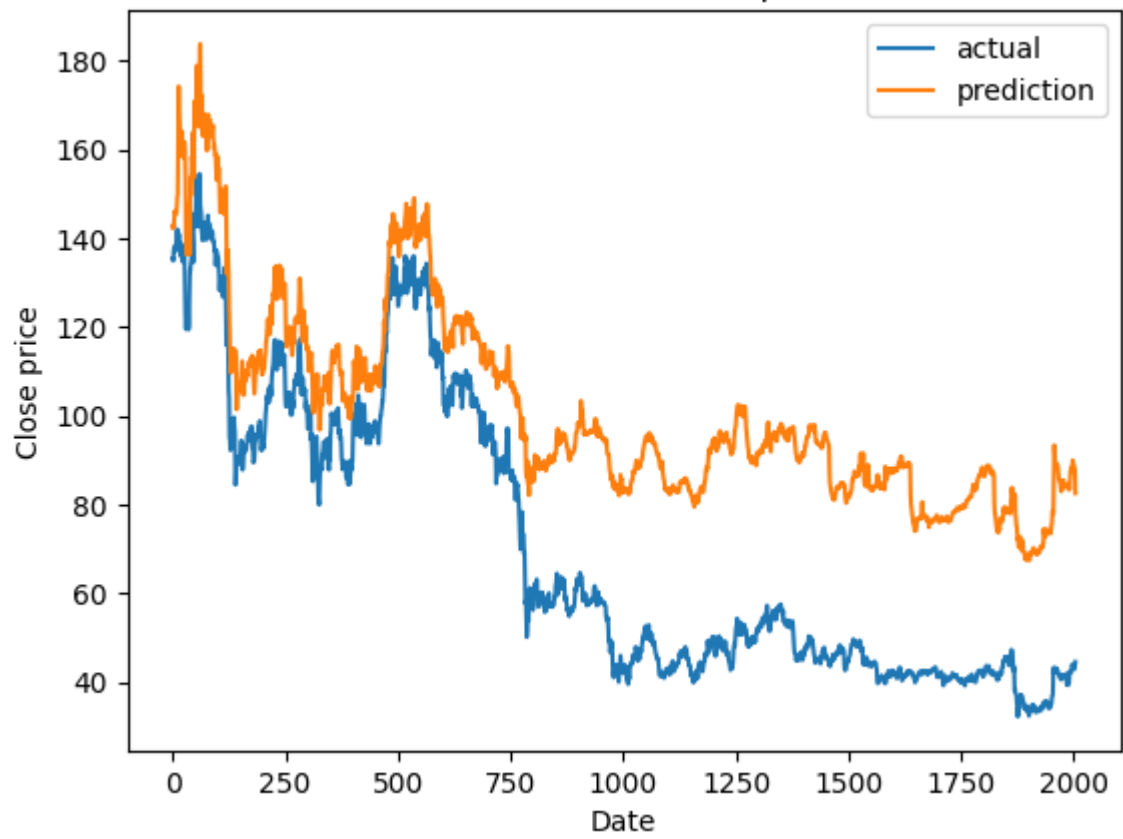
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Epoch 36, Train || MSE: 761.7069764, MAE: 19.1653274, R2: -133.8752397, RMSE: 23.5992876
Epoch 36, Evaluation || MSE: 772.8026113, MAE: 25.4049744, R2: -1423.1365625, RMSE: 25.5528027


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Epoch 37, Train || MSE: 766.2345406, MAE: 18.8653212, R2: -128.0377693, RMSE: 23.5626517
Epoch 37, Evaluation || MSE: 1077.7049359, MAE: 29.8152398, R2: -2091.0947968, RMSE: 29.9415100


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Epoch 38, Train || MSE: 747.8467250, MAE: 19.0319590, R2: -124.6831645, RMSE: 23.6144047
Epoch 38, Evaluation || MSE: 198.1245105, MAE: 12.3348495, R2: -350.7400743, RMSE: 12.5911566


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Epoch 39, Train || MSE: 762.6919537, MAE: 19.0619381, R2: -126.9115373, RMSE: 23.5284634
Epoch 39, Evaluation || MSE: 442.4923186, MAE: 19.6731705, R2: -677.5517684, RMSE: 19.8096276


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Epoch 40, Train || MSE: 827.8813134, MAE: 19.5027055, R2: -130.0898895, RMSE: 24.2205972
Epoch 40, Evaluation || MSE: 375.1368706, MAE: 17.3906174, R2: -625.6429122, RMSE: 17.6032635

DASH Validation actual vs prediction
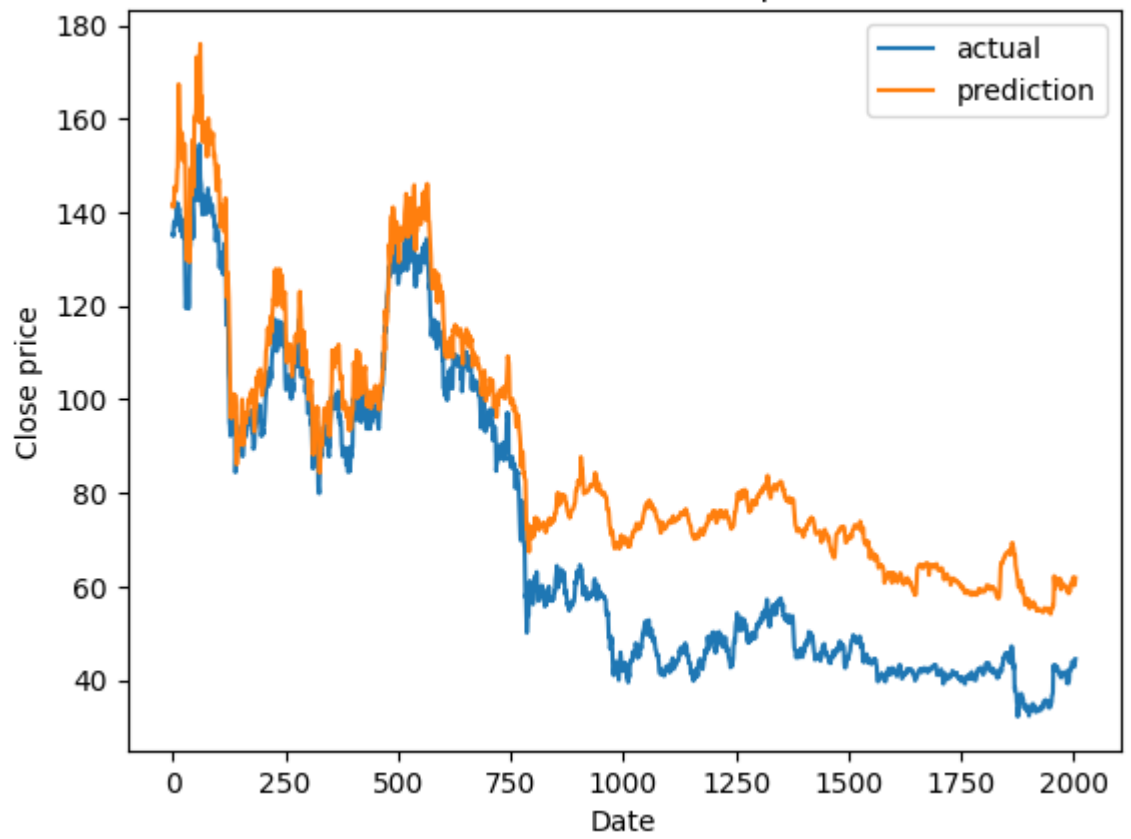
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Epoch 41, Train || MSE: 778.8082200, MAE: 18.9286204, R2: -126.0357048, RMSE: 23.6412433
Epoch 41, Evaluation || MSE: 826.5981239, MAE: 27.3015862, R2: -1295.9500289, RMSE: 27.3988275


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Epoch 42, Train || MSE: 788.9933144, MAE: 19.0520469, R2: -128.3072660, RMSE: 23.7237438
Epoch 42, Evaluation || MSE: 788.2415867, MAE: 26.0508468, R2: -1330.1930928, RMSE: 26.1565638


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Epoch 43, Train || MSE: 702.7447142, MAE: 18.1800517, R2: -130.3412025, RMSE: 22.8338710
Epoch 43, Evaluation || MSE: 612.0979384, MAE: 20.6003643, R2: -1158.7953280, RMSE: 20.7940139


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Epoch 44, Train || MSE: 758.7891175, MAE: 18.4409447, R2: -112.1608254, RMSE: 23.1049558
Epoch 44, Evaluation || MSE: 704.6965127, MAE: 22.8713331, R2: -1297.3113496, RMSE: 23.0495063


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Epoch 45, Train || MSE: 746.2381187, MAE: 18.7124308, R2: -121.3142140, RMSE: 23.1102240
Epoch 45, Evaluation || MSE: 830.5687413, MAE: 25.1795594, R2: -1490.2929804, RMSE: 25.3429773

DASH Validation actual vs prediction
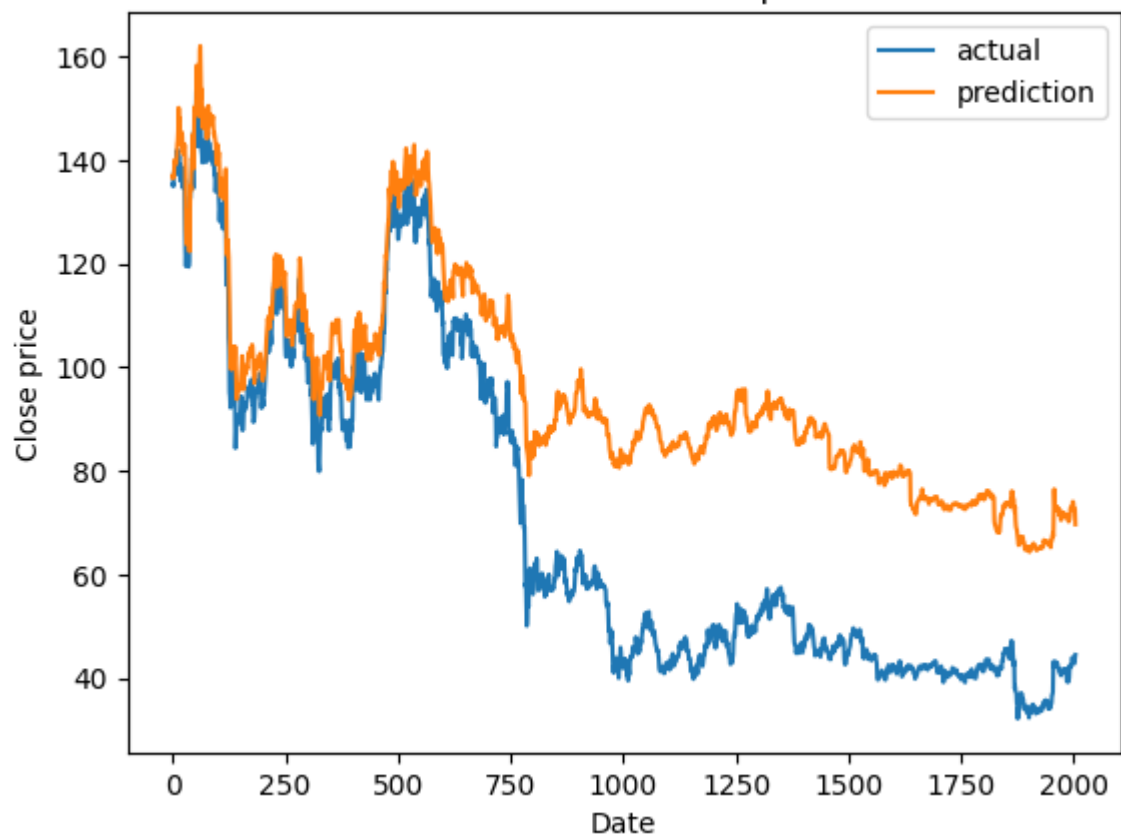
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Epoch 46, Train || MSE: 739.8081915, MAE: 18.7623432, R2: -128.1655194, RMSE: 23.2
085821
Epoch 46, Evaluation || MSE: 992.3794228, MAE: 27.5910044, R2: -1817.8329182, RMS
E: 27.7465126


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Epoch 47, Train || MSE: 790.5014641, MAE: 18.9111063, R2: -127.4291499, RMSE: 23.5
145636
Epoch 47, Evaluation || MSE: 1019.8491230, MAE: 28.8724381, R2: -1824.2295663, RMS
E: 28.9897133


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Epoch 48, Train || MSE: 754.6342717, MAE: 18.7616335, R2: -118.6312148, RMSE: 23.2
990948
Epoch 48, Evaluation || MSE: 812.3587720, MAE: 24.3905395, R2: -1598.6770709, RMS
E: 24.5912433


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Epoch 49, Train || MSE: 741.8970085, MAE: 18.6576282, R2: -119.2114692, RMSE: 23.0
760880
Epoch 49, Evaluation || MSE: 846.0066018, MAE: 25.4280343, R2: -1610.4893798, RMS
E: 25.5947278


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Epoch 50, Train || MSE: 737.8496966, MAE: 18.5857243, R2: -113.4157443, RMSE: 23.1
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Epoch 50, Evaluation || MSE: 939.4621283, MAE: 27.0088507, R2: -1797.3937574, RMS
E: 27.1775567
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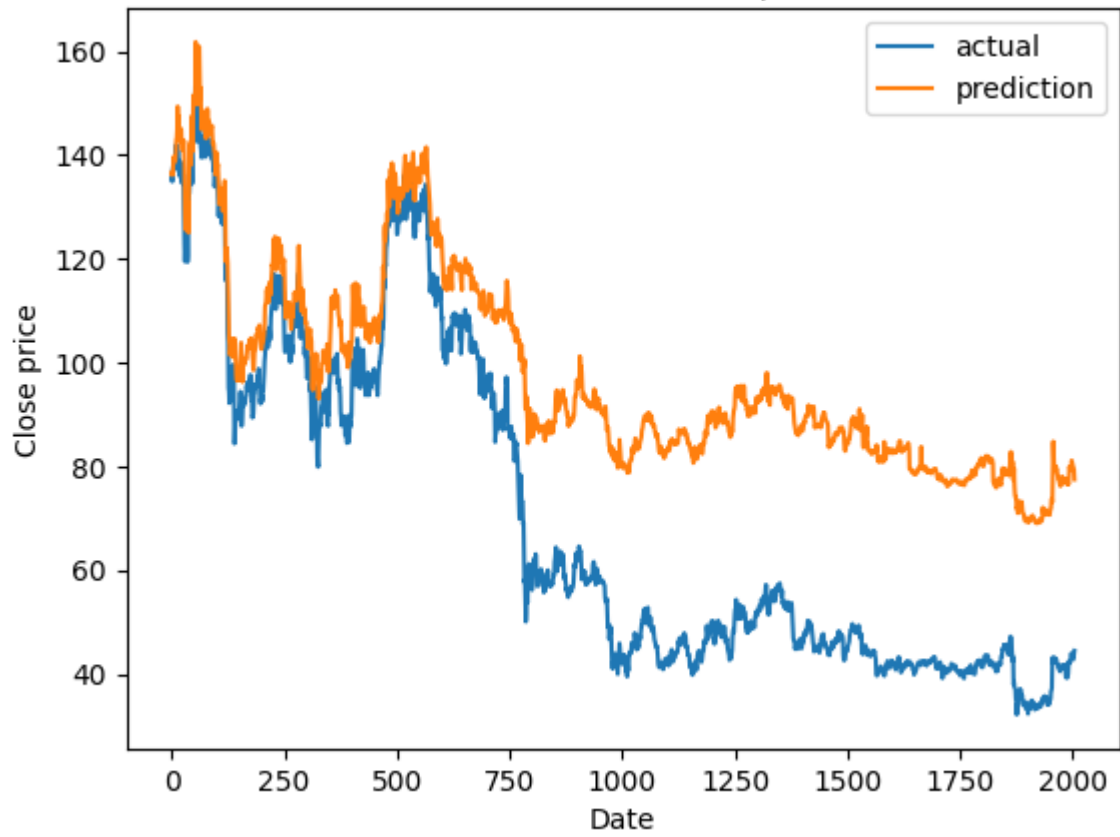
Training ETH coin...:   0%|              | 0/50 [00:00<?, ?it/s]

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Epoch 1, Train || MSE: 1745529.4257769, MAE: 876.2885723, R2: -1987.3502022, RMSE: 884.5888613
Epoch 1, Evaluation || MSE: 1361691.1669854, MAE: 984.6248162, R2: -3362.0106809, RMSE: 989.4753186


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Epoch 2, Train || MSE: 282131.7675821, MAE: 300.2413285, R2: -792.2752667, RMSE: 340.2275313
Epoch 2, Evaluation || MSE: 5221938.7986111, MAE: 2156.3072505, R2: -11062.1719752, RMSE: 2157.5972254


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Epoch 3, Train || MSE: 614497.3587631, MAE: 438.4671266, R2: -1444.9125143, RMSE: 481.3741083
Epoch 3, Evaluation || MSE: 3436022.9045817, MAE: 1689.1043028, R2: -7706.3920983, RMSE: 1691.3306542


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Epoch 4, Train || MSE: 505854.7538538, MAE: 395.6885649, R2: -1198.7927542, RMSE: 436.0680924
Epoch 4, Evaluation || MSE: 3599614.8969959, MAE: 1741.4016530, R2: -8063.3179890, RMSE: 1743.4361822


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Epoch 5, Train || MSE: 554646.7970622, MAE: 405.4016318, R2: -45525.2215046, RMSE: 446.8484051
Epoch 5, Evaluation || MSE: 3346453.7989211, MAE: 1717.2355180, R2: -7206.1374990, RMSE: 1718.5380409

ETH Validation actual vs prediction

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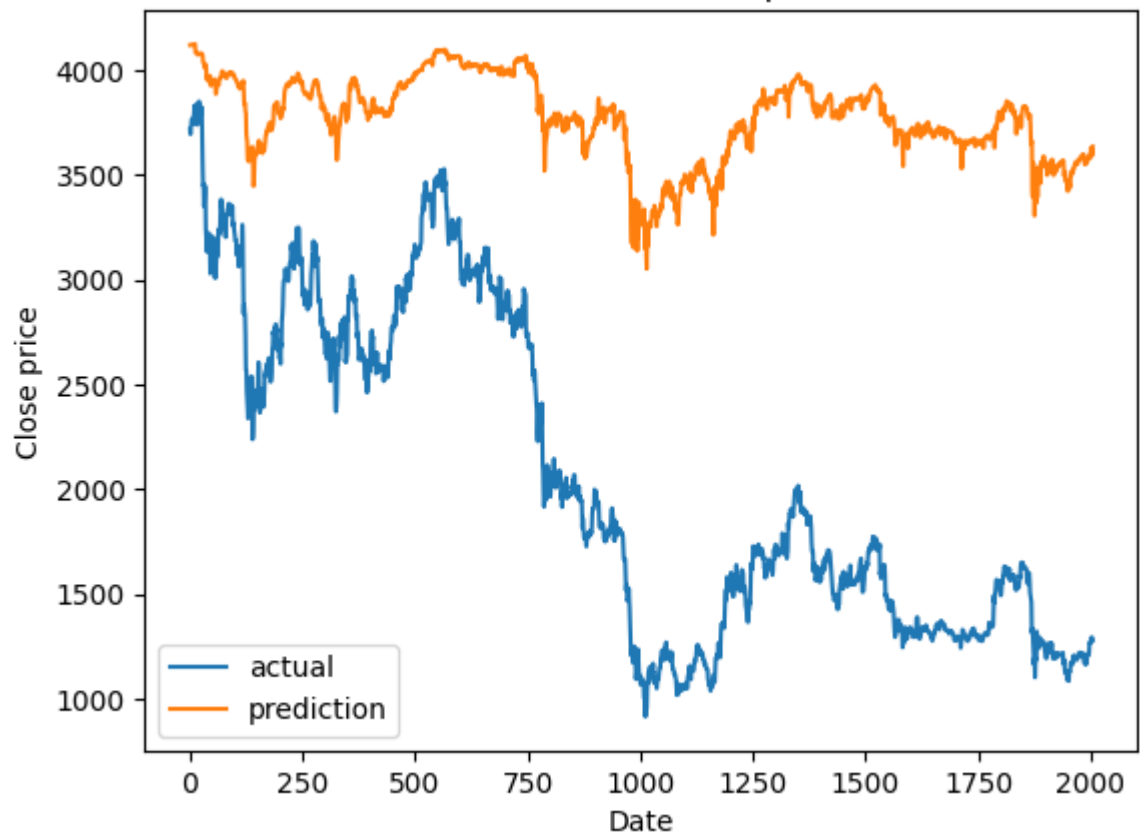
Epoch 6, Train || MSE: 167304.9174645, MAE: 245.2819120, R2: -7317.4303336, RMSE: 288.6060240
Epoch 6, Evaluation || MSE: 1554682.6790055, MAE: 1138.3030455, R2: -3442.0032620, RMSE: 1140.1963035


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Epoch 7, Train || MSE: 106141.5704575, MAE: 190.3806403, R2: -314.0525788, RMSE: 230.4191734
Epoch 7, Evaluation || MSE: 1306452.2236483, MAE: 1037.5283535, R2: -2983.1858272, RMSE: 1039.6545363


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Epoch 8, Train || MSE: 101137.3818253, MAE: 183.9322657, R2: -302.1165963, RMSE: 225.2183768
Epoch 8, Evaluation || MSE: 735320.7985617, MAE: 709.8443493, R2: -1844.6053084, RMSE: 714.0480522


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Epoch 9, Train || MSE: 108807.1148851, MAE: 189.1892175, R2: -293.0285375, RMSE: 230.1167479
Epoch 9, Evaluation || MSE: 1216036.0070375, MAE: 977.2257689, R2: -2945.1115461, RMSE: 979.4364239


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Epoch 10, Train || MSE: 108771.8330506, MAE: 187.8931346, R2: -251.3376085, RMSE: 229.6917877
Epoch 10, Evaluation || MSE: 1118910.3491908, MAE: 934.5842842, R2: -2773.0424197, RMSE: 936.8861736

ETH Validation actual vs prediction
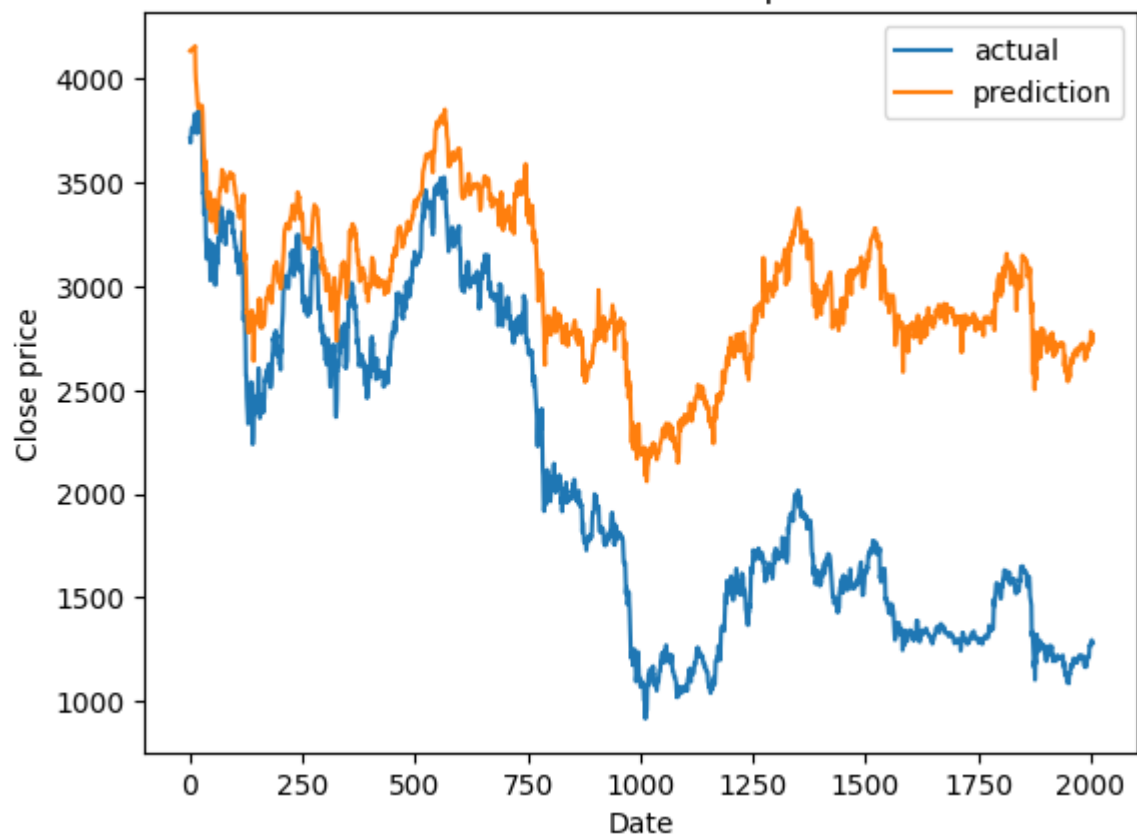
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Epoch 11, Train || MSE: 91879.6193540, MAE: 171.9908561, R2: -216.4171873, RMSE: 2
10.8064511
Epoch 11, Evaluation || MSE: 681723.0388646, MAE: 671.6681448, R2: -1834.1448024,
RMSE: 675.9182126


