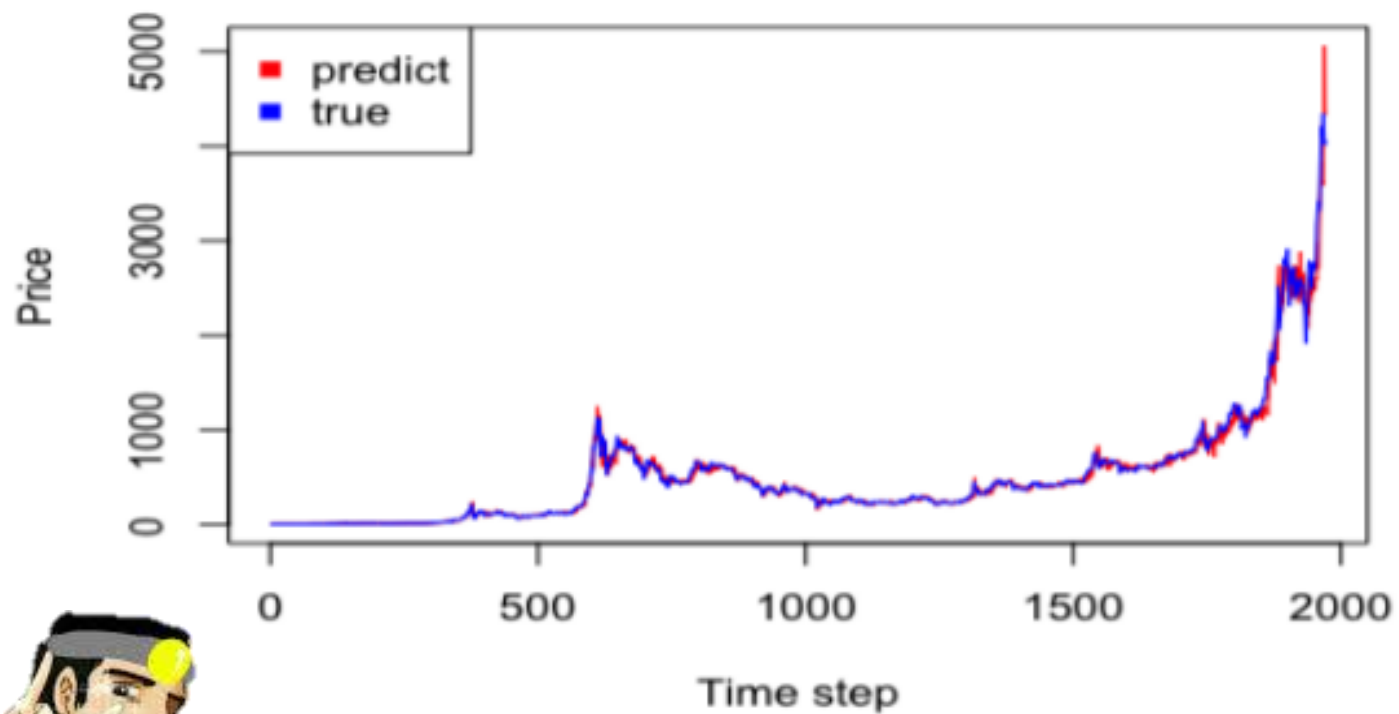


Predicting Bitcoin Prices by using Rolling Window LSTM model

統研所碩一
