Company Bankrutcy Prediciton

Data Science Final Presentation Group 4

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Group Members

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資料介紹

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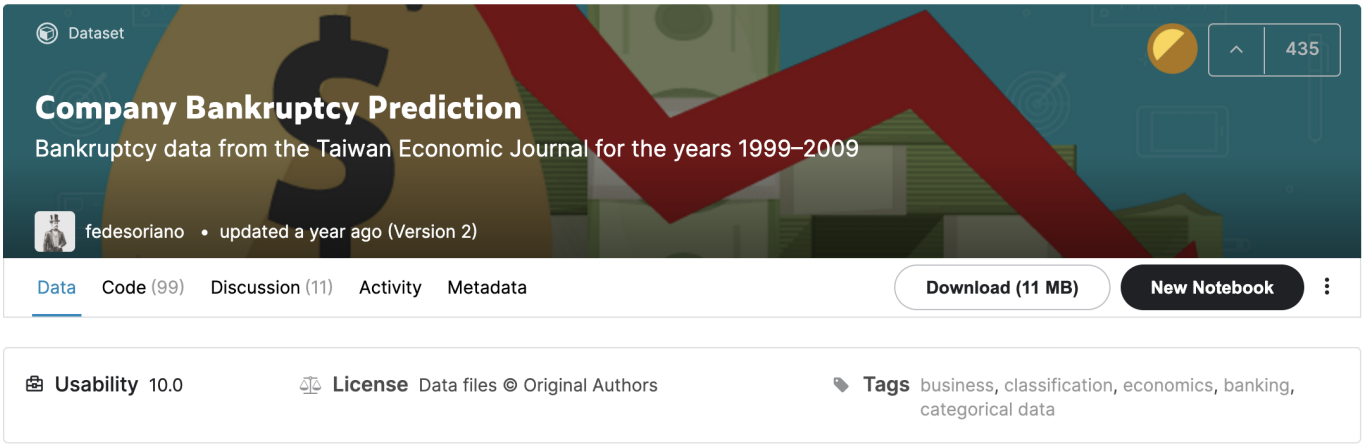
1999 年至 2009 年數據來自自台灣經濟日報的統計。公司破產之定義為台灣證券交易所的業務規則而定。



