STOCK CLOSING PRICE PREDICTION USING MACHINE LEARNING TECHNIQUES[1]

論文復刻及優化

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[1] M. Vijh, D. Chandola and V. D. Tikkiwal, "Stock Closing Price Prediction Using Machine Learning Techniques," Procedia Computer Science, vol. 167, pp. 599–606, 2020.

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Data Description & Variables

DataSet

- 資料來源：Yahoo Finance
- 樣本公司：Nike、Goldman Sachs、Johnson & Johnson、Pfizer、JP Morgan
- 期間：2009/04/05–2019/04/05 共 10 年

Table 1. Statistics of the dataset

	Dataset	Training Dataset	Testing Dataset
Time Interval	04/05/2009 – 04/05/2019	04/06/2009- 04/03/2017	04/04/2017 – 04/05/2019

Variables

1. H-L（High – Low）
2. O-C（Close – Open）
3. 7日移動平均（7 Days MA）
4. 14日移動平均（14 Days MA）
5. 21日移動平均（21 Days MA）
6. 7日標準差（7 Days STD DEV）

↓

這些特徵變數會輸入到 ANN 與 RF 模型中，
用來預測次日收盤價。

Random Forest (RF)

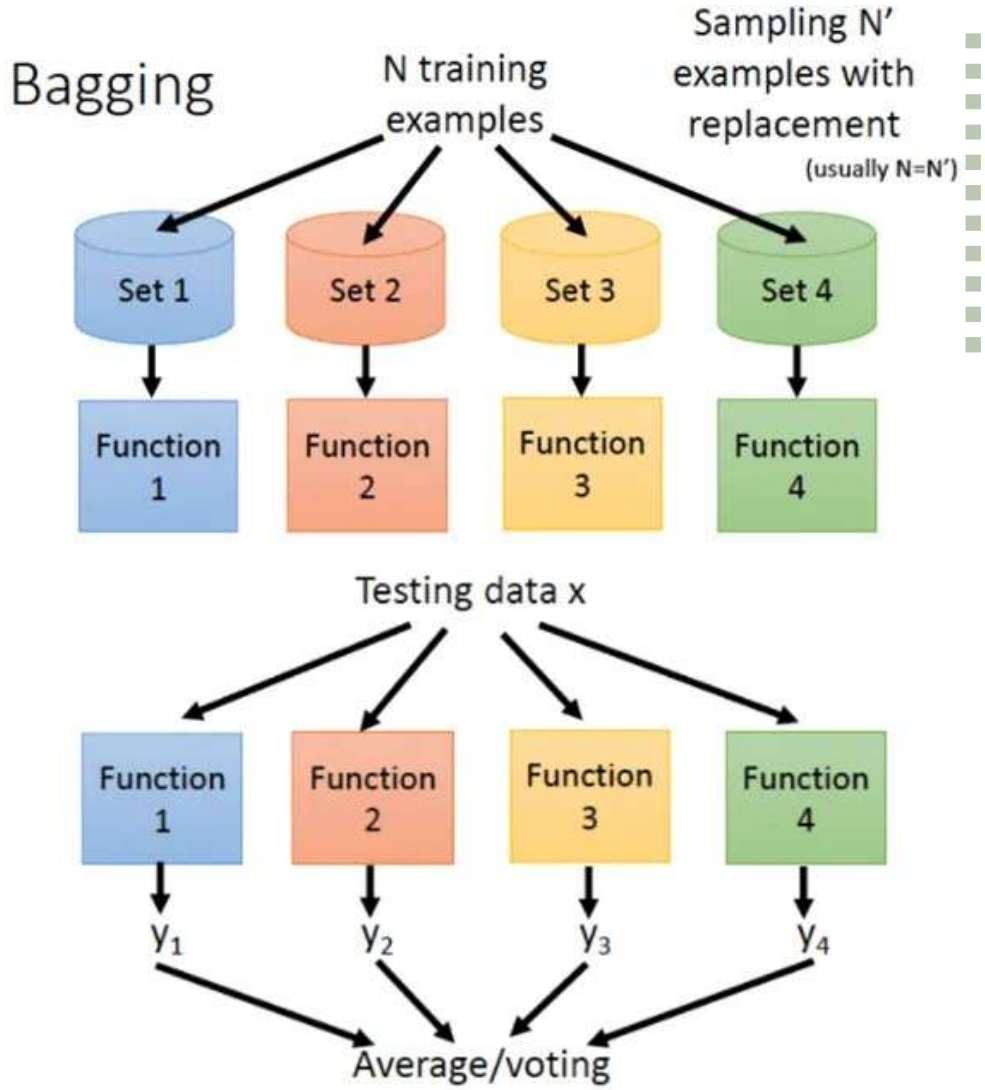
算法演進：

- Bagging(Bootstrap Aggregation)
  - L. Breiman, "Bagging predictors," Machine Learning,vol. 24,no.2,pp.123-140,1996
  - Bootstrap Sampling + Aggregation
- Random Forest
  - L. Breiman, "Random forests," Machine Learning,vol. 45,no.1,pp.5–32,2001
  - Bagging + CART(Classification And Regression Tree)

Random Forest (RF)

Bagging ：

- Bootstrap Sampling
  - 增加隨機性
  - 原始資料集利用拔靴法建立多個子資料集
  - 建立多個學習器(predictor)
- Aggregation
  - 所有學習器的預測值取平均作為最終預測值
  - 多學習器共同決策降低variance
  - 提高泛化能力

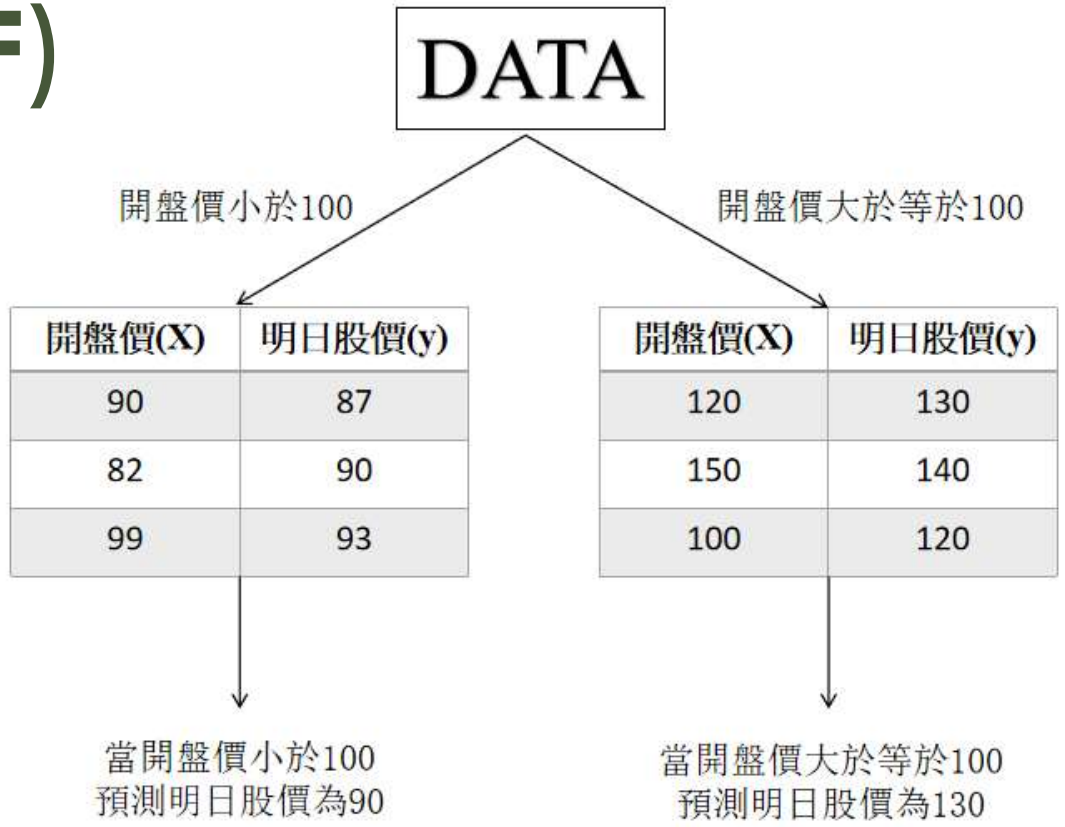


https://medium.com/21-century-girl/random-forest-rf-in-data-analysis-50c3bfa4933a

