Stock Price Forecasting

Tanushri Jajoo Zeing Zheng Jessica Bormann

Goal 1: Replication

The aim is to replicate the results of a recent publication on Stock price forecast based on CNN-BiLSTM-ECA model (see figure 1) [1].

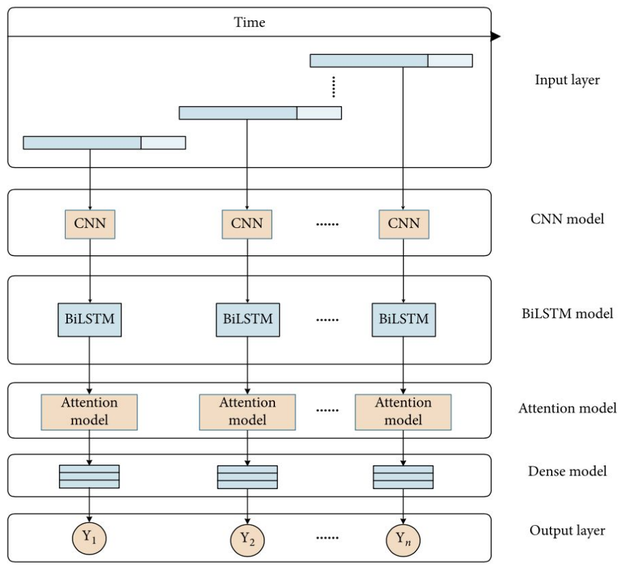


Figure 1: CNN-BiLSTM-ECA model [1]

The model predicts the 11th day's closing price using features from previous 10 days (time step = 10). Key features used in the model include: highest price, lowest price, opening price, previous day's closing price and finally ups and downs (difference between yesterday's and today's stock price).

The model was tested on three data sets, Shanghai Composite Index, China Unicom, and CSI 300. The training and test split is 85% and 15%.

CNN-BiLSTM-ECA Model

The model consists of 3 main elements:

1. **Convolutional Neural Network (CNN)**
   Extract deep feature vectors from the input origin time series data

2. **Bidirectional Long-Short Term Memory (BiLSTM)**
   Learn the temporal features from new time series data constructed by CNN. The model performs two LSTMs, which are trained on the input sequence. The **backward LSTM** processes data from future to past and the **forward LSTM** processes data from past to future (see figure 2)

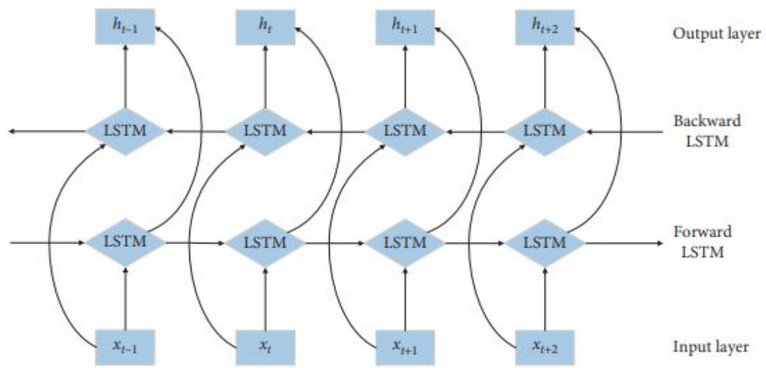


Figure 2: BiLSTM model [1]

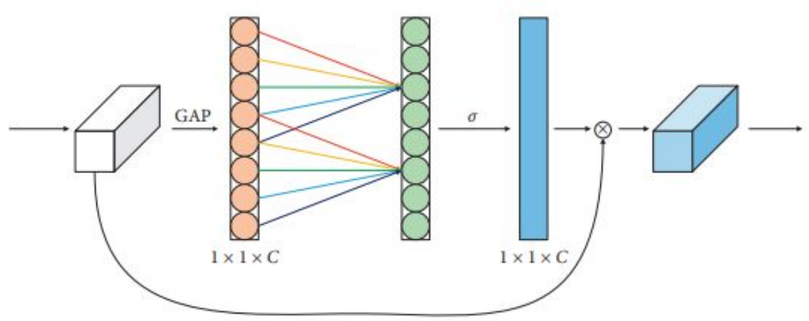


Figure 3: ECA model [1]

3. **Effective Channel Attention model (ECA)**
   ECA is lighter and less complex, which can greatly improve network performance. It improves the sensitivity of the network to the main features. It generates the weights for each channel and learn the correlation among the different channels (see figure 3)

Goal 2: Improvement & Application

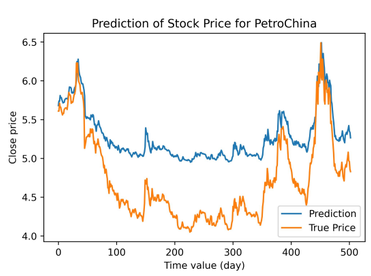
Model improvement
Several changes such as time step = 2, removing the previous day's closing price and ups and downs feature were removed to improve the model accuracy for the new datasets.

Data
Crypto data sets: Bitcoin, Bitcoin Cash, Dogecoin [6], Chinese stock market: PetrolChina [8]

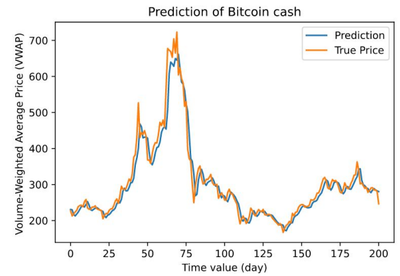
Results

Table 1: Performance metrics

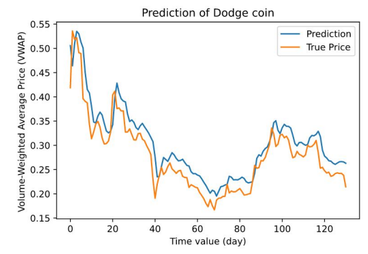
Model	Shanghai Composite Index			China Unicom			CSI 300		
	MSE	RMSE	MAE	MSE	RMSE	MAE	MSE	RMSE	MAE
Article	1956.03	44.23	28.35	0.03	0.17	0.10	3434.41	58.60	39.11
Replication	**1244.76**	**35.28**	**25.33**	**0.01**	**0.11**	**0.08**	**4068.22**	**63.78**	**47.98**



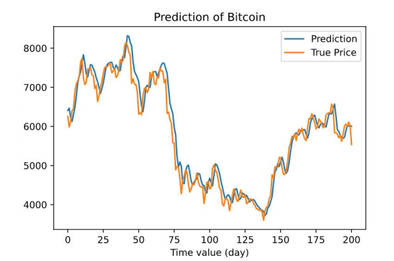
(a)



(b)



(c)



(d)

Figure 4: a. PetrolChina, b. Bitcoin Cash, c. Dogecoin, d. Bitcoin

Conclusion & Discussion

1. The current model can **capture the general pattern of different stocks**
2. Model **performance varies** given different datasets
3. **Adjustment** is needed with certain datasets
4. **Psychological features** such as sentiment of news events or social media should be considered for the future research

UNIVERSITY OF AMSTERDAM

References