IST 707 Applied Machine Learning HW3: Association Rules

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```
library(arules)
```

```
## Loading required package: Matrix
```

```
##
## Attaching package: 'arules'
```

```
## The following objects are masked from 'package:base':
##
##     abbreviate, write
```

```
library(arulesViz)
```

```
## Warning: replacing previous import 'lifecycle::last_warnings' by
## 'rlang::last_warnings' when loading 'tibble'
```

```
## Warning: replacing previous import 'lifecycle::last_warnings' by
## 'rlang::last_warnings' when loading 'pillar'
```

```
# read data from csv file
bankData <- read.csv("/Users/shivangi/Downloads/bank-data(1).csv")
```

```
str(bankData)
```

```
## 'data.frame':    600 obs. of  12 variables:
##  $ id         : chr  "ID12101" "ID12102" "ID12103" "ID12104" ...
##  $ age        : int  48 40 51 23 57 57 22 58 37 54 ...
##  $ sex        : chr  "FEMALE" "MALE" "FEMALE" "FEMALE" ...
##  $ region     : chr  "INNER_CITY" "TOWN" "INNER_CITY" "TOWN" ...
##  $ income     : num  17546 30085 16575 20375 50576 ...
##  $ married    : chr  "NO" "YES" "YES" "YES" ...
##  $ children   : int  1 3 0 3 0 2 0 0 2 2 ...
##  $ car        : chr  "NO" "YES" "YES" "NO" ...
##  $ save_act   : chr  "NO" "NO" "YES" "NO" ...
##  $ current_act: chr  "NO" "YES" "YES" "YES" ...
##  $ mortgage   : chr  "NO" "YES" "NO" "NO" ...
##  $ pep        : chr  "YES" "NO" "NO" "NO" ...
```

```
bankData <- subset(bankData, select = -id)
```

```
str(bankData)
```

```
## 'data.frame':    600 obs. of  11 variables:
##  $ age        : int  48 40 51 23 57 57 22 58 37 54 ...
##  $ sex        : chr  "FEMALE" "MALE" "FEMALE" "FEMALE" ...
##  $ region     : chr  "INNER_CITY" "TOWN" "INNER_CITY" "TOWN" ...
##  $ income     : num  17546 30085 16575 20375 50576 ...
##  $ married    : chr  "NO" "YES" "YES" "YES" ...
##  $ children   : int  1 3 0 3 0 2 0 0 2 2 ...
##  $ car        : chr  "NO" "YES" "YES" "NO" ...
##  $ save_act   : chr  "NO" "NO" "YES" "NO" ...
##  $ current_act: chr  "NO" "YES" "YES" "YES" ...
##  $ mortgage   : chr  "NO" "YES" "NO" "NO" ...
##  $ pep        : chr  "YES" "NO" "NO" "NO" ...
```

```
bankData$age = discretize(bankData$age)
bankData$income = discretize(bankData$income)
```

```
# bankData$married = dplyr::recode(bankData$married, YES = "married=YES", NO = "married=NO")
# bankData$car = dplyr::recode(bankData$car, YES = "car=YES", NO = "car=NO")
# bankData$save_act = dplyr::recode(bankData$save_act, YES = "save_act=YES", NO = "save_act=NO")
# bankData$current_act = dplyr::recode(bankData$current_act, YES = "current_act=YES", NO = "current_act
# bankData$mortgage = dplyr::recode(bankData$mortgage, YES = "mortgage=YES", NO = "mortgage=NO")
# bankData$pep = dplyr::recode(bankData$pep, YES = "pep=YES", NO = "pep=NO")
bankData$children = factor(bankData$children)
bankData$sex = factor(bankData$sex)
bankData$region = factor(bankData$region)
bankData$car = factor(bankData$car)
bankData$save_act = factor(bankData$save_act)
bankData$current_act = factor(bankData$current_act)
bankData$mortgage = factor(bankData$mortgage)
bankData$pep = factor(bankData$pep)
bankData$married = factor(bankData$married)
```

