金融大數據

銀行定期存款推銷預測

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2019.01.02

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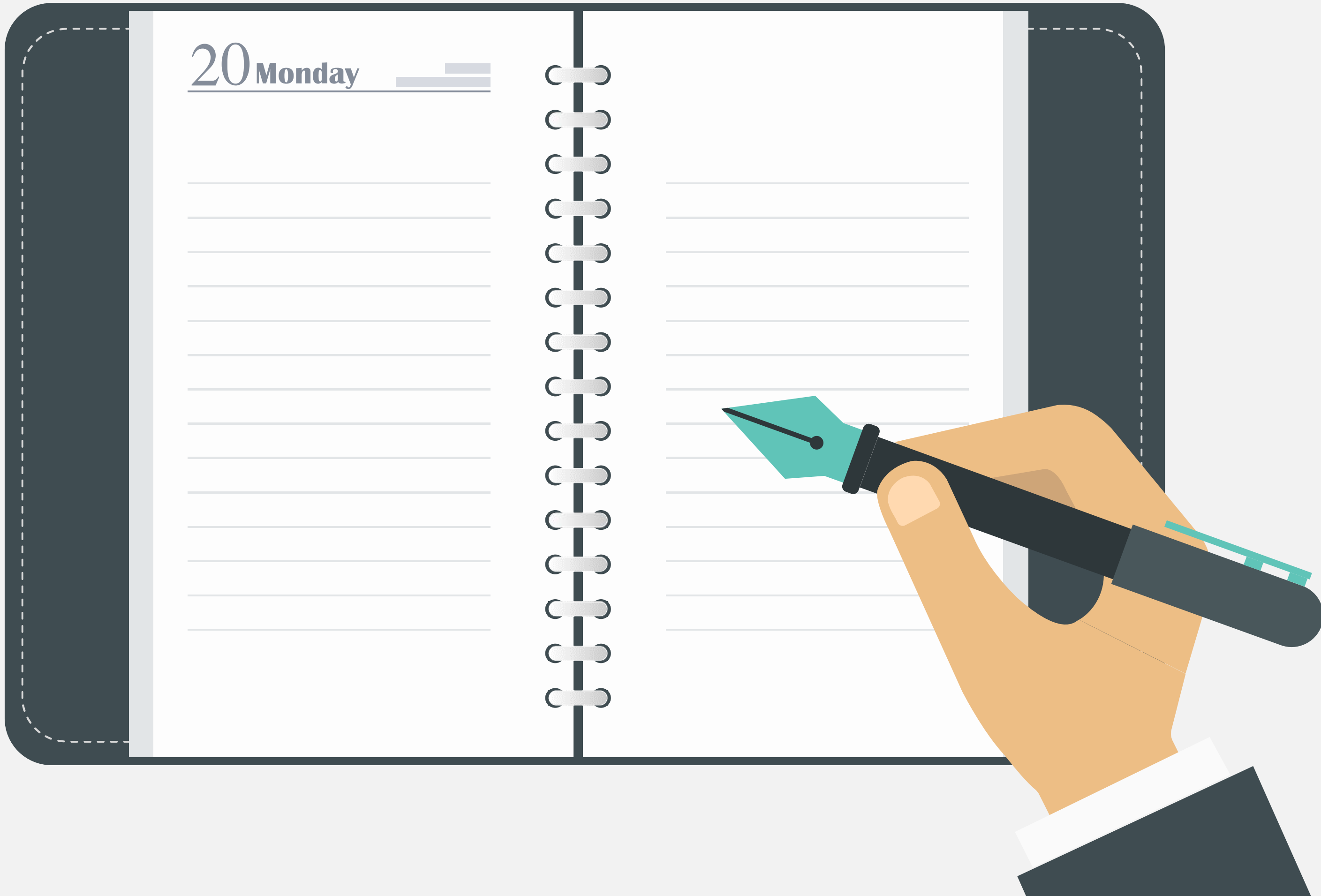
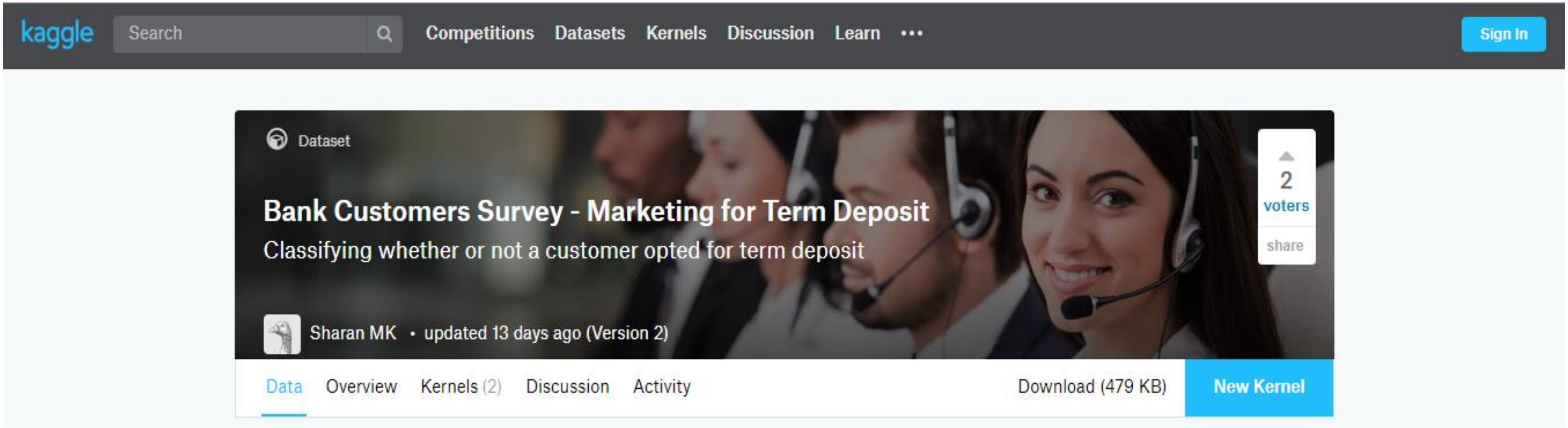
01

資料集簡介



資料集簡介



Bank Customers Survey - Marketing for Term Deposit

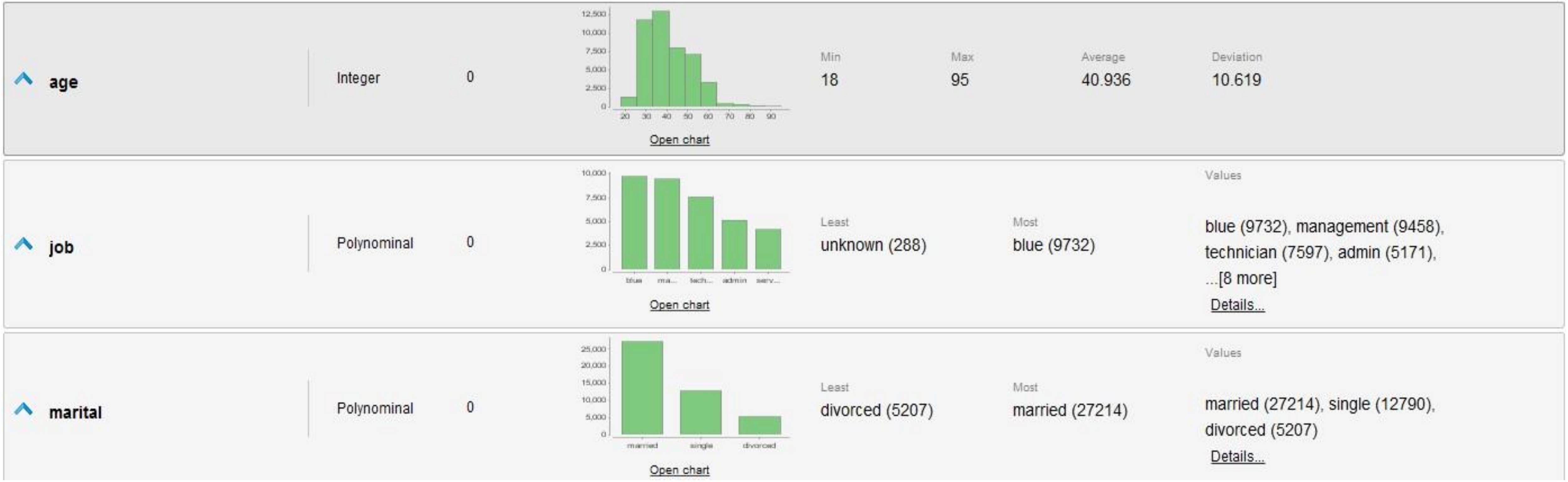
Classifying whether or not a customer opted for term deposit

Sharan MK • updated 13 days ago (Version 2)

資料集名稱：Bank Customers Survey – Marketing for Term Deposit

資料集來源：Kaggle 網站

資料集分佈



age Integer 0

Open chart

Min 18 Max 95 Average 40.936 Deviation 10.619

job Polynominal 0

Open chart

Least unknown (288) Most blue (9732)

Values

blue (9732), management (9458), technician (7597), admin (5171), ...[8 more]

Details...

marital Polynominal 0

Open chart

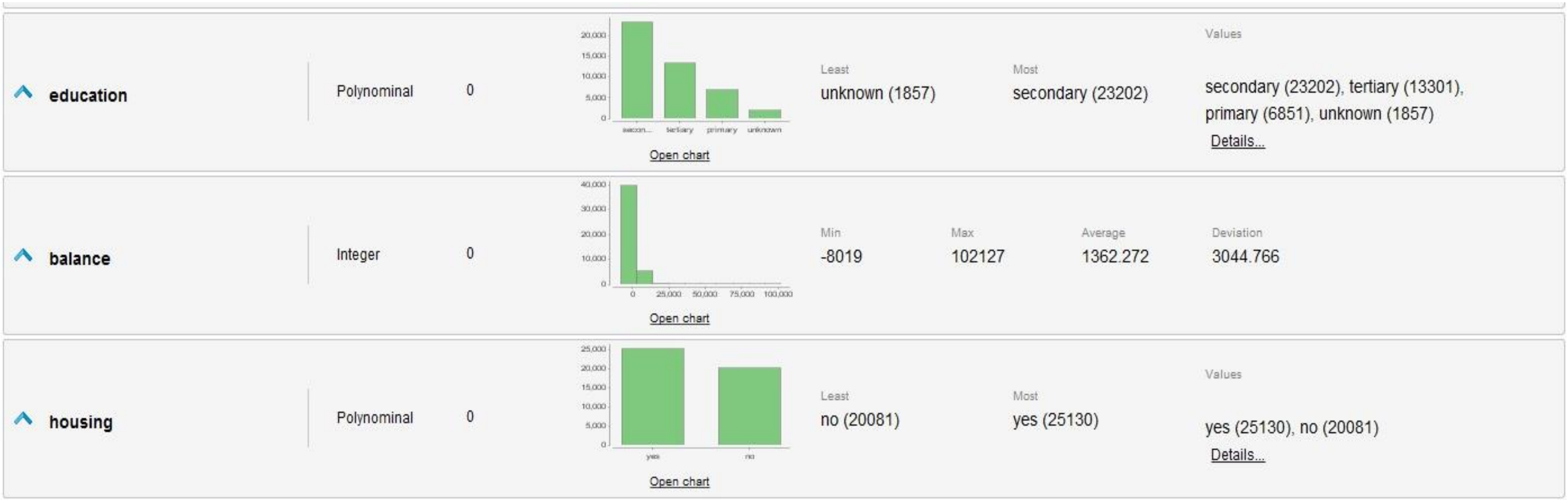
Least divorced (5207) Most married (27214)

Values

married (27214), single (12790), divorced (5207)

Details...