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Epoch 12, Train || MSE: 101406.5470144, MAE: 176.4525186, R2: -184.5228619, RMSE:
216.5818380
Epoch 12, Evaluation || MSE: 618553.9455576, MAE: 636.0687722, R2: -1700.2778769,
RMSE: 640.5666017


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Epoch 13, Train || MSE: 107855.7814446, MAE: 182.9277411, R2: -183.0273864, RMSE:
224.3074488
Epoch 13, Evaluation || MSE: 1124816.1636052, MAE: 929.4829448, R2: -2867.6645077,
RMSE: 932.0939348


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Epoch 14, Train || MSE: 111957.0502990, MAE: 188.4010083, R2: -206.3302660, RMSE:
231.6674122
Epoch 14, Evaluation || MSE: 1114227.2792697, MAE: 921.6604430, R2: -2899.6092940,
RMSE: 924.5774051


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Epoch 15, Train || MSE: 121059.4539093, MAE: 192.2925355, R2: -207.3497140, RMSE:
235.4634793
Epoch 15, Evaluation || MSE: 1082396.3227171, MAE: 904.8284158, R2: -2803.6426578,
RMSE: 907.7783054

ETH Validation actual vs prediction

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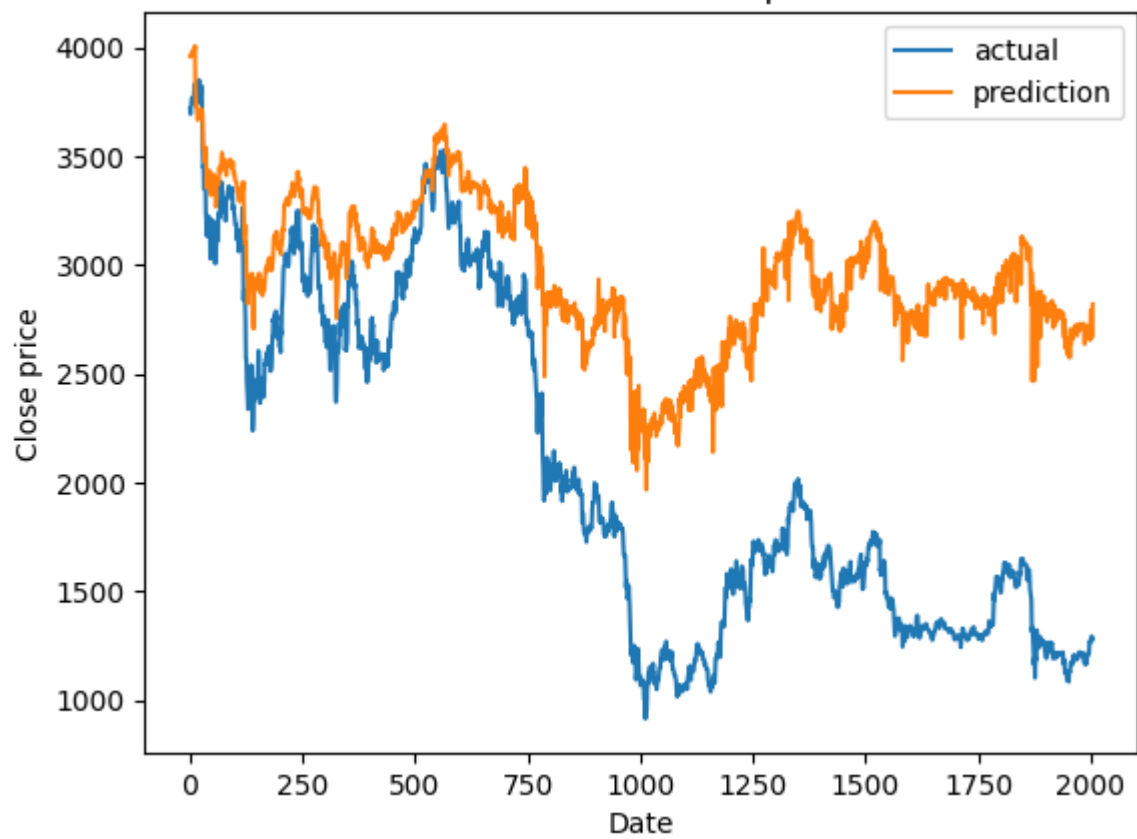
Epoch 16, Train || MSE: 123635.9440571, MAE: 192.8285907, R2: -188.9815041, RMSE: 236.2400873

Epoch 16, Evaluation || MSE: 1045929.7962278, MAE: 891.3978556, R2: -2745.2970358, RMSE: 894.3482765


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Epoch 17, Train || MSE: 129225.1330705, MAE: 193.7311130, R2: -203.0595444, RMSE: 236.0280207

Epoch 17, Evaluation || MSE: 653518.6142123, MAE: 652.8762441, R2: -1847.0594507, RMSE: 657.5488998


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Epoch 18, Train || MSE: 104755.8876240, MAE: 180.1836790, R2: -198.1375334, RMSE: 221.4080412

Epoch 18, Evaluation || MSE: 486760.4579574, MAE: 573.6081534, R2: -1407.4795744, RMSE: 578.3925644


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Epoch 19, Train || MSE: 115985.8463565, MAE: 187.8286091, R2: -199.5970593, RMSE: 230.9232950

Epoch 19, Evaluation || MSE: 622072.3766610, MAE: 640.3430152, R2: -1727.2673837, RMSE: 644.9489698


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Epoch 20, Train || MSE: 112835.3617559, MAE: 190.8856319, R2: -201.6868433, RMSE: 231.1361771

Epoch 20, Evaluation || MSE: 605402.7342546, MAE: 632.4886712, R2: -1671.9452612, RMSE: 636.8750430

ETH Validation actual vs prediction
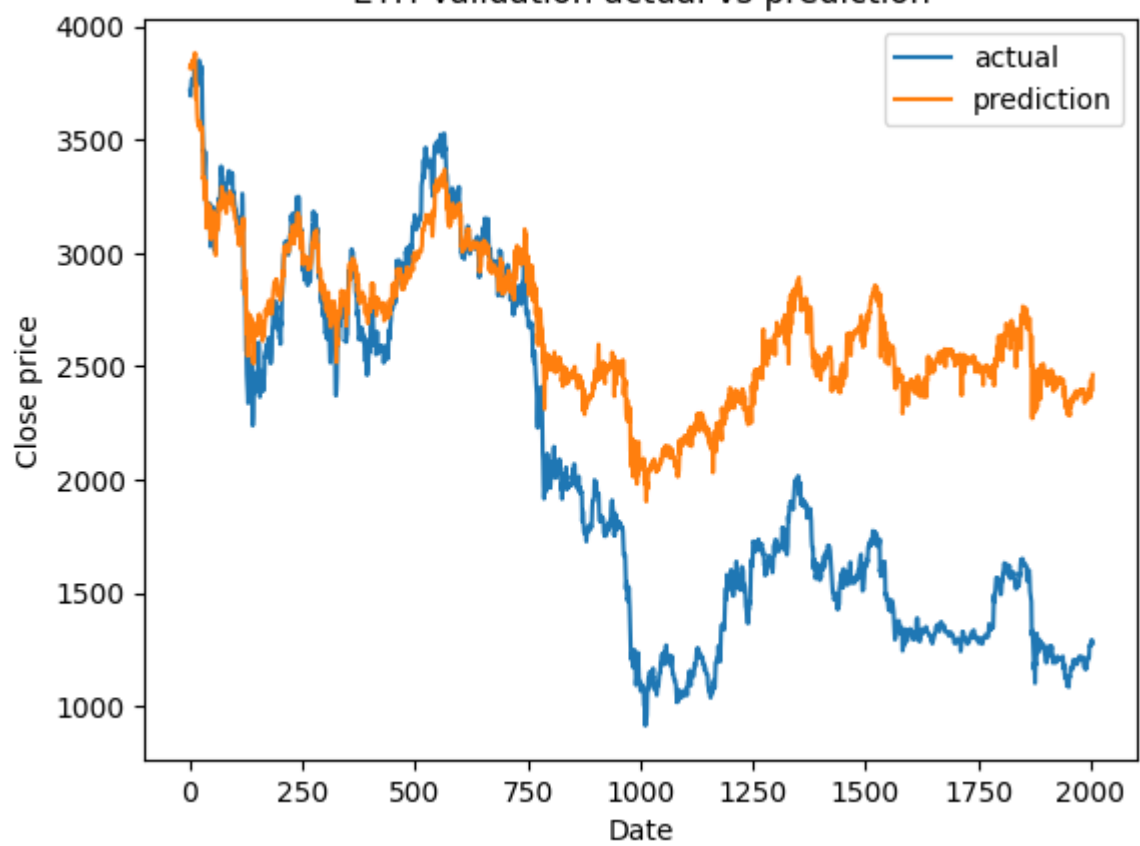
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Epoch 21, Train || MSE: 112868.2209648, MAE: 188.0190059, R2: -180.9200096, RMSE: 229.6718150
Epoch 21, Evaluation || MSE: 423168.1658994, MAE: 533.1019377, R2: -1191.1532581, RMSE: 537.6880312


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Epoch 22, Train || MSE: 444402.7724125, MAE: 291.1883830, R2: -248.8017801, RMSE: 326.9016068
Epoch 22, Evaluation || MSE: 362124.7408215, MAE: 496.0926430, R2: -1005.5521357, RMSE: 500.4615167


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Epoch 23, Train || MSE: 115293.3816234, MAE: 198.4867130, R2: -391.9797105, RMSE: 240.1972713
Epoch 23, Evaluation || MSE: 176915.8271281, MAE: 353.8271277, R2: -532.8869693, RMSE: 358.4218173


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Epoch 24, Train || MSE: 97079.7997112, MAE: 178.2431556, R2: -250.4029627, RMSE: 217.4087094
Epoch 24, Evaluation || MSE: 214575.7503933, MAE: 398.9095519, R2: -637.1819556, RMSE: 402.6431345


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Epoch 25, Train || MSE: 97311.3126893, MAE: 176.6733550, R2: -197.3063339, RMSE: 216.9083894
Epoch 25, Evaluation || MSE: 255987.8825596, MAE: 426.8037866, R2: -720.1870668, RMSE: 430.7192665

ETH Validation actual vs prediction
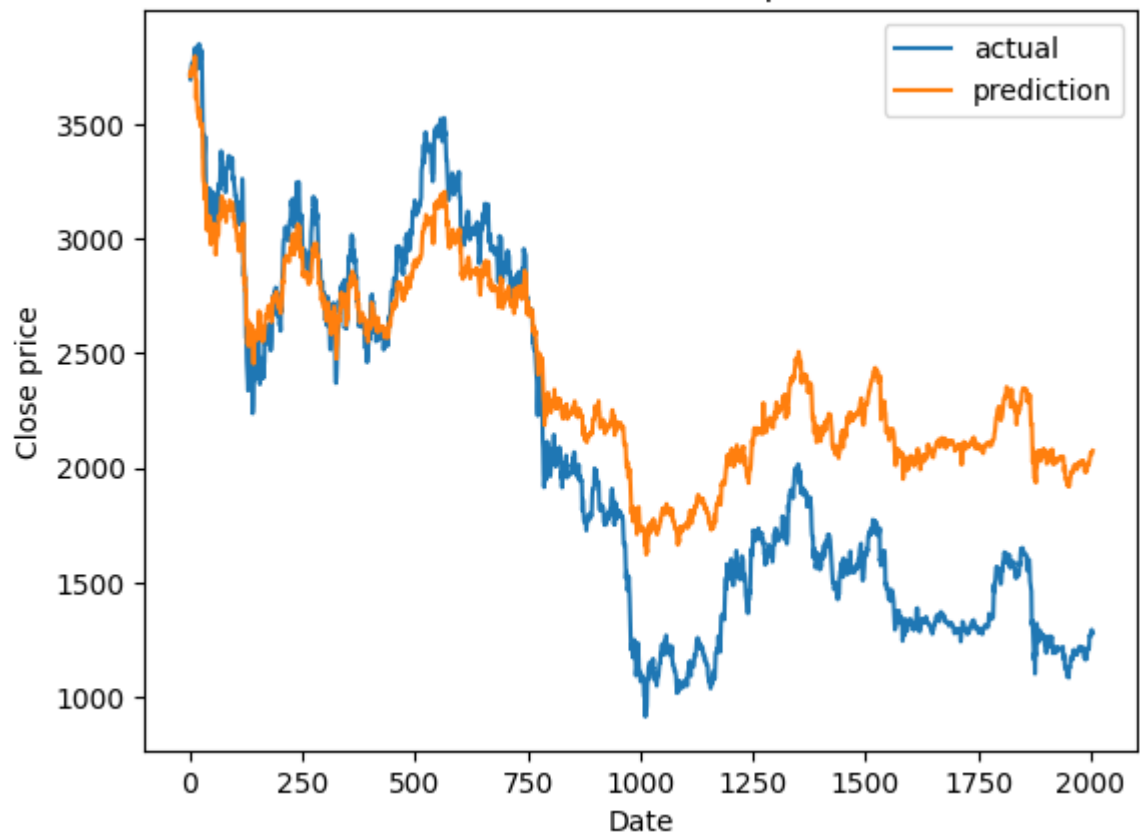
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Epoch 26, Train || MSE: 100633.1177576, MAE: 178.8920327, R2: -202.5941644, RMSE: 219.5387956
Epoch 26, Evaluation || MSE: 191719.8977157, MAE: 370.5703003, R2: -569.0661753, R MSE: 374.5566875


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Epoch 27, Train || MSE: 92608.7356795, MAE: 169.2640122, R2: -152.0682575, RMSE: 2 09.0115637
Epoch 27, Evaluation || MSE: 233374.0969955, MAE: 407.9181228, R2: -659.5643816, R MSE: 411.8132368


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Epoch 28, Train || MSE: 90146.5814147, MAE: 167.6828885, R2: -163.8582864, RMSE: 2 06.6367413
Epoch 28, Evaluation || MSE: 155505.7410332, MAE: 339.2947193, R2: -450.1767940, R MSE: 343.3767918


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Epoch 29, Train || MSE: 88170.8324811, MAE: 168.2661433, R2: -149.9091274, RMSE: 2 06.2461969
Epoch 29, Evaluation || MSE: 186780.7231833, MAE: 362.8225880, R2: -555.5379805, R MSE: 366.7621181


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Epoch 30, Train || MSE: 103343.8915009, MAE: 183.7014165, R2: -337.9006110, RMSE: 223.2782388
Epoch 30, Evaluation || MSE: 192537.2544653, MAE: 361.8195056, R2: -584.0155808, R MSE: 365.9390476

ETH Validation actual vs prediction
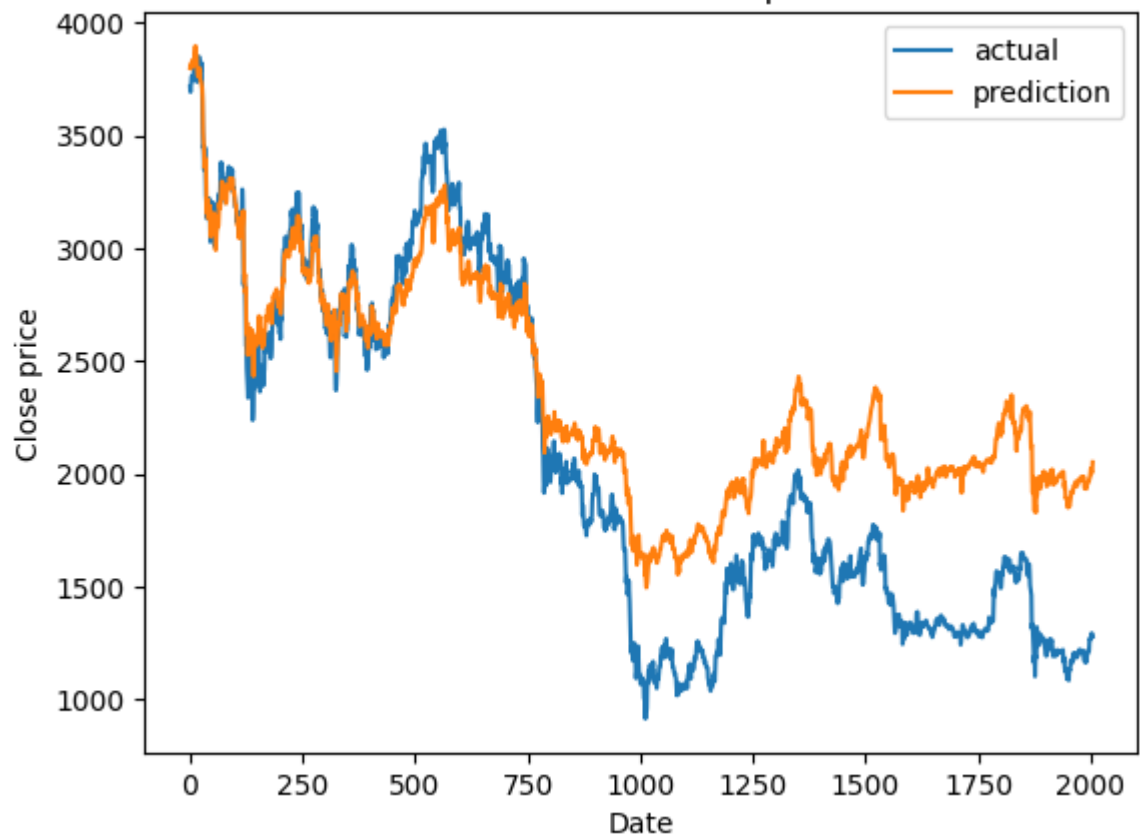
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Epoch 31, Train || MSE: 92798.1203303, MAE: 169.1144931, R2: -157.0828241, RMSE: 2
07.4623239
Epoch 31, Evaluation || MSE: 146361.4575350, MAE: 320.2634956, R2: -443.5935383, R
MSE: 324.4401037


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Epoch 32, Train || MSE: 88397.6521402, MAE: 162.0686571, R2: -131.9433098, RMSE: 2
01.4457473
Epoch 32, Evaluation || MSE: 133868.9136493, MAE: 306.8066515, R2: -392.4877662, R
MSE: 311.1884608


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Epoch 33, Train || MSE: 89271.5771799, MAE: 164.3820735, R2: -161.2811157, RMSE: 2
04.2967678
Epoch 33, Evaluation || MSE: 195814.9734749, MAE: 370.6595954, R2: -546.9999254, R
MSE: 374.7781509


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Epoch 34, Train || MSE: 93558.8038306, MAE: 166.7849111, R2: -135.7982477, RMSE: 2
08.1111066
Epoch 34, Evaluation || MSE: 141537.0935892, MAE: 315.6563486, R2: -422.3646913, R
MSE: 320.2432870


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Epoch 35, Train || MSE: 86031.4575100, MAE: 162.7264372, R2: -135.6261220, RMSE: 2
00.5105151
Epoch 35, Evaluation || MSE: 117912.4002879, MAE: 286.6939233, R2: -359.0112228, R
MSE: 291.4773524

ETH Validation actual vs prediction
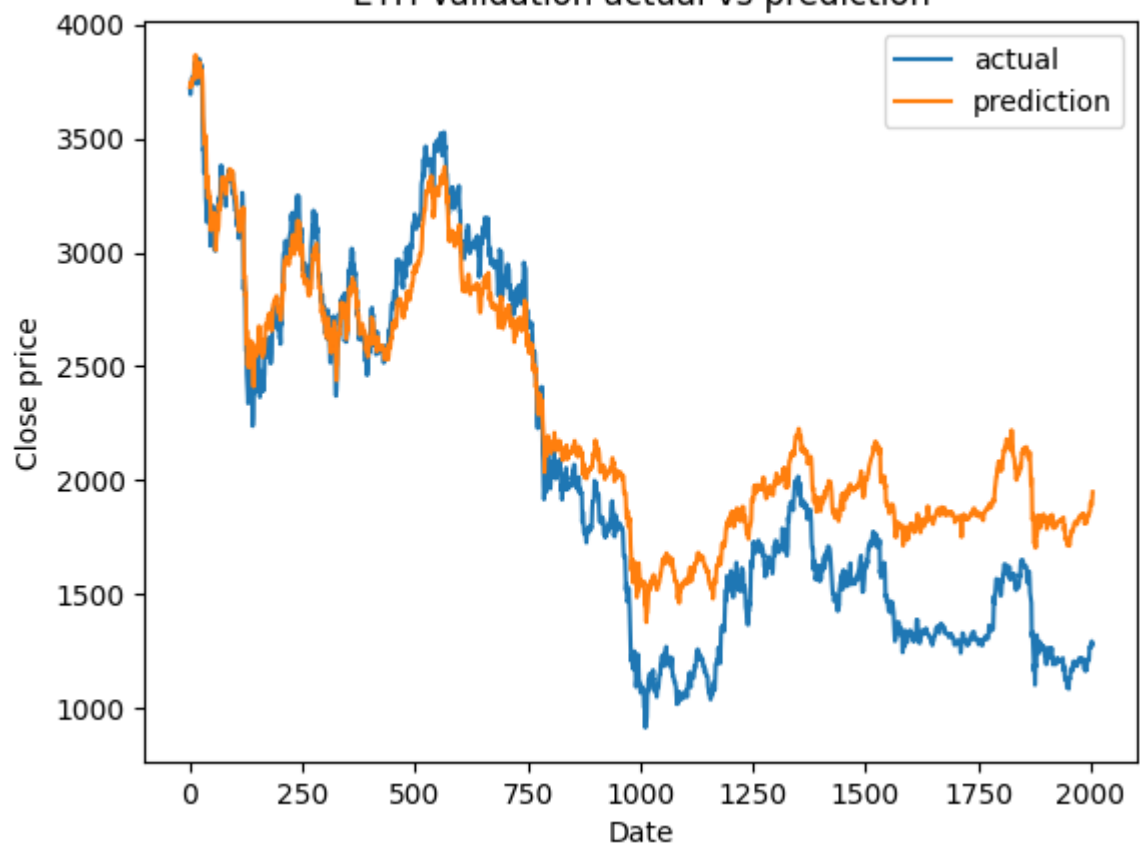
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Epoch 36, Train || MSE: 87588.4127937, MAE: 164.5998353, R2: -136.7856862, RMSE: 2
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Epoch 36, Evaluation || MSE: 216869.0585434, MAE: 409.1993024, R2: -608.3056809, R
MSE: 412.5179759


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Epoch 37, Train || MSE: 82225.6138411, MAE: 159.8046646, R2: -141.7319795, RMSE: 1
97.2748296
Epoch 37, Evaluation || MSE: 228076.8474097, MAE: 405.5071865, R2: -614.4826707, R
MSE: 409.4514634