```
myRules = apriori(bankData, parameter = list(supp = 0.001, conf = 0.9, minlen = 3))
```

```
## Apriori
##
## Parameter specification:
##  confidence minval smax arem  aval originalSupport maxtime support minlen
##         0.9    0.1    1 none FALSE            TRUE       5   0.001      3
##  maxlen target  ext
##      10  rules TRUE
##
## Algorithmic control:
##  filter tree heap memopt load sort verbose
##     0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## Absolute minimum support count: 0
##
```

```
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[28 item(s), 600 transaction(s)] done [0.00s].
## sorting and recoding items ... [28 item(s)] done [0.00s].
## creating transaction tree ... done [0.00s].
## checking subsets of size 1 2 3 4 5 6 7 8 9 10

## Warning in apriori(bankData, parameter = list(supp = 0.001, conf = 0.9, : Mining
## stopped (maxlen reached). Only patterns up to a length of 10 returned!

##  done [0.09s].
## writing ... [681745 rule(s)] done [0.13s].
## creating S4 object  ... done [0.33s].
```

```
# rules = apriori(groceries, parameter = list(supp = 0.001, conf = 0.8))
options(digits = 2)

# myRules <- sort(myRules, by = "confidence", decreasing = TRUE)
# inspect(myRules)

# rules <- apriori(data = bankData, parameter = list(supp = 0.001, conf = 0.09, maxlen = 3), appearance

# rules <- apriori(bankData, parameter = list(supp = 0.001, conf = 0.9, maxlen = 4))
```

```
pepRules <- apriori(data = bankData, parameter = list(supp = 0.08, conf = 0.6, minlen = 3), control = li
pepRulesSorted <- sort(pepRules, by = "lift", descending = TRUE)
inspect(pepRulesSorted)
```

```
##      lhs                            rhs       support confidence coverage lift count
## [1]  {married=YES,
##       children=1,
##       save_act=YES}              => {pep=YES}   0.095       0.88    0.108  1.9    57
## [2]  {children=1,
##       save_act=YES,
##       mortgage=NO}               => {pep=YES}   0.080       0.87    0.092  1.9    48
## [3]  {children=1,
##       save_act=YES,
##       current_act=YES}           => {pep=YES}   0.105       0.86    0.122  1.9    63
## [4]  {married=YES,
##       children=1,
##       current_act=YES}           => {pep=YES}   0.093       0.86    0.108  1.9    56
## [5]  {children=1,
##       mortgage=NO}               => {pep=YES}   0.118       0.85    0.140  1.9    71
## [6]  {children=1,
##       save_act=YES}              => {pep=YES}   0.133       0.84    0.158  1.8    80
## [7]  {children=1,
##       current_act=YES,
##       mortgage=NO}               => {pep=YES}   0.095       0.84    0.113  1.8    57
## [8]  {sex=FEMALE,
##       children=1}                => {pep=YES}   0.092       0.83    0.110  1.8    55
## [9]  {children=1,
##       current_act=YES}           => {pep=YES}   0.140       0.83    0.168  1.8    84
## [10] {married=YES,
```

