

STOCK MARKET PREDICTION BASED ON LSTM MODEL

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Deep Learning Course

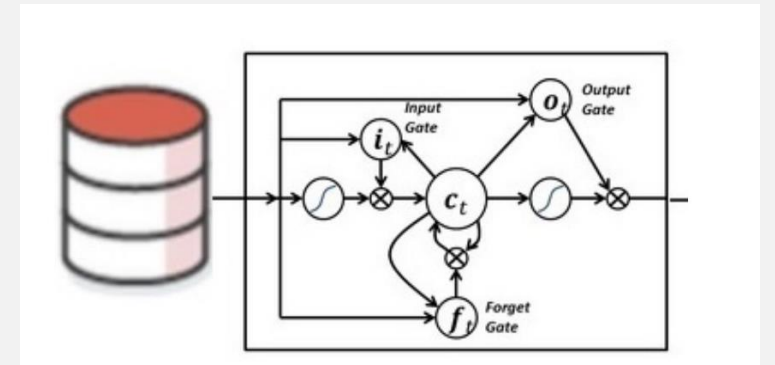
A NEW APPROACH FOR TRADING BASED ON LONG-SHORT TERM MEMORY TECHNIQUE

- Zineb Lanbouri #1, Saaid Achchab

- **Abstract**—. In this Article authors developed a Long Short Term Memory (LSTM) model that includes two time frequencies (annual and daily parameters) in order to predict next day open price (one step ahead).
- . Based on Open High Low Close metrics and other financial ratios , this approach proves that the stock market prediction can be improved.

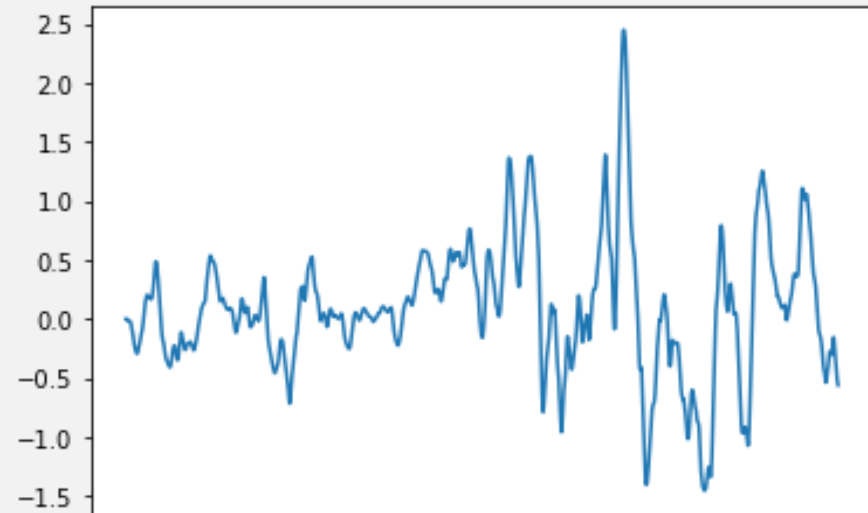
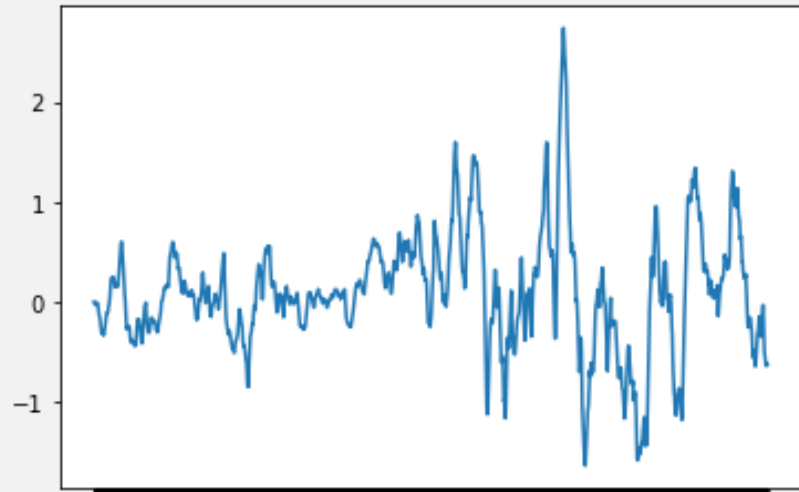
WHY LSTM?

