STOCK FORECASTING USING HIDDEN MARKOV MODELS

ABSTRACT

Predicting & comparing stock prices using probabilistic model(HMM)

OBJECTIVE

Extract important information of stocks from their past prices to predict future trends.

DATASETS USED

- ✓ apple.csv
- ✓ cmcst.csv
- ✓ google.csv
- ✓ qcom.csv

CALCULATING AIC, BIC

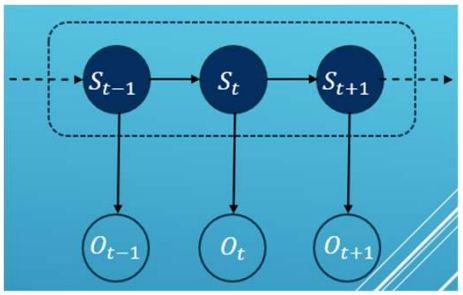
$$AIC = -2\log(P(O_{train\,|\,\lambda})) - 2p$$
$$BIC = -2\log(P(O_{train\,|\,\lambda})) - p.\log(T)$$
$$where, p = N^2 + 2N - 1$$

PERFFORMANCE METRICS FOR PREDICTIONS OF NEXT m DAYS

MAPE (Mean Absolute Percentage Error)

$$\boldsymbol{MAPE} = \frac{1}{N}\sum_{i=1}^{m}\frac{|Predicted(i) - True(i)|}{True(i)}$$

PREDICTION OF STOCK PRICES



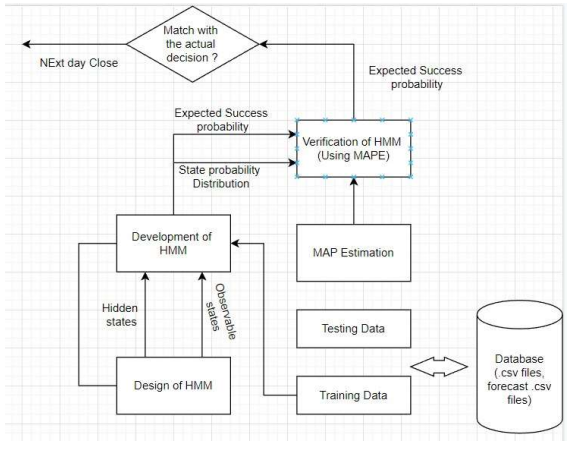
Identify a sub-sequence W_{t-j} whose log-likelihood is the closest to that of the sub-sequence W_t.

$$j = argmin_i|P(O_t, O_{t-1}, O_{t-2} \dots O_{t-k}/\lambda) - P(O_{t-i}, O_{t-i-1}, O_{t-i-2} \dots O_{t-i-k}/\lambda)|$$
where $i = 1,2, \dots, ({}^{T}/_{k})$

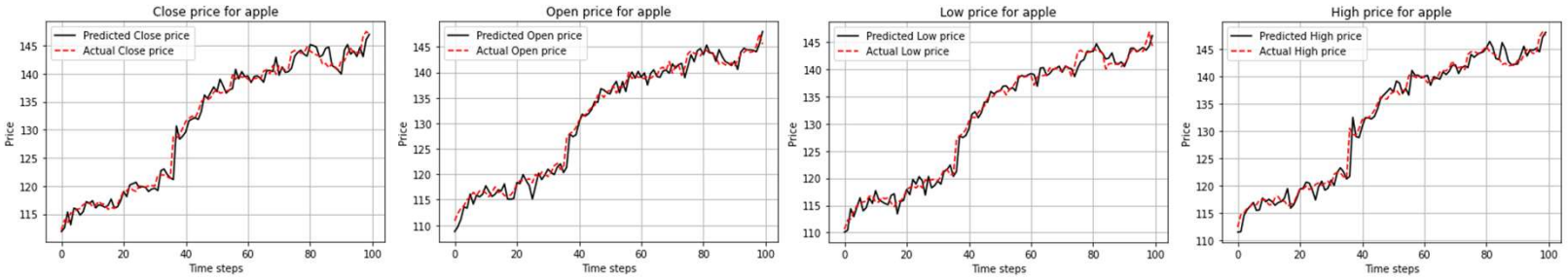
MAPE values for APPLE

Model	Closing	Open	High	Low
HMM	0.0053	0.0057	0.0044	0.0052

SYSTEM ARCHITECTURE



IMPLEMENTATION / VISUALIZATION



RESULT

We have observed that the predicted values for Open, Close, High, Low closely follow the trends exhibited by its corresponding true values in HMM implementation and the MAPE values were found to be closely negligible.

CONCLUSIONS

-> Though in general, the observations will be greatly affected by the choice of model i.e the number of states in Hidden Markov Models, it does not make significant difference when applied to Stocks.

-> The predictions diverge when prices are predicted for more than one day.