屬性資訊

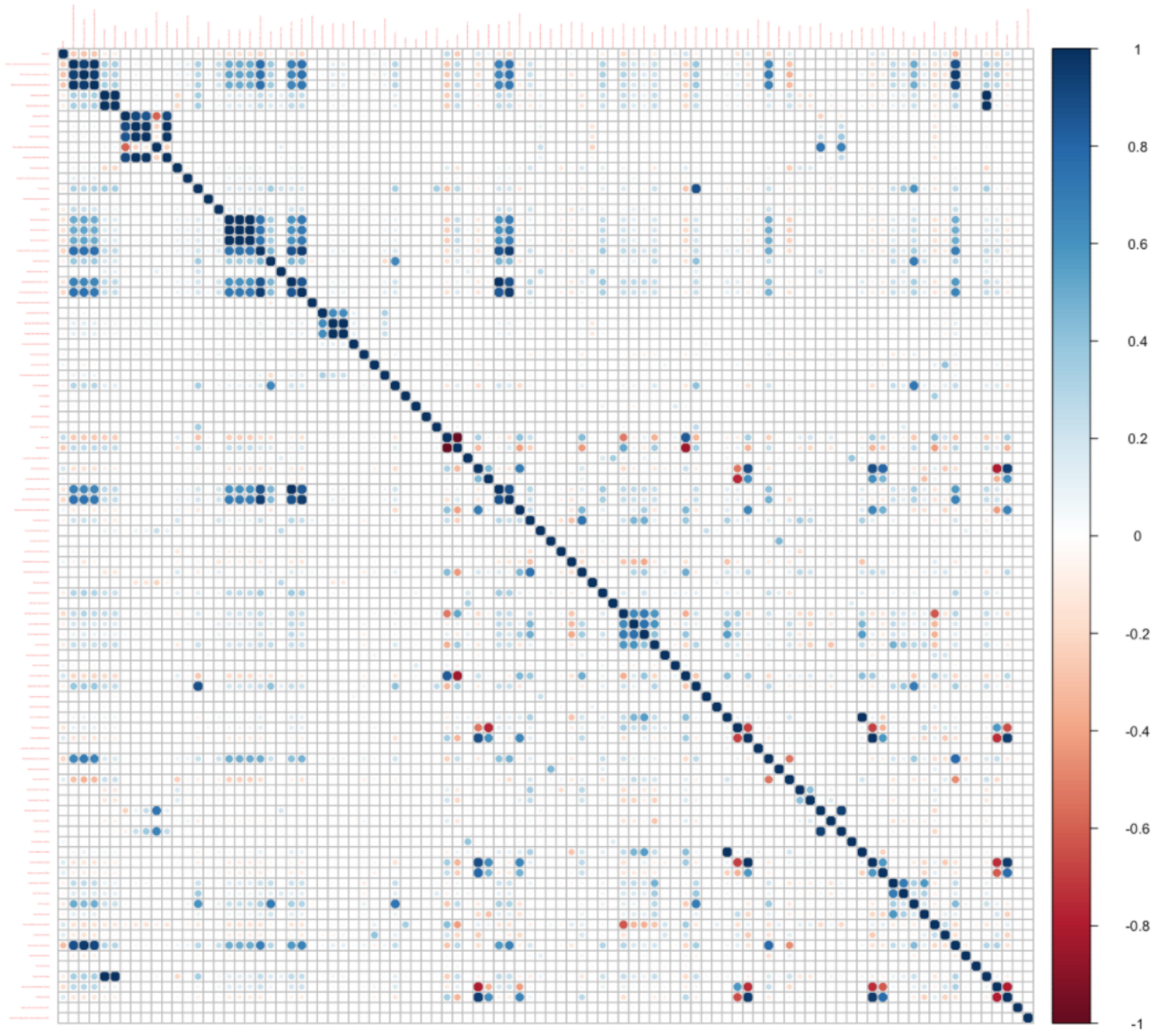
- X2 - ROA(A) before interest and % after tax: Return On Total Assets(A)
- X11 - Operating Expense Rate: Operating Expenses/Net Sales
- X13 - Cash flow rate: Cash Flow from Operating/Current Liabilities
- X33 - Current Ratio
- X92 - Degree of Financial Leverage (DFL)
- X85 - Liability-Assets Flag: 1 if Total Liability exceeds Total Assets, 0 otherwise
- X94 - Net Income Flag: 1 if Net Income is Negative for the last two years, 0 otherwise