資料集分佈



education Polynominal 0

Least: unknown (1857)

Most: secondary (23202)

Values: secondary (23202), tertiary (13301), primary (6851), unknown (1857)
Details...

balance Integer 0

Min: -8019

Max: 102127

Average: 1362.272

Deviation: 3044.766

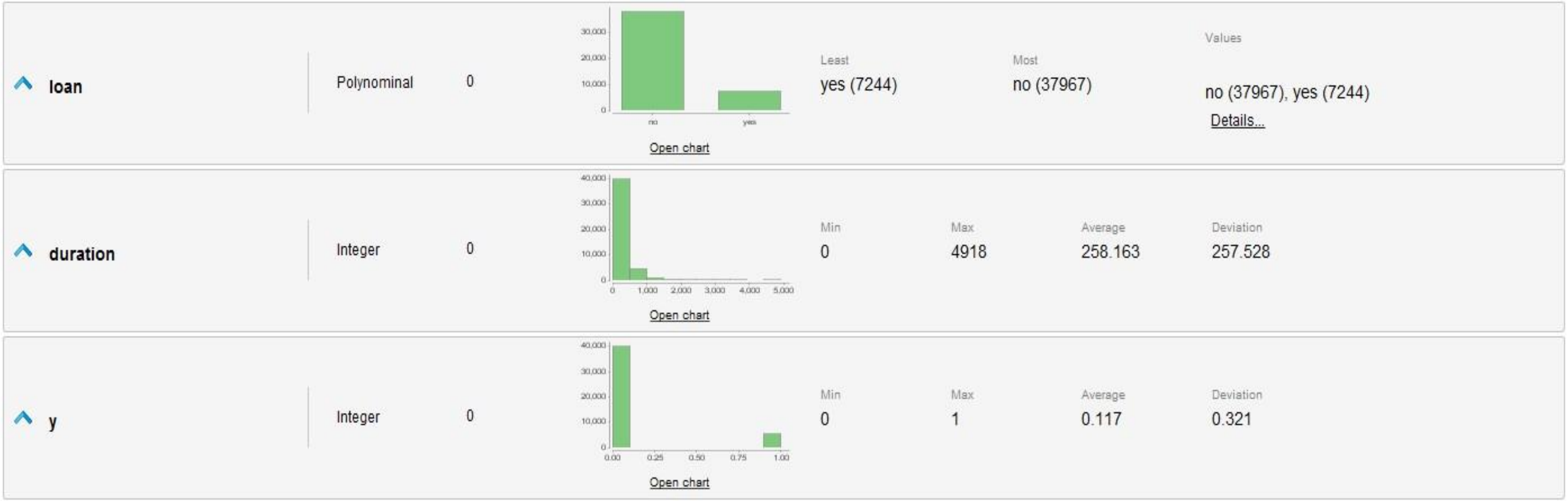
housing Polynominal 0

Least: no (20081)

Most: yes (25130)

Values: yes (25130), no (20081)
Details...

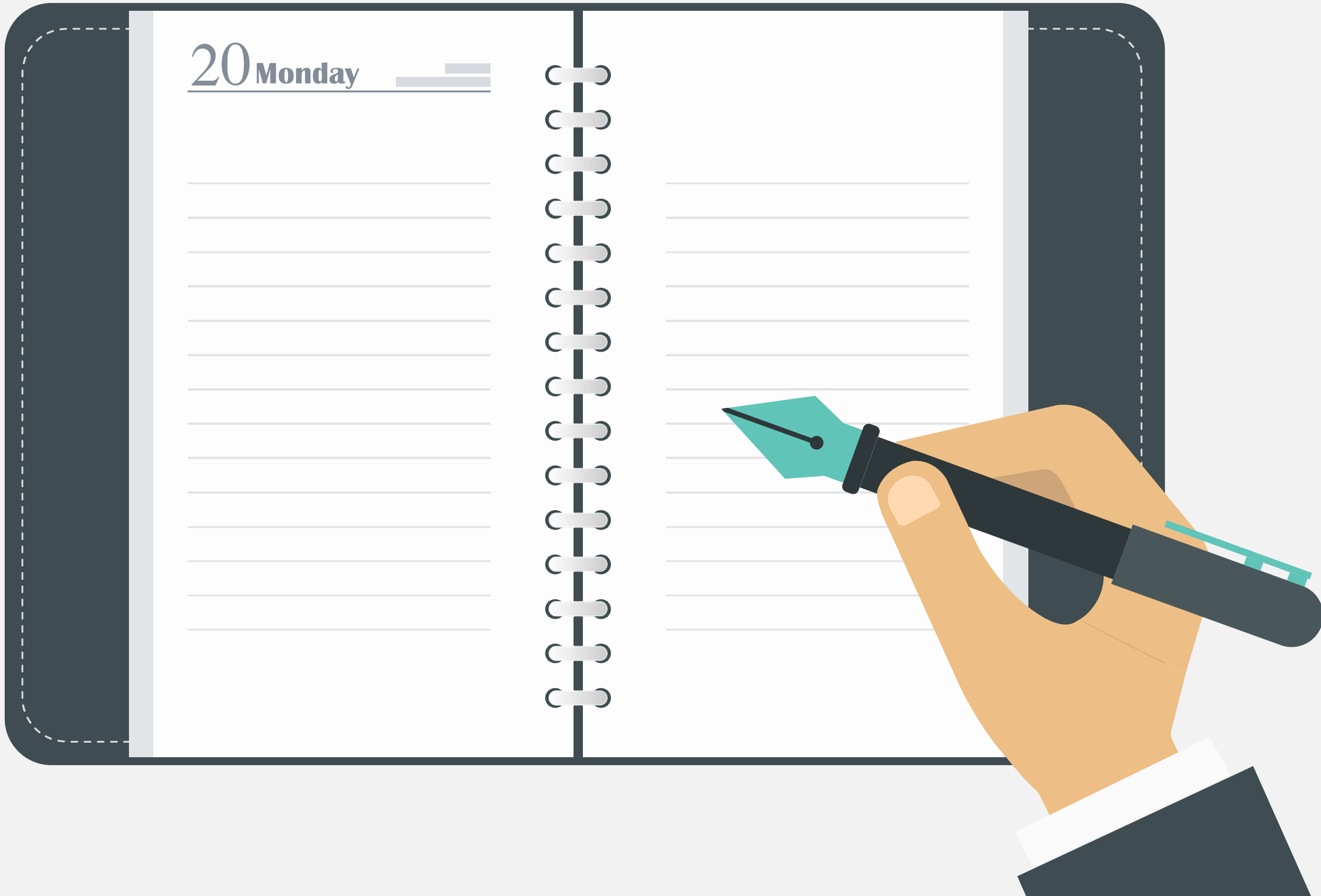
資料集分佈



loan	Polynominal	0	Open chart	Least yes (7244)	Most no (37967)		Values no (37967), yes (7244) Details...
duration	Integer	0	Open chart	Min 0	Max 4918	Average 258.163	Deviation 257.528
y	Integer	0	Open chart	Min 0	Max 1	Average 0.117	Deviation 0.321

02

分析目的



分析目的

分析方法

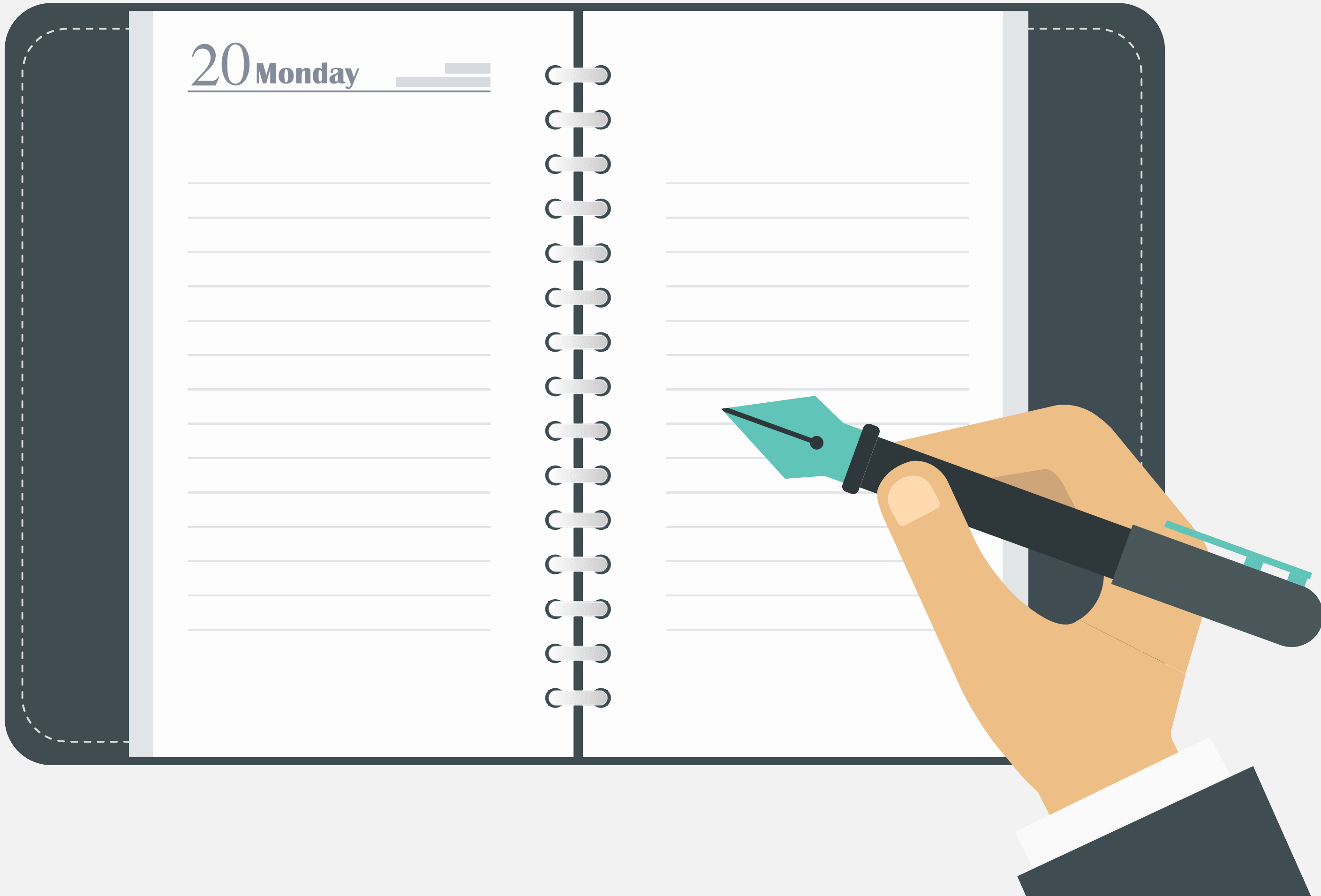
隨機森林(Random Forest)

