# Topic

# Predict what you use when backing home / travel

## 1. What we predict

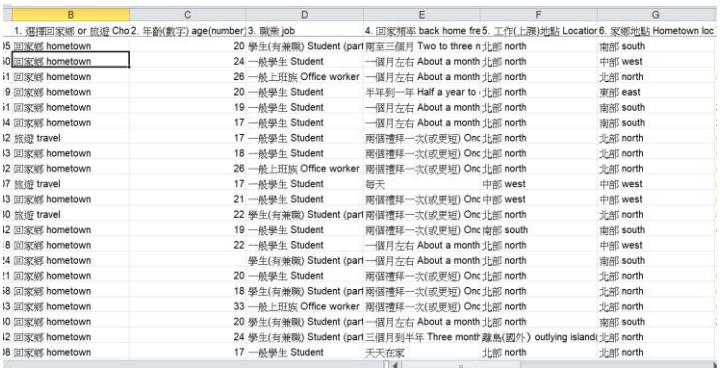
We collect a lot of data which contains one's age, back home frequency, job, and other which may affect what transportation one person choose in backing home.

The target has three items, cheap one, expensive one, and drive by oneself.

For instance: one is student(no part-time), and he has a high frequency of backing home, and his hometown is close to the location of the school, then he has a high probability to choose train. Or one has a high salary, and have a very low frequency of backing home, he might choose HSR.

Note: someone's hometown and location of work/school is at the same place, so they choose the data od traveling