資料分析

Shiny App

相關係數

該圖顯示了每個特徵對於對方的相關性。圖中 x 及 y 軸為資料的屬性，格子中的顏色越深，代表著兩屬性之間的相關性越高。



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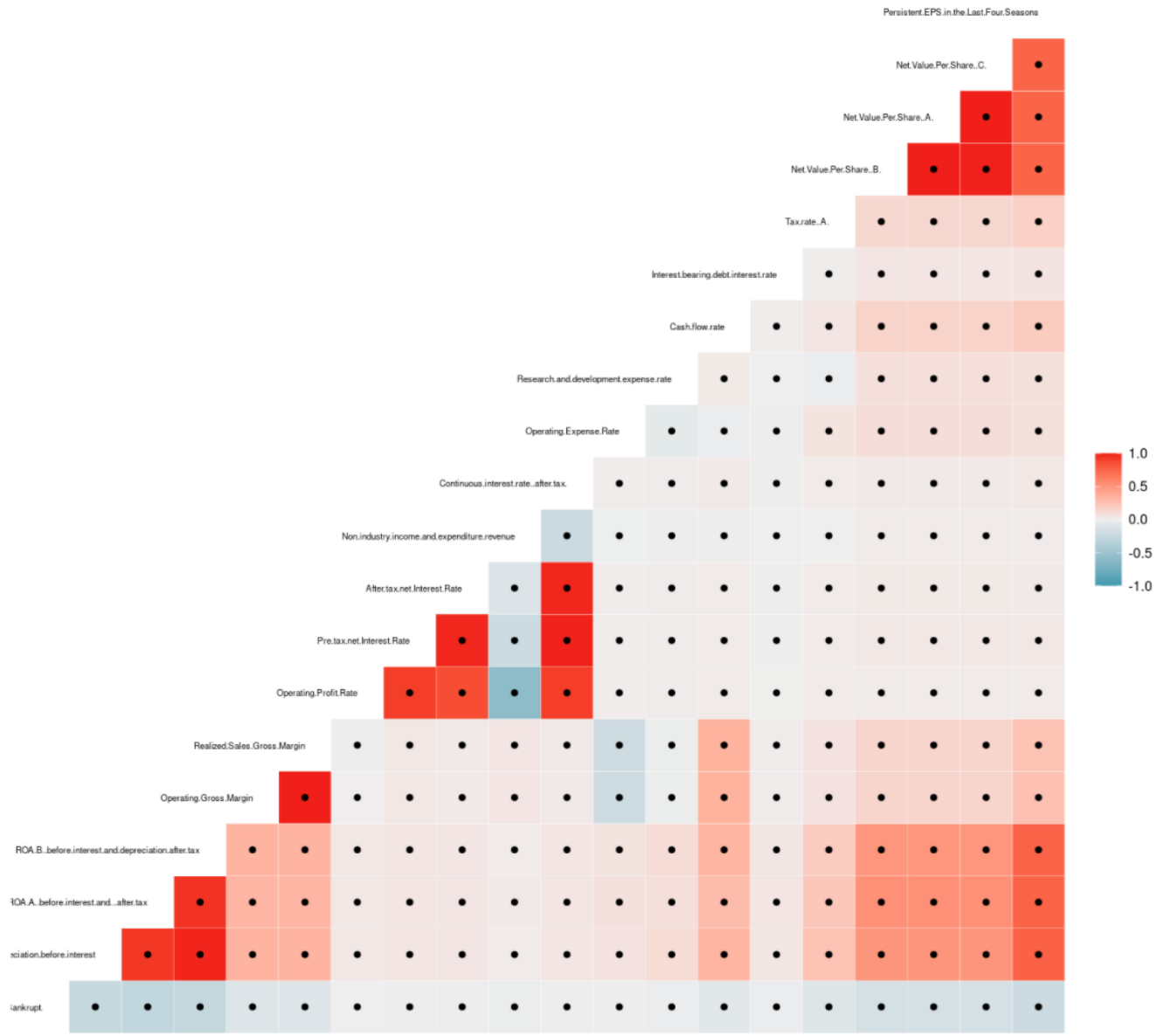
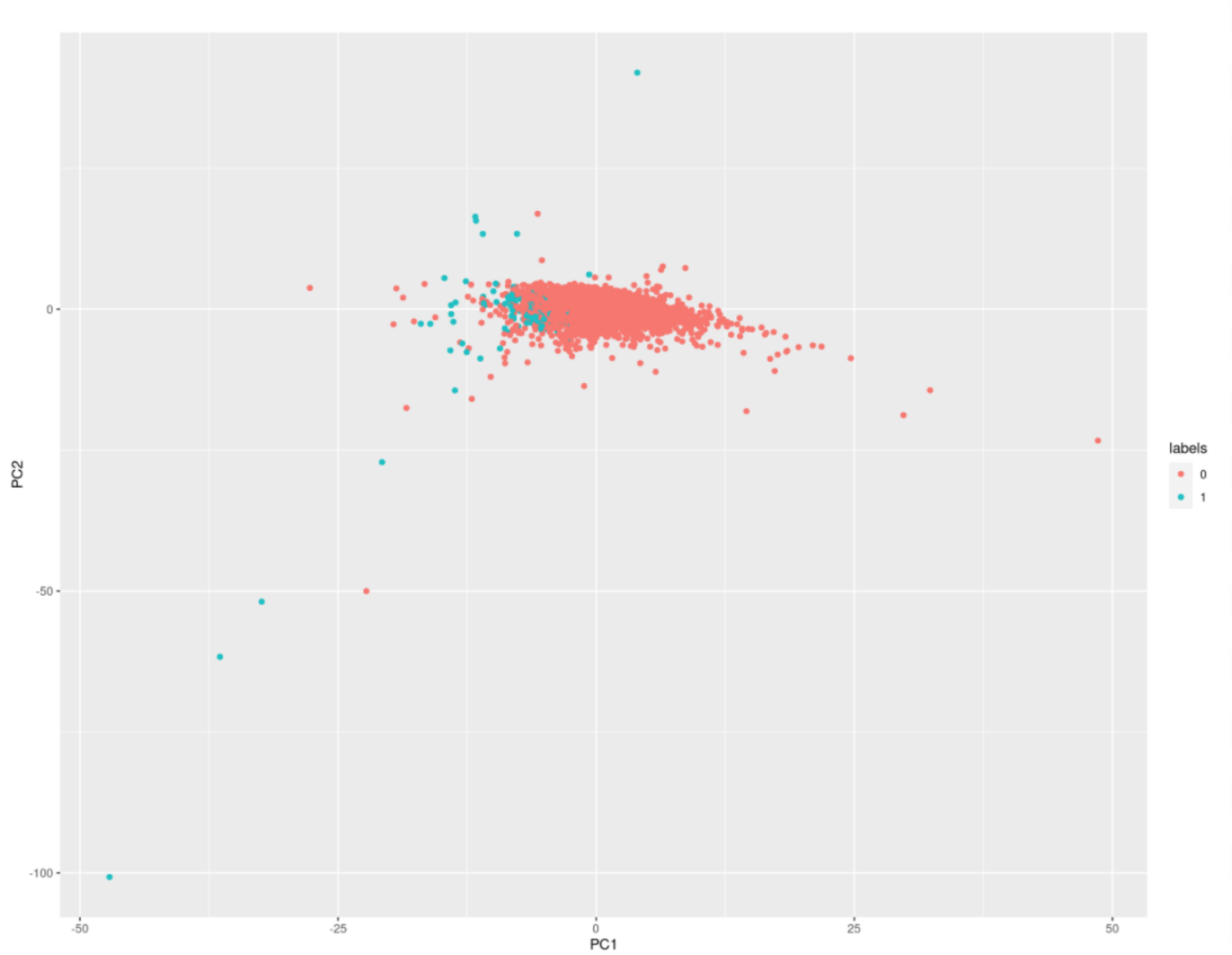


