

Deep Learning in Finance

Stock price Prediction

Introduction:

This project can be titled as Deep Learning in Finance in which we will explore various machine learning and deep learning approaches to predict the stock prices for two world renowned companies. McDonalds and Intel Corporation. We explored various machine learning and deep learning models for doing forecasting and predictions of stocks and produced results. On the McDonalds data, we focused on Linear Regression, MLP and scikit learn's MLP techniques whereas for the Intel Corporation dataset, we explored deep learning approaches of CNN and Recurrent Neural Network. The framework of Pytorch was used to speed up the process of network training because of its torch-based computations fully exploring the functional capacities of GPU provided by Google Colab.

Methodology:

McDonalds stock price data was downloaded for the last 12 years and uses monthly data for prediction of stock values using yfinance API provided by Yahoo. First of all we are going to install the Yfinance library. It is an API by Yahoo which provides live data of multiple stocks of various companies. Using this API we fetched our dataset. Once we had installed the library, we specified the data we were going to download. From the available data we have chosen the data of stocks for McDonald company whose data ticker is 'MCD'. We have selected a time frame of the data i.e. we have defined a time limit of which time frame, we will be fetching the data. The starting date was chosen to be January 1st,2010 and ending date was chosen as Dec 31,2021.

After downloading the data for the time we specified above. The data we downloaded was daily based data and we have resampled the data to monthly instead of daily basis.

We then explored the data and visualized its features and plotted histograms as well as found out various statistical features before we moved on to the stage of model architecture building.

We defined a function that we will be needing to convert our time series data into a suitable format that can be put forward to a Multi layer perceptron. The input parameters and output parameters of the function have been specified as well.

In order to train and test the model, we had to split our data into two sets. One of the sets was used for training while a portion of it was reserved for the validation so we can see the performance of the model on the data.

Then we defined a benchmark by using a naive forecast as a benchmark and evaluated the performance.

After that, we made a linear regression model to predict the stock prices. the model has been imported from the sklearn library and at the end, using the matplotlib library of the python we visualized the forecast of the model to check how good it is performing with respect to actual output on the validation set that we created above

For the MLP model, we define a model architecture of the MLP Model. In the definition of the model where we have used reLU as the activation function and also we have used a drop out of 20% to avoid the risk of overfitting the model.

For the model we defined, we set the loss function and the optimizer function. We chose MSE loss function and Adam optimizer was used as the optimizer of the model to speed up the learning process of the model.

We then trained the model and tested it and observed its output.

The same methodology was used for Intel Corporation dataset but different model architectures were used and were defined by the use of Pytorch library.

Results and Discussion:

The results are available in the Jupyter notebook file attached. It was observed that deep learning models are very useful for predicting the stock prices of the future performance of market and can be used smartly for investment decisions as well.