分析目的

主要是利用Bank Customers Survey – Marketing for Term Deposit資料集，將挑選出來的屬性透過隨機森林的方法去預測顧客是否被推銷成功。

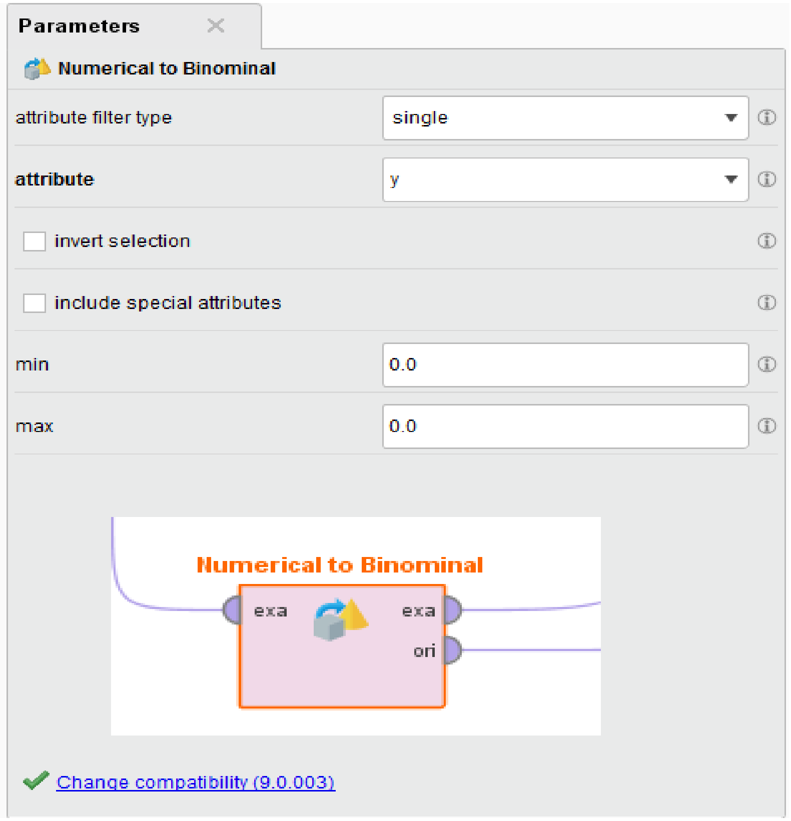
03

資料清理過程



資料清理、轉換

- 將欄位y轉換成類別資料，再將此資料指定為要分析的欄位



Parameters ×

Numerical to Binominal

attribute filter type: single

attribute: y

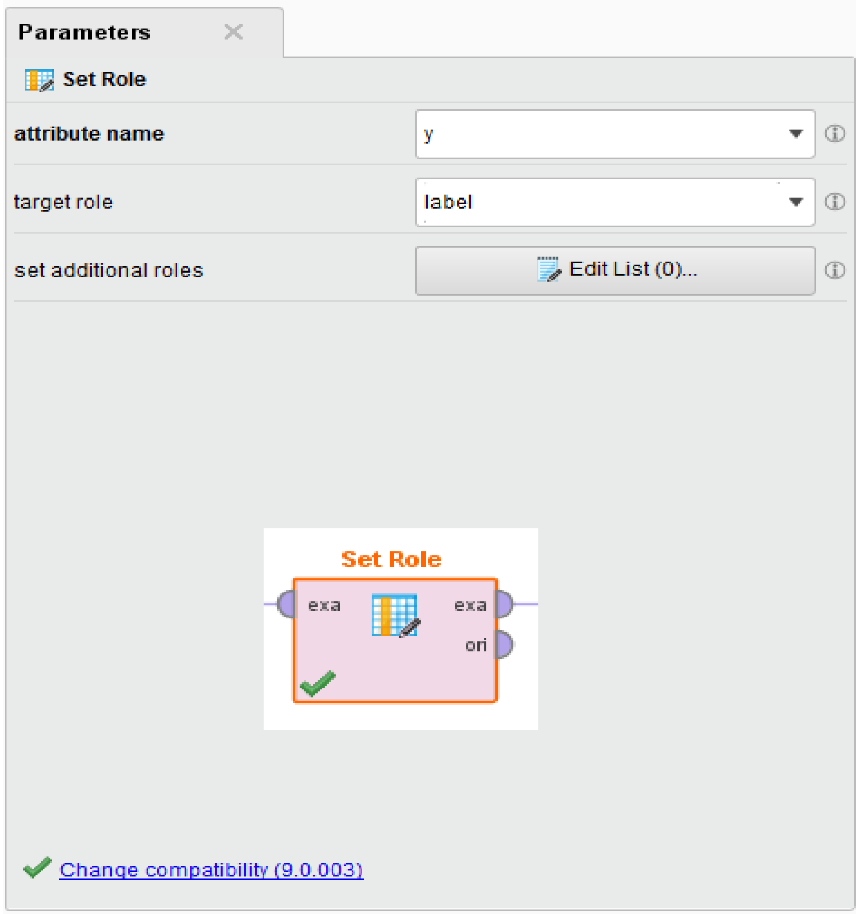
□ invert selection

□ include special attributes

min: 0.0

max: 0.0

✓ Change compatibility (9.0.003)



Parameters ×

Set Role

attribute name: y

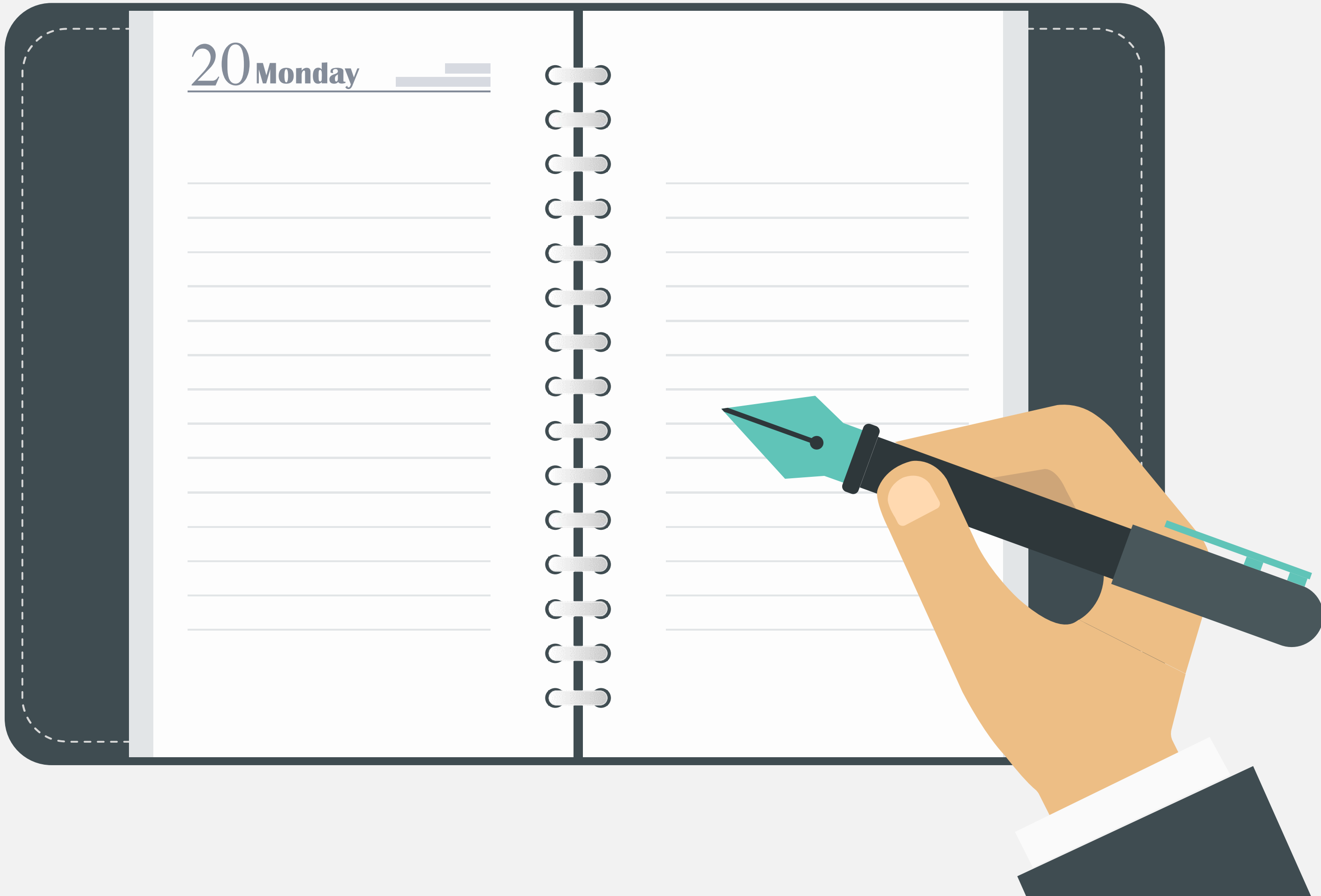
target role: label

set additional roles: Edit List (0)...