- LSTM is considered as an improvement of Recurrent Neural Network which comes as a solution to vanishing and exploding gradient, see figure (Fig 1) Bao et al. (2017); Werbos et al. (1988); Schmidhuber et al. (1997);
- LSTM is suitable for sequences Sutskever et al. (2014);
- LSTM can store and retrieve information using its gates Bengio et al. (2009);
- LSTM doesn't flow in a single way (unlike Neural Networks);
- LSTM technique can distinguish between recent and early examples Nelson et al. (2017).



MACD

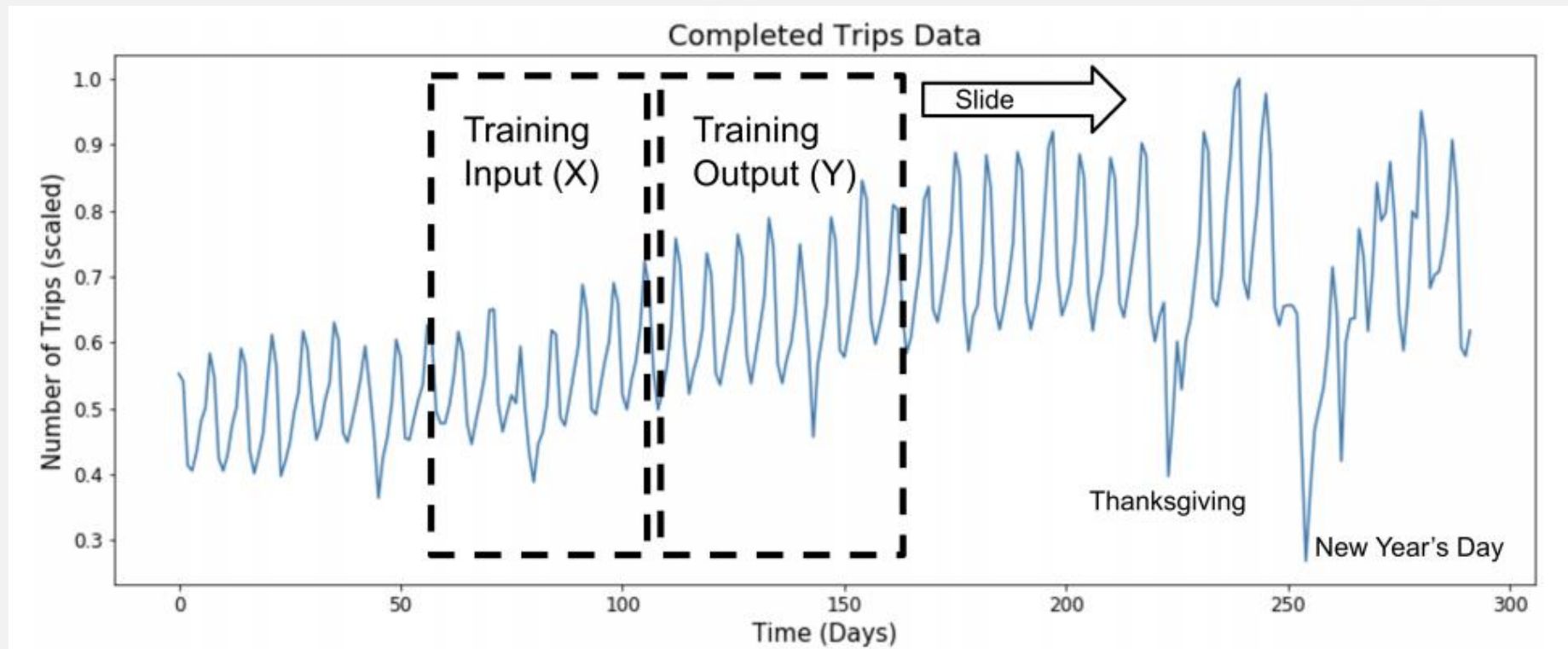
SIGNAL



STOCKSTATS

symbol	open	close	low	high	volume	
date						
2010-01-04	YHOO	16.940001	17.100000	16.879999	17.200001	16587400.0
2010-01-05	YHOO	17.219999	17.230000	17.000000	17.230000	11718100.0
2010-01-06	YHOO	17.170000	17.170000	17.070000	17.299999	16422000.0
2010-01-07	YHOO	16.809999	16.700001	16.570000	16.900000	31816300.0
2010-01-08	YHOO	16.680000	16.700001	16.620001	16.760000	15470000.0