Random Forest (RF)

Random Forest：

- CART
  - bi-branching by purifying
  - 某特徵可以純化兩邊內部的y
  - e.g.大小讓一籃球成功分成紅球藍球
- Feature selection
  - efficiency + generalization
  - 可自訂分支時考慮的特徵空間
  - 用MSE作為評選特徵的指標

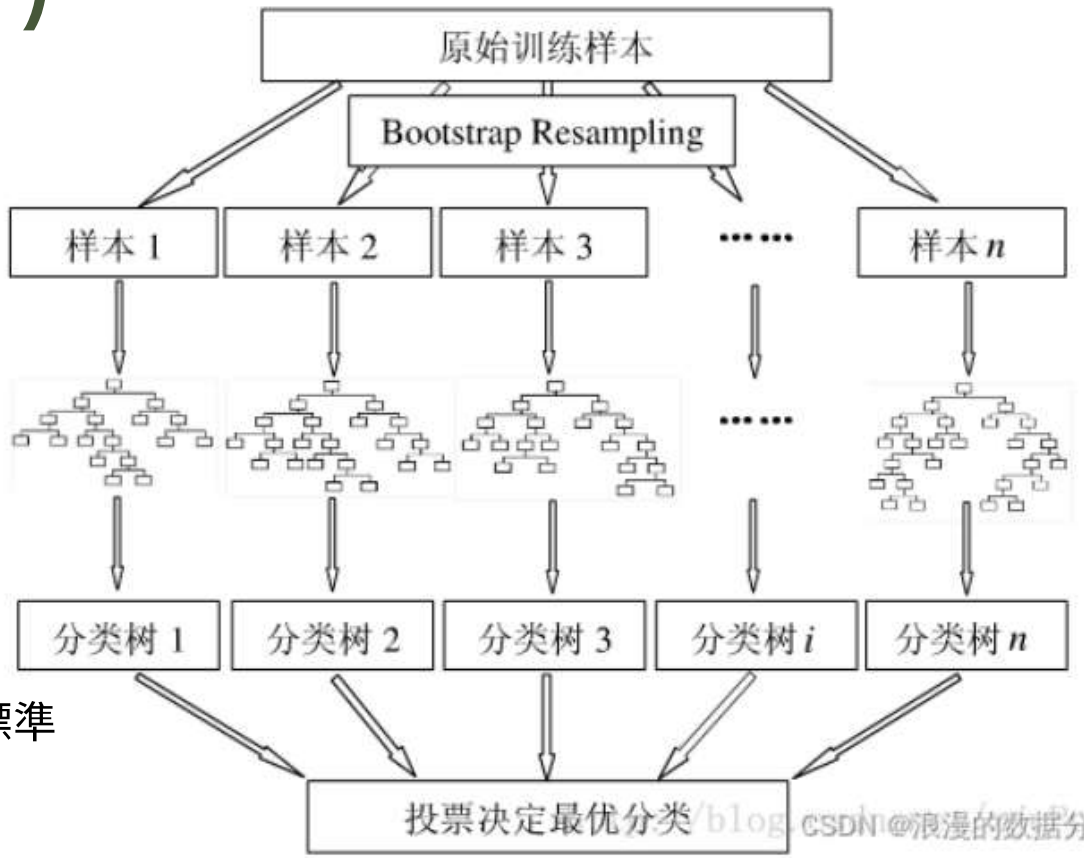


$$MSE(xi) = \sum_{j=1}^{N} (yij - \overline{yi.})^2 , i = 1,2,\ldots,k$$

Random Forest (RF)

超參數設定：

- n_estimators=1000
  - 生成1000顆決策樹
- max_depth=None
  - 不設限樹的深度
- criterion=MSE
  - 結點分裂時使用MSE作為評估特徵的標準
- max_features=auto
  - 結點分裂時的特徵空間包含全部特徵



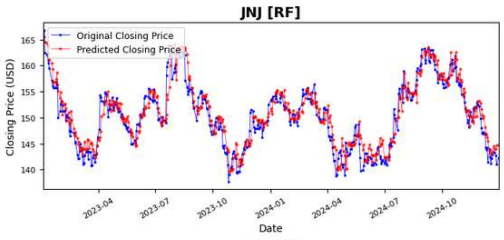
https://blog.csdn.net/weixin_43290383/article/details/123114875