2. Original data, is in the file ‘original.xlsx’ and ‘final.csv’

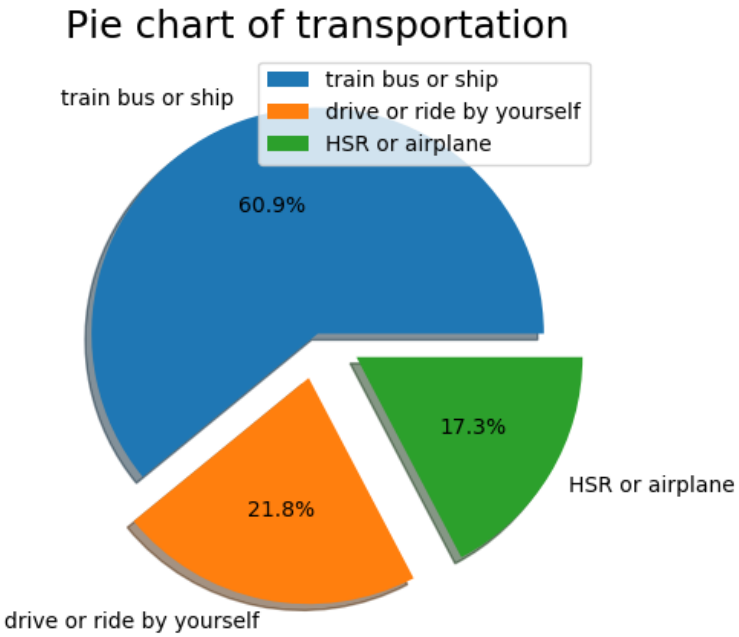


| | B | C | D | E | F | G |
|---|---|---|---|---|---|---|
| | 1. 選擇回家鄉 or 旅遊 Cho | 2. 年齡(數字) age(number) | 3. 職業 job | 4. 回家頻率 back home fre | 5. 工作(上課)地點 Locatior | 6. 家鄉地點 Hometown loc |
| 5 | 回家鄉 hometown | 20 | 學生(有兼職) Student (part | 兩至三個月 Two to three n | 北部 north | 南部 south |
| 0 | 回家鄉 hometown | 24 | 一般學生 Student | 一個月左右 About a month | 北部 north | 中部 west |
| 1 | 回家鄉 hometown | 26 | 一般上班族 Office worker | 一個月左右 About a month | 北部 north | 北部 north |
| 9 | 回家鄉 hometown | 20 | 一般學生 Student | 半年到一年 Half a year to | 北部 north | 東部 east |
| 1 | 回家鄉 hometown | 19 | 一般學生 Student | 一個月左右 About a month | 北部 north | 南部 south |
| 4 | 回家鄉 hometown | 17 | 一般學生 Student | 一個月左右 About a month | 北部 north | 南部 south |
| 2 | 旅遊 travel | 17 | 一般學生 Student | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 3 | 回家鄉 hometown | 18 | 一般學生 Student | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 2 | 回家鄉 hometown | 26 | 一般上班族 Office worker | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 7 | 旅遊 travel | 17 | 一般學生 Student | 每天 | 中部 west | 中部 west |
| 3 | 回家鄉 hometown | 21 | 一般學生 Student | 兩個禮拜一次(或更短) Onc | 中部 west | 中部 west |
| 0 | 旅遊 travel | 22 | 學生(有兼職) Student (part | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 2 | 回家鄉 hometown | 19 | 一般學生 Student | 兩個禮拜一次(或更短) Onc | 南部 south | 南部 south |
| 8 | 回家鄉 hometown | 22 | 一般學生 Student | 一個月左右 About a month | 北部 north | 中部 west |
| 4 | 回家鄉 hometown | | 學生(有兼職) Student (part | 一個月左右 About a month | 北部 north | 南部 south |
| 1 | 回家鄉 hometown | 20 | 一般學生 Student | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 8 | 回家鄉 hometown | 18 | 學生(有兼職) Student (part | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 3 | 回家鄉 hometown | 33 | 一般上班族 Office worker | 兩個禮拜一次(或更短) Onc | 北部 north | 北部 north |
| 0 | 回家鄉 hometown | 20 | 學生(有兼職) Student (part | 一個月左右 About a month | 北部 north | 南部 south |
| 2 | 回家鄉 hometown | 24 | 學生(有兼職) Student (part | 三個月到半年 Three month | 離島(國外) outlying island | 北部 north |
| 8 | 回家鄉 hometown | 17 | 一般學生 Student | 天天在家 | 北部 north | 北部 north |

The features include 12 items, which is hometown/travel, age, job, frequency, location of two, distance of two, relationship of friends and family, financial situation, gender, have married and so on.

We collect the data by ptt, baha, fb and so on, which contain 1300 samples.

3. The data distribution



The above is our target distribution, many people choose train or bus, and this also makes the other two has less train. Others are in the ‘picture’ folder.

4. Data processing

We fill the missing with mode. Then transform them to numeric data to fit in sklearn.

5. Model

Five models be created, which are Decision tree, Random forest, Naïve bayes, SVM, Logistic. We implement our model first, but the result is worse than sklearn, so choose the sklearn.

