NEPSE Time Series Forecasting

Dataset:

The historical data of NEPSE was scraped from Sharesansar. The dataset consists of NEPSE stock prices from 1997-7-20 to 2024-01-15.

Preprocessing:

For analysis, the closing price of NEPSE was used. The data was scaled using the MinMaxScaler from the scikit-learn library. The data was then divided into training and test sets, consisting of 80% and 20% of the overall data respectively.

Here, the current NEPSE price was predicted using the previous prices. This method is also called the Window method. In this case, I have used a window of 64 meaning 64 previous time steps will be used to predict the current next step. The exact value 64 was determined by hyperparameter tuning.

Architecture:

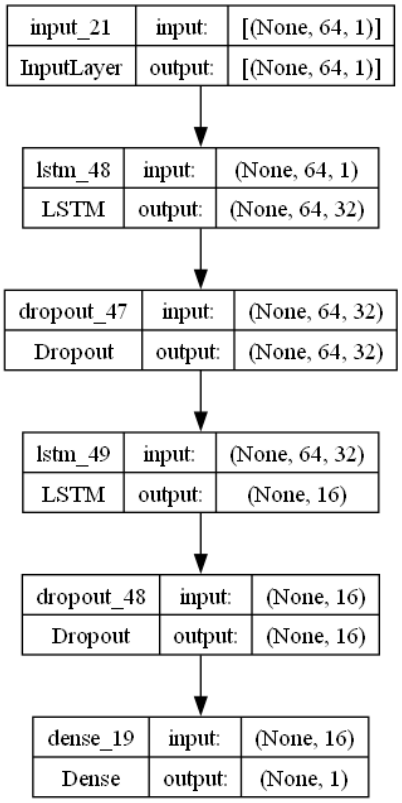

Fig 1: LSTM architecture for NEPSE time-series forecasting

The model consists of 2 LSTM layers with latent dimensions of 32 and 16 respectively. To prevent overfitting, a dropout layer was used after each of the LSTM layers.

Training:

The model was trained for 100 epochs with a batch size of 16. Additionally, the validation loss was monitored using early stopping with patience of 10 due to which the training was cut off at 28 epochs.

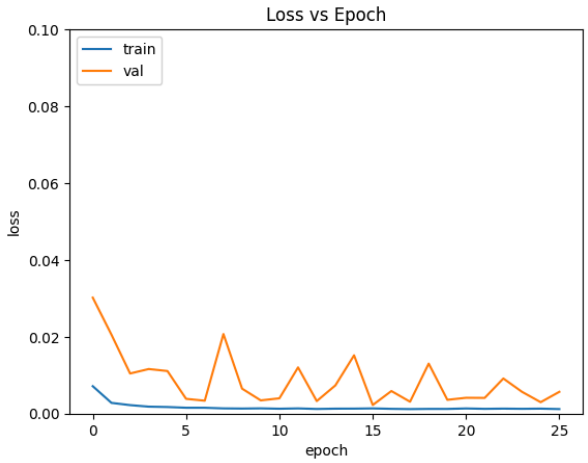

Fig 2: Training Loss (MSE) vs Epoch

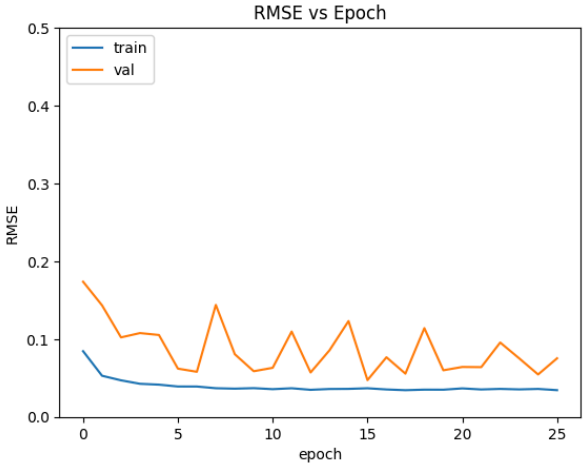

Fig 3: Training RMSE vs Epoch

Parameters used in the model:

Parameters	**Value**
Epochs	100 (cut-off at 28)
Dropout	0.2
Early Stopping	10
Loss	Mean Squared Error
Batch size	16
LSTM Latent Dimension	32, 16

Learning Rate	0.001
Optimization Algorithm	Adam
Sequence Length	64

Model Evaluation:

Metric	Train	Test
Mean Absolute Error (MAE)	591.65	1924.10
Mean Squared Error (MSE)	536346.21	3969528.80
Root Mean Squared Error (RMSE)	732.36	1992.37

Result:

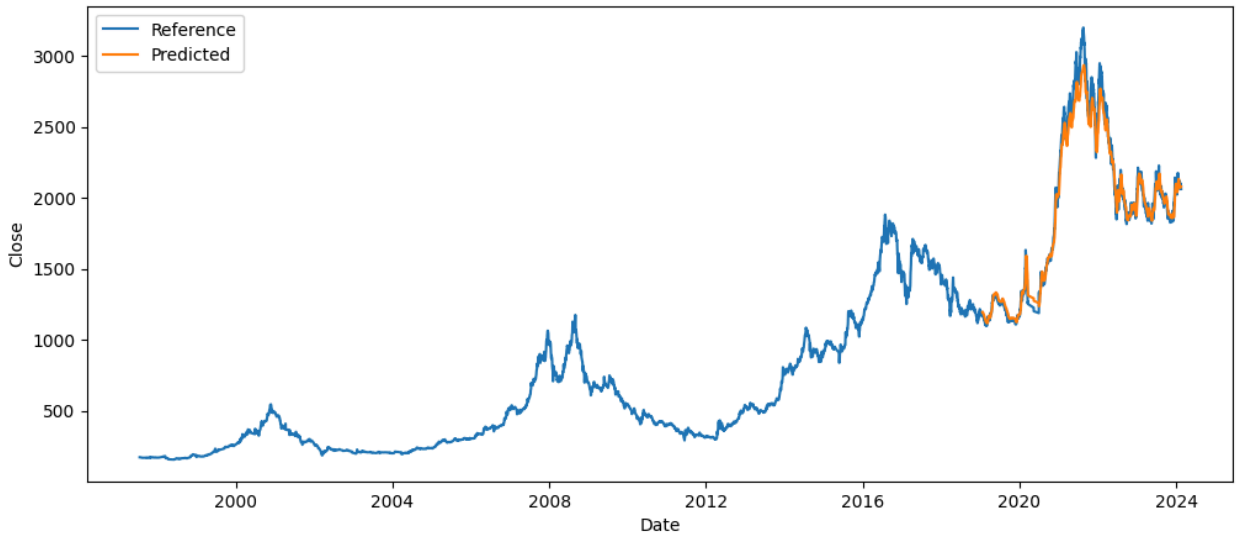

Fig 4: NEPSE Closing Price vs. Date

While the result isn't an exact match, however, the model has learned the price pattern pretty well. For the test set, we can see that the predicted price matches the ups and downs of the original price with a small shift in price now and then.

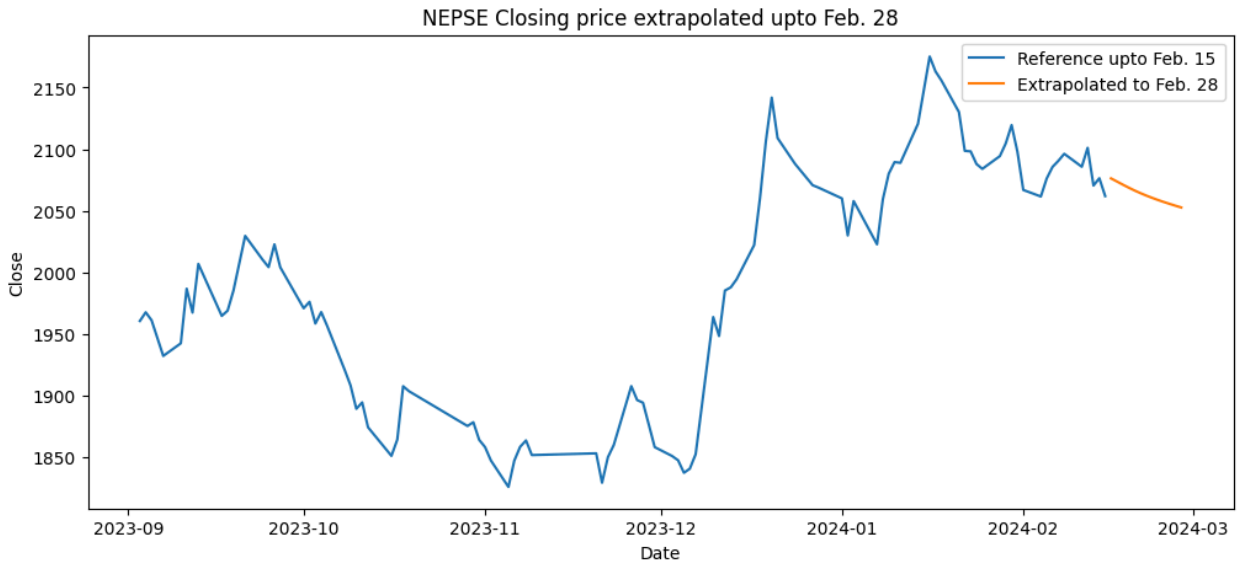

Fig 5: NEPSE Closing price extrapolated up to Feb 28

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[(datetime.date(2024, 2, 16), 2076.355),
 (datetime.date(2024, 2, 17), 2073.8684),
 (datetime.date(2024, 2, 18), 2071.3472),
 (datetime.date(2024, 2, 19), 2068.9116),
 (datetime.date(2024, 2, 20), 2066.615),
 (datetime.date(2024, 2, 21), 2064.4756),
 (datetime.date(2024, 2, 22), 2062.489),
 (datetime.date(2024, 2, 23), 2060.6409),
 (datetime.date(2024, 2, 24), 2058.911),
 (datetime.date(2024, 2, 25), 2057.279),
 (datetime.date(2024, 2, 26), 2055.7275),
 (datetime.date(2024, 2, 27), 2054.2405),
 (datetime.date(2024, 2, 28), 2052.8071)]
```

Fig 6: NEPSE closing price from Feb 16 to Feb 28, 2024, as predicted by the model