張泳樺

研究背景

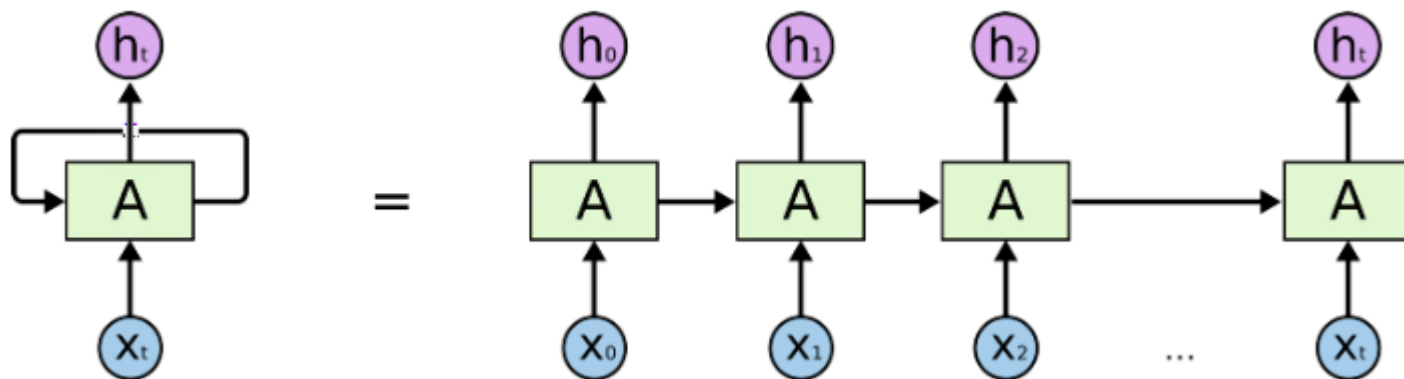
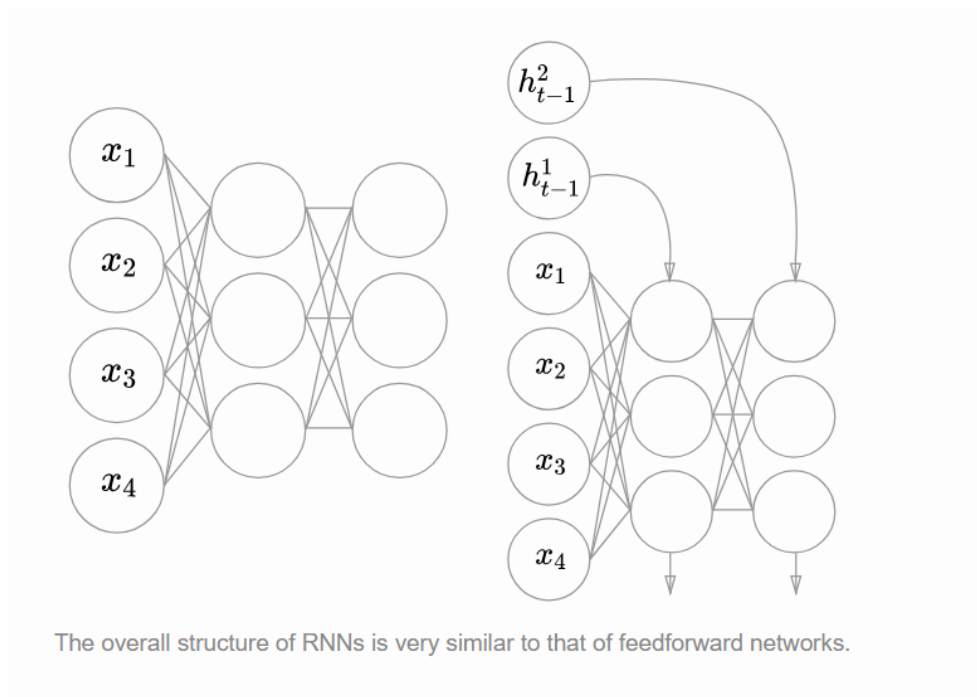
USD 5 to USD 4000