6. Predict result

```
Decision Tree ------------------------------------------------------------------
----
                        Predict train, bus, ship  HSR, airplane  drive, ride
Actual train, bus, ship                       204             18           32
Actual HSR, airplane                           54             11            5
Actual drive, ride                             48              8           26

Accuracy:  0.5935960591133005
           train, bus, ship  HSR, airplane  drive, ride
Recall             0.803150       0.157143     0.317073
Precision          0.666667       0.297297     0.412698


Random Forest ------------------------------------------------------------------
----
                        Predict train, bus, ship  HSR, airplane  drive, ride
Actual train, bus, ship                       211             16           27
Actual HSR, airplane                           45             23            2
Actual drive, ride                             50              8           24

Accuracy:  0.6354679802955665
           train, bus, ship  HSR, airplane  drive, ride
Recall             0.830709       0.328571     0.292683
Precision          0.689542       0.489362     0.452830


Naive Bayes --------------------------------------------------------------------
--
                        Predict train, bus, ship  HSR, airplane  drive, ride
Actual train, bus, ship                       200             11           43
Actual HSR, airplane                           45             16            9
Actual drive, ride                             34              4           44

Accuracy:  0.6403940886699507
           train, bus, ship  HSR, airplane  drive, ride
Recall             0.787402       0.228571     0.536585
Precision          0.716846       0.516129     0.458333
```

```
SVM ---------------------------------------------------------------------
                        Predict train, bus, ship  HSR, airplane  drive, ride
Actual train, bus, ship                       233             10           11
Actual HSR, airplane                           53             17            0
Actual drive, ride                             58              5           19

Accuracy:  0.6625615763546798
           train, bus, ship  HSR, airplane  drive, ride
Recall             0.917323       0.242857     0.231707
Precision          0.677326       0.531250     0.633333


Logistic Regression -------------------------------------------------------------
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                        Predict train, bus, ship  HSR, airplane  drive, ride
Actual train, bus, ship                       227             13           14
Actual HSR, airplane                           47             19            4
Actual drive, ride                             45              7           30

Accuracy:  0.6798029556650246
           train, bus, ship  HSR, airplane  drive, ride
Recall             0.893701       0.271429     0.365854
Precision          0.711599       0.487179     0.625000
```
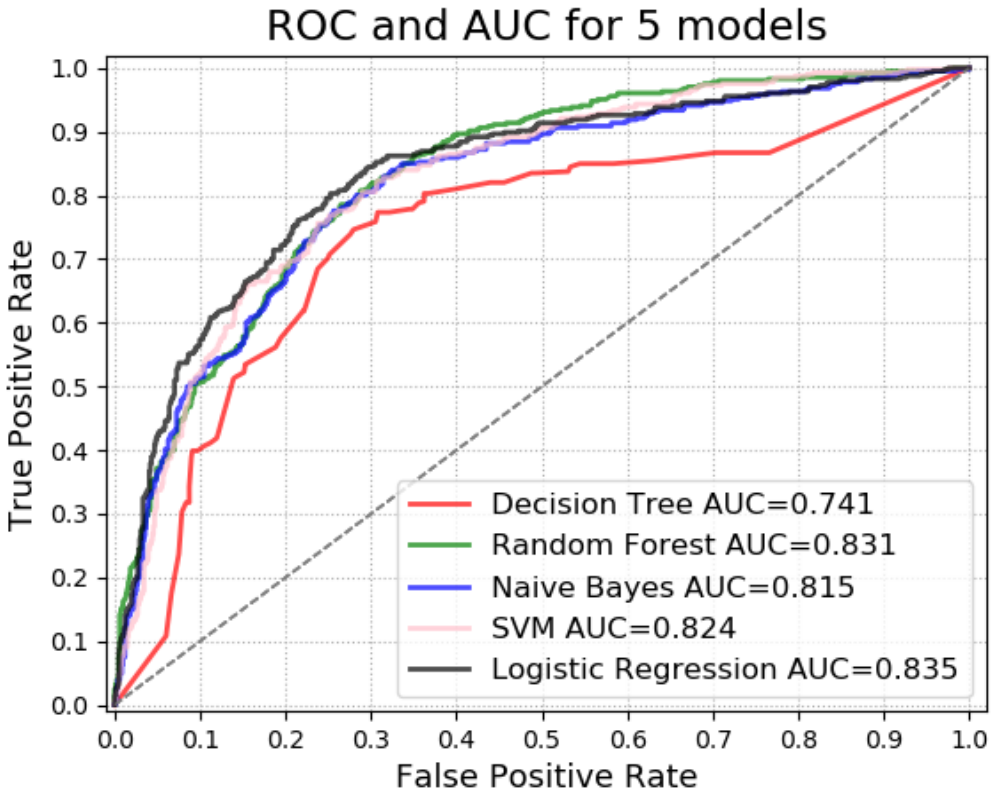

As the picture, Decision tree has the lowest accuracy, and logistic is the highest, but the prediction has too many on train and bus, this also decrease other two's recall.




The ROC curve shows that tree is the worst one, and

random forest and logistic are better.