Credit Card Approval Prediction By using Classification Method

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MATH 509

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Introduction

- The credit score is an essential determination of personal credit evaluation.
- When proceeding with credit card applications, credit companies employ the applicant's personal information and credit history to evaluate future defaults and overdue payments.
- Our objective is to classify whether the applicant is a good credit holder that would repay on time

Data Acquisition

- The dataset we used contains transactions made by credit cards in September 2013 by European cardholders.
- Variables includes marriage status, property ownership, number of family member, number of children, annual income, etc.

Data Cleaning and Feature Selection

- Adjust credit status of applicants to binary categorical variable using scoring system
- Convert categorical predictors using one-hot encoding, adjust employment, births, and work age ratio

Data Cleaning and Feature Selection

- Conduct feature selection by using correlation
- Split data randomly into training 80% and testing 20%

Modeling Assumption

- Classification methods need to have discrete response variable
- Confounding effect
- Independent observations
- Logistic regression assumptions
  - Appropriate outcome structure
  - Linearity of independent variables and log odds
  - Lack of strongly influential outliers
  - Absence of multicollinearity
  - Assumption of a large sample size

Modeling

Logistic Regression:

Logistic regression is a type of generalized linear regression often used as a classification model to predict binary variables.

Formula: $$P(y=1) = \frac{1}{1+e^{-(\beta 0+\beta 1X1+\beta 2x2+\ldots\ldots+\beta nXn)}}$$

Confusion matrix (training):

Accuracy Score is 0.51703

	0	1
0	5389	4664
1	5047	5007

Confusion matrix (testing):

Accuracy Score is 0.51502

	0	1
0	1369	1144
1	1294	1220

Decision Tree:

Decision tree is a tree-like model, which is a decision-making process based on multiple decisions.

Random Forest:

Random forest is a supervised learning model based on a series of decision trees. The random forest combines different decision trees, and produces the outcome by voting the majority of all decision trees.

Confusion matrix (training):

```
Accuracy Score is 0.80067
      0     1
0  8380  1673
1  2335  7719
```

```
Accuracy Score is 0.80067
      0     1
0  7933  2120
1  1888  8166
```

Confusion matrix (testing):

```
Accuracy Score is 0.66382
      0     1
0  1778   735
1   955  1559
```

```
Accuracy Score is 0.66421
      0     1
0  1647   866
1   822  1692
```

Neural network:

Neural network is a computational learning system that uses a network of functions to understand and translate a data input of one form into the desired output. (Hidden layers 200, 150, 100, 50)

SVM:

Support vector machine algorithm is to find a hyperplane in an N-dimensional space that distinctly classifies the data points

Confusion matrix (training):

```
Accuracy Score is 0.64893
      0     1
0  6025  4028
1  3031  7023
```

```
Accuracy Score is 0.54339
      0     1
0  5502  4551
1  4630  5424
```

Confusion matrix (testing):

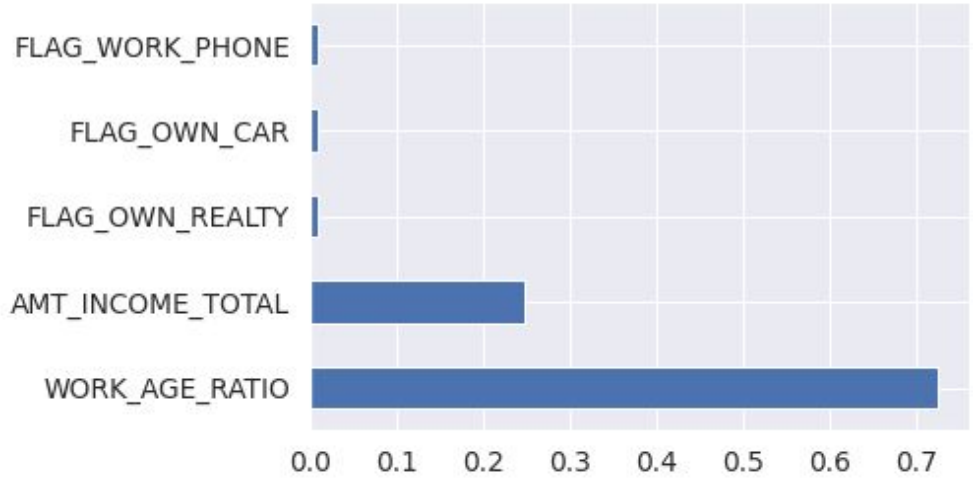
```
Accuracy Score is 0.56734
      0     1
0  1307  1206
1   969  1545
```

```
Accuracy Score is 0.52457
      0     1
0  1349  1164
1  1226  1288
```

Conclusion

- Random forest has the best performance
  - Accuracy Score: 0.66421

	precision	recall	f1-score	support
0	0.67	0.66	0.66	2513
1	0.66	0.67	0.67	2514
accuracy			0.66	5027
macro avg	0.66	0.66	0.66	5027
weighted avg	0.66	0.66	0.66	5027



Discussion

- Optimize data sources by using better sampling methods.
- Use some ways to avoid overfitting problem, like cross-validation.
- Find more relative data from other countries
- Using more recent data may improve the utility of our model on current society

- Thank You for Listening