分析方法-RNN

處理時間序列資料

- long-term dependencies
- gradients vanishing
- LSTM



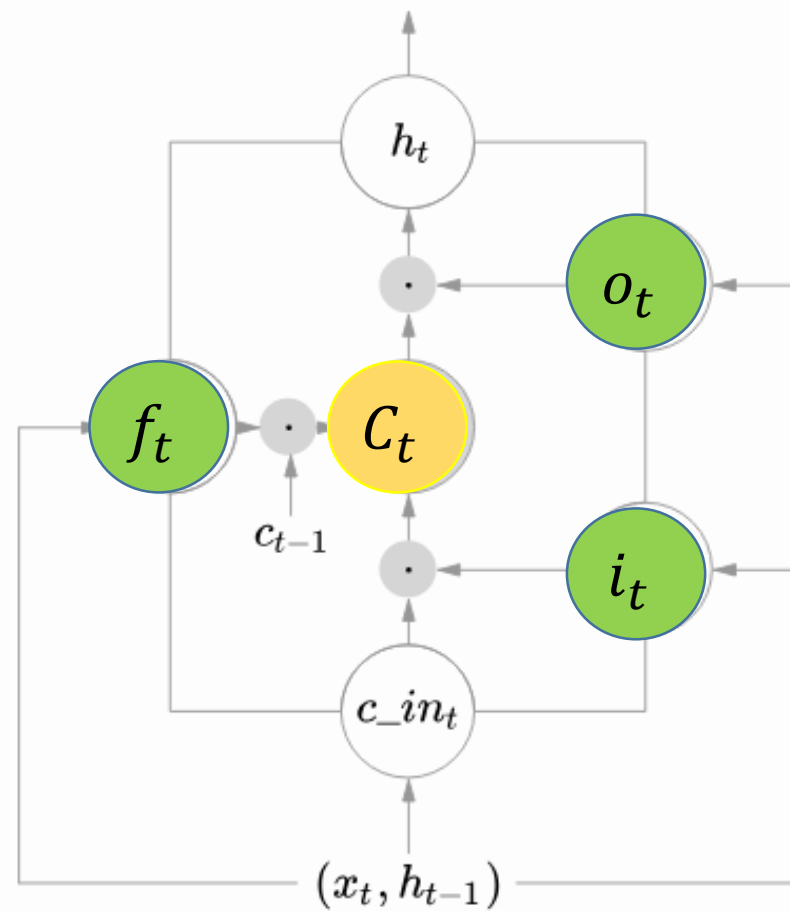
分析方法- LSTM

Gate

- 1) input gate
- 2) forget gate
- 3) output gate

Memory cell :

