Assigment_1_Maninderpreet_Singh_Puri_20494381

by Maninderpreet Singh Puri

Submission date: 10-Apr-2020 01:36PM (UTC+1000)

Submission ID: 1294206037

File name: 293411_Maninderpreet_Singh_Puri_Assigment_1_Maninderpreet_Singh_Puri_20494381_3831316_584460346.docx (213K)

Word count: 1040

Character count: 4700

Great work

STM4PSD **ASSIGNMENT 1**

In submitting my work, you are consenting that it may be copied and transmitted by the University for the detection of plagiarism. Submission is your guarantee that the below statement of originality is correct.

"This is my own work. I have not copied any of it from anyone else."

NAME: **Maninderpreet Singh Puri**

STUDENT NUMBER: **20494381**

1.

a. According to the given information officer will correctly detain someone driving under the influence 75% of the time, and correctly release a driver who is not intoxicated 75%. So probability that the officer will be making a right decision is P (A) = 0.75.

So say probability that a person is not drunk and the officer makes a wrong decision and detains the driver is $P(A^c)$

$P(A) + P(A^c) = 1$
$P(A^c) = 1 - 0.75 = 0.25$

b. For finding the probability of any given driver will be detained we can use the law of total probability that is,
$P(A) = P(A|B) \cdot P(B) + P(A|B^C) \cdot P(B^C)$

According to the given information we can assume $P(A|B) = 0.75$.

$P(A|B^C) = 1 - P(A|B) = 1 - 0.75 = 0.25$

Probability of drivers intoxicated in all the population is $P(B) = 0.14$

$P(B^C) = 1 - P(B) = 1 - 0.14 = 0.86$

So,

$= 0.14 * 0.75 + 0.86 * 0.25 =$
0.32

c. Using Bayes Theorem:

$P(A|B) = \frac{P(B|A) . P(A)}{P(B)}$

$P(B|A) = 0.14$

$P(A) = 0.75$

$P(B) = 0.32$

$= \frac{0.14 * 0.75}{0.32} = 0.328$

d. $P(A^C) = 0.25$

$P(B|A) = 0.14$

$=0.14 * 0.25=0.035$

-2

X

2.

a.

As we know that, Support $(A \to B) = \frac{(A \cup B)}{M}$

Where M is the total number of transactions, and$(A \cup B)$ is A and B occurring together in a sample space. So in the question we have to find the answer using the above formula.

Support $(F \to I) = \frac{(F \cup I)}{M}$

That is $= \frac{4}{6}$ as F and I occur 4 times together out of 6 total transactions. So Support $(F \to I)$=0.66

Now for the calculating the Confidence we use the formula,

Confidence $(A \to B) = \frac{Supp\ (A \to B)}{Supp(A)}$

So using the above formula we can say that,

Confidence $(F \to I) = \frac{Supp\ (F \to I)}{Supp\ (F)}$

Support $(F) = \frac{5}{6} = 0.83$

Confidence $(F \to I) = \frac{0.66}{0.83} = 0.79$

b.

By using the above formula for Support we can say that,

Support $(T \to I) = \frac{(T \cup I)}{M}$

That is $= \frac{2}{6}$ as T and I occur two times together out of six total transactions. So Support $(T \to I)$=0.33

Now for the calculating the Confidence we can say that,

Confidence $(T \to I) = \frac{Supp\ (T \to I)}{Supp\ (T)}$

Support (T) = $\frac{3}{6}$ = 0.50

Confidence (T → I)= $\frac{0.33}{0.50}$ = 0.66

c.

So calculating the lift for (F → I) and (T → I)

Lift (F → I) = $\frac{\text{Support (F→I)}}{\text{Support (F) . Support (I)}}$

= $\frac{0.66}{0.83\,.\,0.83}$ = 0.97

Lift (T → I) = $\frac{\text{Support (T→I)}}{\text{Support (T) . Support (I)}}$

= $\frac{0.33}{05\,.\,0.83}$ = 0.8

So here rule (F → I) has a higher lift value and is close to one so it is better association rule for cross-sales.