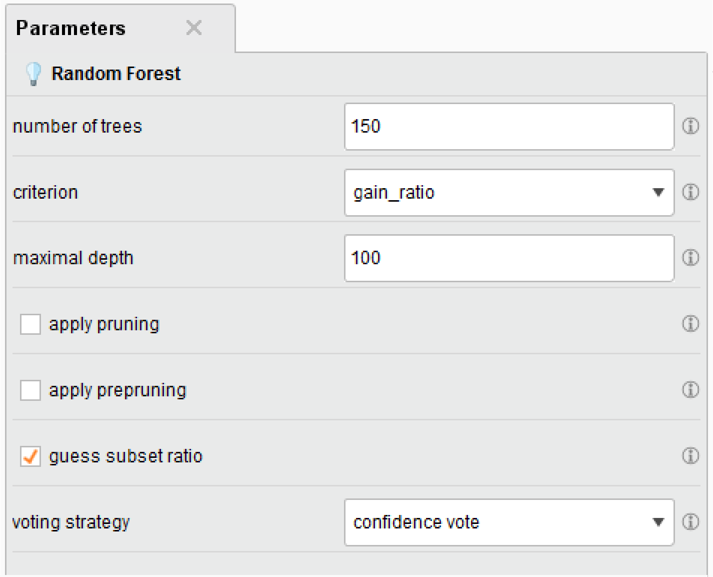
✓ Change compatibility (9.0.003)

04

模型建構與驗證



模型建構、驗證



Parameters

Random Forest

number of trees: 150

criterion: gain_ratio

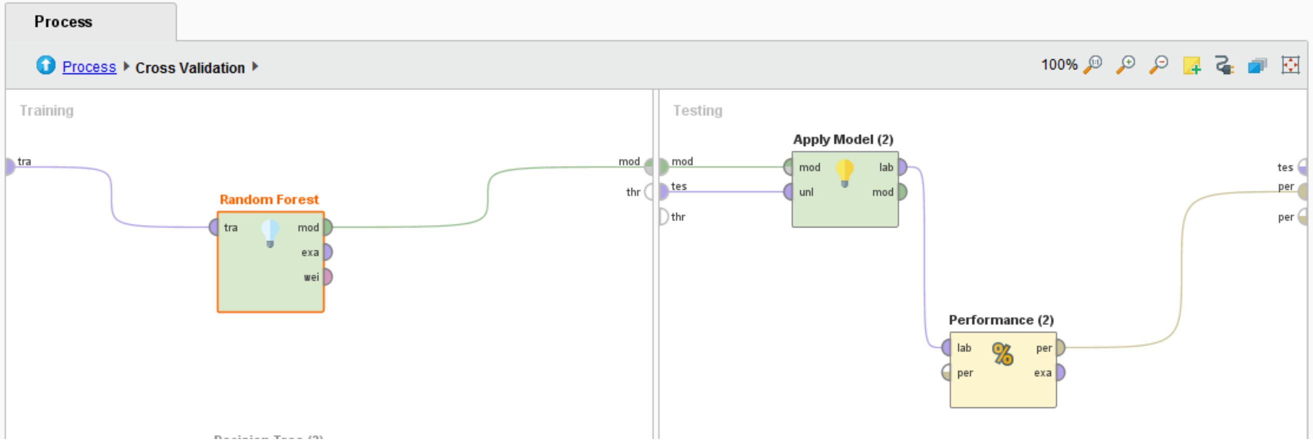
maximal depth: 100

□ apply pruning

□ apply prepruning

☑ guess subset ratio

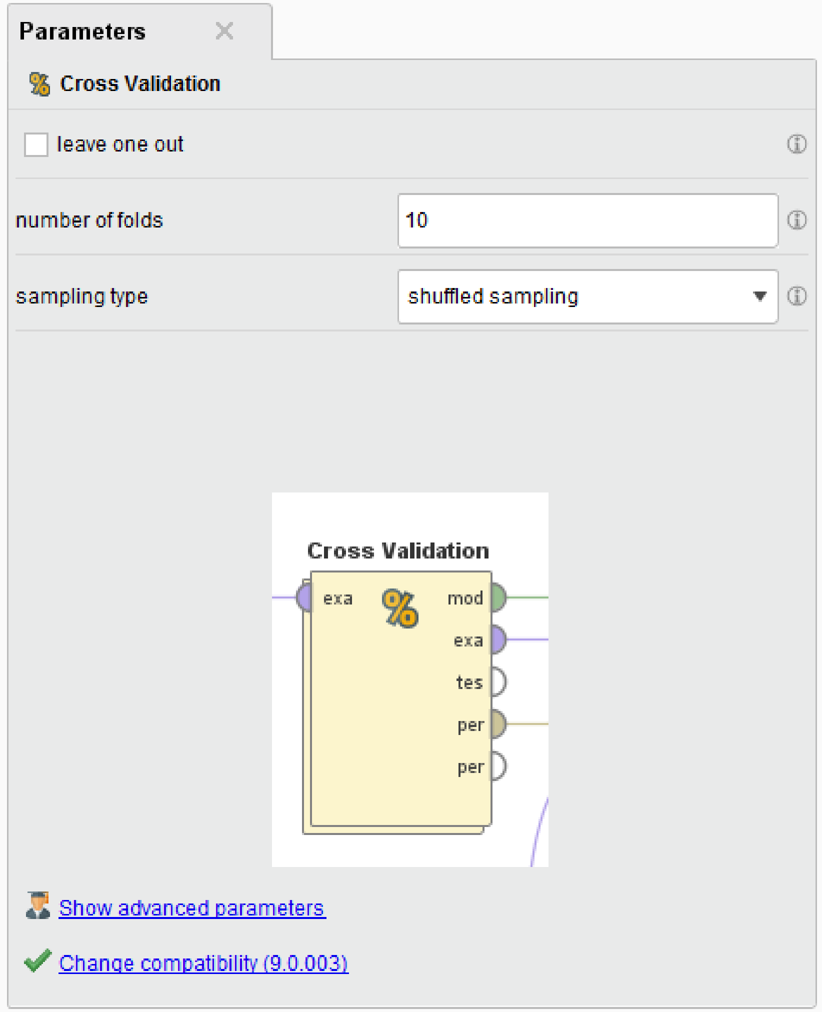
voting strategy: confidence vote



Process

Process ▸ Cross Validation ▸

100%



Parameters

Cross Validation

□ leave one out

number of folds: 10

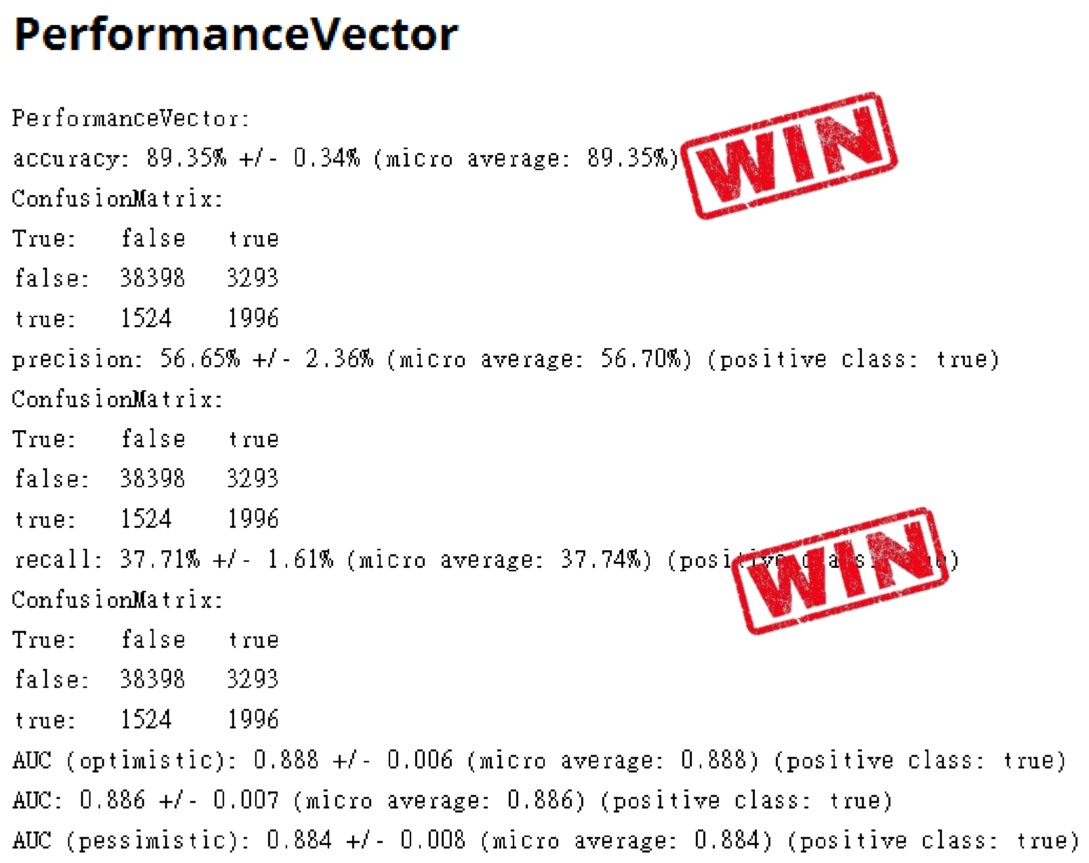
sampling type: shuffled sampling

Show advanced parameters

Change compatibility (9.0.003)