$$c_{in_t} = \tanh(W_{xc}x_t + W_{hc}h_{t-1} + b_{c_{in}})$$



Rolling window

將某個點的取值擴大到包含這個點的一段區間，用區間來進行判斷，此區間即窗口。

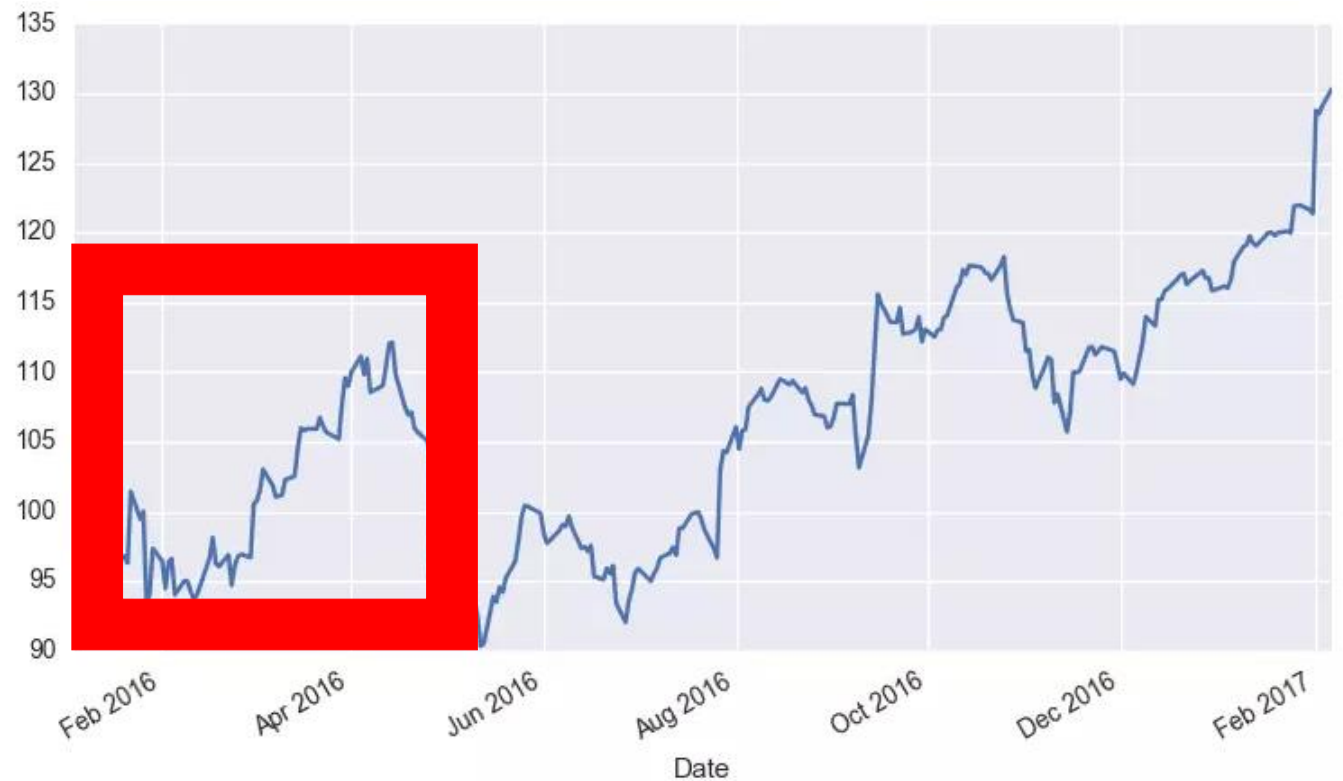
如：有100個觀測，用10個觀測

作為一個rolling window。

$$\widehat{y^{11}} = F(x^1, x^2, \dots, x^{10})$$

$$\widehat{y^{12}} = F(x^2, x^3, \dots, x^{11})$$

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文獻回顧

Bootstrap & fixed-size rolling window

- Difficulty in building a test set for model selection

Rolling window with regression model & Bayesian neural network

- Cannot reflect sequential characteristic in the model

Model setting-(many-to-one)