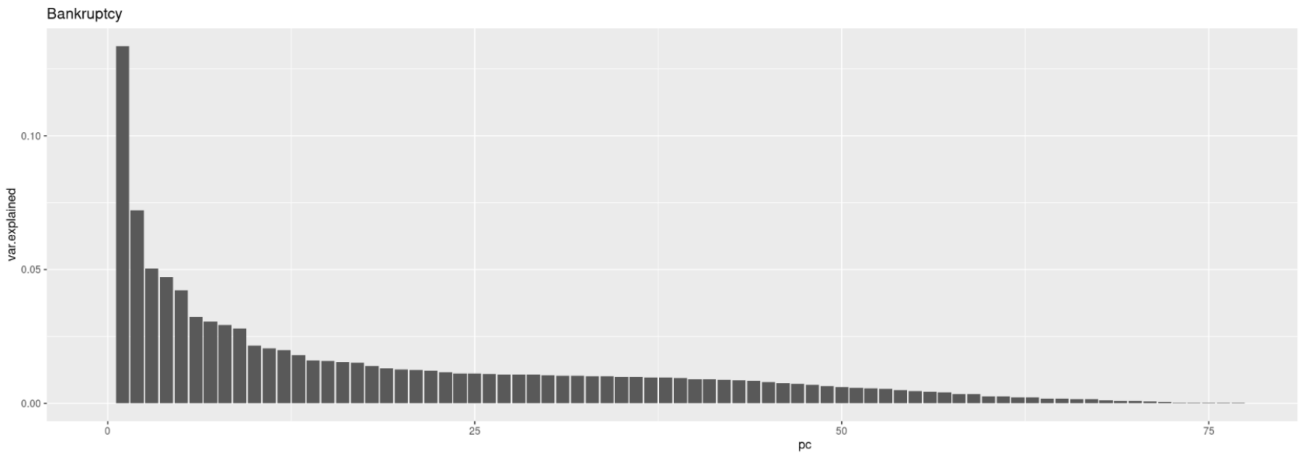
主成份分析

從第一主成份(PC1)到第二主成份(PC2)可以發現沒有明顯可以分辨破產與否的成分。

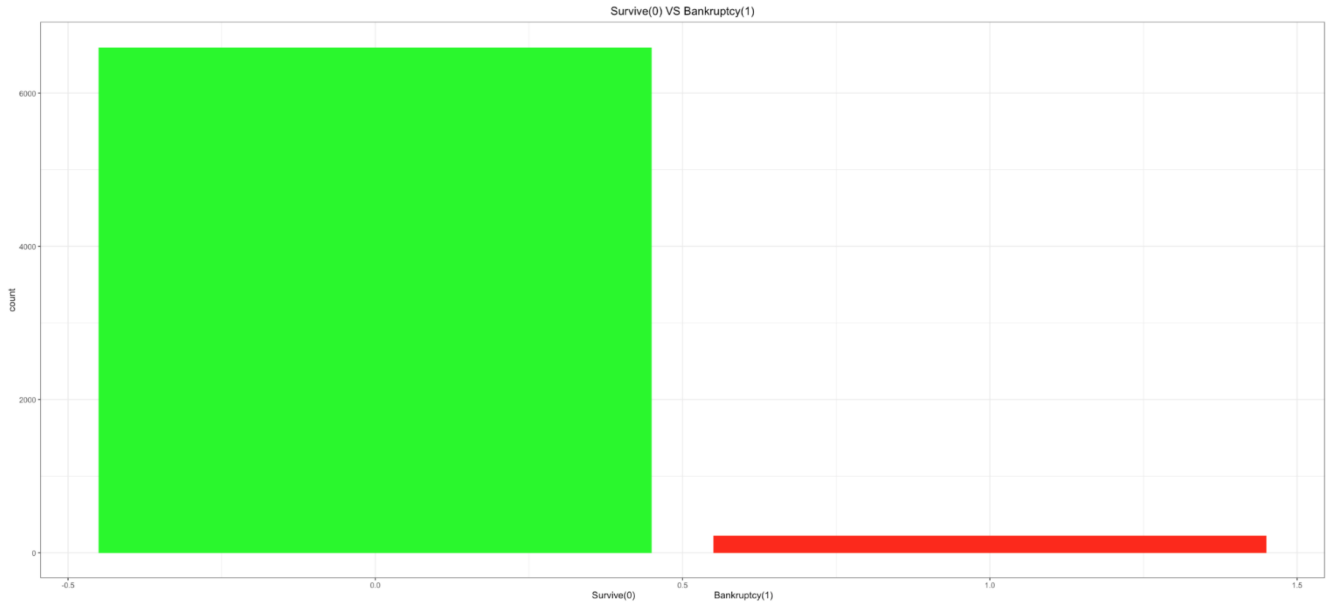


資料解釋度

我們可以看到大約 40 個主成份就解釋了超過 90%的差異。



公司破產分佈



模型評估標準

- 95% 以上的資料中的公司都沒有破產(Bankruptcy == 0) 所以全部猜 1 就可以有超級高的 Accuracy (NULL model)
- 我們將目標設定成要盡可能增加 recall 。 嘗試預測出更多可能會倒的公司去對他們做關切或提早做應對措施，並去檢視可能面臨的問題，是這次專題的主要目標。

