

FML_Assignment_3

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```
UniversalBank <- read.csv("/Users/nithinkumarch/Downloads/UniversalBank-1.csv")
summary(UniversalBank)
```

```
##           ID           Age           Experience           Income           ZIP.Code
## Min.      :    1   Min.    :23.00   Min.     :-3.0    Min.     :  8.00   Min.     : 9307
## 1st Qu.:1251   1st Qu.:35.00   1st Qu.:10.0   1st Qu.: 39.00   1st Qu.:91911
## Median :2500   Median :45.00   Median :20.0   Median : 64.00   Median :93437
## Mean     :2500   Mean    :45.34   Mean     :20.1   Mean    : 73.77   Mean    :93152
## 3rd Qu.:3750   3rd Qu.:55.00   3rd Qu.:30.0   3rd Qu.: 98.00   3rd Qu.:94608
## Max.     :5000   Max.     :67.00   Max.     :43.0   Max.     :224.00   Max.     :96651
##           Family           CCAvg           Education           Mortgage
## Min.      :1.000   Min.     : 0.000   Min.     :1.000   Min.     :  0.0
## 1st Qu.:1.000   1st Qu.: 0.700   1st Qu.:1.000   1st Qu.:  0.0
## Median :2.000   Median : 1.500   Median :2.000   Median :  0.0
## Mean     :2.396   Mean     : 1.938   Mean     :1.881   Mean     : 56.5
## 3rd Qu.:3.000   3rd Qu.: 2.500   3rd Qu.:3.000   3rd Qu.:101.0
## Max.     :4.000   Max.     :10.000   Max.     :3.000   Max.     :635.0
## Personal.Loan Securities.Account CD.Account           Online
## Min.      :0.000   Min.     :0.0000   Min.     :0.0000   Min.     :0.0000
## 1st Qu.:0.000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000
## Median :0.000   Median :0.0000   Median :0.0000   Median :1.0000
## Mean     :0.096   Mean     :0.1044   Mean     :0.0604   Mean     :0.5968
## 3rd Qu.:0.000   3rd Qu.:0.0000   3rd Qu.:0.0000   3rd Qu.:1.0000
## Max.     :1.000   Max.     :1.0000   Max.     :1.0000   Max.     :1.0000
##           CreditCard
## Min.      :0.000
## 1st Qu.:0.000
## Median :0.000
## Mean     :0.294
## 3rd Qu.:1.000
## Max.     :1.000
```

```
library(caret)
```

```
## Loading required package: ggplot2
```

```
## Loading required package: lattice
```

```
library(ISLR)
```

```
library(e1071)
```

```
library(dplyr)
```

```
##
```

```
## Attaching package: 'dplyr'
```

```

## The following objects are masked from 'package:stats':
##
##   filter, lag
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

library(class)
library(reshape2)
library(ggplot2)
library(gmodels)
library(lattice)

UniversalBank$Personal.Loan <- factor(UniversalBank$Personal.Loan)
UniversalBank$Online <- factor(UniversalBank$Online)
UniversalBank$CreditCard <- factor(UniversalBank$CreditCard)
df= UniversalBank

#1

set.seed(64060)
Train_index <- createDataPartition(df$Personal.Loan, p = 0.6, list = FALSE)
train.df = df[Train_index,]
validation.df = df[-Train_index,]

mytable <- xtabs(~ CreditCard + Online + Personal.Loan , data = train.df)
ftable(mytable)

##           Personal.Loan    0    1
## CreditCard Online
## 0           0           772   75
##           1           1152  120
## 1           0           309   34
##           1           479   59

#2

probability = 59/(59+479)
probability

## [1] 0.1096654

#3

table(Personal.Loan = train.df$Personal.Loan, Online = train.df$Online)

##           Online
## Personal.Loan    0    1
##           0 1081 1631
##           1  109  179

table(Personal.Loan = train.df$Personal.Loan, CreditCard = train.df$CreditCard)

##           CreditCard
## Personal.Loan    0    1
##           0 1924  788

```

```
##          1  195   93
```

```
table(Personal.Loan = train.df$Personal.Loan)
```

```
## Personal.Loan
```

```
##      0      1
```

```
## 2712  288
```

```
#4
```

```
#i
```

```
Probablity1 <- 93/(93+195)
```

```
Probablity1
```

```
## [1] 0.3229167
```

```
#ii
```

```
Probablity2 <- 179/(179+109)
```

```
Probablity2
```

```
## [1] 0.6215278
```

```
#iii
```

```
Probablity3 <- 288/(288+2712)
```

```
Probablity3
```

```
## [1] 0.096
```

```
#iv
```

```
Probablity4 <- 788/(788+1924)
```

```
Probablity4
```

```
## [1] 0.2905605
```

```
#v
```

```
Probablity5 <- 1631/(1631+1081)
```

```
Probablity5
```

```
## [1] 0.6014012
```

```
#vi
```

```
Probablity6 <- 2712/(2712+288)
```

```
Probablity6
```

```
## [1] 0.904
```

```
#5
```

```
Task5Probablity <- (Probablity1*Probablity2*Probablity3)/  
((Probablity1*Probablity2*Probablity3) +(Probablity4*Probablity5*Probablity6))
```

```
Task5Probablity
```

```
## [1] 0.1087106
```

```
#6
```

```
#The values we obtained from questions 2 and 5 are nearly identical at 0.1096654 and 0.1087106, respect
```

```
#7
```

```
nb.model <- naiveBayes(Personal.Loan~ Online + CreditCard, data = train.df)
To_Predict=data.frame(Online=1, CreditCard= 1)
predict(nb.model, To_Predict,type = 'raw')
```

```
## Warning in predict.naiveBayes(nb.model, To_Predict, type = "raw"): Type
## mismatch between training and new data for variable 'Online'. Did you use
## factors with numeric labels for training, and numeric values for new data?
```

```
## Warning in predict.naiveBayes(nb.model, To_Predict, type = "raw"): Type
## mismatch between training and new data for variable 'CreditCard'. Did you use
## factors with numeric labels for training, and numeric values for new data?
```

```
##           0           1
## [1,] 0.9153656 0.08463445
```

```
#The value obtained from task 5 is 0.1087106, and the value obtained from question 7 is 0.08463445.
#The outcome nearly matches what we obtained from Task 5.
#The rounding results in a very slight difference.
#The rank order of the output will remain unaffected by the difference.
```