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Epoch 38, Train || MSE: 88972.0156382, MAE: 166.6793624, R2: -136.7222364, RMSE: 2
04.2892995
Epoch 38, Evaluation || MSE: 164735.9992758, MAE: 339.7743772, R2: -480.7638458, R
MSE: 344.5599989


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Epoch 39, Train || MSE: 94287.2779796, MAE: 166.2515655, R2: -122.8854341, RMSE: 2
05.5551963
Epoch 39, Evaluation || MSE: 126614.3509987, MAE: 300.5732445, R2: -372.4529832, R
MSE: 305.3219072


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Epoch 40, Train || MSE: 101416.6568326, MAE: 173.7469301, R2: -130.4461146, RMSE:
215.1389997
Epoch 40, Evaluation || MSE: 275787.3720650, MAE: 460.2429355, R2: -706.9952692, R
MSE: 463.3279507
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ETH Validation actual vs prediction
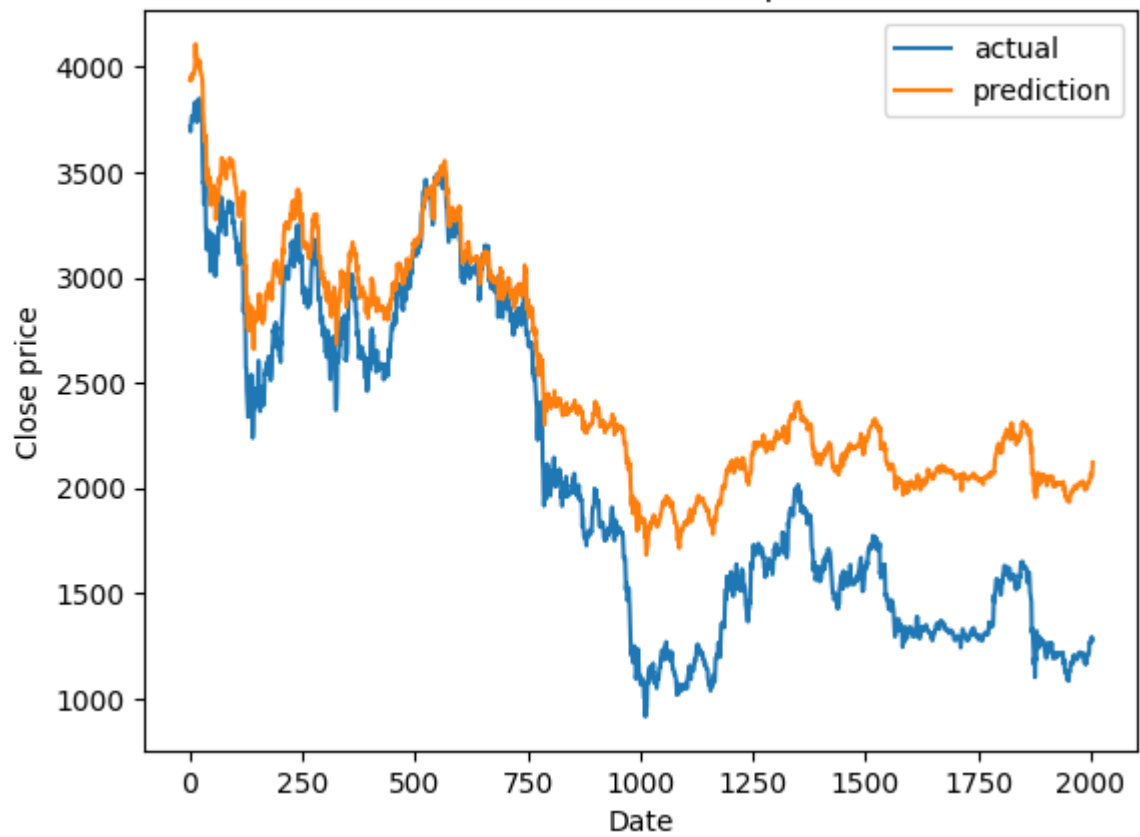
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Epoch 41, Train || MSE: 88515.0436733, MAE: 165.4136392, R2: -195.3615995, RMSE: 2
03.0550646
Epoch 41, Evaluation || MSE: 109777.4436742, MAE: 282.9694595, R2: -323.7927938, R
MSE: 287.3626821


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Epoch 42, Train || MSE: 90609.0740875, MAE: 166.9594250, R2: -131.7448793, RMSE: 2
04.7410844
Epoch 42, Evaluation || MSE: 189167.2622225, MAE: 385.2294160, R2: -504.6961653, R
MSE: 388.6037339


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Epoch 43, Train || MSE: 93413.9840600, MAE: 166.1277377, R2: -151.3330314, RMSE: 2
05.5385275
Epoch 43, Evaluation || MSE: 201762.9564577, MAE: 405.2540045, R2: -505.1959502, R
MSE: 408.1793928


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Epoch 44, Train || MSE: 85466.4987731, MAE: 161.7251946, R2: -128.8877760, RMSE: 1
98.8620421
Epoch 44, Evaluation || MSE: 218703.4363684, MAE: 442.4336599, R2: -513.7396558, R
MSE: 444.6953193


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Epoch 45, Train || MSE: 91265.9268764, MAE: 166.1688724, R2: -127.8395151, RMSE: 2
02.9991432
Epoch 45, Evaluation || MSE: 203571.0165551, MAE: 429.1945997, R2: -459.2581473, R
MSE: 431.3829066

ETH Validation actual vs prediction
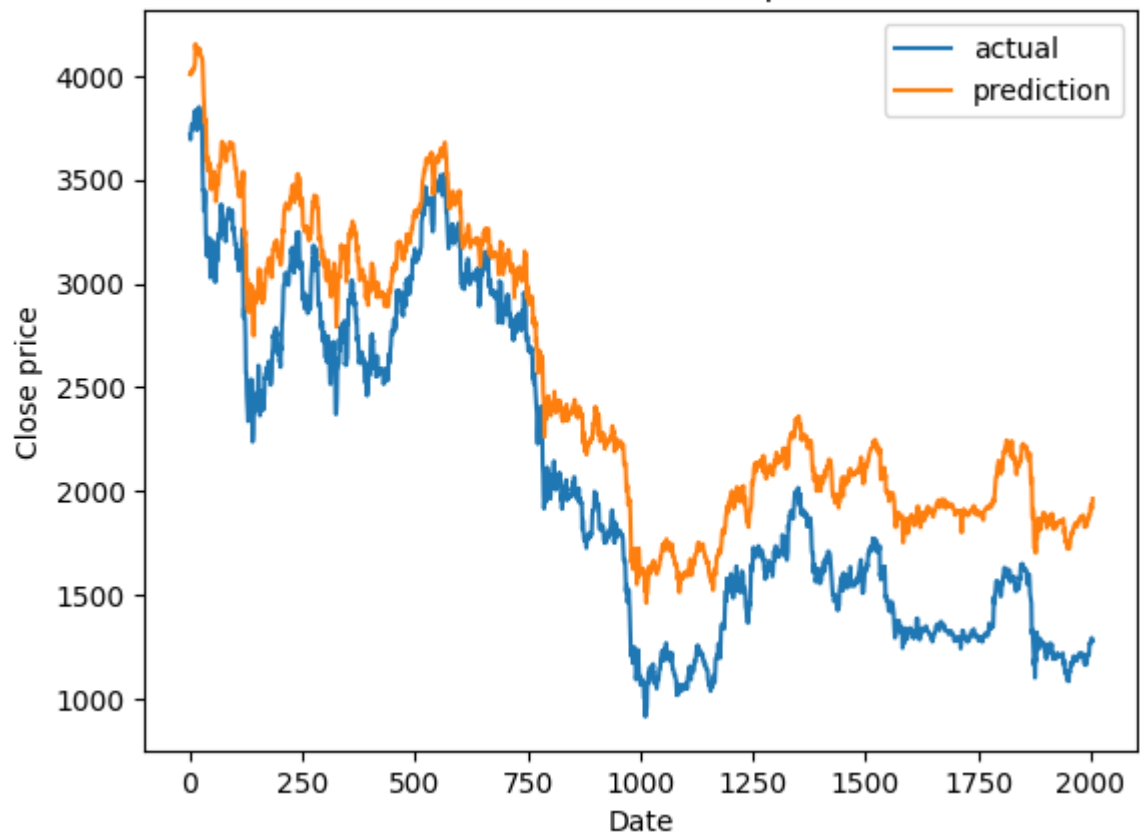
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Epoch 46, Train || MSE: 86392.3396457, MAE: 162.2159897, R2: -125.4620926, RMSE: 1
99.3958220
Epoch 46, Evaluation || MSE: 121850.4623016, MAE: 336.4109829, R2: -259.9216591, R
MSE: 339.0014671


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Epoch 47, Train || MSE: 86440.1744694, MAE: 159.6488187, R2: -123.3083462, RMSE: 1
98.9456066
Epoch 47, Evaluation || MSE: 221823.9379960, MAE: 455.5856605, R2: -465.9176376, R
MSE: 457.5126288


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Epoch 48, Train || MSE: 82712.2755300, MAE: 158.8281231, R2: -146.6548899, RMSE: 1
96.8428356
Epoch 48, Evaluation || MSE: 222455.0875496, MAE: 456.6417793, R2: -479.2638925, R
MSE: 458.6615595


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Epoch 49, Train || MSE: 87405.5960054, MAE: 161.6345214, R2: -120.9024690, RMSE: 1
99.8954549
Epoch 49, Evaluation || MSE: 232996.6563120, MAE: 472.4499986, R2: -478.3539774, R
MSE: 474.3257308


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Epoch 50, Train || MSE: 85297.0688847, MAE: 157.9477113, R2: -120.6494100, RMSE: 1
96.5676412
Epoch 50, Evaluation || MSE: 129296.4702691, MAE: 349.3523745, R2: -251.5991396, R
MSE: 351.8370470

ETH Validation actual vs prediction
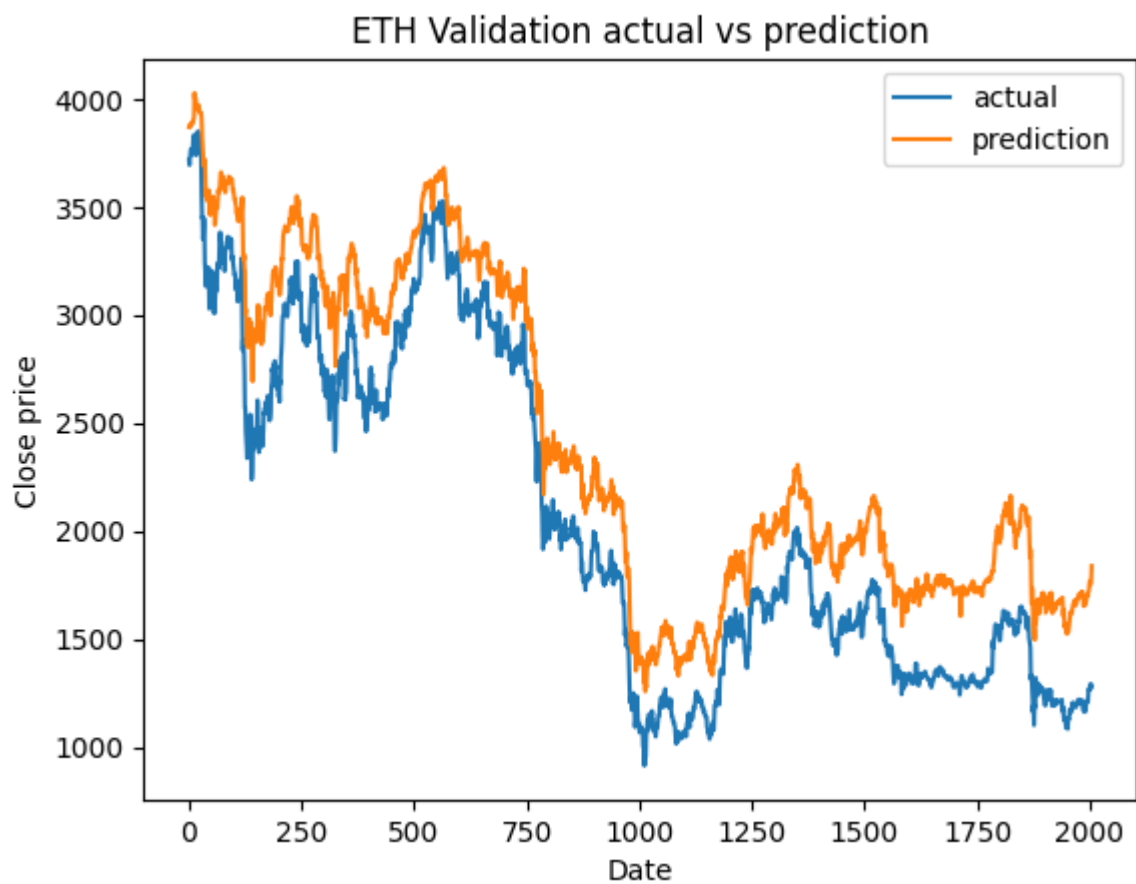
Training LINK coin...:   0%|              | 0/50 [00:00<?, ?it/s]

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256
Epoch 1, Evaluation || MSE: 222.7268827, MAE: 14.1078276, R2: -9492.4237756, RMSE:
14.1242811


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Epoch 2, Train || MSE: 42.2470327, MAE: 4.2039783, R2: -228.3440447, RMSE: 4.90080
06
Epoch 2, Evaluation || MSE: 208.6832398, MAE: 13.6371094, R2: -8927.1784065, RMSE:
13.6546031


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Epoch 3, Train || MSE: 50.3836389, MAE: 4.7406609, R2: -691.2816831, RMSE: 5.41269
96
Epoch 3, Evaluation || MSE: 221.0310623, MAE: 14.0624496, R2: -9387.3504832, RMSE:
14.0788444


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Epoch 4, Train || MSE: 47.0368848, MAE: 4.6427210, R2: -718.1700532, RMSE: 5.33134
87
Epoch 4, Evaluation || MSE: 220.8480879, MAE: 14.0442737, R2: -9420.3891209, RMSE:
14.0607413


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Epoch 5, Train || MSE: 43.4702269, MAE: 4.2585308, R2: -382.4143787, RMSE: 4.97348
46
Epoch 5, Evaluation || MSE: 203.8503992, MAE: 13.4638819, R2: -8749.6957366, RMSE:
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LINK Validation actual vs prediction

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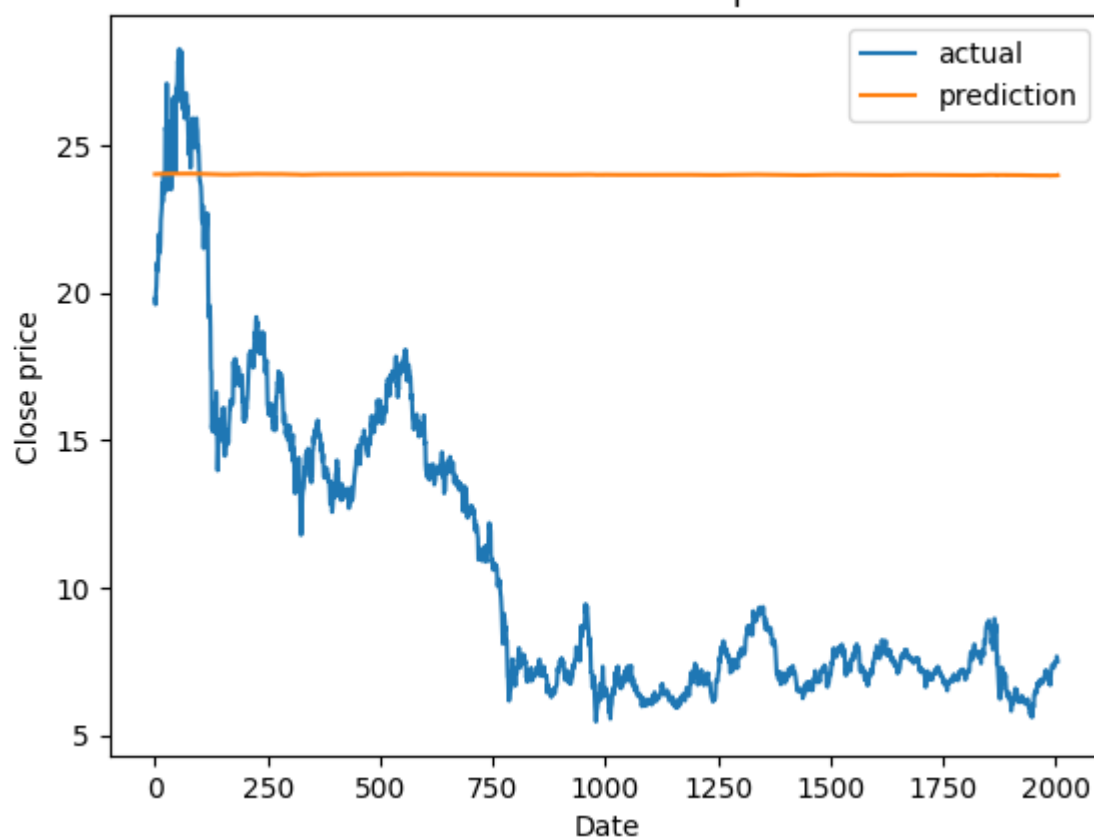
Epoch 6, Train || MSE: 44.7352592, MAE: 4.1832822, R2: -232.5615763, RMSE: 4.9297880

Epoch 6, Evaluation || MSE: 206.9852681, MAE: 13.5744479, R2: -8869.6274123, RMSE: 13.5924204


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Epoch 7, Train || MSE: 43.8265053, MAE: 4.1249827, R2: -203.5867160, RMSE: 4.8711031

Epoch 7, Evaluation || MSE: 208.6339082, MAE: 13.6322987, R2: -8935.6818617, RMSE: 13.6498241


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Epoch 8, Train || MSE: 42.3180116, MAE: 3.9810991, R2: -166.1961143, RMSE: 4.7158647

Epoch 8, Evaluation || MSE: 203.1822023, MAE: 13.4458698, R2: -8719.0051764, RMSE: 13.4639538


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Epoch 9, Train || MSE: 41.8118759, MAE: 3.9446616, R2: -143.8396612, RMSE: 4.6550129

Epoch 9, Evaluation || MSE: 202.6657008, MAE: 13.4380252, R2: -8678.0038700, RMSE: 13.4556169


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Epoch 10, Train || MSE: 39.9130417, MAE: 3.8154052, R2: -135.4880394, RMSE: 4.5060424

Epoch 10, Evaluation || MSE: 188.1135470, MAE: 12.9351989, R2: -8076.6422067, RMSE: 12.9539123

LINK Validation actual vs prediction

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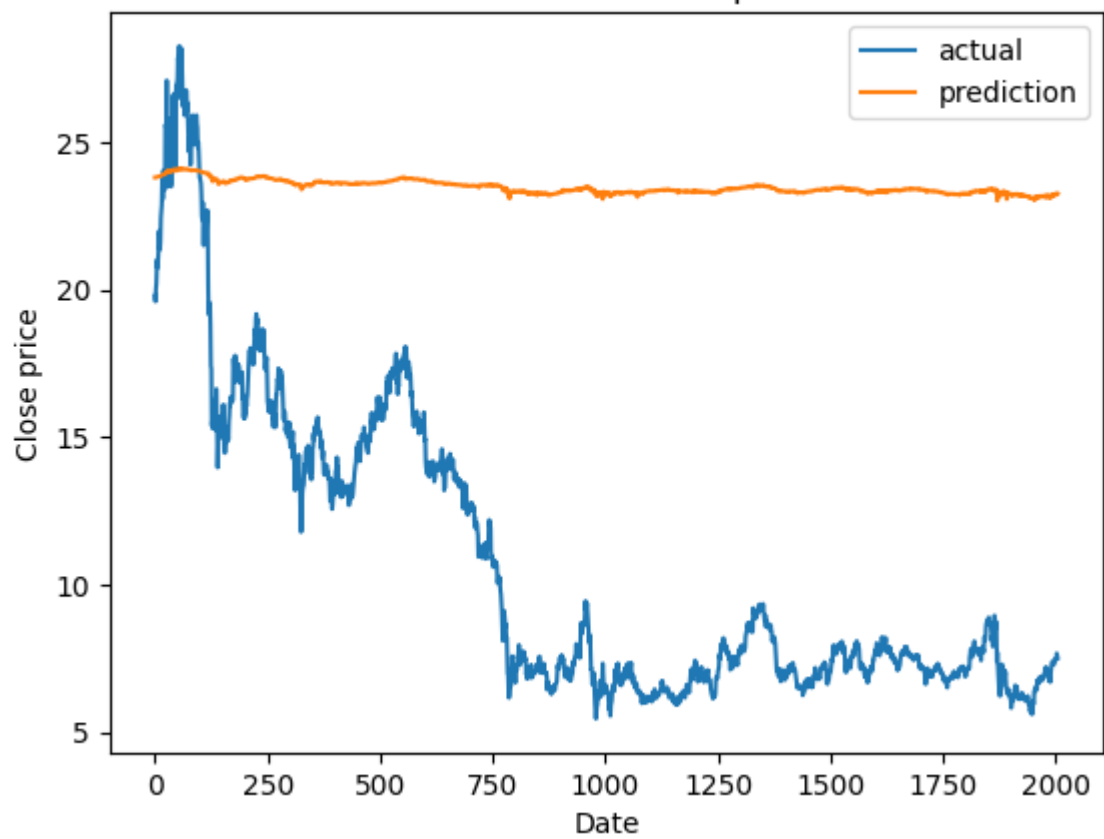
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Epoch 11, Evaluation || MSE: 200.5220257, MAE: 13.3881102, R2: -8533.9231736, RMSE: 13.4043843


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Epoch 12, Train || MSE: 40.9765322, MAE: 3.8991295, R2: -149.5281127, RMSE: 4.5890657

Epoch 12, Evaluation || MSE: 165.0837136, MAE: 12.1202890, R2: -7076.7650719, RMSE: 12.1393557


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Epoch 13, Train || MSE: 34.7300849, MAE: 3.5897798, R2: -134.0641919, RMSE: 4.2806509

Epoch 13, Evaluation || MSE: 131.5842916, MAE: 10.7807091, R2: -5727.2295329, RMSE: 10.7997149


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Epoch 14, Train || MSE: 33.4126602, MAE: 3.5151110, R2: -122.9043864, RMSE: 4.1818050

Epoch 14, Evaluation || MSE: 92.2777560, MAE: 9.0942256, R2: -3931.3395390, RMSE: 9.1125838


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Epoch 15, Train || MSE: 29.2896512, MAE: 3.2097824, R2: -109.4003842, RMSE: 3.8960492

Epoch 15, Evaluation || MSE: 53.6677439, MAE: 6.9072515, R2: -2263.1973737, RMSE: 6.9252089