Models

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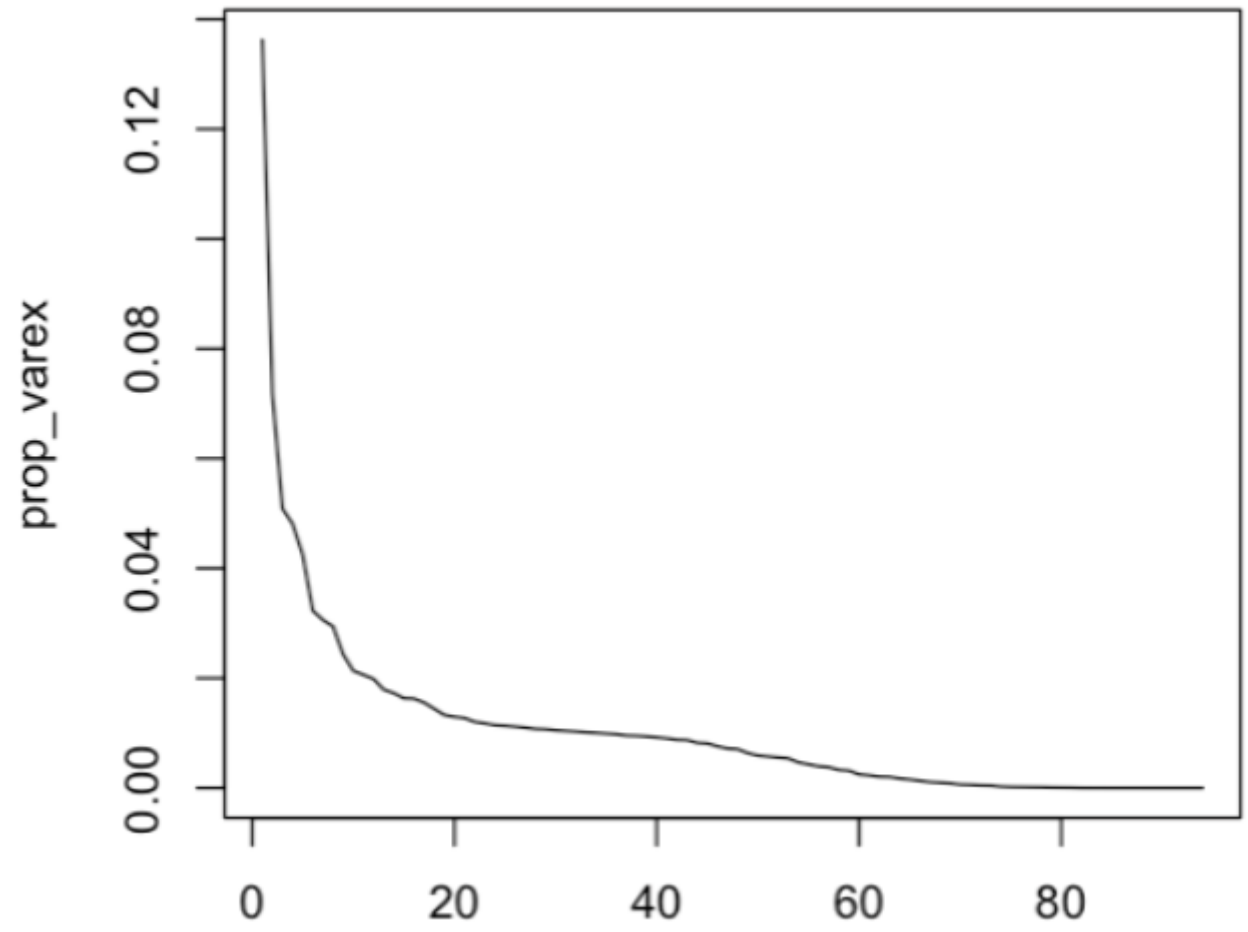
pca 分析 -> 取前 40 個




```
#--- watch pc
std_dev <- pca$sdev
pr_var <- std_dev^2
prop_varex <- pr_var/sum(pr_var)
plot(prop_varex, type = 'lines')
```

