

CS 634 DATA MINING MIDTERM PROJECT

KHANG TRAN

MAR 12, 2021

I. INTRODUCTION:

This project is the implementation of the Apriori algorithm to extract the association rules from the transactions. The input for the algorithm is the transactions and the output from the codes is the association rules. My project is flexible for new data which must meet some requirements and it's also flexible for different support and confidence rate. The code can be found by this link: https://github.com/khangtran2020/CS634_midterm More details will be described below.

II. SET UP:

a. REQUIREMENTS:

- Python 3.6
- Numpy
- Pandas
- Itertools

b. SET UP

- First download the `.zip` file to a location that you will use and extract files to that directory.
- Or you can clone it: https://github.com/khangtran2020/CS634_midterm
- Open a terminal and run command: `pip install -r requirements.txt`

III. RUNNING:

a. Data Format:

The transactions are put into a `.csv` file with the rows is the transactions and the columns is the `transaction_id` and the transaction's items. The transaction's items are separated by a

comma. In my project, I provided five datasets: amazon, nike, kmart, bestbuy and custom – all of these data are given in the `data` folder. Figure 1 show the data format of the amazon data.

| A | B |
|---------------|--|
| TransactionID | Transaction |
| Trans1 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, Android Programming: The Big Nerd Ranch |
| Trans2 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies |
| Trans3 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, Android Programming: The Big Nerd Ranch, Head First Java 2nd Edition |
| Trans4 | Android Programming: The Big Nerd Ranch, Head First Java 2nd Edition , Beginning Programming with Java, |
| Trans5 | Android Programming: The Big Nerd Ranch, Beginning Programming with Java, Java 8 Pocket Guide |
| Trans6 | A Beginner's Guide, Android Programming: The Big Nerd Ranch, Head First Java 2nd Edition |
| Trans7 | A Beginner's Guide, Head First Java 2nd Edition , Beginning Programming with Java |
| Trans8 | Java: The Complete Reference, Java For Dummies, Android Programming: The Big Nerd Ranch, |
| Trans9 | Java For Dummies, Android Programming: The Big Nerd Ranch, Head First Java 2nd Edition , Beginning Programming with Java, |
| Trans10 | Beginning Programming with Java, Java 8 Pocket Guide, C++ Programming in Easy Steps |
| Trans11 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, Android Programming: The Big Nerd Ranch |
| Trans12 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, HTML and CSS: Design and Build Websites |
| Trans13 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, Java 8 Pocket Guide, HTML and CSS: Design and Build Websites |
| Trans14 | Java For Dummies, Android Programming: The Big Nerd Ranch, Head First Java 2nd Edition |
| Trans15 | Java For Dummies, Android Programming: The Big Nerd Ranch |
| Trans16 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, Android Programming: The Big Nerd Ranch |
| Trans17 | A Beginner's Guide, Java: The Complete Reference, Java For Dummies, Android Programming: The Big Nerd Ranch |
| Trans18 | Head First Java 2nd Edition , Beginning Programming with Java, Java 8 Pocket Guide |
| Trans19 | Android Programming: The Big Nerd Ranch, Head First Java 2nd Edition |

Figure 1: Data Format – Amazon Data.

In order to run your own data, set up your transaction and put it into a `csv` file as figure 1 and remember the second columns contains the transaction. Then you put it into the `data` directory. And it's all done.

b. Running process:

To run the program, open a terminal and go to the directory that contains the codes. Next you just have to put this command into the terminal: `python MIDTERM_PROJECT.py`

First of all, the program will show up the data that's available to use and their option – the input number to choose the data. To choose the data, input the number corresponding to the data as in figure 2 and press `ENTER`.

```
Welcome to the simulation of the apriori algorithms.
The available data is listed bellow, input the choice you want
amazon.csv - to choose this data input (1)
kmart.csv - to choose this data input (2)
nike.csv - to choose this data input (3)
bestbuy.csv - to choose this data input (4)
custom.csv - to choose this data input (5)
```

Figure 2: List of data and the option which is lie between the parentheses.

After that the program will let you choose the support rate and the confidence rate. For the input the options and the support/confident rate will be make sure to be in the right form: support rate must lie in [0, 1] and the confidence rate must also be in this range.

```

3
User chose nike.csv dataset
Loading and processing data ...
Done processing the data!
Please choose the support rate ( $\geq 0$  &  $\leq 1$ )
0.5
User chose support rate: 0.500000
Please choose the confidence rate ( $\geq 0$  &  $\leq 1$ )
0.4
User chose confidence rate: 0.400000

```

Figure 3: optional Support rate and confidence rate.

After that, the program will start working with the Apriori algorithm. After a while to process the data, will output the association rules with the confidence of that rules

```

Processing ...
Result:
* ['Socks'] => "Sweatshirts" with confidence: 0.9230769230769231
* ['Sweatshirts'] => "Socks" with confidence: 0.9230769230769231
* ['Socks'] => "Running Shoe" with confidence: 0.8461538461538461
* ['Running Shoe'] => "Socks" with confidence: 0.7857142857142857
* ['Sweatshirts'] => "Modern Pants" with confidence: 0.7692307692307693
* ['Modern Pants'] => "Sweatshirts" with confidence: 1.0
* ['Sweatshirts'] => "Running Shoe" with confidence: 0.8461538461538461
* ['Running Shoe'] => "Sweatshirts" with confidence: 0.7857142857142857
* ['Swimming Shirt'] => "Rash Guard" with confidence: 0.9090909090909091
* ['Rash Guard'] => "Swimming Shirt" with confidence: 0.8333333333333334
* ['Socks', 'Sweatshirts'] => "Running Shoe" with confidence: 0.8333333333333334
* ['Socks', 'Running Shoe'] => "Sweatshirts" with confidence: 0.9090909090909091
* ['Sweatshirts', 'Socks'] => "Running Shoe" with confidence: 0.8333333333333334
* ['Sweatshirts', 'Running Shoe'] => "Socks" with confidence: 0.9090909090909091
* ['Running Shoe', 'Socks'] => "Sweatshirts" with confidence: 0.9090909090909091
* ['Running Shoe', 'Sweatshirts'] => "Socks" with confidence: 0.9090909090909091