LINK Validation actual vs prediction
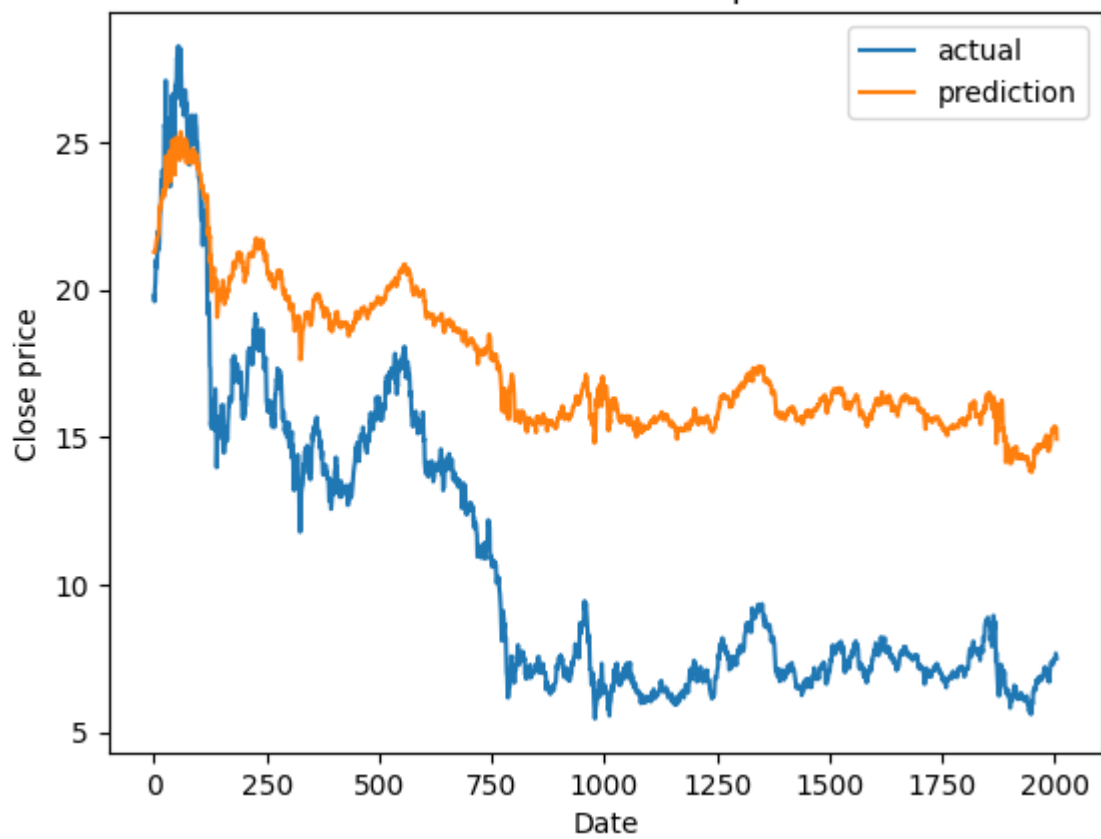
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Epoch 16, Train || MSE: 26.9238227, MAE: 3.1192431, R2: -121.1981087, RMSE: 3.7509
150
Epoch 16, Evaluation || MSE: 44.9690164, MAE: 6.3546910, R2: -1909.4836657, RMSE:
6.3709167


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Epoch 17, Train || MSE: 22.7659024, MAE: 2.8579791, R2: -102.3708491, RMSE: 3.5108
877
Epoch 17, Evaluation || MSE: 19.6928701, MAE: 4.2347068, R2: -838.3937686, RMSE:
4.2530490


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Epoch 18, Train || MSE: 18.0194478, MAE: 2.6552468, R2: -90.4723518, RMSE: 3.18526
61
Epoch 18, Evaluation || MSE: 14.2754324, MAE: 3.5789083, R2: -610.5309798, RMSE:
3.6012539


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Epoch 19, Train || MSE: 19.1457265, MAE: 2.7357922, R2: -96.7097206, RMSE: 3.26889
62
Epoch 19, Evaluation || MSE: 5.1116426, MAE: 1.9302663, R2: -241.8333204, RMSE: 1.
9669732


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Epoch 20, Train || MSE: 16.9685328, MAE: 2.6178334, R2: -96.2480813, RMSE: 3.12670
82
Epoch 20, Evaluation || MSE: 3.4154408, MAE: 1.6449655, R2: -158.9003301, RMSE: 1.
6799448

LINK Validation actual vs prediction
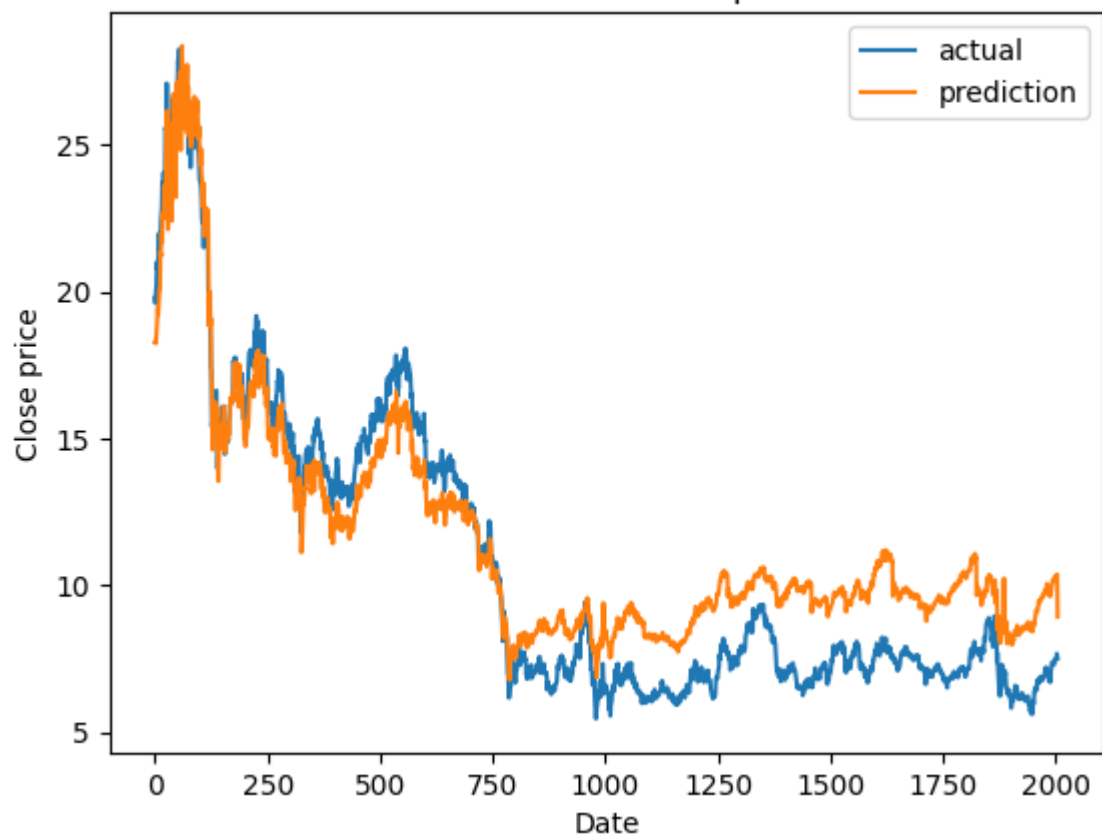
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Epoch 21, Train || MSE: 18.5716960, MAE: 2.6845583, R2: -83.2868869, RMSE: 3.16712
47
Epoch 21, Evaluation || MSE: 3.9225910, MAE: 1.7741798, R2: -182.6039554, RMSE: 1.
8065521


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Epoch 22, Train || MSE: 18.6040359, MAE: 2.6455570, R2: -77.8844822, RMSE: 3.15830
81
Epoch 22, Evaluation || MSE: 4.8710620, MAE: 1.9888569, R2: -228.6156408, RMSE: 2.
0175238


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Epoch 23, Train || MSE: 18.6027607, MAE: 2.6710305, R2: -78.8985354, RMSE: 3.17340
70
Epoch 23, Evaluation || MSE: 3.4015441, MAE: 1.6739153, R2: -153.2794998, RMSE: 1.
7046372


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Epoch 24, Train || MSE: 19.0217760, MAE: 2.6559220, R2: -83.0557172, RMSE: 3.18580
81
Epoch 24, Evaluation || MSE: 3.5814463, MAE: 1.6920170, R2: -162.1393795, RMSE: 1.
7251267


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Epoch 25, Train || MSE: 19.1078172, MAE: 2.6347067, R2: -82.0684333, RMSE: 3.17257
49
Epoch 25, Evaluation || MSE: 9.0427303, MAE: 2.5527357, R2: -429.8634135, RMSE: 2.
5852808
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LINK Validation actual vs prediction
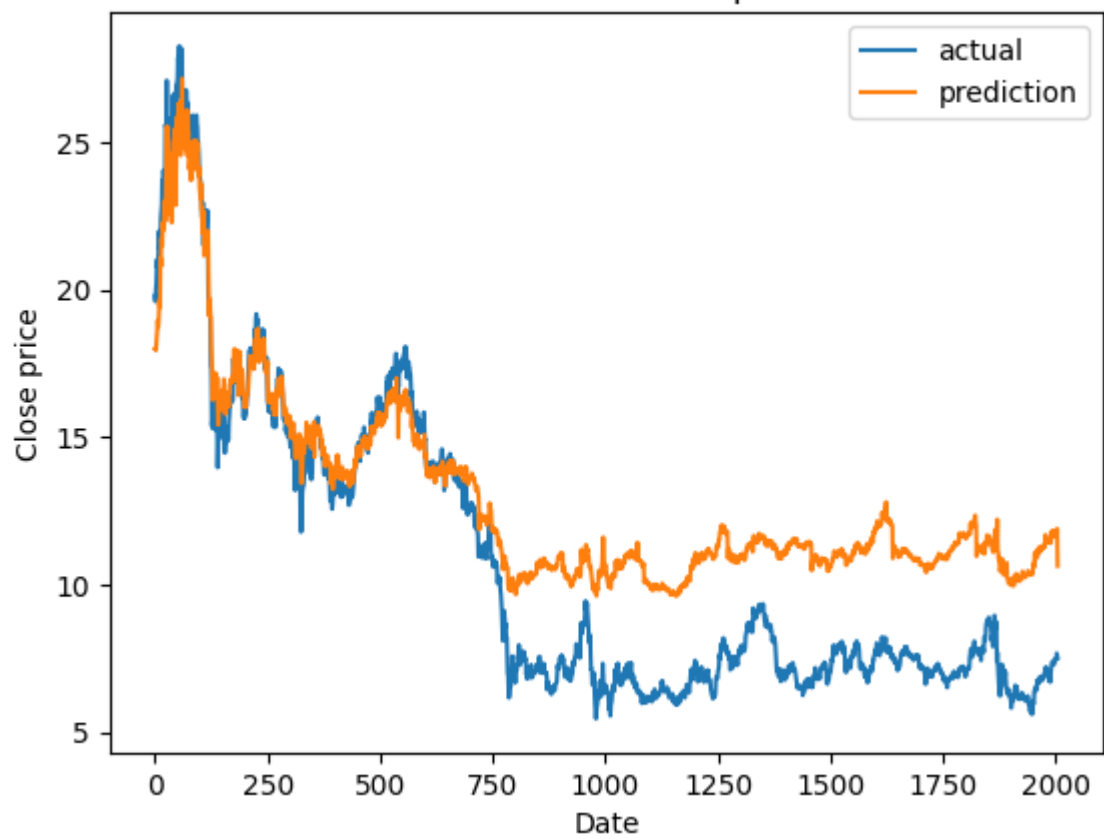
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Epoch 26, Train || MSE: 18.0895960, MAE: 2.6157409, R2: -92.8909312, RMSE: 3.11924
26
Epoch 26, Evaluation || MSE: 4.2400054, MAE: 1.7514403, R2: -198.6582057, RMSE: 1.
7892854


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Epoch 27, Train || MSE: 16.8744535, MAE: 2.5510331, R2: -85.8160809, RMSE: 3.02270
52
Epoch 27, Evaluation || MSE: 6.5845881, MAE: 2.1310645, R2: -326.4108954, RMSE: 2.
1881600


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Epoch 28, Train || MSE: 18.0016586, MAE: 2.5816194, R2: -89.7424000, RMSE: 3.11422
52
Epoch 28, Evaluation || MSE: 4.4438248, MAE: 1.9045220, R2: -204.7702222, RMSE: 1.
9582266


---------
Epoch 29, Train || MSE: 17.1756186, MAE: 2.5118292, R2: -79.3859030, RMSE: 3.00828
42
Epoch 29, Evaluation || MSE: 2.8326599, MAE: 1.4773982, R2: -129.1350909, RMSE: 1.
5103637


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Epoch 30, Train || MSE: 16.4345759, MAE: 2.4850054, R2: -71.4740075, RMSE: 2.94216
51
Epoch 30, Evaluation || MSE: 2.8880831, MAE: 1.4696440, R2: -127.4265868, RMSE: 1.
5083676

LINK Validation actual vs prediction
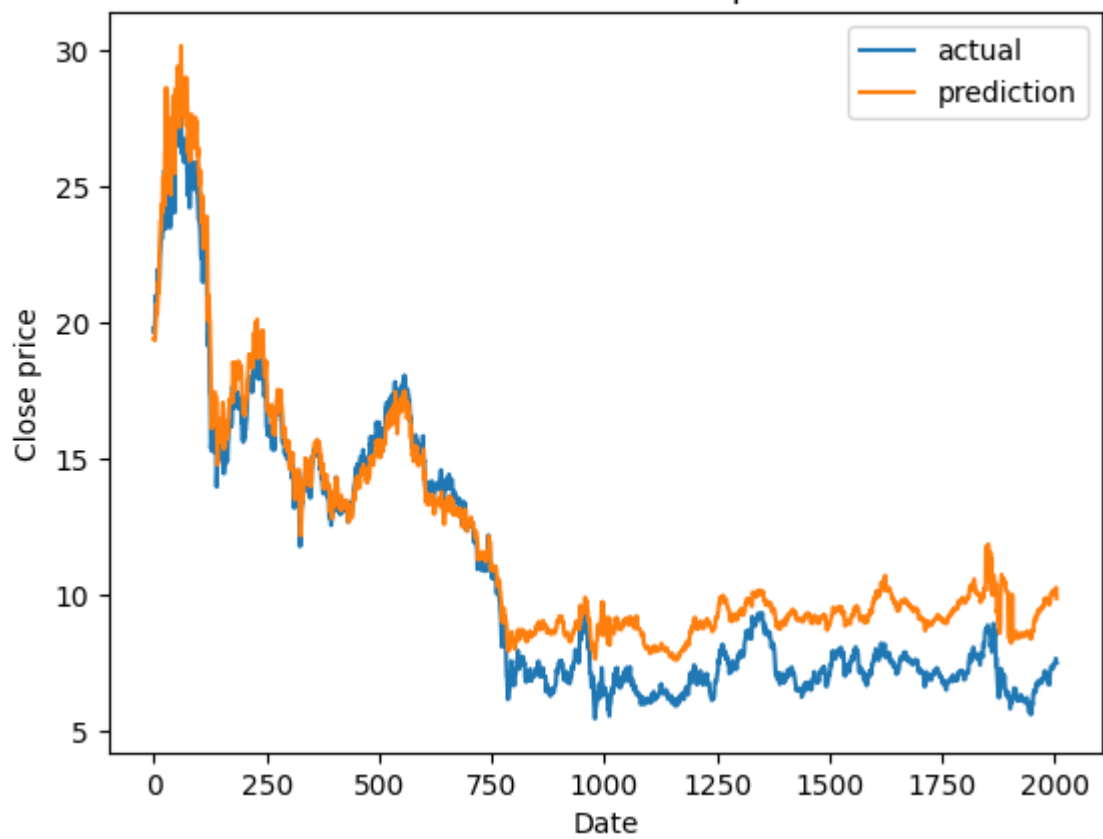
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Epoch 31, Train || MSE: 16.0131405, MAE: 2.4615412, R2: -71.7356987, RMSE: 2.9201253

Epoch 31, Evaluation || MSE: 3.4240032, MAE: 1.5731692, R2: -161.3947665, RMSE: 1.6097329


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Epoch 32, Train || MSE: 15.6842532, MAE: 2.4188907, R2: -81.9260218, RMSE: 2.8757374

Epoch 32, Evaluation || MSE: 3.0502914, MAE: 1.5760606, R2: -130.6185352, RMSE: 1.6059865


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Epoch 33, Train || MSE: 16.0539338, MAE: 2.4288693, R2: -84.7301237, RMSE: 2.9177183

Epoch 33, Evaluation || MSE: 3.2887791, MAE: 1.5286577, R2: -155.8129864, RMSE: 1.5649493


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Epoch 34, Train || MSE: 16.8985476, MAE: 2.4966119, R2: -101.3153441, RMSE: 3.0046001

Epoch 34, Evaluation || MSE: 2.5128910, MAE: 1.4003180, R2: -112.8835250, RMSE: 1.4349358


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Epoch 35, Train || MSE: 15.7223769, MAE: 2.4041038, R2: -98.0248793, RMSE: 2.8981731

Epoch 35, Evaluation || MSE: 7.7470016, MAE: 2.3033266, R2: -376.1030161, RMSE: 2.3384676

LINK Validation actual vs prediction
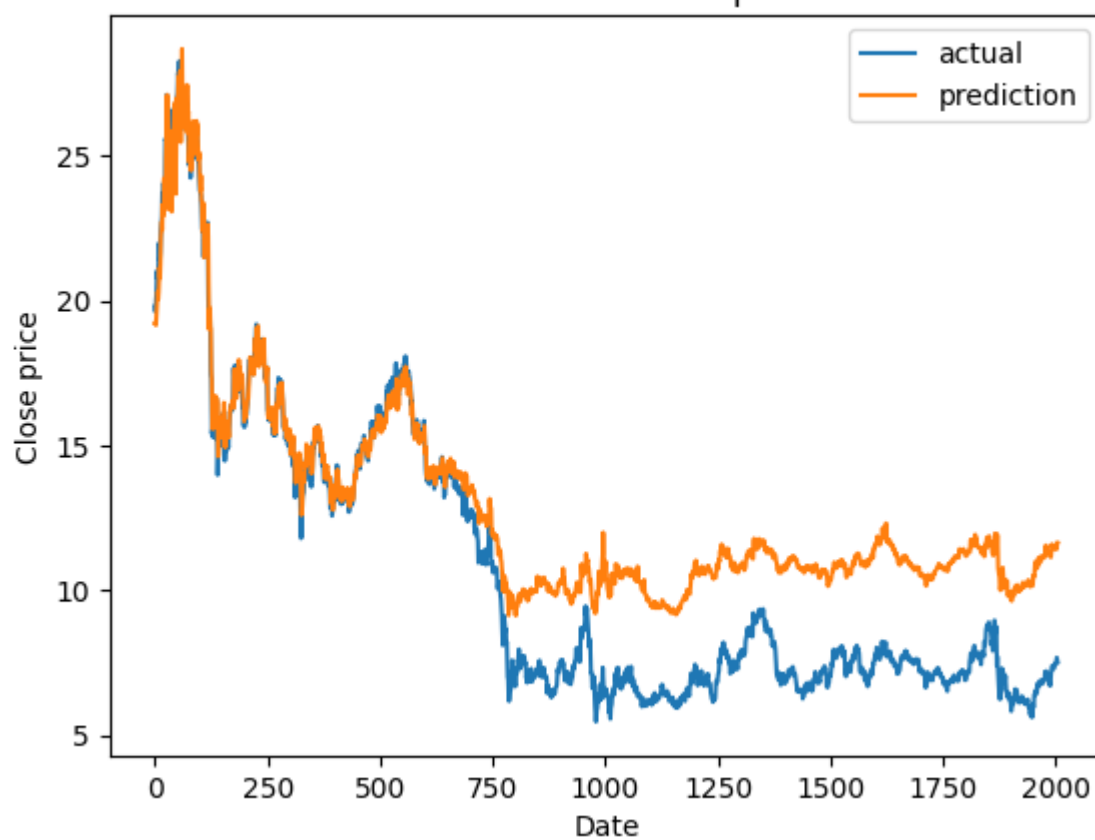
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Epoch 36, Train || MSE: 15.6951807, MAE: 2.4285342, R2: -115.1807894, RMSE: 2.9064
059
Epoch 36, Evaluation || MSE: 2.6133538, MAE: 1.5254381, R2: -89.3157425, RMSE: 1.5
537725


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Epoch 37, Train || MSE: 16.0468538, MAE: 2.4099129, R2: -111.2972526, RMSE: 2.9217
143
Epoch 37, Evaluation || MSE: 6.6093539, MAE: 2.1558665, R2: -308.1789923, RMSE: 2.
1903069


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Epoch 38, Train || MSE: 15.4358649, MAE: 2.4175926, R2: -141.1705933, RMSE: 2.8800
085
Epoch 38, Evaluation || MSE: 5.1815222, MAE: 1.9118753, R2: -237.0772006, RMSE: 1.
9471405


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Epoch 39, Train || MSE: 14.6929084, MAE: 2.3491730, R2: -162.4610839, RMSE: 2.8242
421
Epoch 39, Evaluation || MSE: 3.3070072, MAE: 1.6000854, R2: -141.3322387, RMSE: 1.
6339655


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Epoch 40, Train || MSE: 14.7709082, MAE: 2.3645751, R2: -156.1389586, RMSE: 2.8382
376
Epoch 40, Evaluation || MSE: 3.1885896, MAE: 1.5108271, R2: -134.2670112, RMSE: 1.
5510655

LINK Validation actual vs prediction
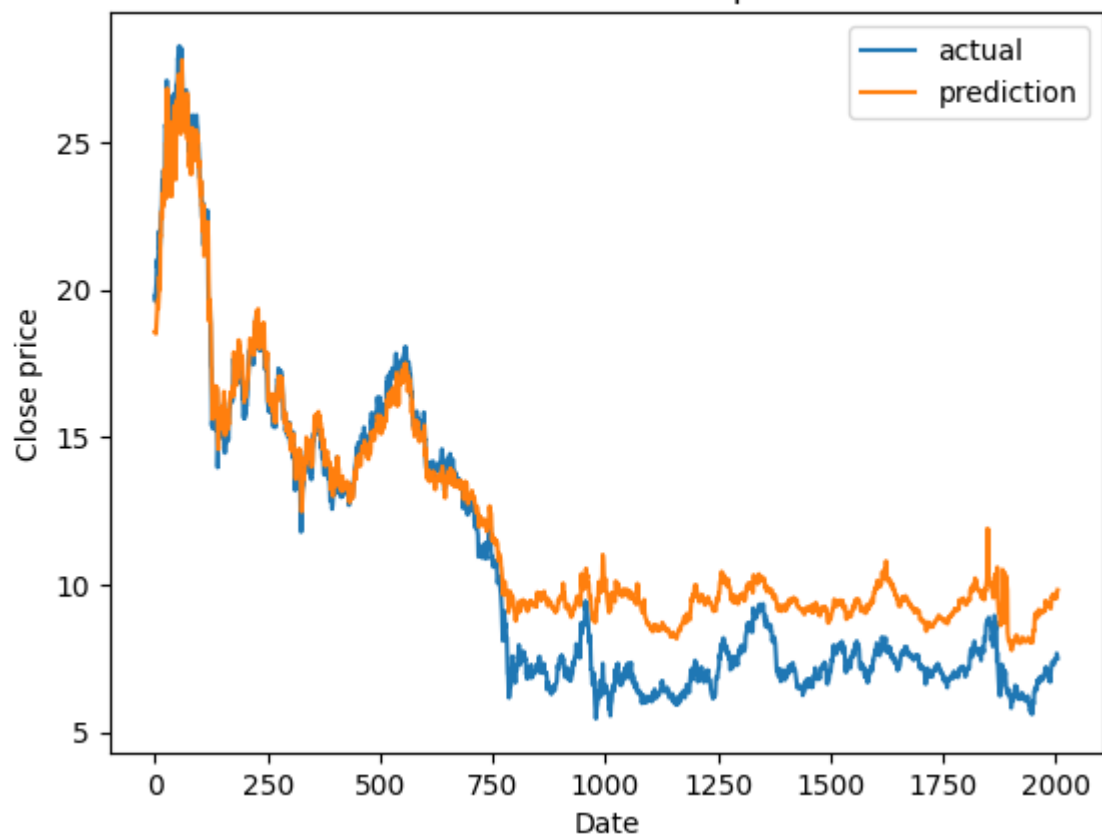
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Epoch 41, Train || MSE: 14.7337683, MAE: 2.3600475, R2: -161.5306380, RMSE: 2.8370860

Epoch 41, Evaluation || MSE: 2.8933177, MAE: 1.4356787, R2: -113.8800785, RMSE: 1.4718261


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Epoch 42, Train || MSE: 15.9489970, MAE: 2.3781084, R2: -190.2430808, RMSE: 2.9139654

Epoch 42, Evaluation || MSE: 4.8140844, MAE: 1.8284122, R2: -188.9102220, RMSE: 1.8678405


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Epoch 43, Train || MSE: 15.8214250, MAE: 2.4085467, R2: -186.3430715, RMSE: 2.9285897

Epoch 43, Evaluation || MSE: 6.6743624, MAE: 2.3354032, R2: -257.7384631, RMSE: 2.3686121