選擇Random Forest原因

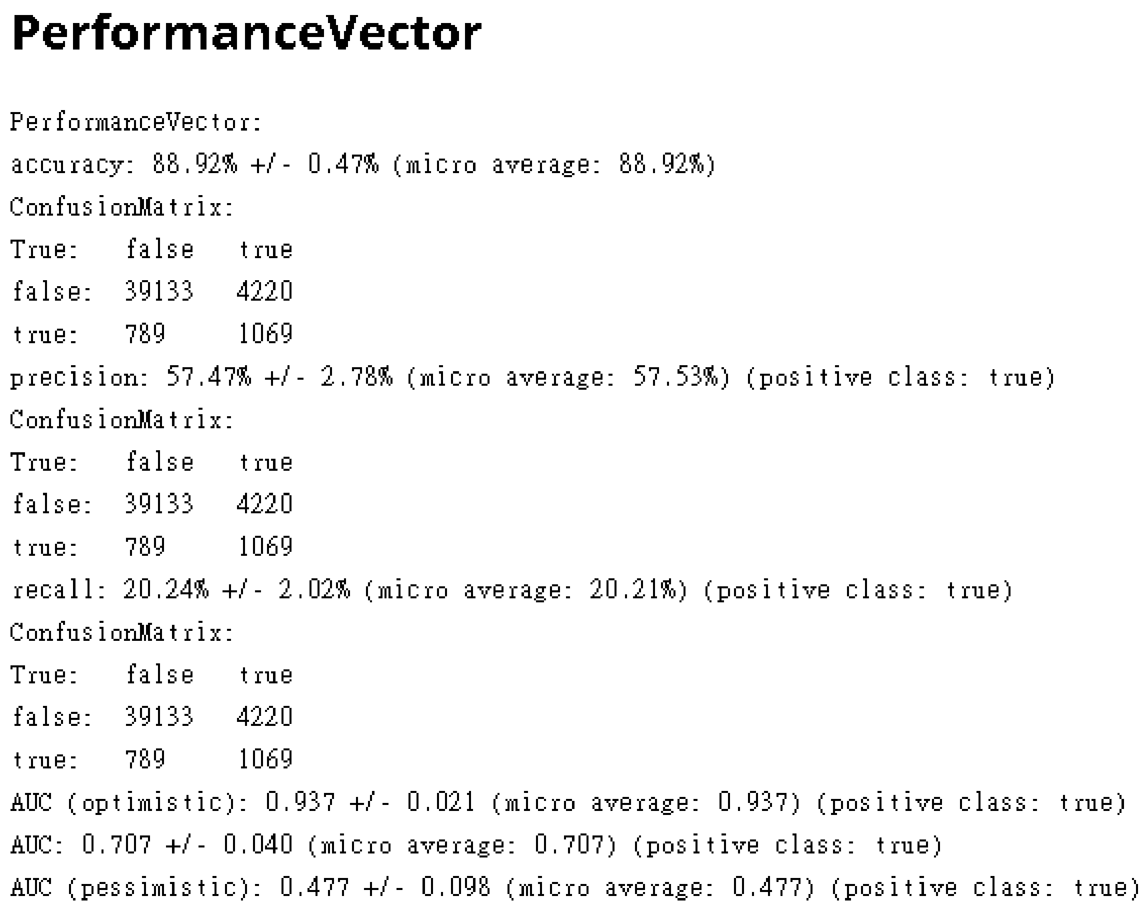
Random Forest



PerformanceVector

```
PerformanceVector:
accuracy: 89.35% +/- 0.34% (micro average: 89.35%)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
precision: 56.65% +/- 2.36% (micro average: 56.70%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
recall: 37.71% +/- 1.61% (micro average: 37.74%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
AUC (optimistic): 0.888 +/- 0.006 (micro average: 0.888) (positive class: true)
AUC: 0.886 +/- 0.007 (micro average: 0.886) (positive class: true)
AUC (pessimistic): 0.884 +/- 0.008 (micro average: 0.884) (positive class: true)
```

Decision Tree

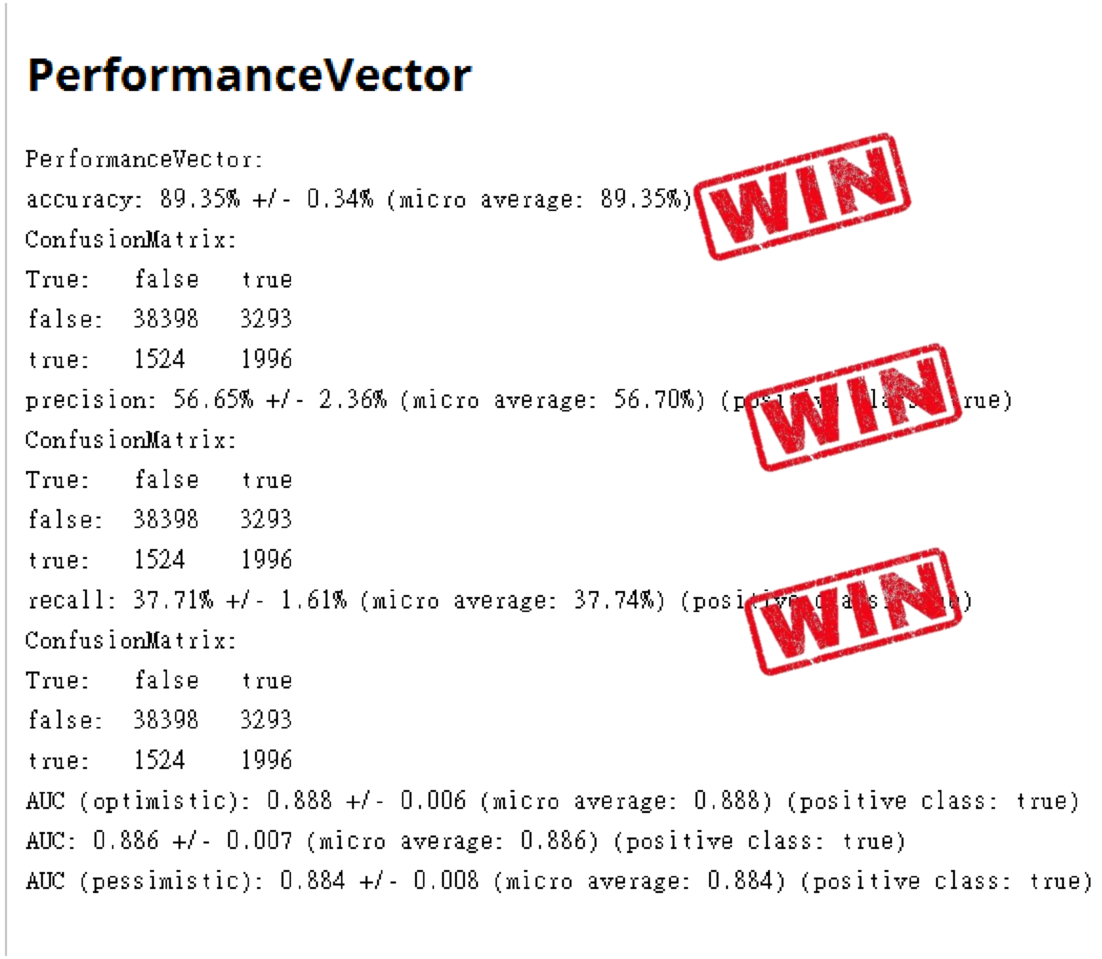


PerformanceVector

```
PerformanceVector:
accuracy: 88.92% +/- 0.47% (micro average: 88.92%)
ConfusionMatrix:
True:   false   true
false:  39133   4220
true:   789     1069
precision: 57.47% +/- 2.78% (micro average: 57.53%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  39133   4220
true:   789     1069
recall: 20.24% +/- 2.02% (micro average: 20.21%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  39133   4220
true:   789     1069
AUC (optimistic): 0.937 +/- 0.021 (micro average: 0.937) (positive class: true)
AUC: 0.707 +/- 0.040 (micro average: 0.707) (positive class: true)
AUC (pessimistic): 0.477 +/- 0.098 (micro average: 0.477) (positive class: true)
```

選擇Random Forest原因

Random Forest



PerformanceVector

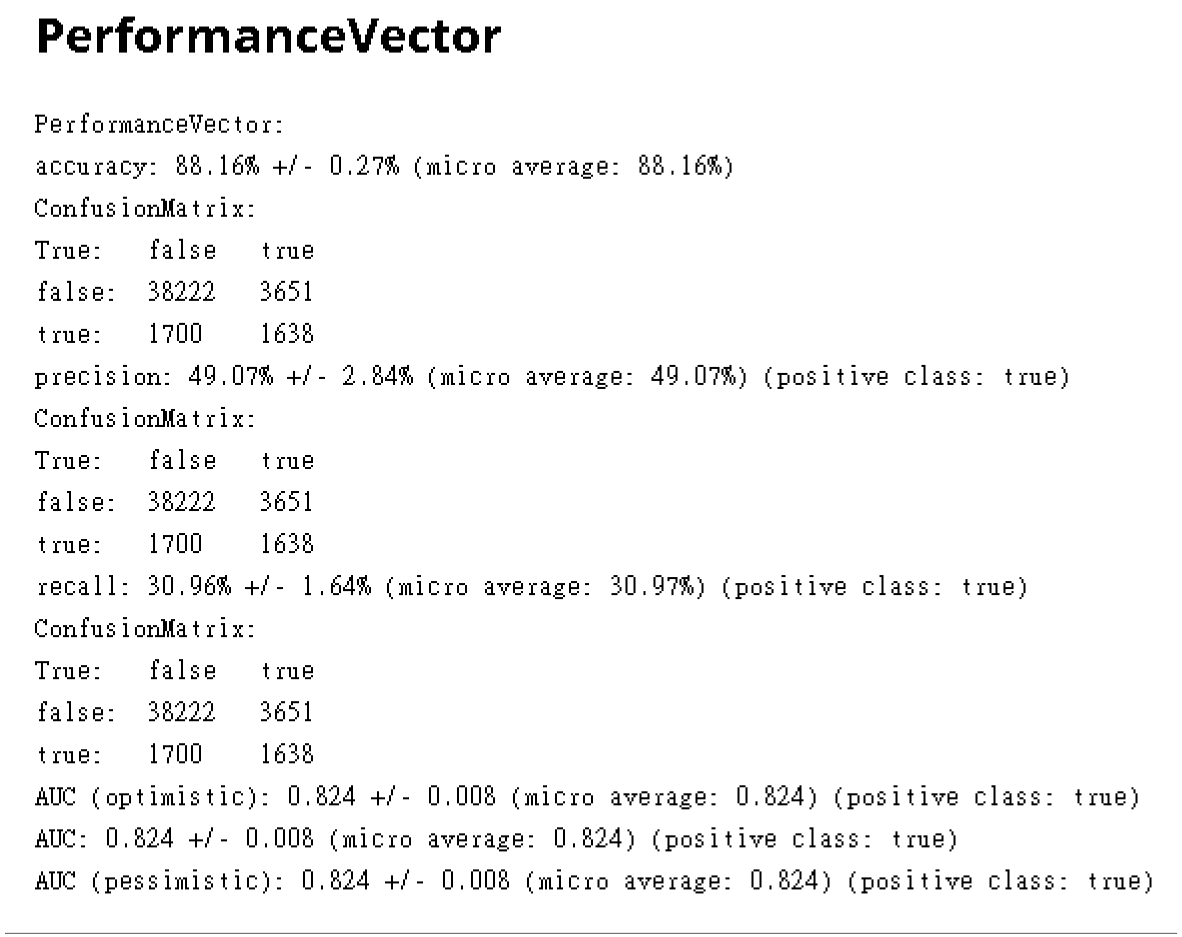
```
PerformanceVector:
accuracy: 89.35% +/- 0.34% (micro average: 89.35%)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
precision: 56.65% +/- 2.36% (micro average: 56.70%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
recall: 37.71% +/- 1.61% (micro average: 37.74%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
AUC (optimistic): 0.888 +/- 0.006 (micro average: 0.888) (positive class: true)
AUC: 0.886 +/- 0.007 (micro average: 0.886) (positive class: true)
AUC (pessimistic): 0.884 +/- 0.008 (micro average: 0.884) (positive class: true)
```