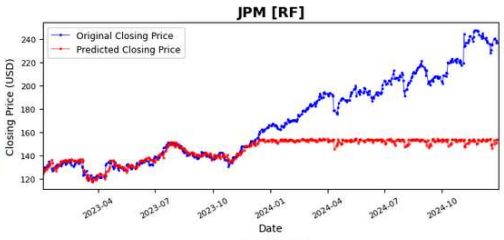
資料來源及區間

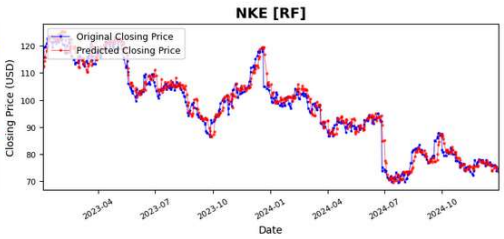
- 資料來源 ： yahoo finance
- 樣本公司 ：JNJ, JP Morgan, Goldman Sachs, Nike, Pfizer (與論文相同)
- 資料區間 ：2015 / 01 / 01 - 2025 / 01 / 01
  - test size ：0.2

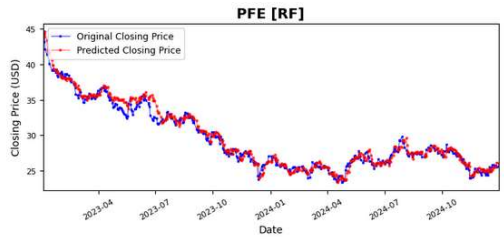
延伸討論 - via return (RF)

via price

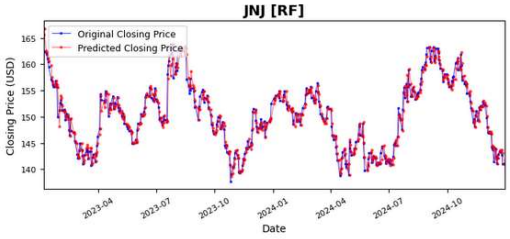








via return



延伸討論

via price	ANN_RMSE	ANN_MAPE	ANN_MBE	RF_RMSE	RF_MAPE	RF_MBE
Compony						
GS	11.9834	2.12%	3.5177	82.5615	10.46%	47.0373
JNJ	2.5474	1.36%	-1.1026	2.5738	1.33%	-0.5132
JPM	4.0624	1.73%	0.5464	38.2917	12.81%	24.8557
NKE	3.6843	2.69%	-0.3684	3.2331	2.44%	-0.4612
PFE	0.7399	1.98%	-0.1055	1.0176	2.47%	-0.3761

via return	ANN_RMSE	ANN_MAPE	ANN_MBE	RF_RMSE	RF_MAPE	RF_MBE
Compony						
GS	6.6117	0.01%	0.7741	8.1449	0.01%	1.5331
JNJ	1.5101	0.01%	0.0037	1.5522	0.01%	-0.0238
JPM	2.5424	0.01%	0.0137	3.3631	0.01%	0.4529
NKE	2.1141	0.01%	-0.2917	1.9142	0.01%	-0.2763
PFE	0.4589	0.01%	-0.0316	0.4447	0.01%	-0.0389

Reference

- [1]M. Vijh, D. Chandola and V. D. Tikkiwal, "Stock Closing Price Prediction Using Machine Learning Techniques," Procedia Computer Science, vol. 167, pp. 599–606, 2020.
- [2] https://online.stat.psu.edu/stat857/node/155/
- [3] https://www.ibm.com/think/topics/ridge-regression
- [4]https://www.youtube.com/watch?v=s9Um2O7N7YM&list=PLXVfgk9fNX2IQOYPmqjqWsNUFl2kpk1U2&index=35
- [5]L. Breiman, "Bagging predictors," Machine Learning,vol. 24,no.2,pp.123-140,1996
- [6]L. Breiman, "Random forests," Machine Learning,vol. 45,no.1,pp.5–32,2001