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Epoch 44, Train || MSE: 14.2488968, MAE: 2.3242278, R2: -203.4285638, RMSE: 2.8468928

Epoch 44, Evaluation || MSE: 3.4689665, MAE: 1.5594870, R2: -135.6855327, RMSE: 1.6050660


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Epoch 45, Train || MSE: 15.0620187, MAE: 2.4030980, R2: -207.3938101, RMSE: 2.9030139

Epoch 45, Evaluation || MSE: 4.1210303, MAE: 1.8268151, R2: -151.6429163, RMSE: 1.8632329

LINK Validation actual vs prediction
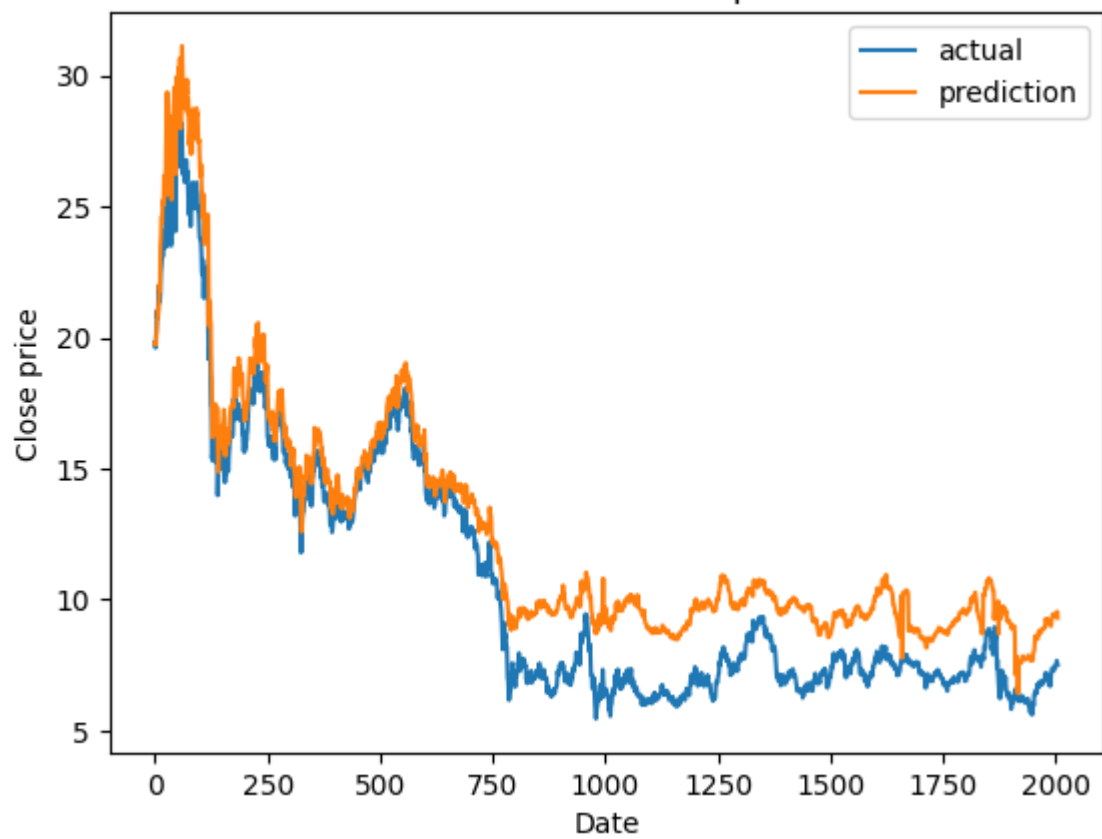
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Epoch 46, Train || MSE: 15.0150504, MAE: 2.3794320, R2: -255.1074912, RMSE: 2.9119317
Epoch 46, Evaluation || MSE: 7.3609814, MAE: 2.3039542, R2: -327.9745839, RMSE: 2.3386923


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Epoch 47, Train || MSE: 14.6801691, MAE: 2.3334562, R2: -300.6502801, RMSE: 2.8760774
Epoch 47, Evaluation || MSE: 7.4692725, MAE: 2.4409014, R2: -326.2381670, RMSE: 2.4668129


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Epoch 48, Train || MSE: 14.0077717, MAE: 2.3461515, R2: -281.2836222, RMSE: 2.8613530
Epoch 48, Evaluation || MSE: 10.3526605, MAE: 2.7615731, R2: -476.0317269, RMSE: 2.7926313


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Epoch 49, Train || MSE: 13.9602354, MAE: 2.2970087, R2: -265.1224465, RMSE: 2.8242769
Epoch 49, Evaluation || MSE: 8.5217145, MAE: 2.4752836, R2: -398.2556028, RMSE: 2.5069360


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Epoch 50, Train || MSE: 14.8713552, MAE: 2.3903741, R2: -281.5820312, RMSE: 2.9461133
Epoch 50, Evaluation || MSE: 7.4721993, MAE: 2.2902714, R2: -343.3818328, RMSE: 2.3243573

LINK Validation actual vs prediction
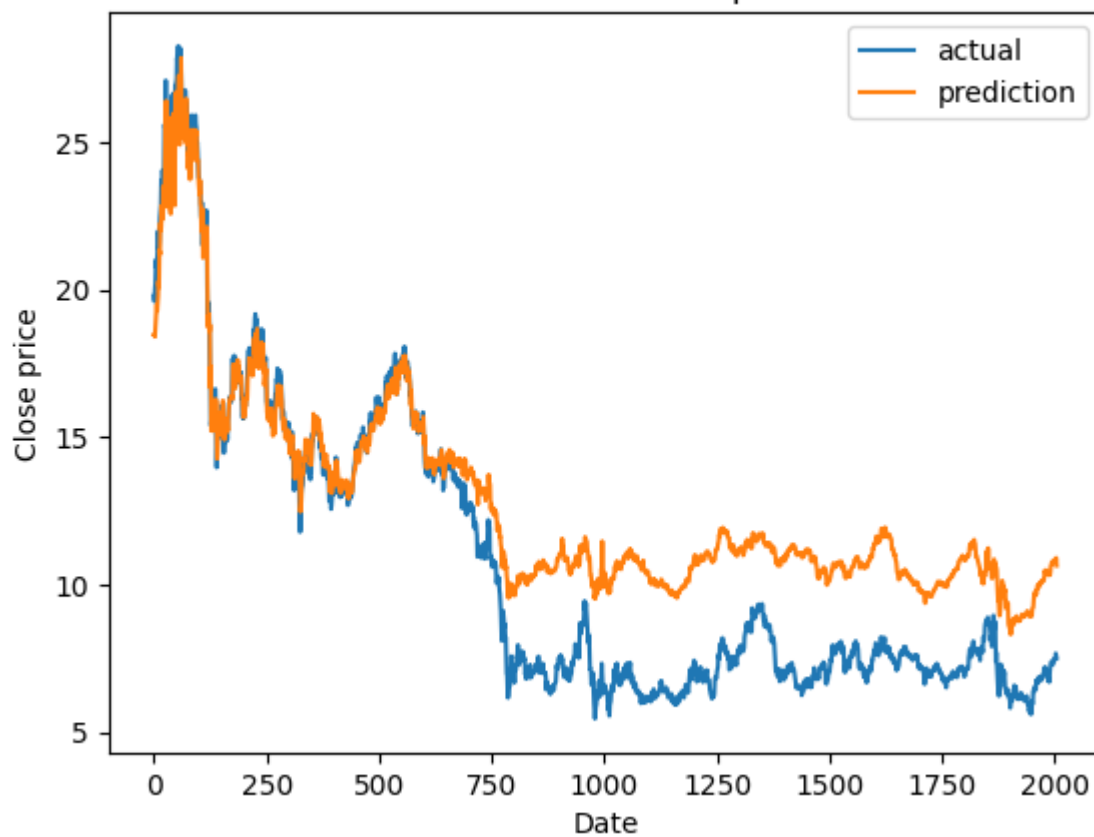
Training LTC coin...:   0%|              | 0/50 [00:00<?, ?it/s]

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Epoch 1, Train || MSE: 7873.3273903, MAE: 57.5447568, R2: -1071.1916143, RMSE: 60.2469866
Epoch 1, Evaluation || MSE: 12265.3599543, MAE: 106.5983265, R2: -13532.8513119, RMSE: 106.6409483


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Epoch 2, Train || MSE: 1837.7601875, MAE: 29.4582637, R2: -280.5874256, RMSE: 33.4919159
Epoch 2, Evaluation || MSE: 11704.1681054, MAE: 104.1631922, R2: -12843.5554920, RMSE: 104.2059343


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Epoch 3, Train || MSE: 1943.8840136, MAE: 30.1945178, R2: -427.0135252, RMSE: 34.4796434
Epoch 3, Evaluation || MSE: 11267.8535389, MAE: 102.4737738, R2: -12219.9330177, RMSE: 102.5149544


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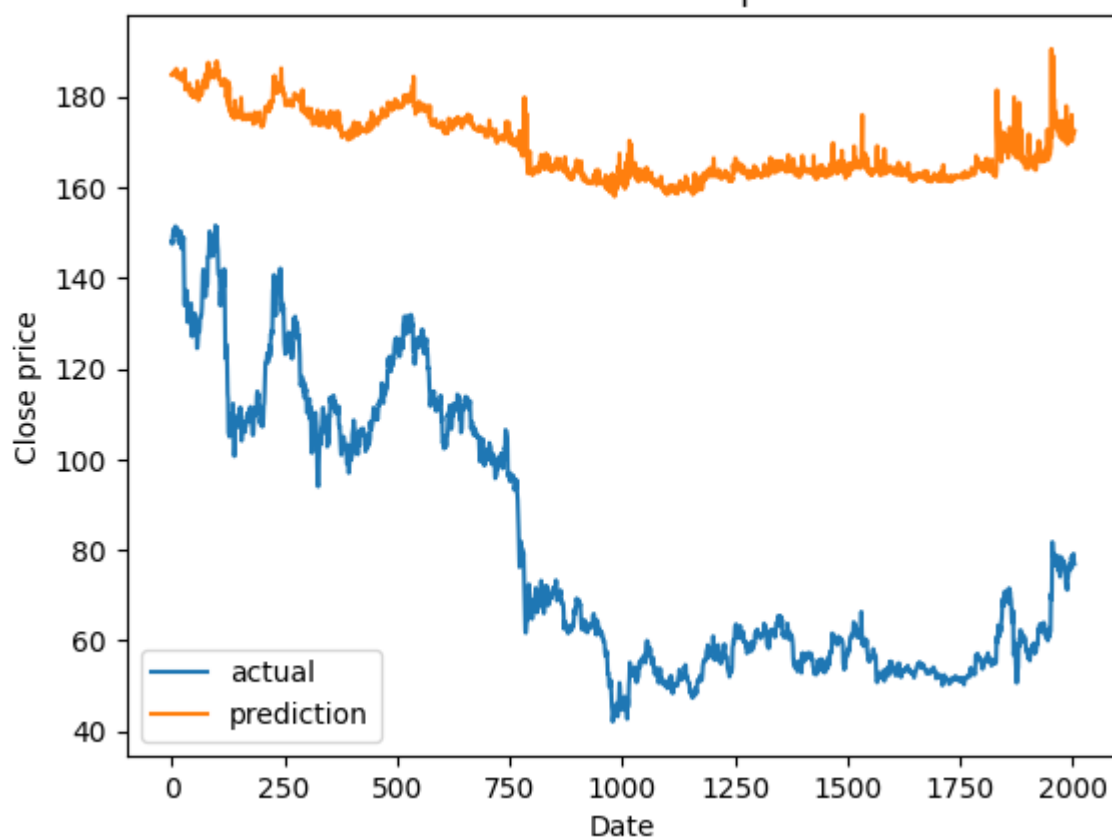Epoch 4, Train || MSE: 1644.6200369, MAE: 27.0330252, R2: -258.2796010, RMSE: 31.1758433
Epoch 4, Evaluation || MSE: 9691.8459037, MAE: 95.0502830, R2: -10524.7388631, RMSE: 95.0929464


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Epoch 5, Train || MSE: 1299.4362774, MAE: 23.6906894, R2: -210.2202448, RMSE: 28.1096608
Epoch 5, Evaluation || MSE: 8314.9633469, MAE: 88.1095483, R2: -9017.4011215, RMSE: 88.1574050

LTC Validation actual vs prediction

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Epoch 6, Train || MSE: 1002.9594740, MAE: 20.9694280, R2: -177.0326315, RMSE: 25.0671181

Epoch 6, Evaluation || MSE: 5822.7373933, MAE: 73.3795832, R2: -6413.1508703, RMSE: 73.4442451


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Epoch 7, Train || MSE: 829.0227690, MAE: 19.4588369, R2: -163.8330565, RMSE: 23.6489057

Epoch 7, Evaluation || MSE: 3682.2719140, MAE: 58.0141419, R2: -4127.1171500, RMSE: 58.0920513


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Epoch 8, Train || MSE: 676.8346622, MAE: 17.7901500, R2: -150.8520692, RMSE: 21.6911206

Epoch 8, Evaluation || MSE: 2563.0684790, MAE: 48.5761633, R2: -2871.3253428, RMSE: 48.6504385


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Epoch 9, Train || MSE: 579.2455470, MAE: 16.6538277, R2: -149.7564721, RMSE: 20.2823550
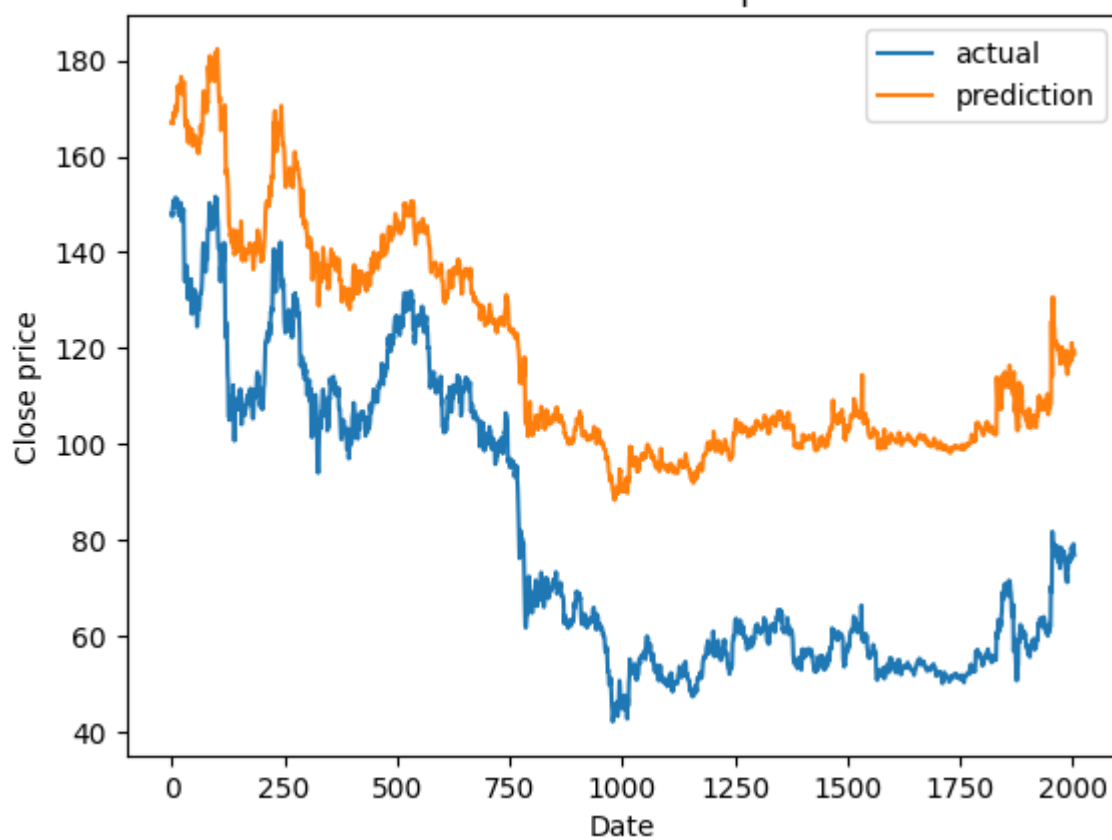
Epoch 9, Evaluation || MSE: 1565.5563893, MAE: 37.7833023, R2: -1788.0216703, RMSE: 37.8506036


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Epoch 10, Train || MSE: 592.7617203, MAE: 16.8015361, R2: -142.6273192, RMSE: 20.5463632

Epoch 10, Evaluation || MSE: 1497.9515504, MAE: 37.6653345, R2: -1619.2649325, RMSE: 37.7169865

LTC Validation actual vs prediction

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Epoch 11, Train || MSE: 537.1188766, MAE: 15.9176885, R2: -128.8830013, RMSE: 19.5973719
Epoch 11, Evaluation || MSE: 1147.8955592, MAE: 32.5848781, R2: -1305.8292301, RMSE: 32.6378590


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Epoch 12, Train || MSE: 563.6214292, MAE: 16.2392094, R2: -134.3911086, RMSE: 19.9600386
Epoch 12, Evaluation || MSE: 942.4942899, MAE: 29.6229481, R2: -1053.6911166, RMSE: 29.6770449


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Epoch 13, Train || MSE: 560.0147701, MAE: 16.1475569, R2: -137.3445467, RMSE: 19.7546076
Epoch 13, Evaluation || MSE: 1295.7815898, MAE: 35.2735676, R2: -1366.9677103, RMSE: 35.3161221


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Epoch 14, Train || MSE: 553.0083153, MAE: 16.0159668, R2: -128.9194422, RMSE: 19.7312586
Epoch 14, Evaluation || MSE: 1102.6606486, MAE: 32.3944770, R2: -1189.1363822, RMSE: 32.4414339
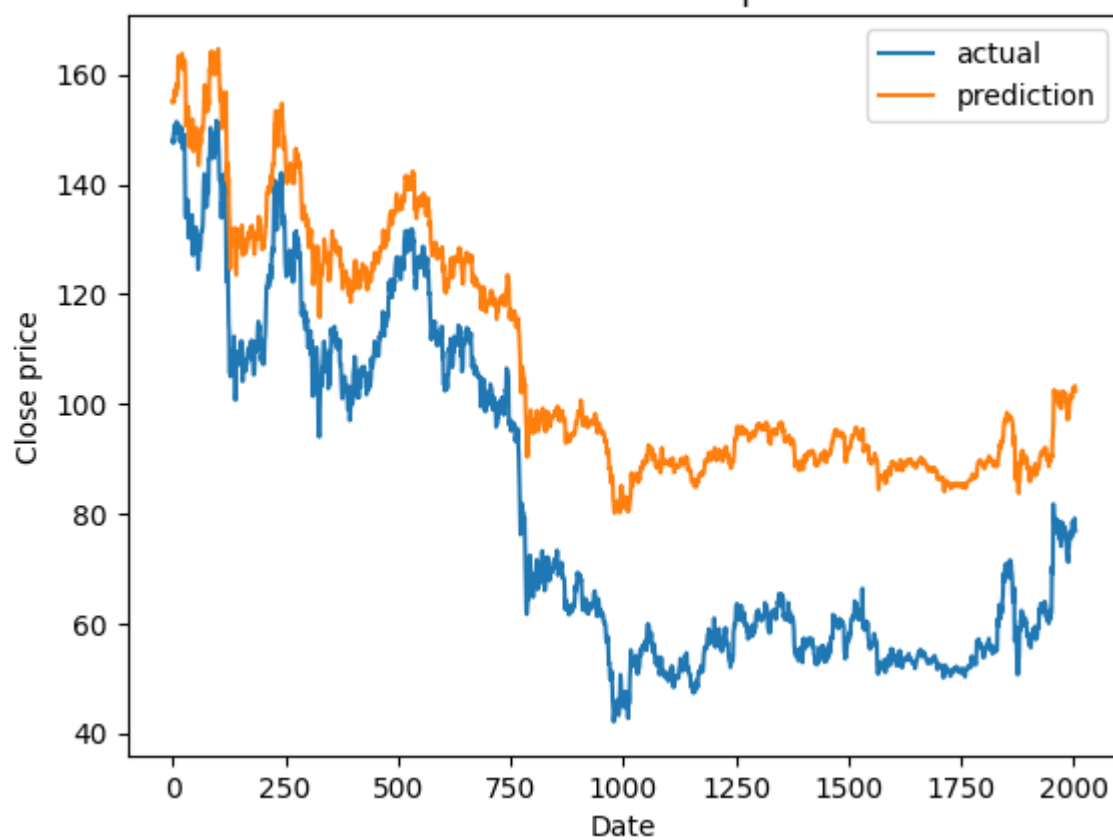

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Epoch 15, Train || MSE: 527.3545171, MAE: 15.8734109, R2: -121.1984442, RMSE: 19.5068795
Epoch 15, Evaluation || MSE: 787.4294658, MAE: 26.7066673, R2: -901.2892037, RMSE: 26.7709779

LTC Validation actual vs prediction

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Epoch 16, Train || MSE: 547.4501754, MAE: 15.7586639, R2: -122.5142789, RMSE: 19.3573327
Epoch 16, Evaluation || MSE: 942.8908722, MAE: 29.4428691, R2: -1043.1779287, RMSE: 29.5001522


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Epoch 17, Train || MSE: 490.7950705, MAE: 15.0808030, R2: -116.1056047, RMSE: 18.5193397
Epoch 17, Evaluation || MSE: 897.6063792, MAE: 29.4810838, R2: -871.2419854, RMSE: 29.5324247


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Epoch 18, Train || MSE: 480.5937521, MAE: 14.8921376, R2: -101.1752183, RMSE: 18.3072319
Epoch 18, Evaluation || MSE: 603.7022595, MAE: 23.9604402, R2: -597.5376321, RMSE: 24.0241051


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Epoch 19, Train || MSE: 483.2771473, MAE: 14.9234979, R2: -105.2469372, RMSE: 18.2745598
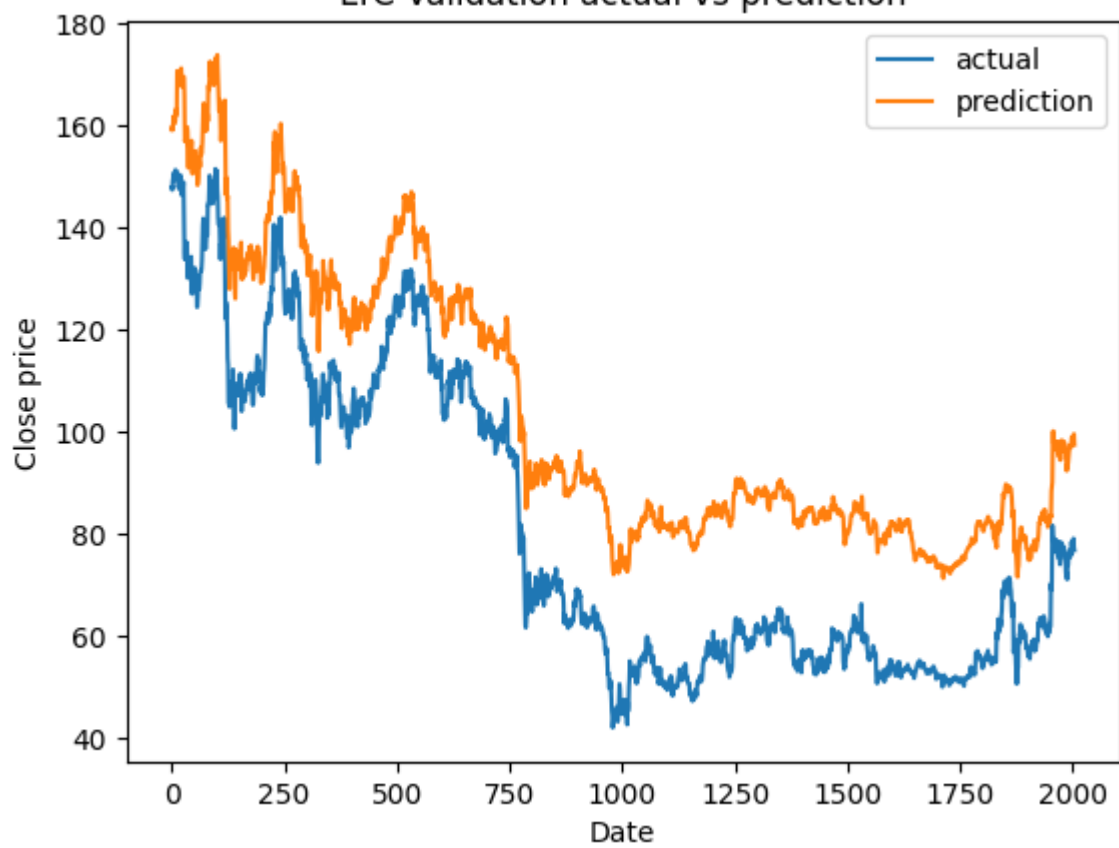Epoch 19, Evaluation || MSE: 692.2950064, MAE: 25.5938055, R2: -706.7985039, RMSE: 25.6552086