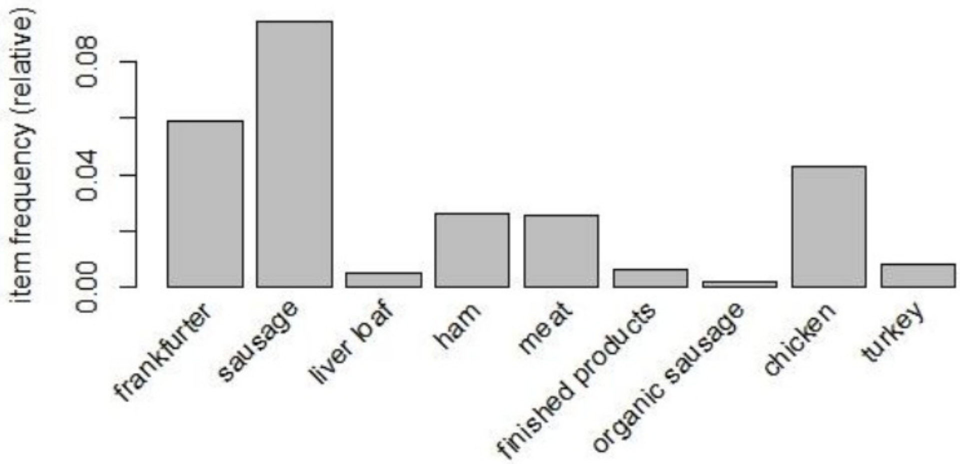
3.

a.

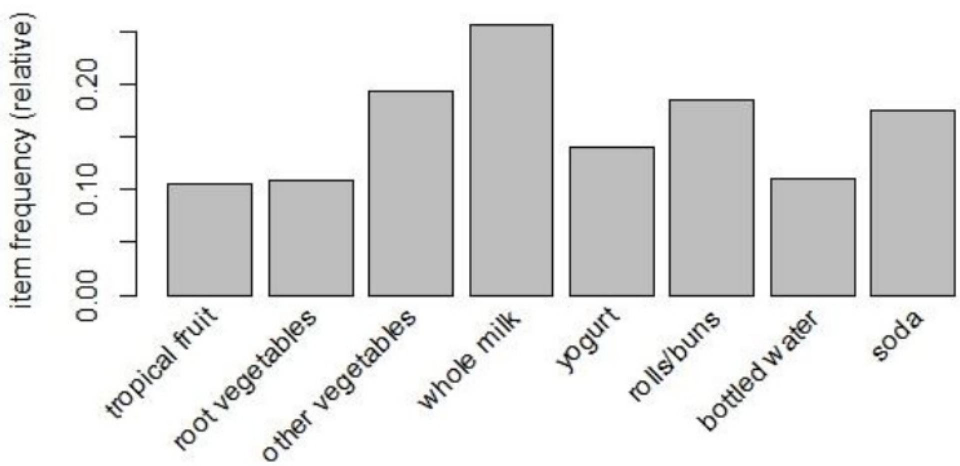
Input in R:

itemFrequencyPlot(Groceries[,1:9])

Output:



b.
Input in R:
itemFrequencyPlot(Groceries, support= 0.1)
Output:

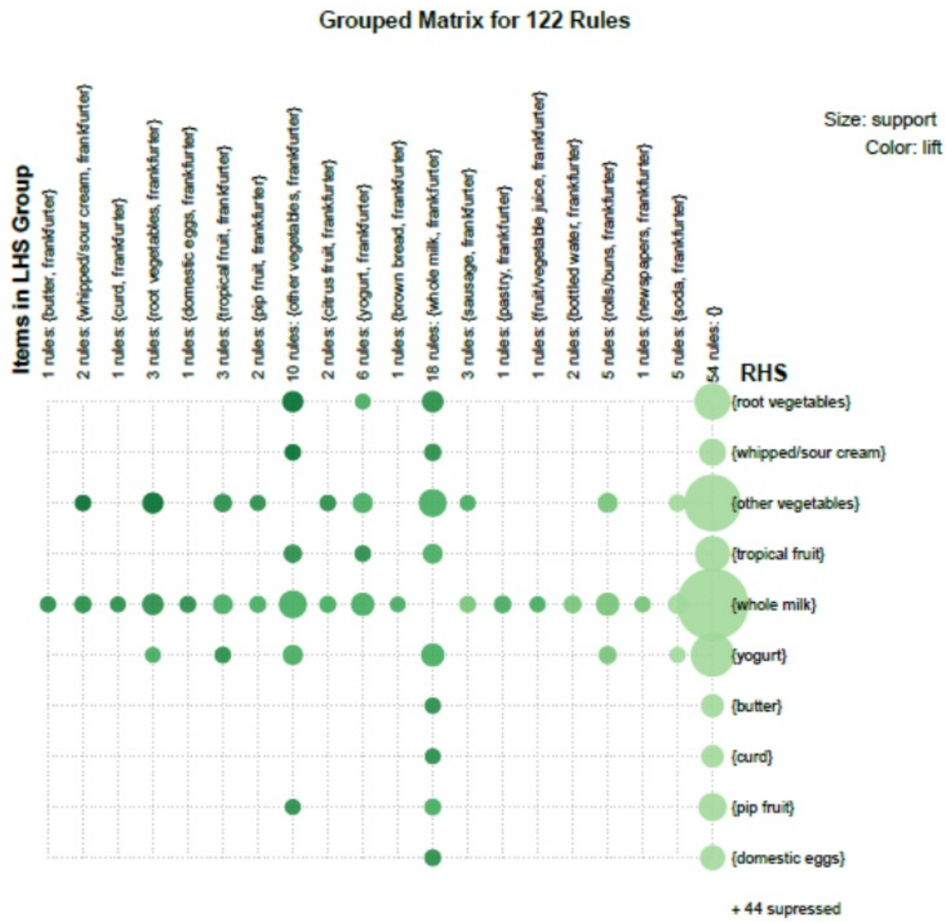


c.
Input in R:

```
data(Groceries)

second.rules <- apriori(Groceries,
                    parameter = list(support = 0.025, confidence = 0.025))
pdf(file="fig_market_basket_rules_matrix.pdf", width = 8.5, height = 8.5)
plot(second.rules, method="grouped",
    control=list(col = rev(brewer.pal(9, "Greens")[4:9])))
dev.off()
```

Output:



The antecedent {tropical fruit, frankfurter} represents three association rules with {other vegetables}, {Whole milk}, {yogurt}.
The color of the bubble represents the lift of the association rule and size of the bubble represents the support of the association rule.

The lift of the association rule {tropical fruit, frankfurter} with {other vegetables}, {yogurt} is almost same and with {Whole milk} it is less.
The support of the association rule {tropical fruit, frankfurter} with {other vegetables} and {Whole milk} is almost same and with {yogurt} it is less.

4.

a. Given $F(T) = \begin{cases} 1 - \frac{1}{(1+t)^{\alpha}} & \text{where } (1 < \alpha < 2, t \geq 0) \\ 0 \text{ where } t < 0 \end{cases}$

Now derivative of the F (T) can be written as $\frac{d}{dx}$ F (T)

So $\frac{d}{dx}$ F (T) = $\frac{d}{dx}(1 - \frac{1}{(1+t)^{\alpha}})$

Or

$= \frac{d}{dx}(1 - (1+t)^{-\alpha})$

$= 0 - (-\alpha(1+t)^{-\alpha-1})$

$= \alpha(1+t)^{-\alpha-1}$

So turns out to be F (T) = $\alpha(1+t)^{-\alpha-1}$

b. As the messages sent are measured in bytes and mean should also be described as Bytes.

c. E(T)= $\frac{1}{\alpha-1}$

As given in the question $\alpha = 1.5$

So, E (T) = $\frac{1}{1.5-1} = \frac{1}{0.5}$

So according to the Question, a message will have size less than or equal to E (T), when α = 1.5.

So we can say that Probability of message having size less than or equal to E (T) which is $\frac{1}{0.5}$ lies in the range,

P ($0<t\leq \frac{1}{0.5}$)

Or

P ($0<t\leq 2$)

As ($1 < \alpha < 2$), so we can integrate f (t)

$=\int_0^2 f(t)dt$

Using the R code calculating the value of f (t):

```
fn <- function(t) {
  1.5 * (1+t) ^ (-2.5)
```

}

c <- integrate (fn, lower=0, upper=2)$value

Output we get for ‘c’ is

Values	
alpha	1.5
c	0.807549910270125

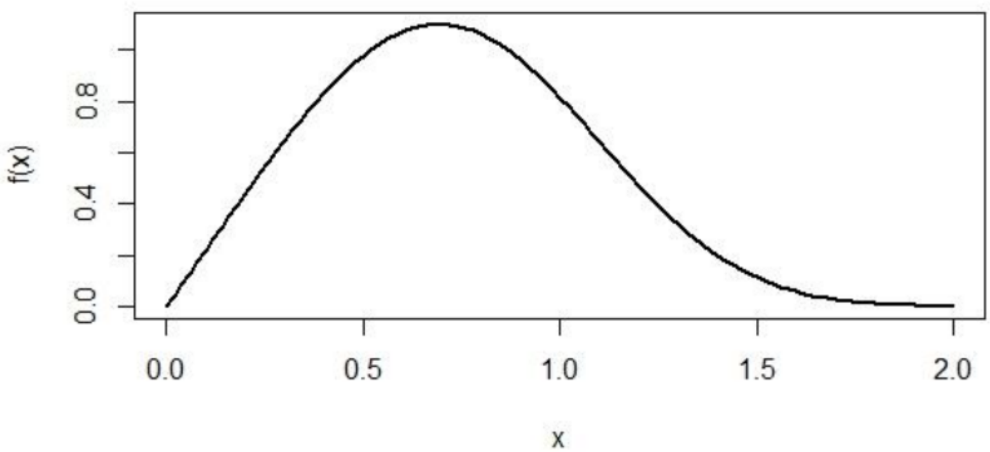
5.