---

model #1: decision tree

decision tree	decision tree with pca

decision tree **decision tree with pca**

```
     prediction
truth    0    1
    0 1303   15
    1   39    7
```

```
     pred
truth    0    1
    0 1306   15
    1   32   11
>
```

model #1: decision tree

decision tree **decision tree with pca**

```
> print( accuracy )
[1] 0.9604106
> print( recall )
[1] 0.1521739
> print( precision )
[1] 0.3181818
> print( NegativePrecision )
[1] 0.9709389
```

```
> print( accuracy )
[1] 0.9655425
> print( recall )
[1] 0.255814
> print( precision )
[1] 0.4230769
> print( NegativePrecision )
[1] 0.9760837
```

model #2: random forest

random forest **decision tree with pca**

```
     prediction
truth    0    1
    0 1301   16
    1   30   17
```

```
     prediction
truth    0    1
    0 1297   20
    1   40    7
```

model #2: random forest

random forest **decision tree with pca**

random forest

```
> print( accuracy )
[1] 0.9662757
> print( recall )
[1] 0.3617021
> print( precision )
[1] 0.5151515
> print( NegativePrecision )
[1] 0.9774606
```

decision tree with pca

```
> print( accuracy )
[1] 0.9560117
> print( recall )
[1] 0.1489362
> print( precision )
[1] 0.2592593
> print( NegativePrecision )
[1] 0.9700823
```

model #3: logistic regression

logistic regression

```
      prediction
truth    0    1
    0 1306   17
    1   28   13
```

logistic regression with pca

```
     pred
truth    0    1
    0 1237   86
    1   15   26
```

model #3: logistic regression

logistic regression

```
> print( accuracy )
[1] 0.9670088
> print( recall )
[1] 0.3170732
> print( precision )
[1] 0.4333333
> print( NegativePrecision )
[1] 0.9790105
```

logistic regression with pca

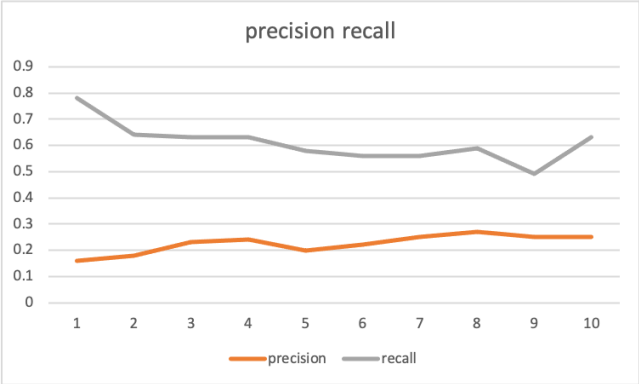
```
> print( accuracy )
[1] 0.9259531
> print( recall )
[1] 0.6341463
> print( precision )
[1] 0.2321429
> print( NegativePrecision )
[1] 0.9880192
```

SMOTE 生成資料

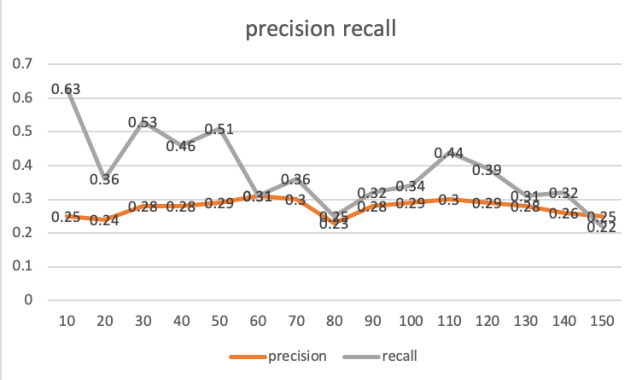
Pytorch

epoch 次數比較

epoch 1-10



epoch 10-150



總結

recall	原始資料	透過 PCA 降維處理
Decision Tree	0.15	0.26
Random Forest	0.36	0.15
Logistic Regression	0.32	0.63
Convolution Neural Network	0.78	0.58

問題與討論

- 資料面?
  - 資料的收集
  - 資料的真實性
- 模型面?
  - 資料數量
  - 對未來預測的時效性

Reference

https://www.kaggle.com/jerryfang5/bankrutcy-prediciton-by-r/notebook
https://www.kaggle.com/seongwonr/bankruptcy-prediction-with-smote
https://colab.research.google.com/drive/12wXAyrbX8Ji5J6CNAEIQwtDOaxy8BCIO?usp=sharing