$T = t$

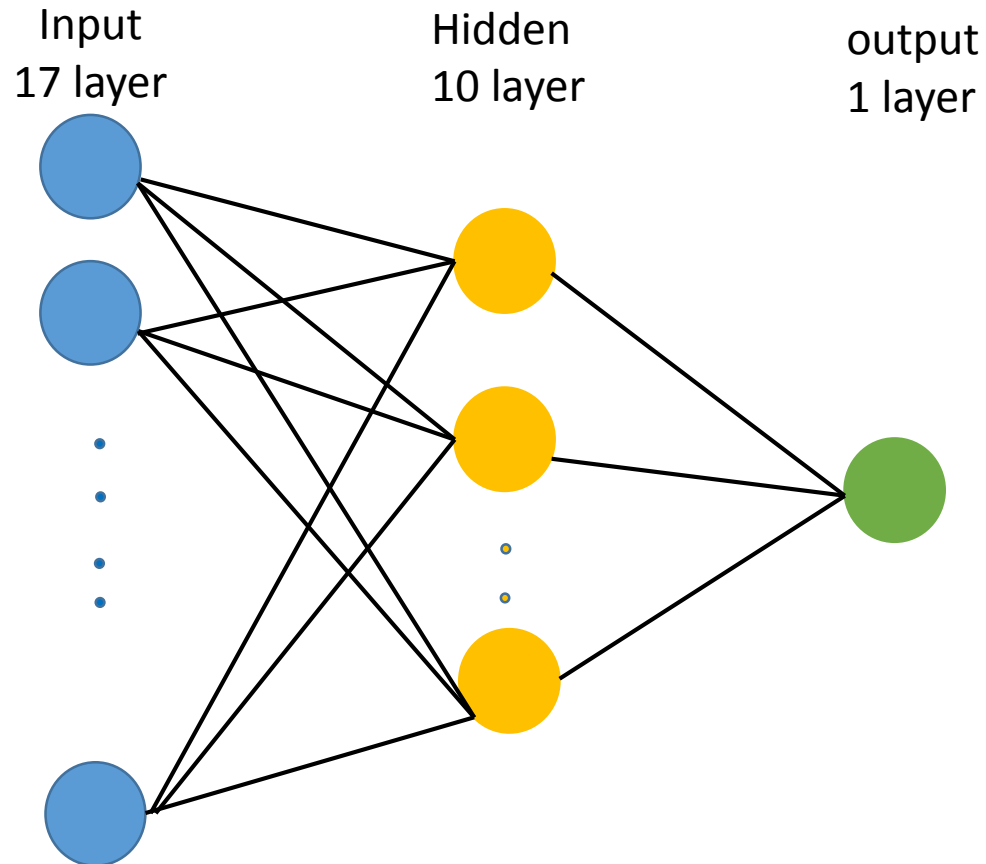


Table 2: common hyperparameter setting

Hyperparameter	
output dimension of hidden layer	10
activation function of hidden layer	hyperbolic tangent
loss function	sum of the squares
optimizer	Adam
learning rate	0.01

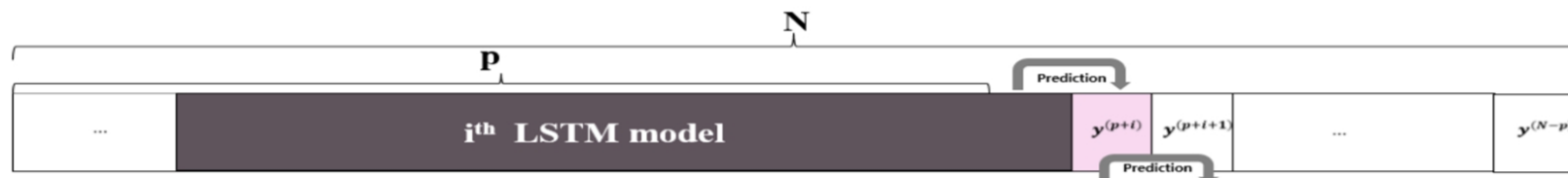
參數介紹

N : # of sample data

P : sequence of time

q : the i^{th} *LSTM's training length*(time-step)

$N-p$: models that predict $N-P$ time series , and these model **don't share weights**