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Epoch 20, Train || MSE: 462.9527731, MAE: 14.5364161, R2: -101.0196026, RMSE: 17.9288734
Epoch 20, Evaluation || MSE: 547.9912975, MAE: 22.9086227, R2: -518.5486431, RMSE: 22.9745355

LTC Validation actual vs prediction

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Epoch 21, Train || MSE: 494.3378599, MAE: 14.8312357, R2: -102.3101872, RMSE: 18.2
264206
Epoch 21, Evaluation || MSE: 512.0167476, MAE: 21.6621398, R2: -525.3801796, RMSE:
21.7438756


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Epoch 22, Train || MSE: 502.5577279, MAE: 14.9079498, R2: -103.7266516, RMSE: 18.2
523111
Epoch 22, Evaluation || MSE: 383.9641920, MAE: 19.0519922, R2: -331.9705669, RMSE:
19.1340034


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Epoch 23, Train || MSE: 461.5840757, MAE: 14.6232954, R2: -102.8750012, RMSE: 17.9
412516
Epoch 23, Evaluation || MSE: 364.8674723, MAE: 18.4188020, R2: -252.3070051, RMSE:
18.5057459


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Epoch 24, Train || MSE: 489.2932549, MAE: 14.8740103, R2: -105.1319539, RMSE: 18.2
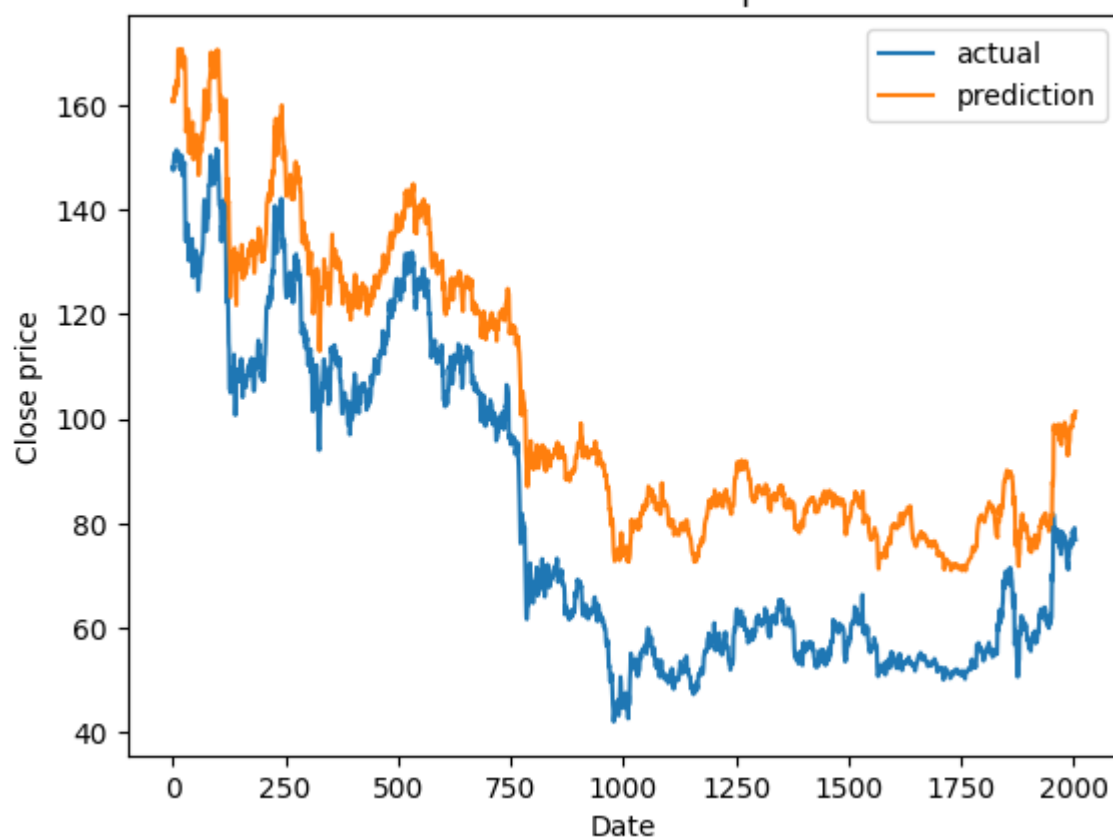921557
Epoch 24, Evaluation || MSE: 350.9840349, MAE: 18.2574016, R2: -300.1874464, RMSE:
18.3419543


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Epoch 25, Train || MSE: 486.6251483, MAE: 14.8559566, R2: -99.1682379, RMSE: 18.19
63558
Epoch 25, Evaluation || MSE: 521.7660898, MAE: 22.3049700, R2: -490.1131579, RMSE:
22.3733579

LTC Validation actual vs prediction

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Epoch 26, Train || MSE: 518.3122202, MAE: 15.0616710, R2: -97.8440846, RMSE: 18.50
21563
Epoch 26, Evaluation || MSE: 457.2085790, MAE: 20.7928178, R2: -429.1270078, RMSE:
20.8657415


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Epoch 27, Train || MSE: 469.6229452, MAE: 14.5473985, R2: -97.8253458, RMSE: 17.94
90570
Epoch 27, Evaluation || MSE: 292.7397310, MAE: 16.4830309, R2: -255.2786109, RMSE:
16.5740530


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Epoch 28, Train || MSE: 445.1458593, MAE: 14.2273657, R2: -93.1203536, RMSE: 17.45
78499
Epoch 28, Evaluation || MSE: 413.3199939, MAE: 19.5438518, R2: -396.4411842, RMSE:
19.6250319


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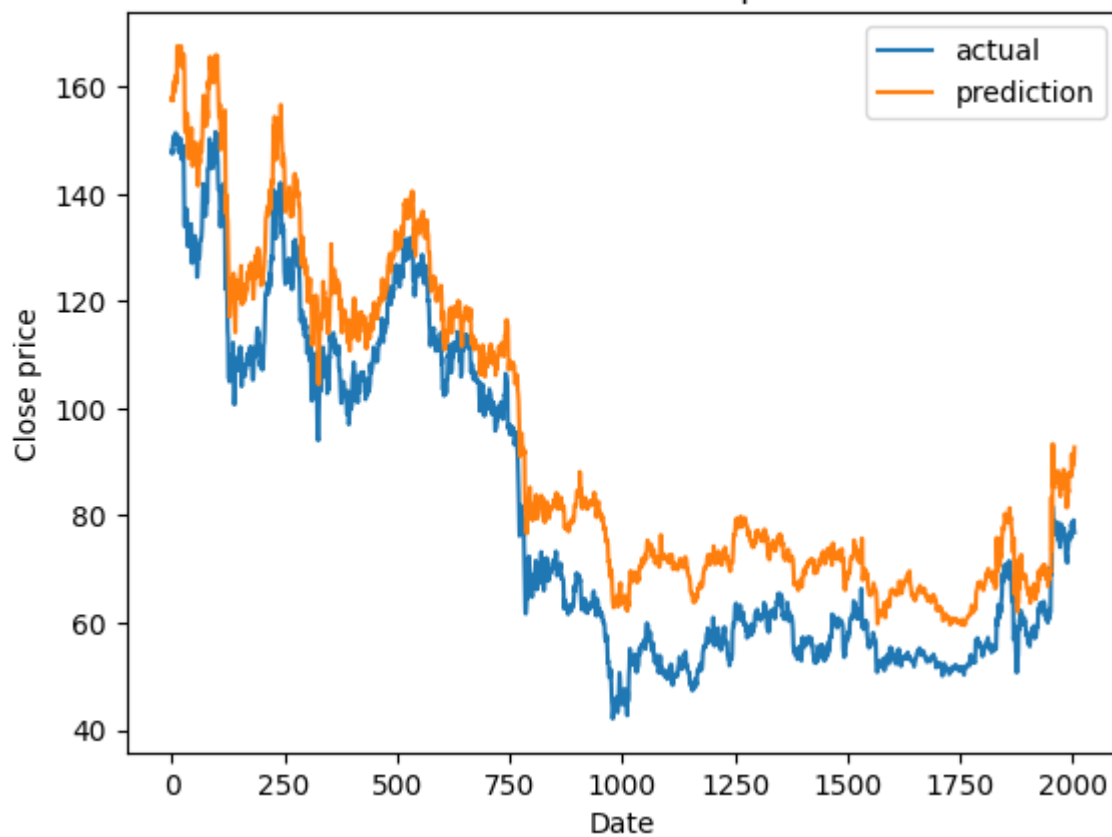Epoch 29, Train || MSE: 476.0335788, MAE: 14.6675617, R2: -95.9557365, RMSE: 17.97
64248
Epoch 29, Evaluation || MSE: 80.8321125, MAE: 8.2115138, R2: -59.0735108, RMSE: 8.
4001465


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Epoch 30, Train || MSE: 499.2562708, MAE: 15.1186818, R2: -100.8070979, RMSE: 18.4
364552
Epoch 30, Evaluation || MSE: 178.1575993, MAE: 12.7274659, R2: -145.9002658, RMSE:
12.8466605

LTC Validation actual vs prediction

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Epoch 31, Train || MSE: 495.9175119, MAE: 14.7461077, R2: -93.2386572, RMSE: 18.18
61480
Epoch 31, Evaluation || MSE: 179.4104138, MAE: 12.5925974, R2: -172.5233005, RMSE:
12.7167016


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Epoch 32, Train || MSE: 463.7061034, MAE: 14.5529939, R2: -93.9587988, RMSE: 17.90
35724
Epoch 32, Evaluation || MSE: 242.4795143, MAE: 15.1053053, R2: -200.5646942, RMSE:
15.1997322


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Epoch 33, Train || MSE: 466.0551068, MAE: 14.4022579, R2: -89.3008611, RMSE: 17.75
75872
Epoch 33, Evaluation || MSE: 511.8733651, MAE: 22.1745941, R2: -456.8979964, RMSE:
22.2400118


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Epoch 34, Train || MSE: 461.6861446, MAE: 14.3154550, R2: -94.6651293, RMSE: 17.63
20932
Epoch 34, Evaluation || MSE: 538.2963417, MAE: 22.5780595, R2: -494.6103532, RMSE:
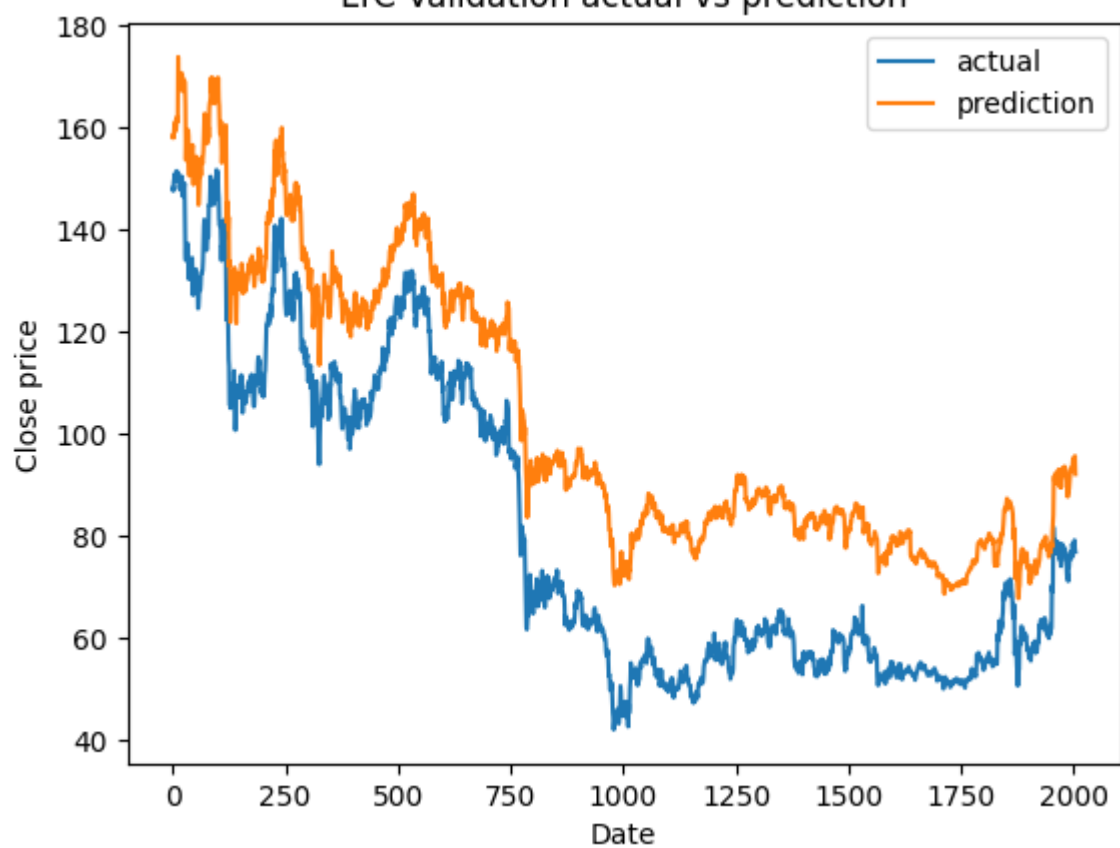22.6479077


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Epoch 35, Train || MSE: 519.5219434, MAE: 15.0260438, R2: -89.6047481, RMSE: 18.37
04548
Epoch 35, Evaluation || MSE: 513.1062537, MAE: 22.0879313, R2: -467.5218942, RMSE:
22.1583905

LTC Validation actual vs prediction

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Epoch 36, Train || MSE: 474.3747418, MAE: 14.5340203, R2: -93.2326722, RMSE: 17.96
84654
Epoch 36, Evaluation || MSE: 464.9039350, MAE: 21.0761779, R2: -394.4747531, RMSE:
21.1546012


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Epoch 37, Train || MSE: 491.4794234, MAE: 14.5851565, R2: -88.7406789, RMSE: 17.90
68600
Epoch 37, Evaluation || MSE: 570.2182730, MAE: 23.4141010, R2: -477.8257331, RMSE:
23.4856705


---------
Epoch 38, Train || MSE: 495.4204526, MAE: 14.7083237, R2: -94.0784684, RMSE: 18.15
83390
Epoch 38, Evaluation || MSE: 396.9179560, MAE: 19.1461574, R2: -379.7256787, RMSE:
19.2298206


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Epoch 39, Train || MSE: 503.8452840, MAE: 14.9253861, R2: -94.6539027, RMSE: 18.37
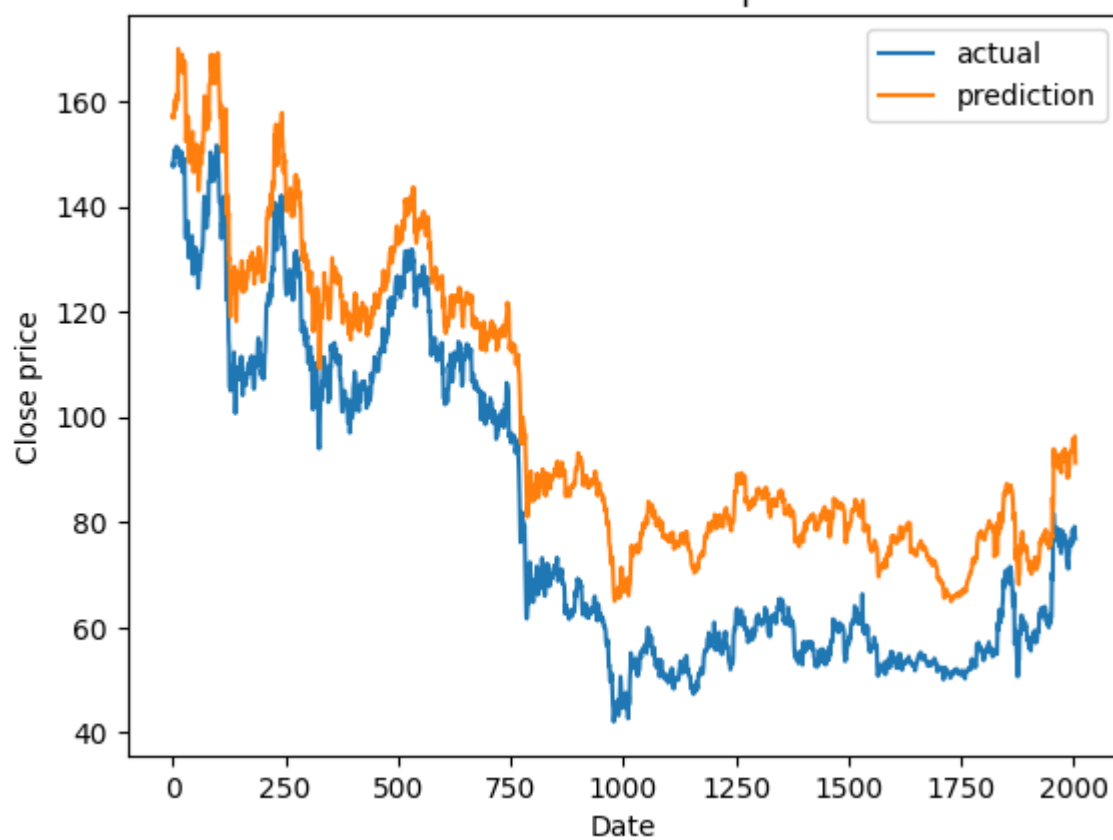24611
Epoch 39, Evaluation || MSE: 486.7474032, MAE: 21.4008281, R2: -478.5611951, RMSE:
21.4723341


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Epoch 40, Train || MSE: 466.4306061, MAE: 14.2751026, R2: -92.7761973, RMSE: 17.58
46135
Epoch 40, Evaluation || MSE: 373.7239958, MAE: 18.7269527, R2: -353.6552276, RMSE:
18.8095733

LTC Validation actual vs prediction

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Epoch 41, Train || MSE: 471.5927217, MAE: 14.6928984, R2: -96.2766119, RMSE: 17.94
41292
Epoch 41, Evaluation || MSE: 329.3296661, MAE: 17.4697028, R2: -297.5649536, RMSE:
17.5625629


---------
Epoch 42, Train || MSE: 479.1813287, MAE: 14.4343151, R2: -91.2738267, RMSE: 17.80
86778
Epoch 42, Evaluation || MSE: 195.8611288, MAE: 13.3543046, R2: -166.5080172, RMSE:
13.4671690


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Epoch 43, Train || MSE: 490.8211903, MAE: 14.7365718, R2: -92.9619851, RMSE: 18.06
05242
Epoch 43, Evaluation || MSE: 538.2729443, MAE: 22.3656562, R2: -516.6315526, RMSE:
22.4363732


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Epoch 44, Train || MSE: 470.1737909, MAE: 14.5221785, R2: -88.4376543, RMSE: 17.82
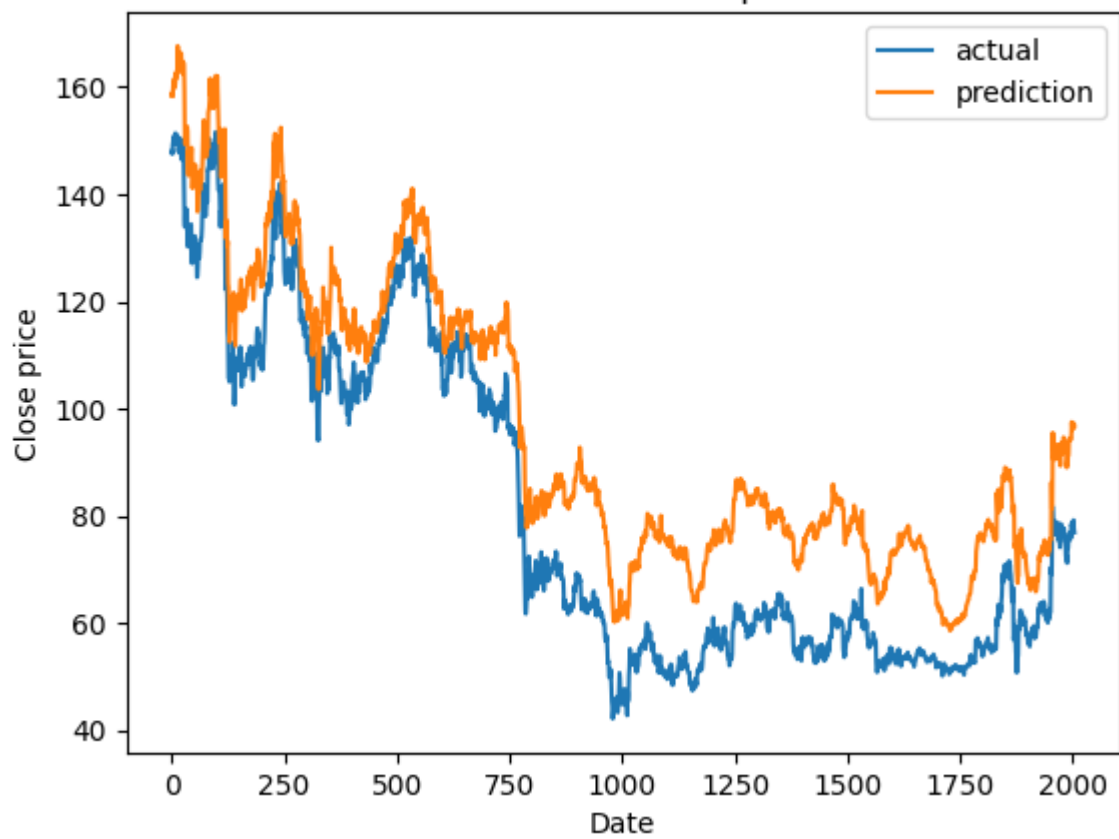28688
Epoch 44, Evaluation || MSE: 221.7420983, MAE: 13.7148878, R2: -226.7656174, RMSE:
13.8499864


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Epoch 45, Train || MSE: 439.4799540, MAE: 14.0326918, R2: -84.6409711, RMSE: 17.21
86013
Epoch 45, Evaluation || MSE: 256.3870170, MAE: 14.9691077, R2: -255.8312043, RMSE:
15.0898057

LTC Validation actual vs prediction

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Epoch 46, Train || MSE: 462.6176384, MAE: 14.2134442, R2: -83.7001403, RMSE: 17.47
60914
Epoch 46, Evaluation || MSE: 323.6169711, MAE: 17.1664603, R2: -323.5885166, RMSE:
17.2611145


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Epoch 47, Train || MSE: 491.1018042, MAE: 14.6017183, R2: -90.7527866, RMSE: 17.98
35831
Epoch 47, Evaluation || MSE: 110.3404931, MAE: 9.6000709, R2: -101.6744432, RMSE:
9.7747686


---------
Epoch 48, Train || MSE: 443.7238249, MAE: 14.0069462, R2: -82.2364931, RMSE: 17.26
95901
Epoch 48, Evaluation || MSE: 140.7060814, MAE: 11.0334066, R2: -96.5334843, RMSE:
11.1702589