WIN

WIN

WIN

Naïve Bayes

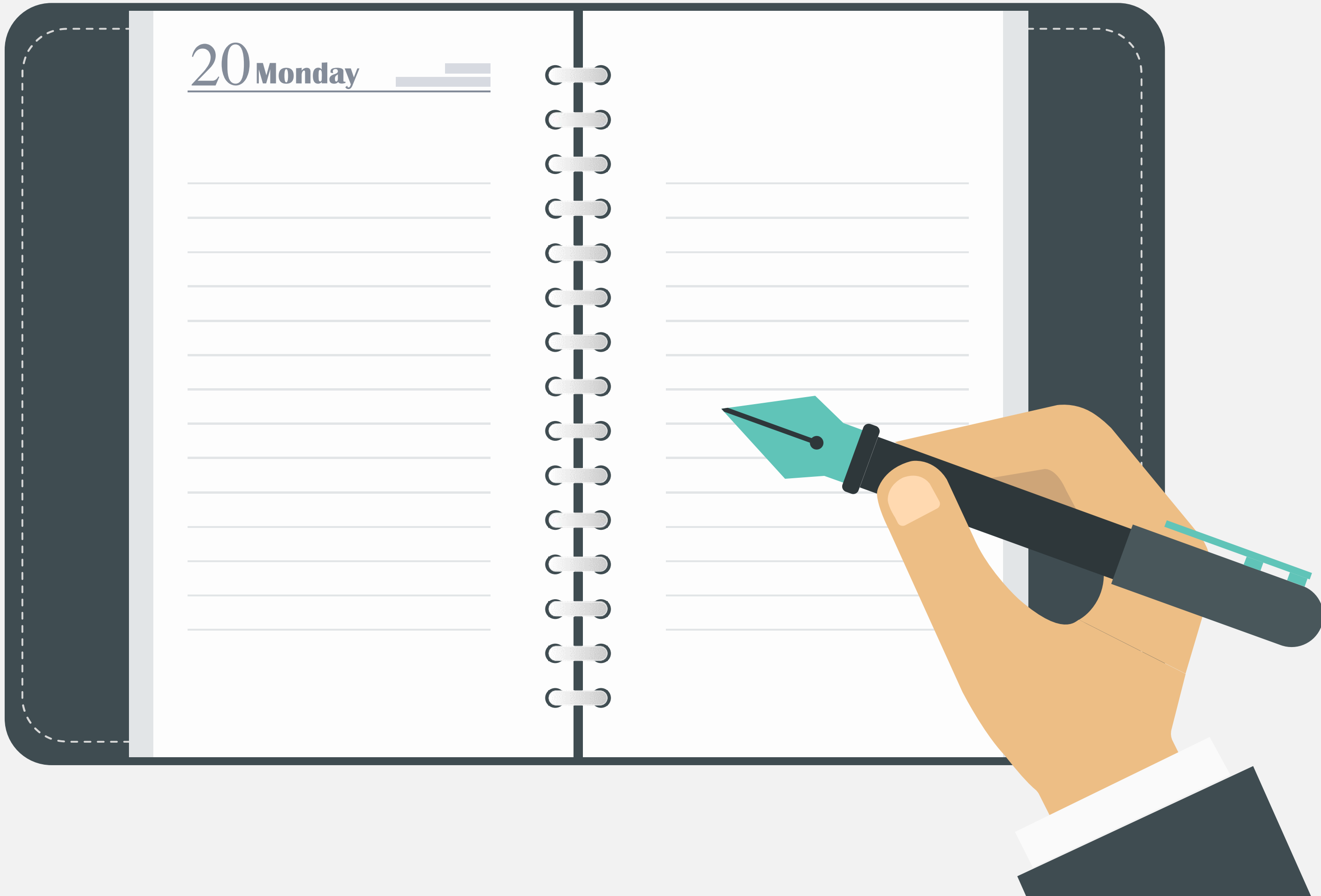


PerformanceVector

```
PerformanceVector:
accuracy: 88.16% +/- 0.27% (micro average: 88.16%)
ConfusionMatrix:
True:   false   true
false:  38222   3651
true:   1700    1638
precision: 49.07% +/- 2.84% (micro average: 49.07%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38222   3651
true:   1700    1638
recall: 30.96% +/- 1.64% (micro average: 30.97%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38222   3651
true:   1700    1638
AUC (optimistic): 0.824 +/- 0.008 (micro average: 0.824) (positive class: true)
AUC: 0.824 +/- 0.008 (micro average: 0.824) (positive class: true)
AUC (pessimistic): 0.824 +/- 0.008 (micro average: 0.824) (positive class: true)
```

05

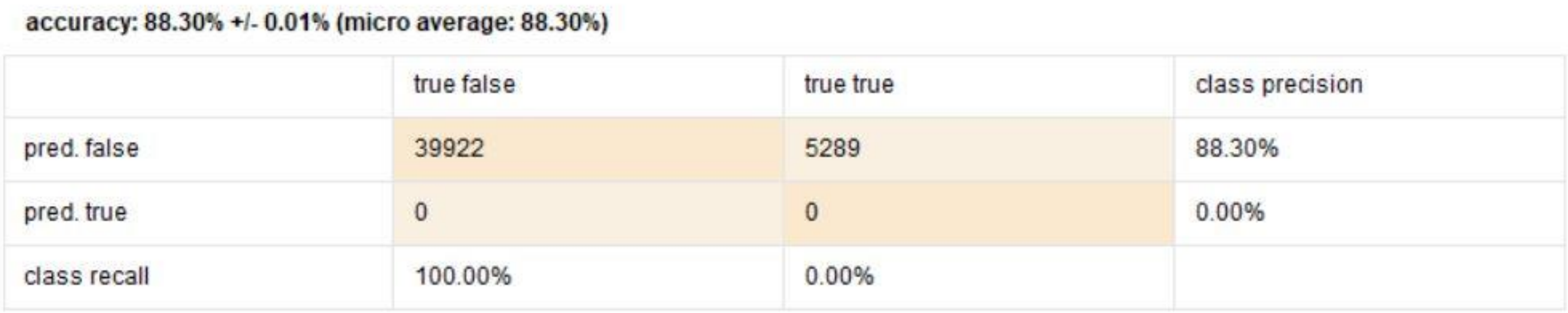
結論與未來改善方向



結論與改善方向

- Y值，false的資料筆數太多，true的筆數太少，不管怎麼分，他的accuracy都會很高，因此我們就去看precision跟recall，發現很低。

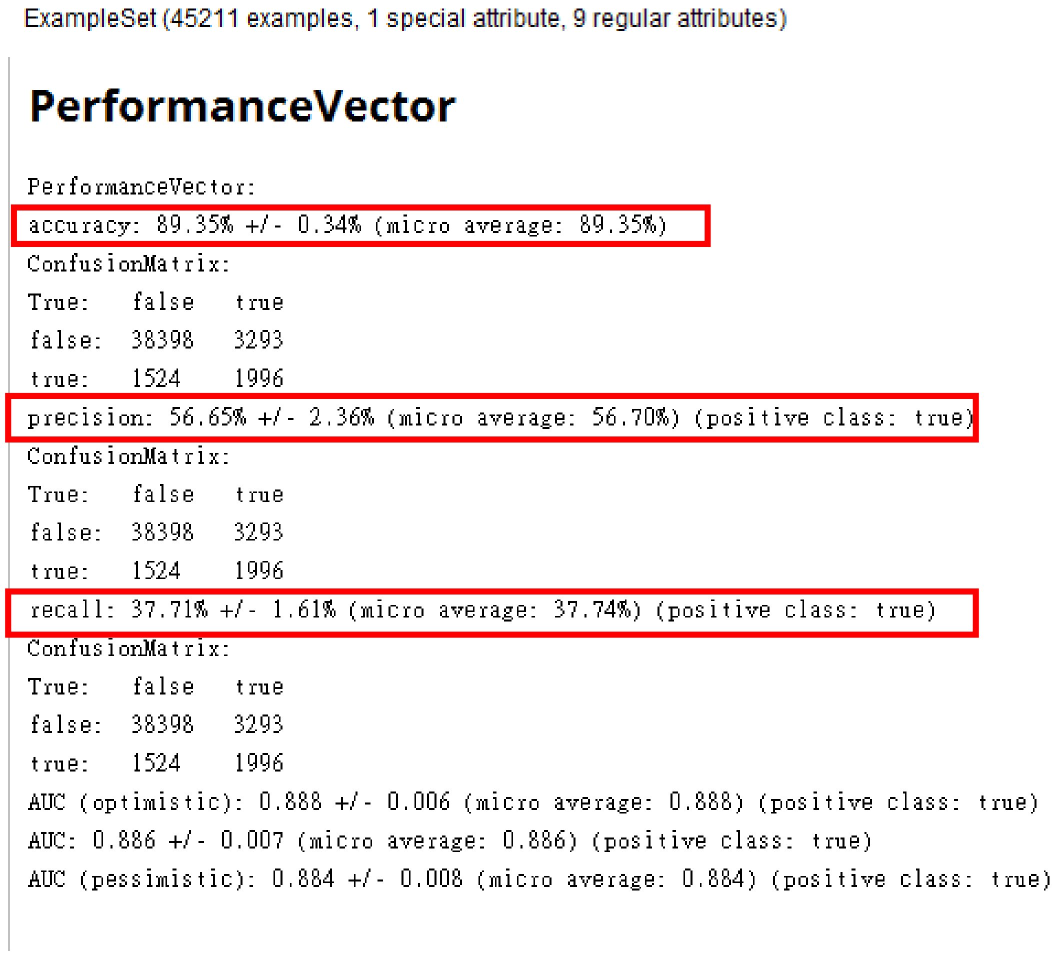
- 解方: (1)增加Y=true的筆數 (2) 減少Y=false的筆數



accuracy: 88.30% +/- 0.01% (micro average: 88.30%)

	true false	true true	class precision
pred. false	39922	5289	88.30%
pred. true	0	0	0.00%
class recall	100.00%	0.00%	