a. R code:

```
f <-function (x){
(3/gamma(2/3)*x*exp(-x^3))
}

curve(f, from = 0, to = 2, xlab = "x", ylab = "f(x)", lwd = 2)
```

Output plot:



b. R code input:

```
funct <- integrate(f, lower=0, upper= Inf)
funct$value
```

Output:

Name	Type	Value
funct	list [5] (S3: integrate)	List of length 5
value	double [1]	1
abs.error	double [1]	4.621412e-06
subdivisions	integer [1]	4
message	character [1]	'OK'
call	language	integrate(f = f, lower = 0, upper = Inf)

c.

I. R code input:

```
functm <- function (x) {
  x* (3/gamma(2/3)*x*exp(-x^3))
}
mean <- integrate(functm, lower=0, upper= Inf)
mean $ value
```

We get probability= 0.7384881

II. E(x)= $\int_0^\infty x\, f(x)dx$

$= \int_0^\infty x\, \frac{3\,xe^{-x^3}}{\gamma(2/3)} dx$

$= \frac{3}{\gamma(2/3)} \int_0^\infty x^2 e^{-x^3}\, dx$

$= \frac{3}{1.3541} \int_0^\infty x^2 e^{-x^3}\, dx$

Let t = x^3, dt= $3x^3$ dx

$= \frac{1}{1.3541} \int_0^\infty e^{-t}\, dt = \frac{1}{1.3541}\, [-e^{-t}]_0^\infty$

$= -\frac{1}{1.3541}\, [e^{-\infty}-e^{-0}] = -\frac{1}{1.3541}\, [0-1$

$= \frac{1}{1.3541} = 0.7384$

d. Using R code:

```
demandexceed <- integrate(fm, lower=1.2, upper= Inf)
demandexceed $ value
```

We get probability= 0.09605142

e. Using R code:

```
demandmeet <- integrate(fm, lower=0.064, upper= 1.2)
demandmeet $ value
```

We get probability= 0.8994118

6.

a. So from the given table we can say that P(X=1000 and Y=500) = 0.075

b. P(X=750|Y=500)= $\frac{P(X=750 \cap Y=500)}{P(Y=500)}$

So = $\frac{0.25}{0.525}$= 0.475

c. $F_{X,Y}(750, 250)$= F($X \leq 750, Y \leq 250$)

=P (500,200) +P (750,250)

=0.25 + 0.175=0.425

d. So the marginal probability of Y is the sum of the values when y=250 and y=500

f_X (x)= $\begin{cases} 0.25 + 0.175 + 0.05 = 0.475, \text{when } y = 250 \\ 0.20 + 0.25 + 0.075 = 0.525, \text{when } y = 500 \end{cases}$

e. T=X+Y

So f_T (t)= $\begin{cases} y & f(t) \\ 250 & 0.25 \\ 1000 & 0.2 + 0.175 = 0.375 \\ 1250 & 0.25 + 0.05 = 0.3 \\ 1500 & 0.075 \end{cases}$

f. E(T)= 750 (0.25) +1000 (0.375) + 1250 (0.3) +1500 (0.075)= 1050

Assigment_1_Maninderpreet_Singh_Puri_20494381

ORIGINALITY REPORT

38%	11%	2%	36%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to La Trobe University Student Paper	32%
2	docplayer.net Internet Source	1%
3	koofers.com Internet Source	1%
4	www.coursehero.com Internet Source	1%
5	mxepstein.com Internet Source	1%
6	fr.slideshare.net Internet Source	1%
7	Anna Kamińska, Yves Raynaud. "Abstract Lorentz spaces and Köthe duality", Indagationes Mathematicae, 2019 Publication	1%
8	Shigeki Akiyama, Jeong-Yup Lee. "Determining quasicrystal structures on substitution tilings", Philosophical Magazine, 2010	<1%

Publication

9	Submitted to University of Birmingham Student Paper	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		

Assigment_1_Maninderpreet_Singh_Puri_20494381

GRADEMARK REPORT

FINAL GRADE

98/100

GENERAL COMMENTS

Instructor

PAGE 1

QM **Great work**

PAGE 2

QM **-2**

QM **X**

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9