---------
Epoch 49, Train || MSE: 476.1262524, MAE: 14.3768829, R2: -81.8034281, RMSE: 17.71
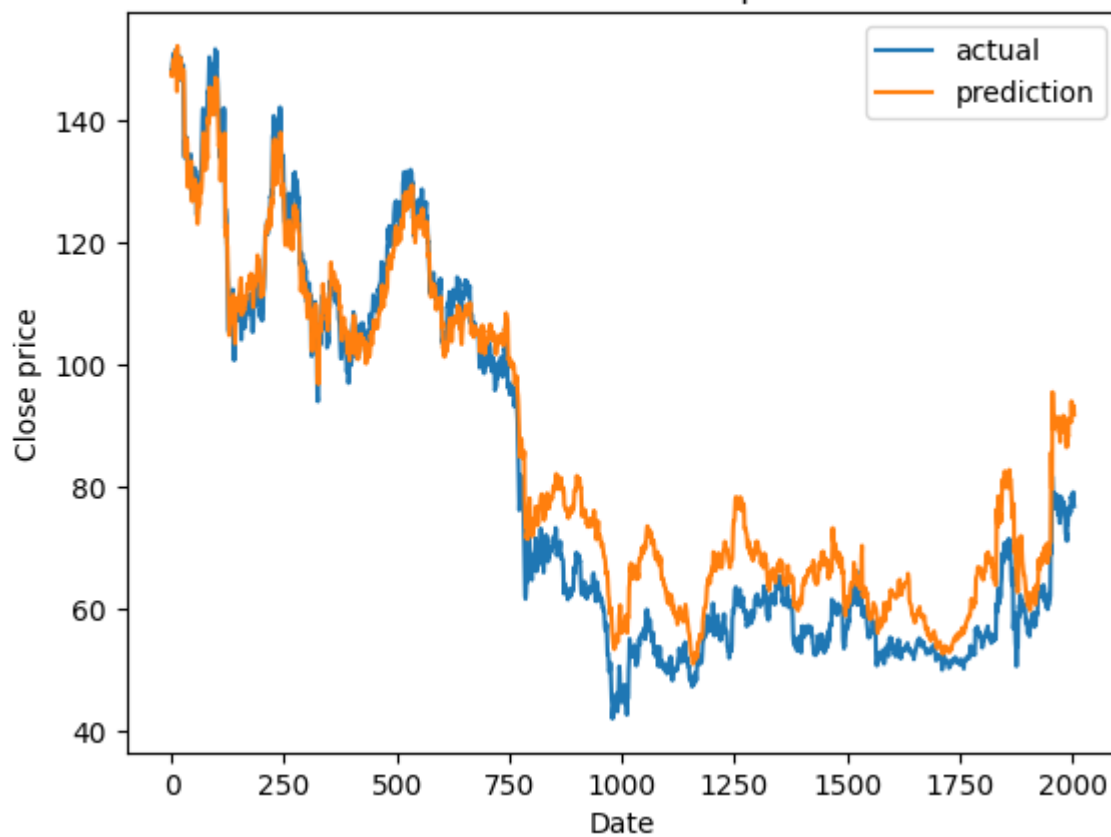94413
Epoch 49, Evaluation || MSE: 153.8278094, MAE: 10.8493634, R2: -158.5969291, RMSE:
11.0382089


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Epoch 50, Train || MSE: 461.4708247, MAE: 14.2815054, R2: -83.5134010, RMSE: 17.59
75866
Epoch 50, Evaluation || MSE: 62.4557462, MAE: 6.5376514, R2: -52.9804621, RMSE: 6.
7799628

LTC Validation actual vs prediction

Training XRP coin...:   0%|              | 0/50 [00:00<?, ?it/s]

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Epoch 1, Train || MSE: 0.0293311, MAE: 0.0969617, R2: -72.8343935, RMSE: 0.1070356
Epoch 1, Evaluation || MSE: 0.0679933, MAE: 0.2236476, R2: -1795.4376925, RMSE: 0.
2246808


---------
Epoch 2, Train || MSE: 0.0316711, MAE: 0.1058495, R2: -160.9607135, RMSE: 0.116899
3
Epoch 2, Evaluation || MSE: 0.1184199, MAE: 0.3174466, R2: -2909.0018896, RMSE: 0.
3179892


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Epoch 3, Train || MSE: 0.0265520, MAE: 0.0977729, R2: -96.8030426, RMSE: 0.1087787
Epoch 3, Evaluation || MSE: 0.0682595, MAE: 0.2398218, R2: -1717.6417250, RMSE: 0.
2404155


---------
Epoch 4, Train || MSE: 0.0170529, MAE: 0.0828416, R2: -101.3543648, RMSE: 0.094812
1
Epoch 4, Evaluation || MSE: 0.0411677, MAE: 0.1764774, R2: -1111.5345564, RMSE: 0.
1774082


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Epoch 5, Train || MSE: 0.0140647, MAE: 0.0740297, R2: -89.7433814, RMSE: 0.0863384
Epoch 5, Evaluation || MSE: 0.0341379, MAE: 0.1530968, R2: -959.7889322, RMSE: 0.1
543203
```
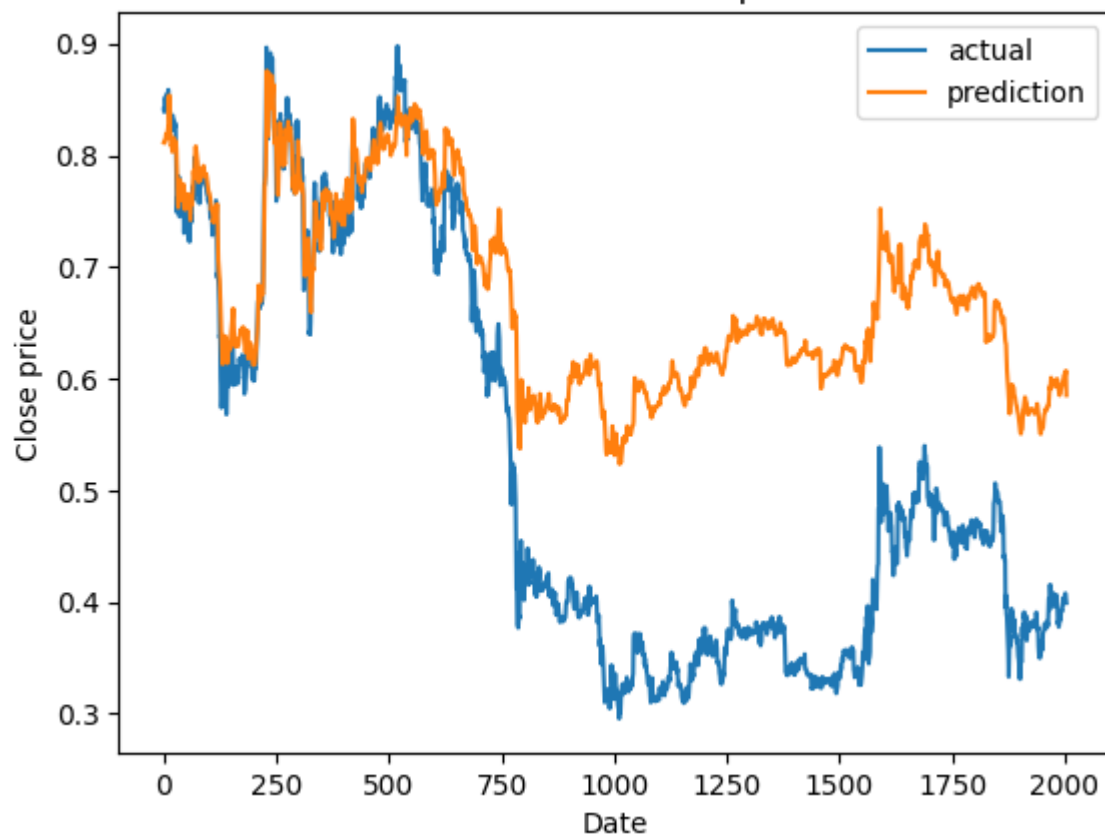
XRP Validation actual vs prediction

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Epoch 6, Train || MSE: 0.0112676, MAE: 0.0671256, R2: -75.7101989, RMSE: 0.0798435
Epoch 6, Evaluation || MSE: 0.0248604, MAE: 0.1311123, R2: -707.8201038, RMSE: 0.1322383


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Epoch 7, Train || MSE: 0.0098129, MAE: 0.0664526, R2: -80.3596635, RMSE: 0.0788827
Epoch 7, Evaluation || MSE: 0.0201457, MAE: 0.1187830, R2: -568.7867270, RMSE: 0.1200565


---------
Epoch 8, Train || MSE: 0.0085467, MAE: 0.0624252, R2: -76.6089897, RMSE: 0.0747853
Epoch 8, Evaluation || MSE: 0.0176936, MAE: 0.1121798, R2: -502.3993348, RMSE: 0.1134199


---------
Epoch 9, Train || MSE: 0.0088624, MAE: 0.0628320, R2: -73.2691646, RMSE: 0.0757676
Epoch 9, Evaluation || MSE: 0.0158344, MAE: 0.1060206, R2: -452.8763081, RMSE: 0.1073044


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Epoch 10, Train || MSE: 0.0086542, MAE: 0.0601816, R2: -68.2931138, RMSE: 0.0734141
Epoch 10, Evaluation || MSE: 0.0120136, MAE: 0.0935863, R2: -343.7038360, RMSE: 0.0948803

XRP Validation actual vs prediction
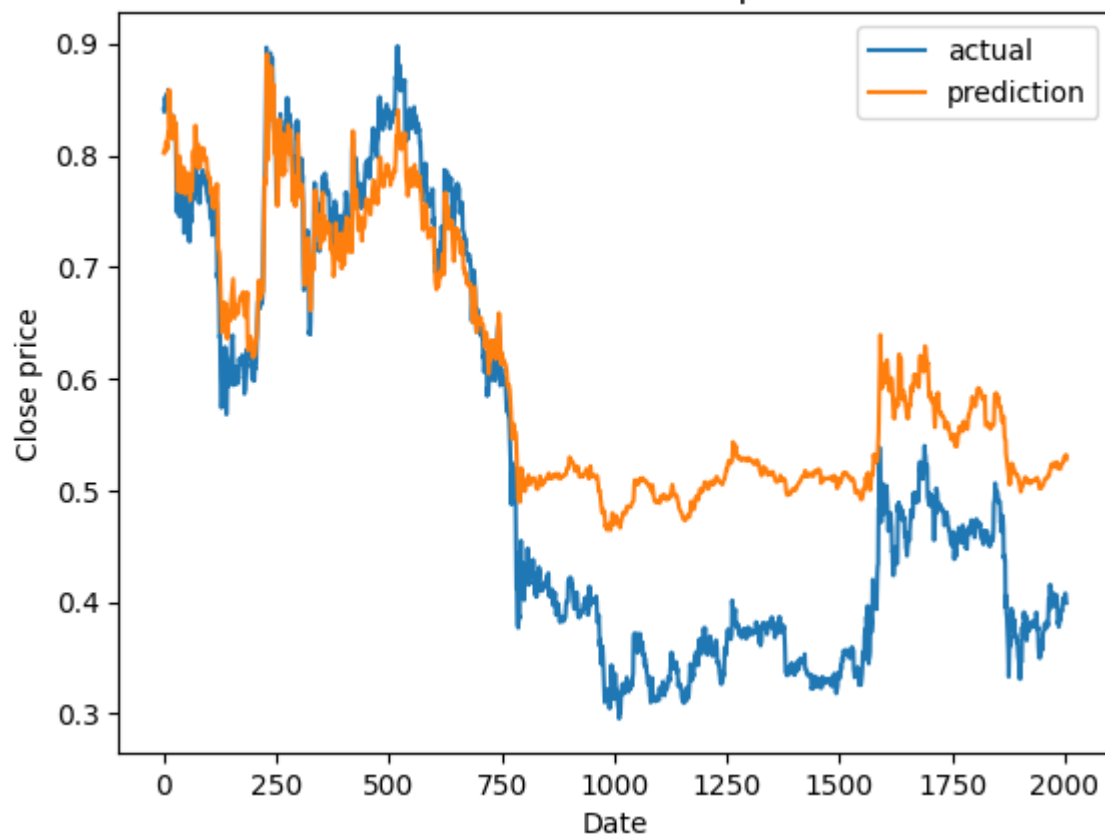
```
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Epoch 11, Train || MSE: 0.0079284, MAE: 0.0586024, R2: -66.9501788, RMSE: 0.071278
2
Epoch 11, Evaluation || MSE: 0.0153447, MAE: 0.1072966, R2: -428.5048238, RMSE: 0.
1083699


---------
Epoch 12, Train || MSE: 0.0079364, MAE: 0.0582843, R2: -67.3766301, RMSE: 0.070621
2
Epoch 12, Evaluation || MSE: 0.0116210, MAE: 0.0906250, R2: -340.6888347, RMSE: 0.
0918617


---------
Epoch 13, Train || MSE: 0.0087845, MAE: 0.0588981, R2: -61.1268988, RMSE: 0.072440
0
Epoch 13, Evaluation || MSE: 0.0123842, MAE: 0.0941319, R2: -354.1361756, RMSE: 0.
0953509


---------
Epoch 14, Train || MSE: 0.0087210, MAE: 0.0586266, R2: -63.5765141, RMSE: 0.071129
0
Epoch 14, Evaluation || MSE: 0.0153449, MAE: 0.1049320, R2: -437.2536442, RMSE: 0.
1060118


---------
Epoch 15, Train || MSE: 0.0087229, MAE: 0.0589580, R2: -63.6504016, RMSE: 0.072223
1
Epoch 15, Evaluation || MSE: 0.0133406, MAE: 0.0982626, R2: -388.5693022, RMSE: 0.
0994309
```
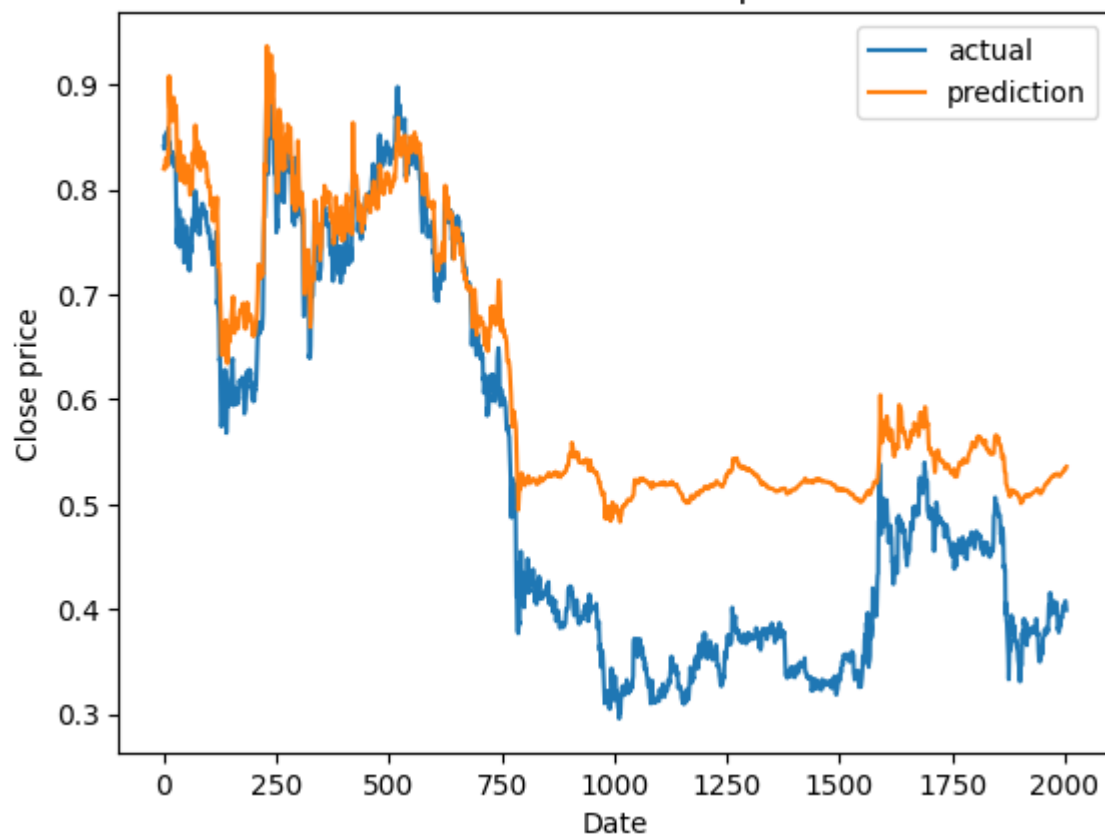
XRP Validation actual vs prediction

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Epoch 16, Train || MSE: 0.0079995, MAE: 0.0564670, R2: -60.6746601, RMSE: 0.0694873

Epoch 16, Evaluation || MSE: 0.0125345, MAE: 0.0955625, R2: -363.4577959, RMSE: 0.0967242


---------
Epoch 17, Train || MSE: 0.0075237, MAE: 0.0554172, R2: -58.5620207, RMSE: 0.0680396

Epoch 17, Evaluation || MSE: 0.0225367, MAE: 0.1255076, R2: -645.4129586, RMSE: 0.1265536


---------
Epoch 18, Train || MSE: 0.0084952, MAE: 0.0581228, R2: -63.2473466, RMSE: 0.0717525

Epoch 18, Evaluation || MSE: 0.0185432, MAE: 0.1146452, R2: -527.2187072, RMSE: 0.1157800


---------
Epoch 19, Train || MSE: 0.0081363, MAE: 0.0587810, R2: -64.0028064, RMSE: 0.0714594
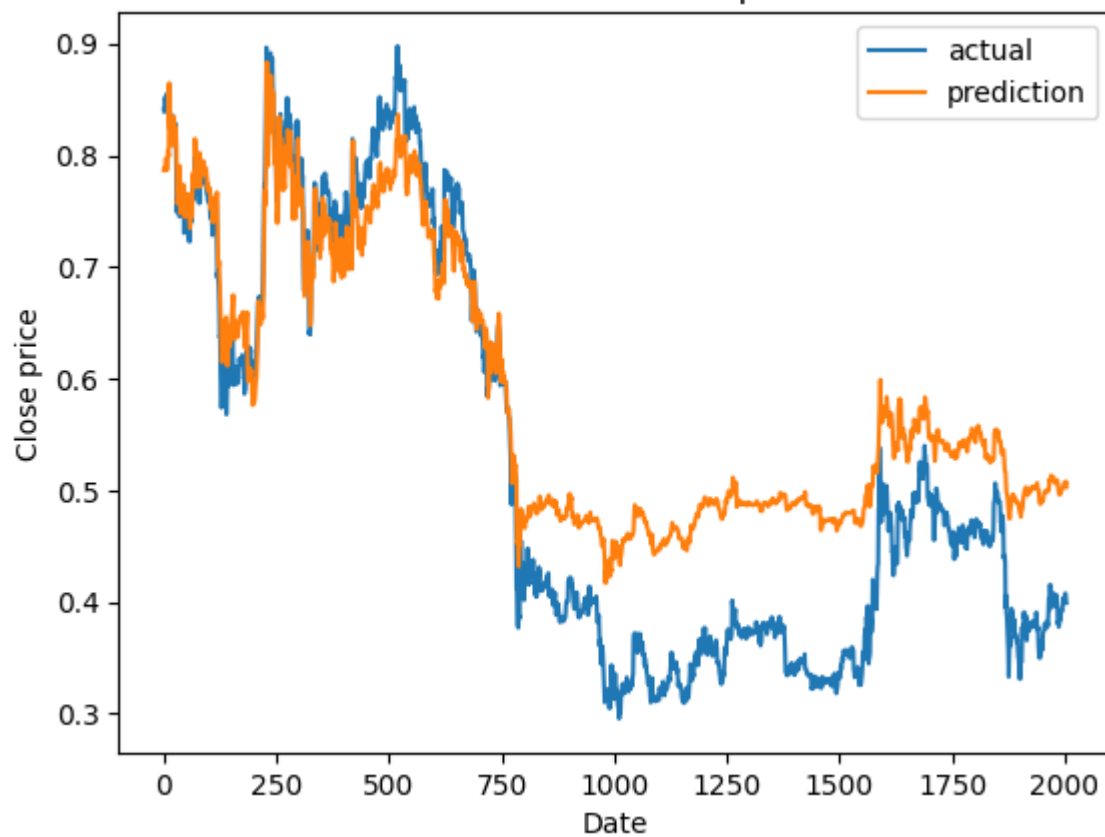
Epoch 19, Evaluation || MSE: 0.0143036, MAE: 0.1027083, R2: -399.6283530, RMSE: 0.1038659


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Epoch 20, Train || MSE: 0.0084804, MAE: 0.0586463, R2: -61.2217899, RMSE: 0.0714839

Epoch 20, Evaluation || MSE: 0.0078444, MAE: 0.0757082, R2: -225.1016557, RMSE: 0.0770329

XRP Validation actual vs prediction

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Epoch 21, Train || MSE: 0.0085198, MAE: 0.0584004, R2: -65.5362835, RMSE: 0.0716903
Epoch 21, Evaluation || MSE: 0.0124026, MAE: 0.0952678, R2: -349.0658720, RMSE: 0.0964228


---------
Epoch 22, Train || MSE: 0.0084371, MAE: 0.0586239, R2: -59.2465209, RMSE: 0.0712279
Epoch 22, Evaluation || MSE: 0.0164891, MAE: 0.1106234, R2: -466.4212409, RMSE: 0.1117192


---------
Epoch 23, Train || MSE: 0.0079472, MAE: 0.0565544, R2: -58.4947273, RMSE: 0.0695750
Epoch 23, Evaluation || MSE: 0.0108265, MAE: 0.0869705, R2: -325.0516760, RMSE: 0.0882018


---------
Epoch 24, Train || MSE: 0.0082746, MAE: 0.0565026, R2: -58.5166534, RMSE: 0.0694792
Epoch 24, Evaluation || MSE: 0.0093016, MAE: 0.0808672, R2: -277.2824574, RMSE: 0.0822028


---------
Epoch 25, Train || MSE: 0.0078088, MAE: 0.0551462, R2: -53.7962828, RMSE: 0.0681494
Epoch 25, Evaluation || MSE: 0.0166704, MAE: 0.1091226, R2: -480.3433372, RMSE: 0.1102552
```
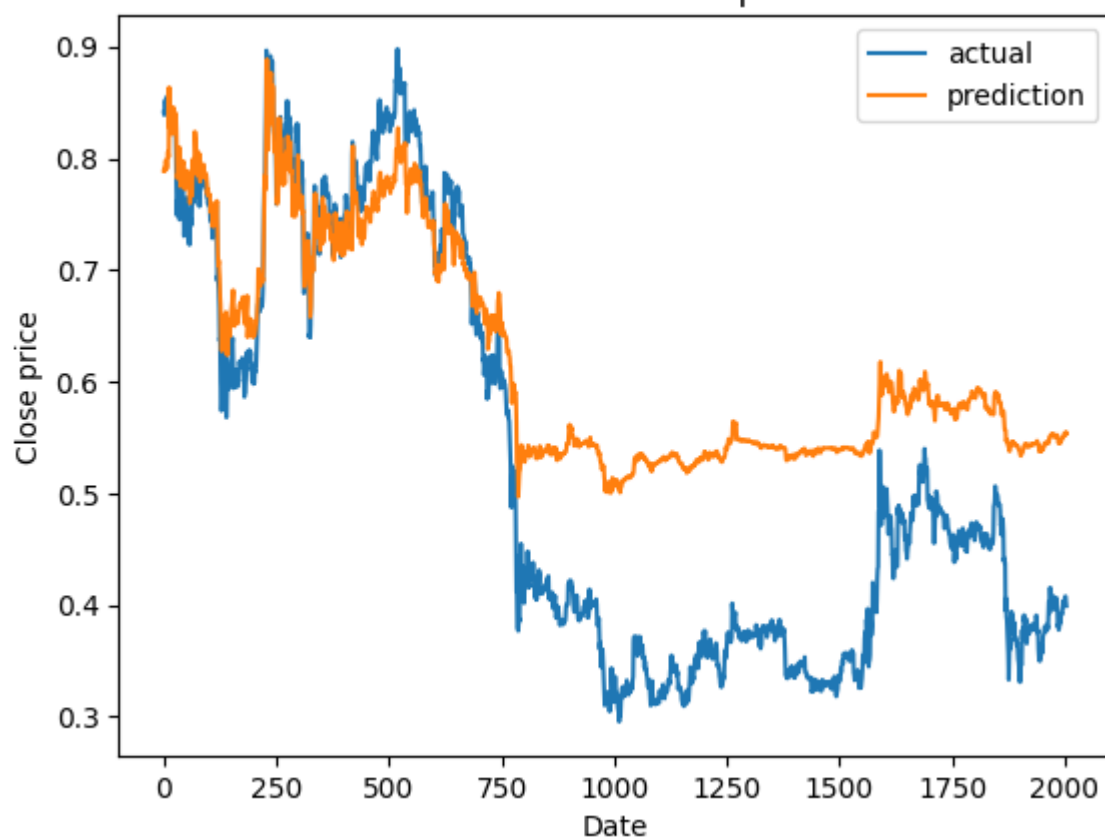
XRP Validation actual vs prediction