結論與改善方向-(1)增加Y=true的筆數



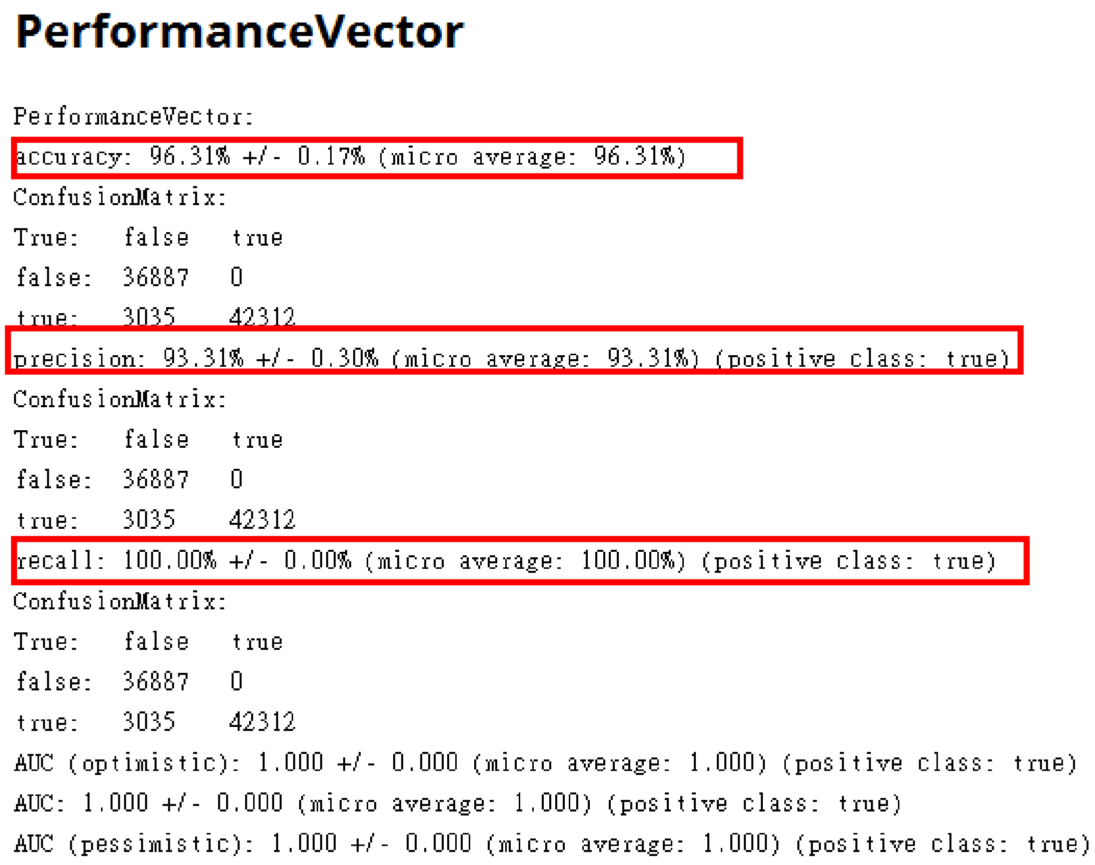
ExampleSet (45211 examples, 1 special attribute, 9 regular attributes)

PerformanceVector

```
PerformanceVector:
accuracy: 89.35% +/- 0.34% (micro average: 89.35%)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
precision: 56.65% +/- 2.36% (micro average: 56.70%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
recall: 37.71% +/- 1.61% (micro average: 37.74%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
AUC (optimistic): 0.888 +/- 0.006 (micro average: 0.888) (positive class: true)
AUC: 0.886 +/- 0.007 (micro average: 0.886) (positive class: true)
AUC (pessimistic): 0.884 +/- 0.008 (micro average: 0.884) (positive class: true)
```

增加前

八萬多筆，true跟false各一半



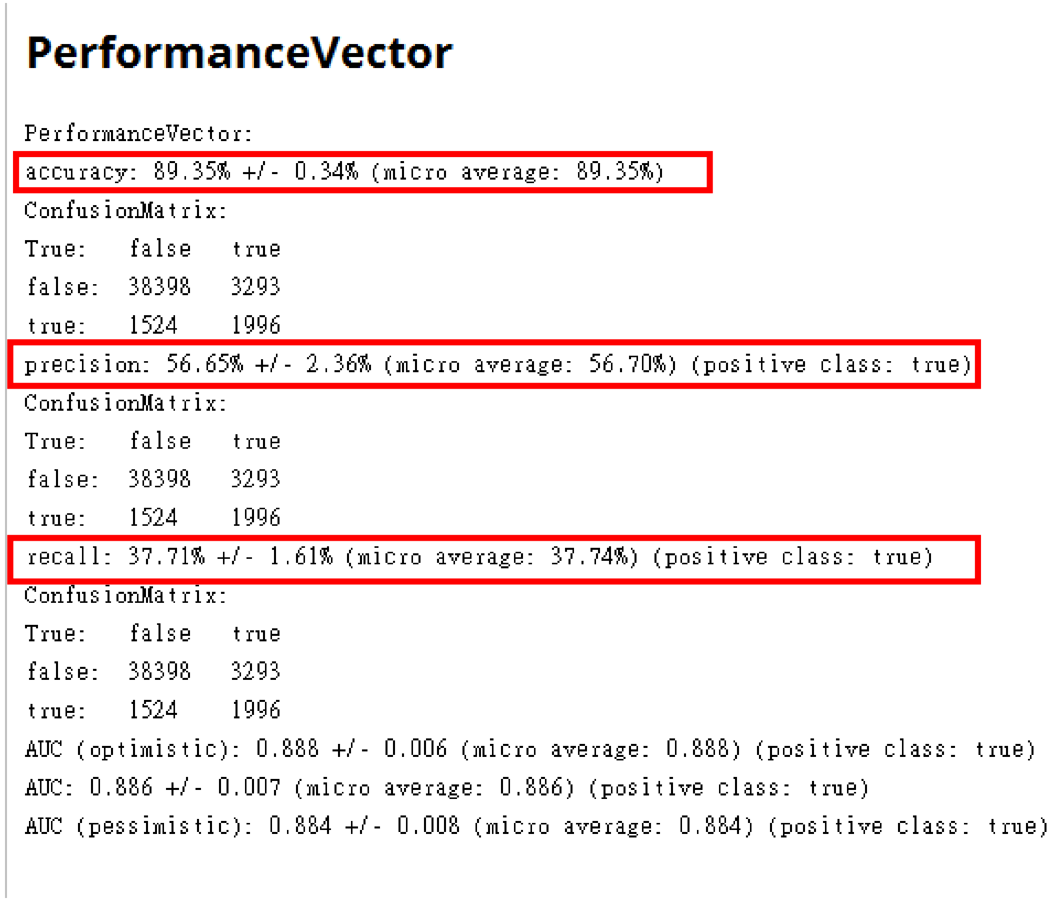
PerformanceVector

```
PerformanceVector:
accuracy: 96.31% +/- 0.17% (micro average: 96.31%)
ConfusionMatrix:
True:   false   true
false:  36887   0
true:   3035    42312
precision: 93.31% +/- 0.30% (micro average: 93.31%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  36887   0
true:   3035    42312
recall: 100.00% +/- 0.00% (micro average: 100.00%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  36887   0
true:   3035    42312
AUC (optimistic): 1.000 +/- 0.000 (micro average: 1.000) (positive class: true)
AUC: 1.000 +/- 0.000 (micro average: 1.000) (positive class: true)
AUC (pessimistic): 1.000 +/- 0.000 (micro average: 1.000) (positive class: true)
```

增加後

結論與改善方向-(2)減少Y=false的筆數

ExampleSet (45211 examples, 1 special attribute, 9 regular attributes)

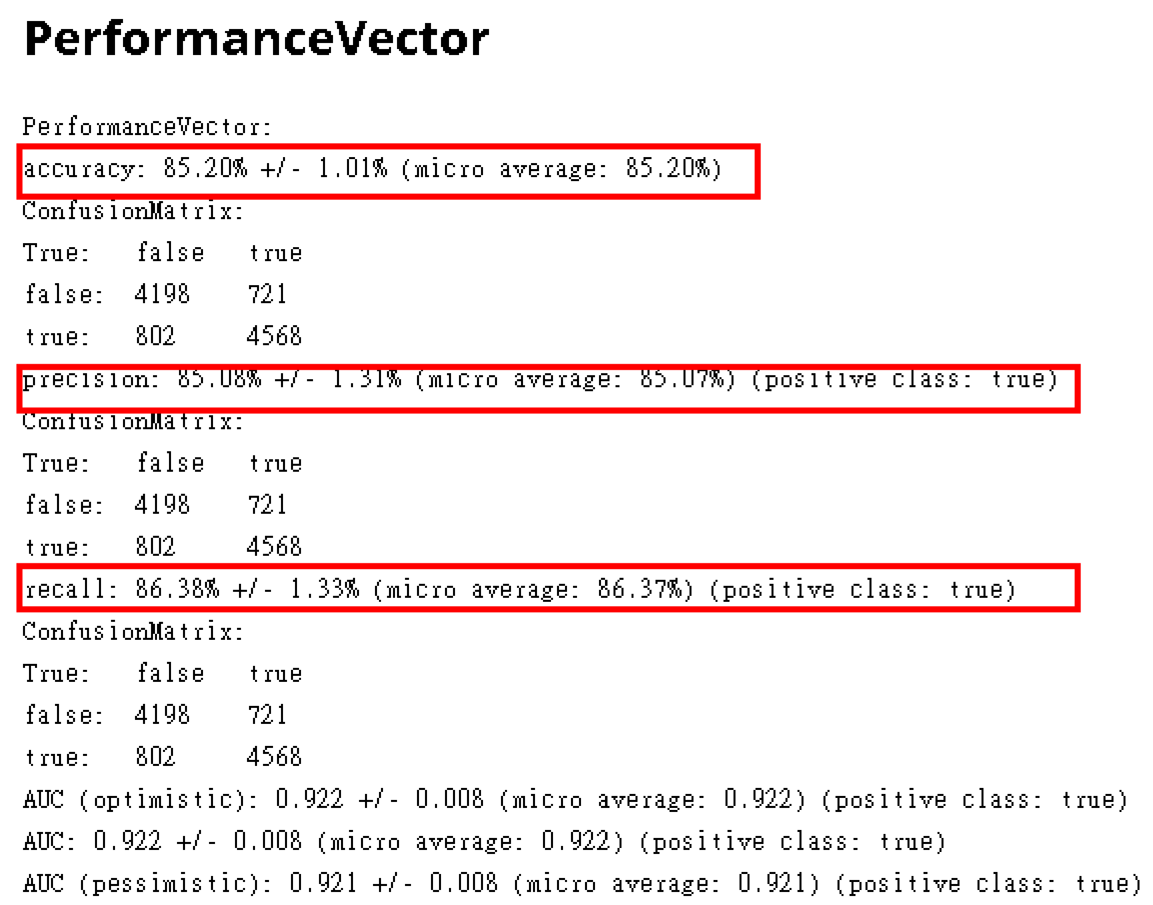


PerformanceVector

```
PerformanceVector:
accuracy: 89.35% +/- 0.34% (micro average: 89.35%)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
precision: 56.65% +/- 2.36% (micro average: 56.70%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
recall: 37.71% +/- 1.61% (micro average: 37.74%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  38398   3293
true:   1524    1996
AUC (optimistic): 0.888 +/- 0.006 (micro average: 0.888) (positive class: true)
AUC: 0.886 +/- 0.007 (micro average: 0.886) (positive class: true)
AUC (pessimistic): 0.884 +/- 0.008 (micro average: 0.884) (positive class: true)
```

減少前

ExampleSet (10289 examples, 1 special attribute, 8 regular attributes) True跟false各半



