INC491 Homework 4 Stock Trend Prediction using Recurrent Neural Network (RNN)

Due: Dec 3, 2023 (in LEB2)

What to submit: (in a single pdf file)

1. Diagram of your network and parameter used (such as size, no. of neurons, learning rate, etc.)
2. Printed Source code
3. Graph Results (4 graphs)
4. The profit when apply "hold-one-day when the trend is up" strategy

In this homework, you have to implement a recurrent neural network to predict the trend of a stock price on the next day. Stock prices are time series data. In technical analysis of stock prices, people believe that they can predict stock prices using historical prices of the previous days. You will use data of 10 previous days to predict the trend of the price on the 11^{th} day whether it is lower(down), higher(up), or equal(neutral) to the close price of the 10^{th} day.

The data file that you received is a real stock price of "PTT" from year 2011 to 2019. Each trading day consists of Open, High, Low, Close (OHLC) prices and volume (V) in that day. You can read more about OHLC at

https://en.wikipedia.org/wiki/Open-high-low-close_chart

These OHLCV will be used as 5 features of the input. This homework uses 10 time steps. Therefore, your input should have a shape of [None,10,5].

You should normalize both the prices and the volume.

We will perform a classification task. You must generate a label of 3 classes as follows.

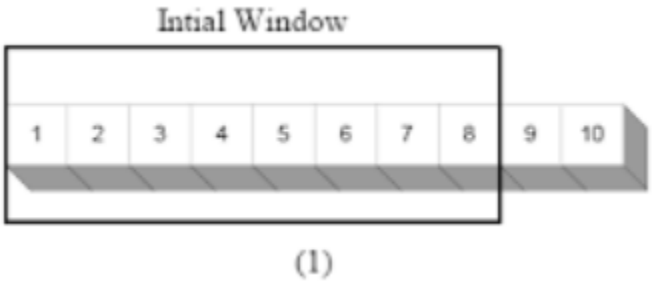
Up – If the close price of the 11^{th} day is +1% more than the close price of the 10^{th} day.

Down – If the close price of the 11^{th} day is -1% lower than the close price of the 10^{th} day.

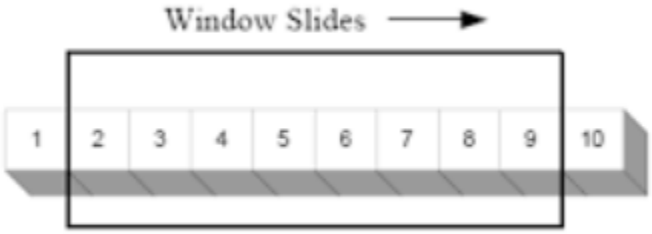
Neutral – If the close price of the 11^{th} day is within +/- 1% of the close price of the 10^{th} day.

Drop the rows that has no label.

Implement an LSTM model and train it. You have to choose a reasonable hyperparameters. Please divide your data into year 2011-2016 for training set and year 2017-2019 for testing set. You must use a sliding window to arrange your data in batch as in the example code ex08-1 in class.



(1)



(2)

Use the techniques that we learn in to get a good performance. Print and show the graphs of

1. loss of the training set

2. loss of the test set

3. Accuracy of the training set

4. Accuracy of the test set

Please note that your network and parameters should achieve a reasonable loss in prediction. You have to try and find your own parameters.

Next, write a code to apply a strategy “hold-one-day when the trend is up” to the test set (2017-2019). This strategy will buy at the close of the 10^{th} day and sell at the close of 11^{th} day to gain a price different when the model predicts as up trend. It will do nothing when the trend is neutral or down. Assume that there are no commission charges. Calculate the total gain using this strategy and compare it with the buy-and-hold strategy.

The buy-and-hold strategy buys stock on 1/4/2017 at 37.4, and sell the stock on 12/30/2019 at 44 Baht. Thus it accrues a profit of 6.6 baht or 17.65% over 3 years.