```
##       children=1}                => {pep=YES}   0.123       0.83    0.148  1.8    74
## [11] {children=1,
##       car=YES}                   => {pep=YES}   0.092       0.82    0.112  1.8    55
## [12] {children=1,
##       car=NO}                    => {pep=YES}   0.092       0.81    0.113  1.8    55
## [13] {sex=MALE,
##       children=1}                => {pep=YES}   0.092       0.80    0.115  1.7    55
## [14] {region=INNER_CITY,
##       children=1}                => {pep=YES}   0.085       0.78    0.108  1.7    51
## [15] {income=[3.11e+04,6.31e+04],
##       married=NO}                => {pep=YES}   0.093       0.78    0.120  1.7    56
## [16] {married=NO,
##       save_act=YES,
##       current_act=YES,
##       mortgage=NO}               => {pep=YES}   0.088       0.76    0.117  1.7    53
## [17] {married=NO,
##       save_act=YES,
##       mortgage=NO}               => {pep=YES}   0.107       0.74    0.143  1.6    64
## [18] {married=NO,
##       current_act=YES,
##       mortgage=NO}               => {pep=YES}   0.122       0.72    0.170  1.6    73
## [19] {age=[49,67],
##       married=NO}                => {pep=YES}   0.087       0.71    0.122  1.6    52
## [20] {married=NO,
##       mortgage=NO}               => {pep=YES}   0.153       0.71    0.217  1.5    92
## [21] {married=NO,
##       children=0}                => {pep=YES}   0.095       0.69    0.138  1.5    57
## [22] {age=[49,67],
##       income=[3.11e+04,6.31e+04],
##       save_act=YES,
##       mortgage=NO}               => {pep=YES}   0.092       0.68    0.135  1.5    55
## [23] {income=[3.11e+04,6.31e+04],
##       car=YES,
##       mortgage=NO}               => {pep=YES}   0.083       0.68    0.123  1.5    50
## [24] {income=[3.11e+04,6.31e+04],
##       save_act=YES,
##       mortgage=NO}               => {pep=YES}   0.127       0.67    0.188  1.5    76
## [25] {income=[3.11e+04,6.31e+04],
##       save_act=YES,
##       current_act=YES,
##       mortgage=NO}               => {pep=YES}   0.102       0.66    0.153  1.5    61
## [26] {age=[49,67],
##       income=[3.11e+04,6.31e+04],
##       current_act=YES,
##       mortgage=NO}               => {pep=YES}   0.085       0.66    0.128  1.5    51
## [27] {age=[49,67],
##       income=[3.11e+04,6.31e+04],
##       mortgage=NO}               => {pep=YES}   0.105       0.66    0.160  1.4    63
## [28] {income=[3.11e+04,6.31e+04],
##       mortgage=NO}               => {pep=YES}   0.145       0.65    0.222  1.4    87
## [29] {income=[3.11e+04,6.31e+04],
##       current_act=YES,
##       mortgage=NO}               => {pep=YES}   0.117       0.65    0.180  1.4    70
## [30] {region=INNER_CITY,
```

```
##       married=NO}                 => {pep=YES}   0.095       0.63    0.152  1.4    57
## [31] {age=[49,67],
##       save_act=YES,
##       current_act=YES,
##       mortgage=NO}                => {pep=YES}   0.085       0.62    0.137  1.4    51
## [32] {age=[49,67],
##       income=[3.11e+04,6.31e+04],
##       car=YES}                    => {pep=YES}   0.080       0.62    0.130  1.3    48
## [33] {age=[49,67],
##       income=[3.11e+04,6.31e+04],
##       save_act=YES}               => {pep=YES}   0.125       0.61    0.203  1.3    75
## [34] {income=[3.11e+04,6.31e+04],
##       car=YES,
##       save_act=YES}               => {pep=YES}   0.095       0.61    0.155  1.3    57
## [35] {sex=MALE,
##       income=[3.11e+04,6.31e+04]} => {pep=YES}   0.105       0.61    0.172  1.3    63
## [36] {married=NO,
##       car=NO,
##       current_act=YES}            => {pep=YES}   0.085       0.61    0.140  1.3    51
## [37] {sex=MALE,
##       income=[3.11e+04,6.31e+04],
##       save_act=YES}               => {pep=YES}   0.090       0.61    0.148  1.3    54
## [38] {age=[49,67],
##       income=[3.11e+04,6.31e+04],
##       save_act=YES,
##       current_act=YES}            => {pep=YES}   0.095       0.61    0.157  1.3    57
## [39] {age=[49,67],
##       income=[3.11e+04,6.31e+04]} => {pep=YES}   0.140       0.60    0.233  1.3    84
## [40] {age=[49,67],
##       current_act=YES,
##       mortgage=NO}                => {pep=YES}   0.110       0.60    0.183  1.3    66
```