```

Figure 4: Result

IV. RESULT:

```

Result:
* ['Java: The Complete Reference'] => "A Beginner's Guide" with confidence: 0.8888888888888888
* ['A Beginner's Guide'] => "Java: The Complete Reference" with confidence: 0.8
* ['Java: The Complete Reference'] => "Java For Dummies" with confidence: 1.0
* ['Java For Dummies'] => "Java: The Complete Reference" with confidence: 0.75
* ['Android Programming: The Big Nerd Ranch'] => "Java For Dummies" with confidence: 0.6666666666666666
* ['Java For Dummies'] => "Android Programming: The Big Nerd Ranch" with confidence: 0.6666666666666666
* ['A Beginner's Guide'] => "Java For Dummies" with confidence: 0.8
* ['Java For Dummies'] => "A Beginner's Guide" with confidence: 0.6666666666666666
* ['Java: The Complete Reference', 'A Beginner's Guide'] => "Java For Dummies" with confidence: 1.0
* ['Java: The Complete Reference', 'Java For Dummies'] => "A Beginner's Guide" with confidence: 0.8888888888888888
* ['A Beginner's Guide', 'Java: The Complete Reference'] => "Java For Dummies" with confidence: 1.0
* ['A Beginner's Guide', 'Java For Dummies'] => "Java: The Complete Reference" with confidence: 1.0
* ['Java For Dummies', 'Java: The Complete Reference'] => "A Beginner's Guide" with confidence: 0.8888888888888888
* ['Java For Dummies', 'A Beginner's Guide'] => "Java: The Complete Reference" with confidence: 1.0

```

Figure 5: Result for amazon dataset, support 0.4, confidence 0.4


```

Result:
* ['Bed Skirts'] => "Kids Bedding" with confidence: 0.909090
* ['Kids Bedding'] => "Bed Skirts" with confidence: 0.833333
* ['Sheets'] => "Kids Bedding" with confidence: 1.0
* ['Kids Bedding'] => "Sheets" with confidence: 0.8333333333

```

Figure 9: Results for kmart dataset, support 0.5, confidence 0.5

```

Result:
* ['Running Shoe'] => "Sweatshirts" with confidence: 0.7857142857142857
* ['Sweatshirts'] => "Running Shoe" with confidence: 0.8461538461538461
* ['Running Shoe'] => "Socks" with confidence: 0.7857142857142857
* ['Socks'] => "Running Shoe" with confidence: 0.8461538461538461
* ['Modern Pants'] => "Sweatshirts" with confidence: 1.0
* ['Sweatshirts'] => "Modern Pants" with confidence: 0.7692307692307693
* ['Rash Guard'] => "Swimming Shirt" with confidence: 0.8333333333333334
* ['Swimming Shirt'] => "Rash Guard" with confidence: 0.9090909090909091
* ['Sweatshirts'] => "Socks" with confidence: 0.9230769230769231
* ['Socks'] => "Sweatshirts" with confidence: 0.9230769230769231
* ['Running Shoe', 'Sweatshirts'] => "Socks" with confidence: 0.9090909090909091
* ['Running Shoe', 'Socks'] => "Sweatshirts" with confidence: 0.9090909090909091
* ['Sweatshirts', 'Running Shoe'] => "Socks" with confidence: 0.9090909090909091
* ['Sweatshirts', 'Socks'] => "Running Shoe" with confidence: 0.8333333333333334
* ['Socks', 'Running Shoe'] => "Sweatshirts" with confidence: 0.9090909090909091
* ['Socks', 'Sweatshirts'] => "Running Shoe" with confidence: 0.8333333333333334

```

Figure 10: Results for nike dataset, support 0.5, confidence 0.6

```

Result:
* ['Modern Pants'] => "Sweatshirts" with confidence: 1.0
* ['Sweatshirts'] => "Socks" with confidence: 0.9230769230769231
* ['Socks'] => "Sweatshirts" with confidence: 0.9230769230769231
* ['Sweatshirts'] => "Running Shoe" with confidence: 0.8461538461538461
* ['Swimming Shirt'] => "Rash Guard" with confidence: 0.9090909090909091
* ['Rash Guard'] => "Swimming Shirt" with confidence: 0.8333333333333334
* ['Socks'] => "Running Shoe" with confidence: 0.8461538461538461
* ['Sweatshirts', 'Socks'] => "Running Shoe" with confidence: 0.8333333333333334
* ['Sweatshirts', 'Running Shoe'] => "Socks" with confidence: 0.9090909090909091
* ['Socks', 'Sweatshirts'] => "Running Shoe" with confidence: 0.8333333333333334
* ['Socks', 'Running Shoe'] => "Sweatshirts" with confidence: 0.9090909090909091
* ['Running Shoe', 'Sweatshirts'] => "Socks" with confidence: 0.9090909090909091
* ['Running Shoe', 'Socks'] => "Sweatshirts" with confidence: 0.9090909090909091

```

Figure 11: Results for nike dataset, support 0.5, confidence 0.8