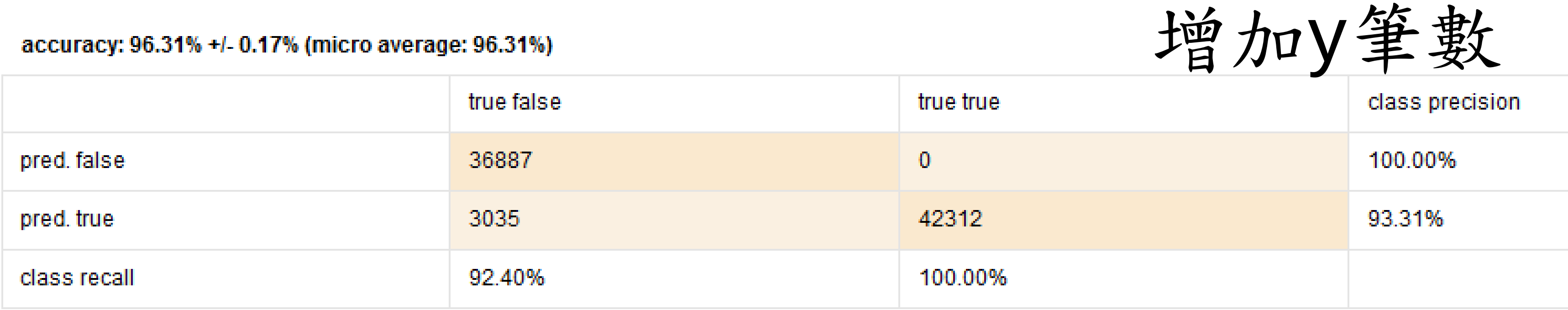
PerformanceVector

```
PerformanceVector:
accuracy: 85.20% +/- 1.01% (micro average: 85.20%)
ConfusionMatrix:
True:   false   true
false:  4198    721
true:   802     4568
precision: 85.08% +/- 1.31% (micro average: 85.07%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  4198    721
true:   802     4568
recall: 86.38% +/- 1.33% (micro average: 86.37%) (positive class: true)
ConfusionMatrix:
True:   false   true
false:  4198    721
true:   802     4568
AUC (optimistic): 0.922 +/- 0.008 (micro average: 0.922) (positive class: true)
AUC: 0.922 +/- 0.008 (micro average: 0.922) (positive class: true)
AUC (pessimistic): 0.921 +/- 0.008 (micro average: 0.921) (positive class: true)
```

減少後

結論與改善方向-混淆矩陣

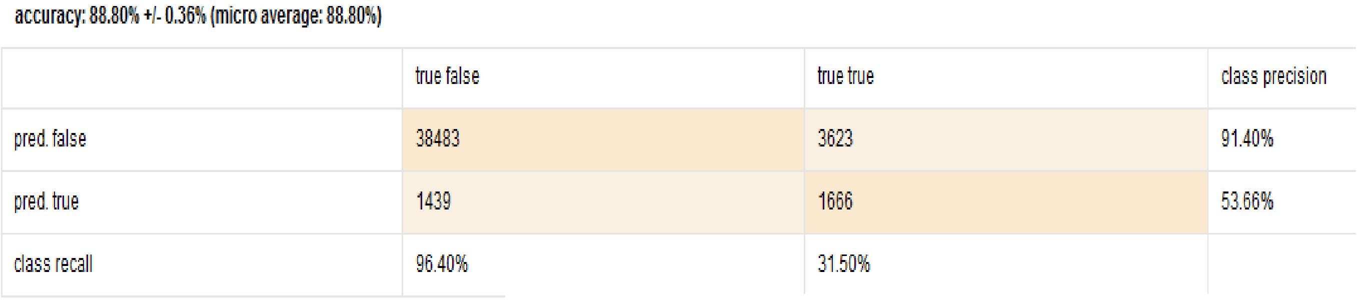
增加y筆數



accuracy: 96.31% +/- 0.17% (micro average: 96.31%)

	true false	true true	class precision
pred. false	36887	0	100.00%
pred. true	3035	42312	93.31%
class recall	92.40%	100.00%	

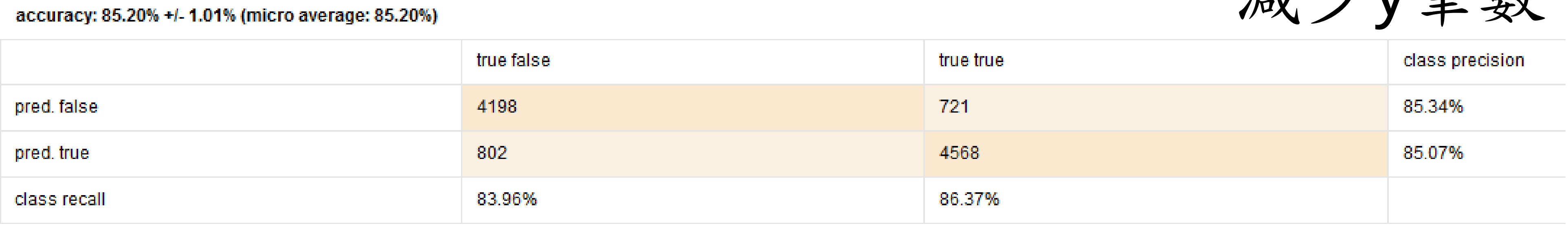
原始結果



accuracy: 88.80% +/- 0.36% (micro average: 88.80%)

	true false	true true	class precision
pred. false	38483	3623	91.40%
pred. true	1439	1666	53.66%
class recall	96.40%	31.50%	

減少y筆數

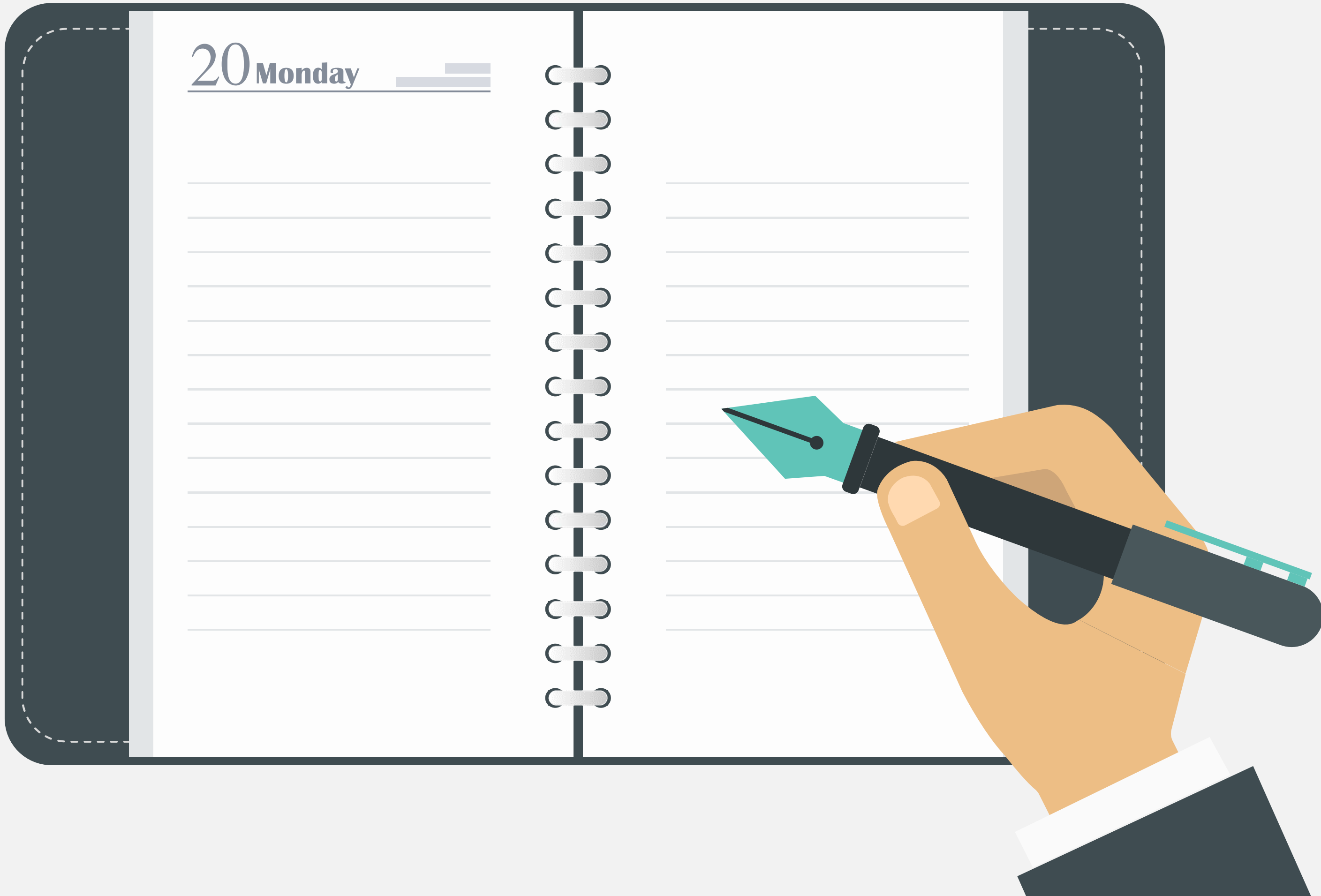


accuracy: 85.20% +/- 1.01% (micro average: 85.20%)

	true false	true true	class precision
pred. false	4198	721	85.34%
pred. true	802	4568	85.07%
class recall	83.96%	86.37%	

06

組員工作分配



組員工作分配

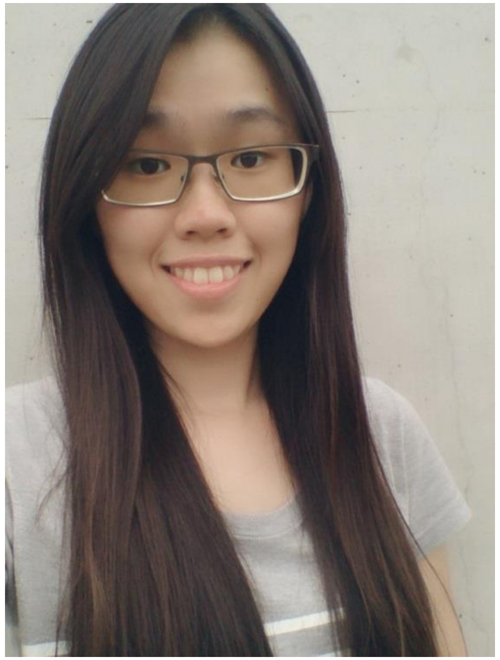
107AB8001　蔡雯惠
負責資料集分析、測試

107AB8002　蕭家希
負責資料集分析、口頭報告

107AB8003 林芝儀
負責資料集分析、測試

組員工作分配

107AB8004　陳鴻妮
負責口頭報告



107AB8005 李予蒨
負責資料統整為PPT

107AB8406 袁嘉妮
負責資料統整為PPT

Thanks for listening.