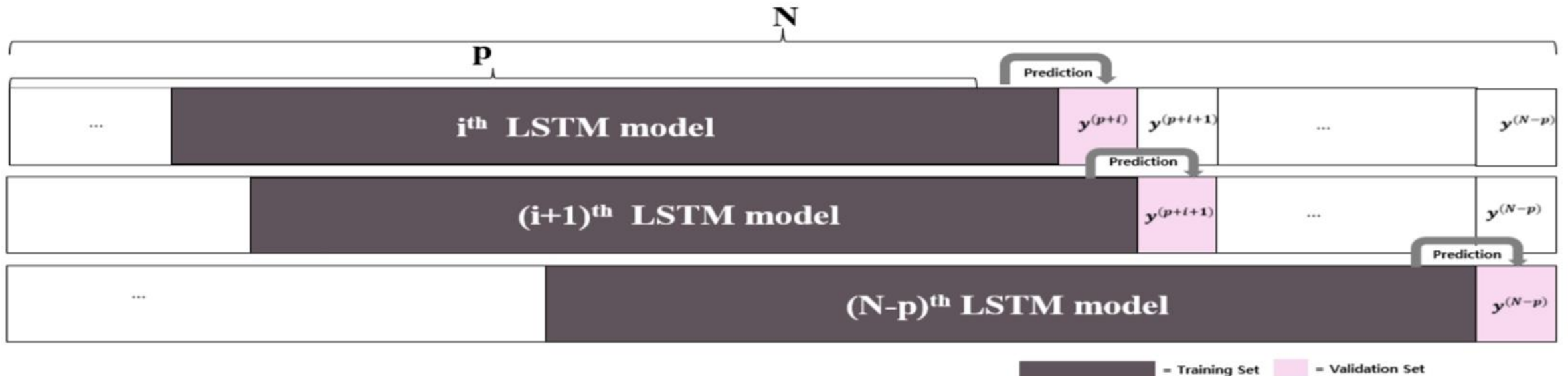


Hyperparameter tuning

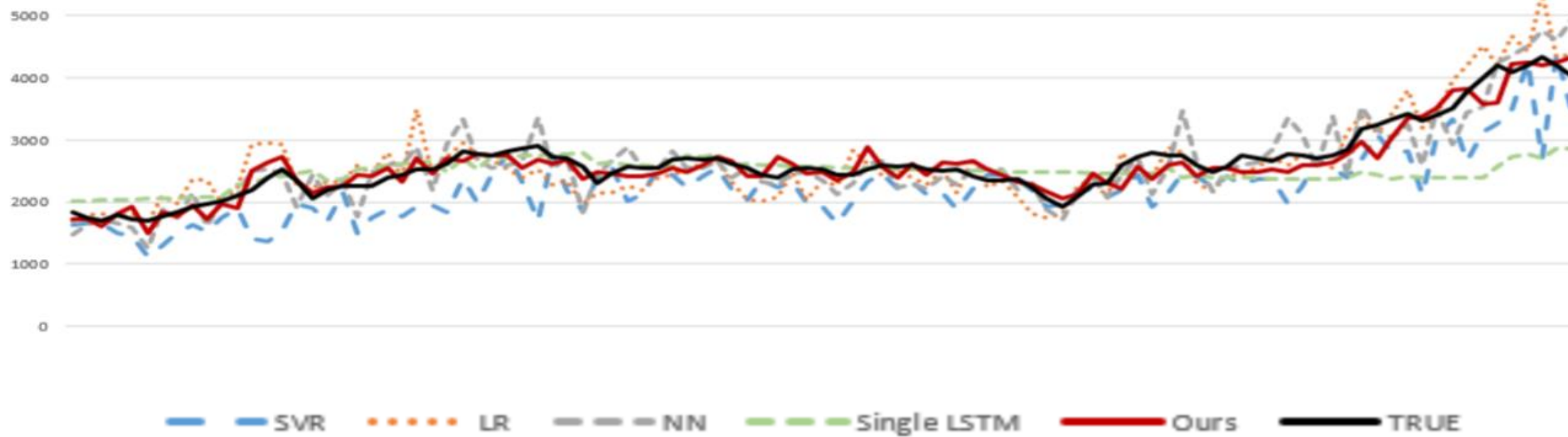
Model

$$\hat{y}^{j+i+q} = F_i(x^{i+j-1} \dots x^{i+j+q-1}; \theta^i)$$

$$\theta^{i*} = \underset{\theta}{\operatorname{argmin}} \sum_{j=1}^{p-q} (\hat{y}^{j+i} - y^{j+i})^2$$



conclusion





validation data

Common Machine learning :

- Dividing into train VS test

Rolling window LSTM model :

- Building a model structure

資料介紹

1. In particular, we thought that the degree of change of the **blockchain variable** had a significant effect on the target variable
2. The bitcoin price is **the weighted sum of the daily** open price, closing price, lowest price, and highest price of the bitstamp exchange

資料介紹

time :

as daily data from September 2011 to August 2017

Input:

Global Economic Measure :

①prices of crude oil, ②SSE, ③gold, ④VIX, ⑤FTSE100

Global Currency :

⑥USD/CNY, ⑦USD/JPY, and ⑧USD/CHF

Blockchain Information :

⑨block size, ⑩median confirmation time, ⑪hash rate, ⑫miner's revenue, ⑬cost per transaction, ⑭confirmed transactions per day, ⑮the number of transactions, excluding popular addresses

Trading Information :

⑯The trading volume of the bitstamp exchange 、 ⑰the historical value of the target variable

Hyperparameter tuning

- (sequence length, training length) :
(50, 25), (100, 50), (150, 100), (200, 150), (500, 250), (1000, 500),
(1000, 750), (1500, 500), (1500, 750), (1500, 1000)

資料整理