DATA PREPERATION



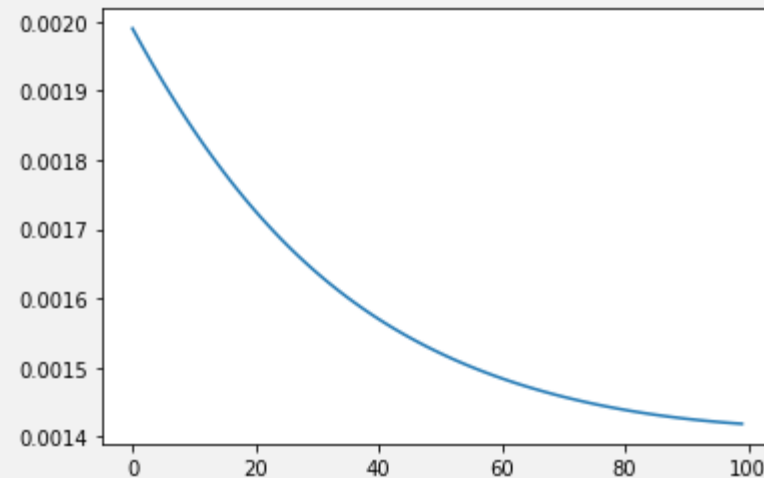
CODES: (SOME PARTS OF CODES)

- `scaler = StandardScaler()`
- $Z = (X - \mu) / \sigma$
- `self.dropout = nn.Dropout(0.3)`

LOSSES WITHOUT INDICATOR

```
epoch : 10 loss : 0.0018423907458782196
epoch : 20 loss : 0.0017257591243833303
epoch : 30 loss : 0.0016366703202947974
epoch : 40 loss : 0.0015701311640441418
epoch : 50 loss : 0.0015208745608106256
epoch : 60 loss : 0.0014845333062112331
epoch : 70 loss : 0.0014579554554075003
epoch : 80 loss : 0.001439007930457592
epoch : 90 loss : 0.001426180824637413
```

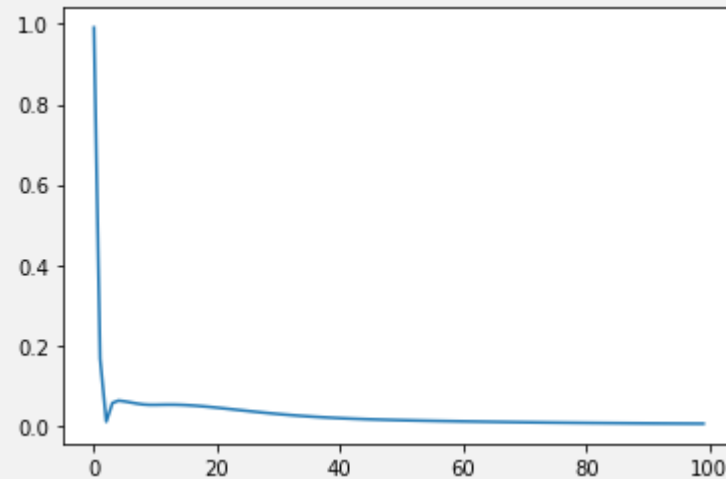
```
epoch : 10 loss : 0.0005161606823094189
epoch : 20 loss : 0.00045598490396514535
epoch : 30 loss : 0.0004289547214284539
epoch : 40 loss : 0.00042912515345960855
epoch : 50 loss : 0.00043777222163043916
epoch : 60 loss : 0.00044951107702217996
epoch : 70 loss : 0.0004624048597179353
epoch : 80 loss : 0.0004757371498271823
epoch : 90 loss : 0.0004892226424999535
```



LOSSES WITH INDICATORS

```
epoch : 10 loss : 0.05171046033501625
epoch : 20 loss : 0.044600412249565125
epoch : 30 loss : 0.028755374252796173
epoch : 40 loss : 0.018499724566936493
epoch : 50 loss : 0.013431991450488567
epoch : 60 loss : 0.010472817346453667
epoch : 70 loss : 0.008309234865009785
epoch : 80 loss : 0.006693469826132059
epoch : 90 loss : 0.0055273850448429585
```

```
epoch : 10 loss : 0.0004646712332032621
epoch : 20 loss : 0.000409039668738842
epoch : 30 loss : 0.00040265743155032396
epoch : 40 loss : 0.0004058975027874112
epoch : 50 loss : 0.0004115113406442106
epoch : 60 loss : 0.00041817521560005844
epoch : 70 loss : 0.00042477011447772384
epoch : 80 loss : 0.00042932573705911636
epoch : 90 loss : 0.00042919270345009863
```



MODELS RMSE