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Epoch 26, Train || MSE: 0.0088599, MAE: 0.0575508, R2: -61.8503810, RMSE: 0.070937
7
Epoch 26, Evaluation || MSE: 0.0161220, MAE: 0.1095084, R2: -456.2814252, RMSE: 0.
1106040


---------
Epoch 27, Train || MSE: 0.0084688, MAE: 0.0583330, R2: -62.0663433, RMSE: 0.071520
2
Epoch 27, Evaluation || MSE: 0.0118671, MAE: 0.0899397, R2: -361.1831175, RMSE: 0.
0912598


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Epoch 28, Train || MSE: 0.0082133, MAE: 0.0574888, R2: -60.4963182, RMSE: 0.070679
8
Epoch 28, Evaluation || MSE: 0.0233633, MAE: 0.1263426, R2: -679.5407491, RMSE: 0.
1273837


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Epoch 29, Train || MSE: 0.0081691, MAE: 0.0558090, R2: -57.7837889, RMSE: 0.068819
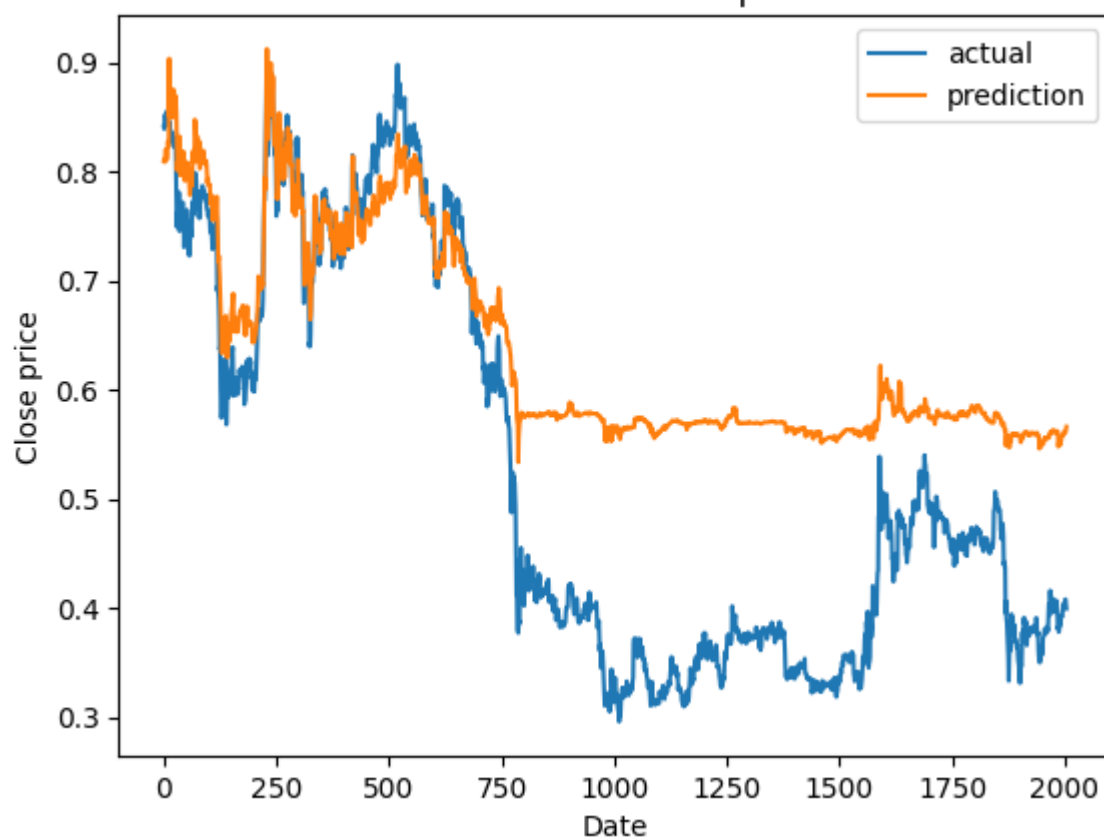6
Epoch 29, Evaluation || MSE: 0.0230182, MAE: 0.1250362, R2: -671.5751224, RMSE: 0.
1261757


---------
Epoch 30, Train || MSE: 0.0076442, MAE: 0.0552169, R2: -56.4845259, RMSE: 0.068535
7
Epoch 30, Evaluation || MSE: 0.0219475, MAE: 0.1228473, R2: -631.0099721, RMSE: 0.
1239484

XRP Validation actual vs prediction

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Epoch 31, Train || MSE: 0.0079138, MAE: 0.0565296, R2: -56.0539878, RMSE: 0.069161
0
Epoch 31, Evaluation || MSE: 0.0170091, MAE: 0.1095315, R2: -491.9193074, RMSE: 0.
1106931


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Epoch 32, Train || MSE: 0.0075661, MAE: 0.0548139, R2: -50.6132921, RMSE: 0.067317
7
Epoch 32, Evaluation || MSE: 0.0076660, MAE: 0.0754941, R2: -217.5469602, RMSE: 0.
0767845


---------
Epoch 33, Train || MSE: 0.0072321, MAE: 0.0542146, R2: -57.0838560, RMSE: 0.066657
2
Epoch 33, Evaluation || MSE: 0.0135686, MAE: 0.1006155, R2: -384.0207015, RMSE: 0.
1017924


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Epoch 34, Train || MSE: 0.0080606, MAE: 0.0551364, R2: -53.7009770, RMSE: 0.068144
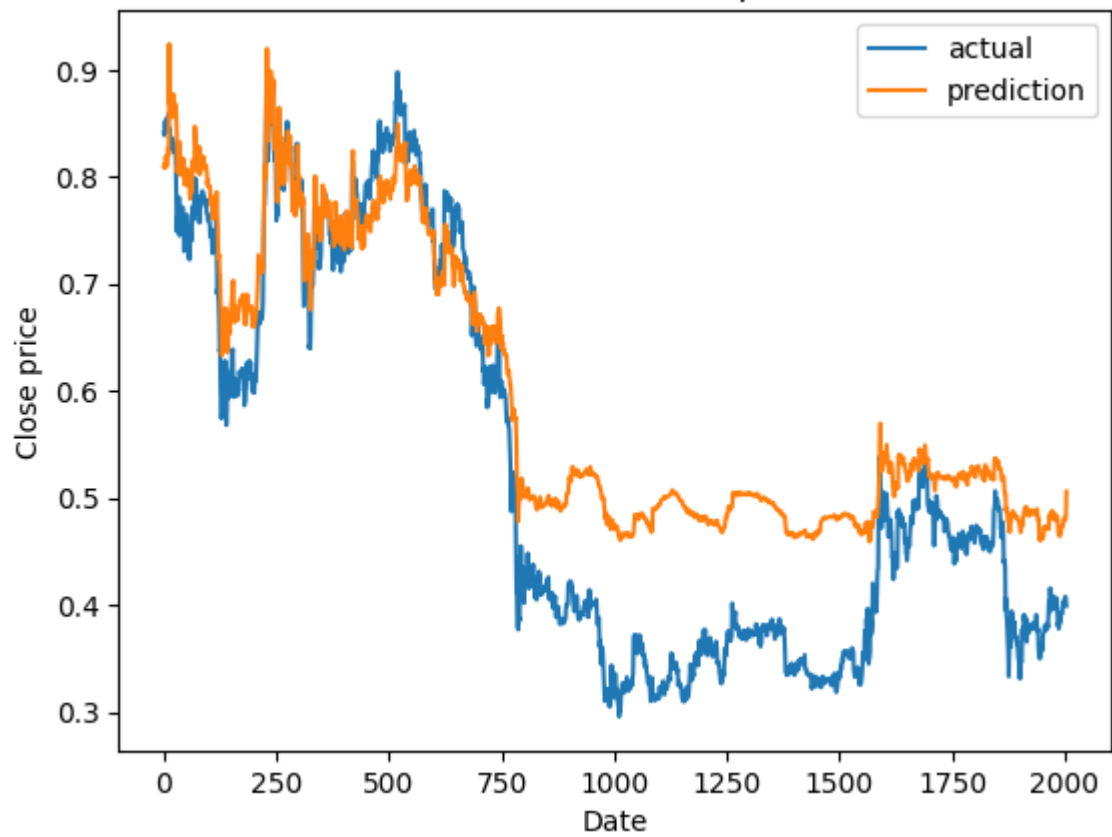3
Epoch 34, Evaluation || MSE: 0.0118619, MAE: 0.0967779, R2: -325.0061451, RMSE: 0.
0977300


---------
Epoch 35, Train || MSE: 0.0083357, MAE: 0.0556570, R2: -54.5411643, RMSE: 0.068991
6
Epoch 35, Evaluation || MSE: 0.0084983, MAE: 0.0782346, R2: -246.6154863, RMSE: 0.
0794424

XRP Validation actual vs prediction

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Epoch 36, Train || MSE: 0.0073725, MAE: 0.0530956, R2: -51.1162119, RMSE: 0.0656717
Epoch 36, Evaluation || MSE: 0.0183847, MAE: 0.1116633, R2: -541.4171595, RMSE: 0.1128363


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Epoch 37, Train || MSE: 0.0075633, MAE: 0.0524921, R2: -50.2934543, RMSE: 0.0654787
Epoch 37, Evaluation || MSE: 0.0155246, MAE: 0.1019673, R2: -462.5140487, RMSE: 0.1032571


---------
Epoch 38, Train || MSE: 0.0074136, MAE: 0.0530763, R2: -49.2640677, RMSE: 0.0659920
Epoch 38, Evaluation || MSE: 0.0209203, MAE: 0.1233411, R2: -600.5302415, RMSE: 0.1243511


---------
Epoch 39, Train || MSE: 0.0071527, MAE: 0.0532334, R2: -53.3056850, RMSE: 0.0660369
Epoch 39, Evaluation || MSE: 0.0199407, MAE: 0.1172149, R2: -550.6412270, RMSE: 0.1183413


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Epoch 40, Train || MSE: 0.0073538, MAE: 0.0546133, R2: -53.3577655, RMSE: 0.0672669
Epoch 40, Evaluation || MSE: 0.0131926, MAE: 0.0966455, R2: -366.6586061, RMSE: 0.0979252
```
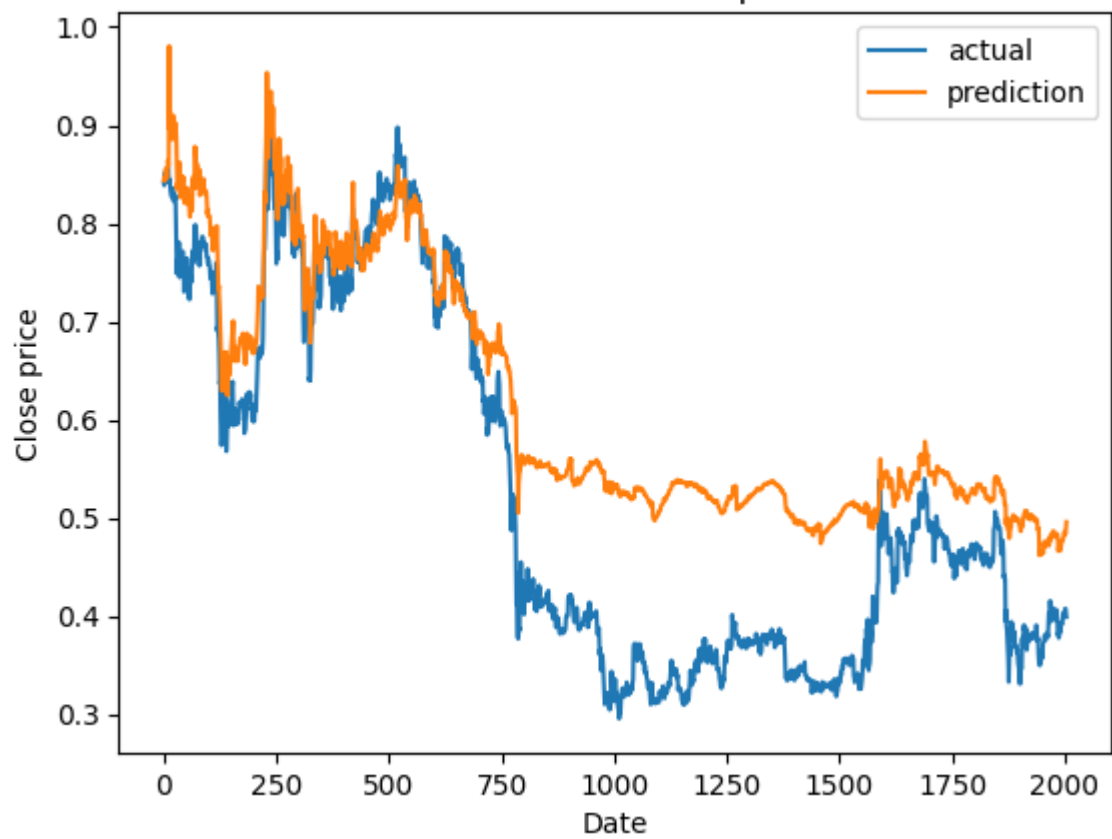
XRP Validation actual vs prediction

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Epoch 41, Train || MSE: 0.0069984, MAE: 0.0539014, R2: -56.1770876, RMSE: 0.0665526

Epoch 41, Evaluation || MSE: 0.0115643, MAE: 0.0926186, R2: -325.0358547, RMSE: 0.0936907


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Epoch 42, Train || MSE: 0.0063113, MAE: 0.0496196, R2: -41.0430933, RMSE: 0.0616532

Epoch 42, Evaluation || MSE: 0.0096435, MAE: 0.0887711, R2: -225.1284080, RMSE: 0.0897028


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Epoch 43, Train || MSE: 0.0081302, MAE: 0.0548714, R2: -48.6848209, RMSE: 0.0678564

Epoch 43, Evaluation || MSE: 0.0157820, MAE: 0.1064213, R2: -451.0423712, RMSE: 0.1075170


---------
Epoch 44, Train || MSE: 0.0074137, MAE: 0.0529382, R2: -50.0154193, RMSE: 0.0658613

Epoch 44, Evaluation || MSE: 0.0183202, MAE: 0.1128858, R2: -532.3047361, RMSE: 0.1140831
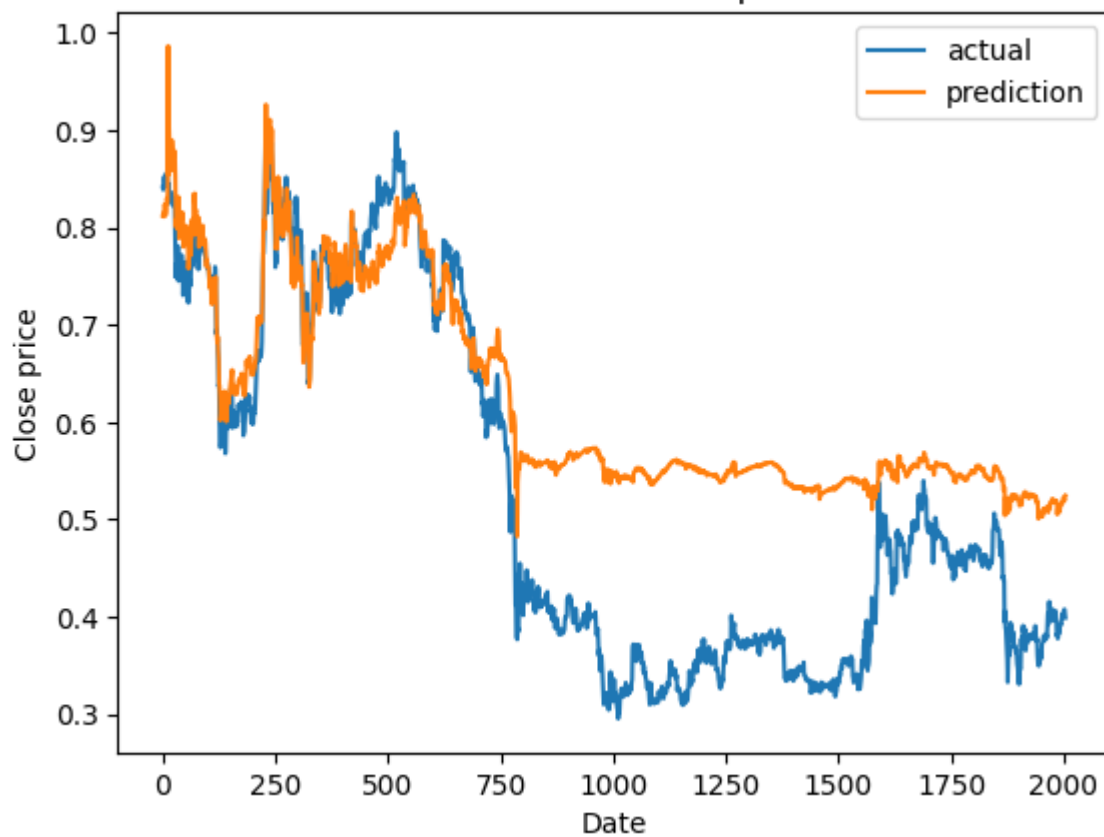

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Epoch 45, Train || MSE: 0.0071498, MAE: 0.0533040, R2: -54.0227175, RMSE: 0.0658267

Epoch 45, Evaluation || MSE: 0.0171742, MAE: 0.1076740, R2: -504.7410364, RMSE: 0.1088712

XRP Validation actual vs prediction

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Epoch 46, Train || MSE: 0.0067743, MAE: 0.0509921, R2: -47.1894509, RMSE: 0.0635708

Epoch 46, Evaluation || MSE: 0.0148055, MAE: 0.0999124, R2: -433.0206385, RMSE: 0.1010651


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Epoch 47, Train || MSE: 0.0071613, MAE: 0.0522133, R2: -45.4290171, RMSE: 0.0649045

Epoch 47, Evaluation || MSE: 0.0201778, MAE: 0.1190158, R2: -578.6054543, RMSE: 0.1200886


---------
Epoch 48, Train || MSE: 0.0075664, MAE: 0.0534402, R2: -50.5088971, RMSE: 0.0666542

Epoch 48, Evaluation || MSE: 0.0127863, MAE: 0.0933098, R2: -364.8593186, RMSE: 0.0945503
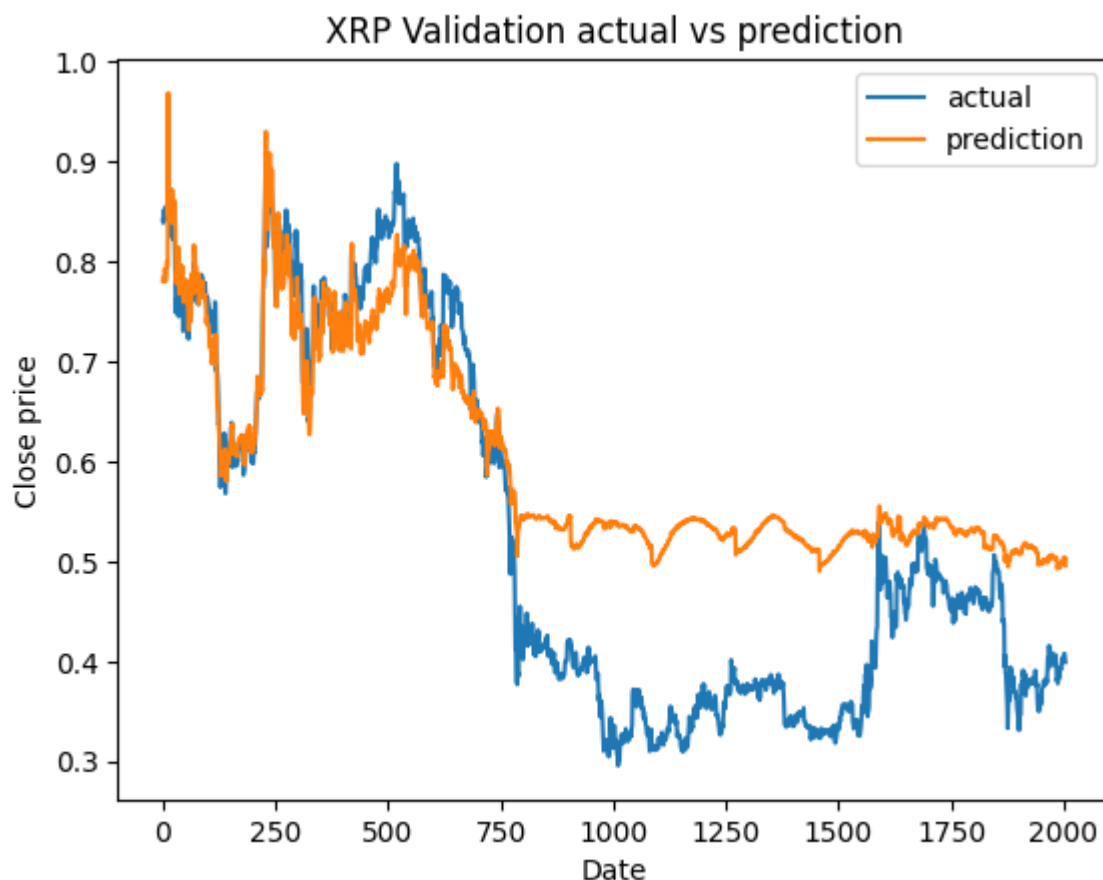

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Epoch 49, Train || MSE: 0.0069897, MAE: 0.0515549, R2: -46.2180322, RMSE: 0.0639460

Epoch 49, Evaluation || MSE: 0.0155818, MAE: 0.1023301, R2: -458.2921958, RMSE: 0.1035696


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Epoch 50, Train || MSE: 0.0073389, MAE: 0.0519800, R2: -50.3146762, RMSE: 0.0650547

Epoch 50, Evaluation || MSE: 0.0137608, MAE: 0.0955168, R2: -401.4765056, RMSE: 0.0968585

## XRP Validation actual vs prediction



# Save results

```
In [39]:   timestamp = datetime.now().strftime("%Y-%m-%d-%H-%M-%S")
           predictions_df, actual_df = append_means(predictions_df, actual_df)
           predictions_df.to_csv(f'./io/output/exports/predictions/LSTM_predictions_{timestamp
           actual_df.to_csv(f'./io/output/exports/predictions/LSTM_actual_{timestamp}_epochs_{
           print('Dataframes saved!')

           mean_results = compute_mean_metrics(coin_results=coin_results)
           print(f"mean mse: {round(mean_results['mean_mse'], 6)}")
           print(f"mean mae: {round(mean_results['mean_mae'], 6)}")
           print(f"mean r2: {round(mean_results['mean_r2'], 6)}")
           print(f"mean rmse: {round(mean_results['mean_rmse'], 6)}")

           # Save the dictionary to a file
           with open('./io/output/exports/metrics_plots/lstm_metrics.json', 'a') as f:
               json.dump(mean_results, f, indent=len(mean_results))
           print("Results saved to json file!")
```

```
Dataframes saved!
mean mse: 23156409.213299
mean mae: 2603.176878
mean r2: -6319.482812
mean rmse: 2611.796453
Results saved to json file!
```