

Churn_ANN_classification.R

S Varatharajan

Tue Oct 16 15:06:16 2018

```
setwd("C:/Users/tsraj/Desktop/Acadgild project")
library(readr)
churnM <- read_csv("churnM.csv")

## Parsed with column specification:
## cols(
##   `Account Length` = col_integer(),
##   `VMail Message` = col_integer(),
##   `Day Mins` = col_double(),
##   `Eve Mins` = col_double(),
##   `Night Mins` = col_double(),
##   `Intl Mins` = col_double(),
##   `CustServ Calls` = col_integer(),
##   `Int'l Plan` = col_integer(),
##   `VMail Plan` = col_integer(),
##   `Day Calls` = col_integer(),
##   `Day Charge` = col_double(),
##   `Eve Calls` = col_integer(),
##   `Eve Charge` = col_double(),
##   `Night Calls` = col_integer(),
##   `Night Charge` = col_double(),
##   `Intl Calls` = col_integer(),
##   `Intl Charge` = col_double(),
##   `Area Code` = col_integer(),
##   Churn = col_integer()
## )

View(churnM )
mydata<-churnM
names(mydata)

## [1] "Account Length" "VMail Message" "Day Mins" "Eve Mins"
## [5] "Night Mins" "Intl Mins" "CustServ Calls" "Int'l Plan"
## [9] "VMail Plan" "Day Calls" "Day Charge" "Eve Calls"
## [13] "Eve Charge" "Night Calls" "Night Charge" "Intl Calls"
## [17] "Intl Charge" "Area Code" "Churn"

normalize<-function(x){return((x-min(x))/(max(x)-min(x)))}
mydata_n<-as.data.frame(lapply(mydata[1:19],normalize))
str(mydata)

## Classes 'tbl_df', 'tbl' and 'data.frame': 3333 obs. of 19 variables:
## $ Account Length: int 128 107 137 84 75 118 121 147 117 141 ...
```

```

## $ VMail Message : int 25 26 0 0 0 0 24 0 0 37 ...
## $ Day Mins      : num 265 162 243 299 167 ...
## $ Eve Mins      : num 197.4 195.5 121.2 61.9 148.3 ...
## $ Night Mins    : num 245 254 163 197 187 ...
## $ Intl Mins     : num 10 13.7 12.2 6.6 10.1 6.3 7.5 7.1 8.7 11.2 ...
## $ CustServ Calls: int 1 1 0 2 3 0 3 0 1 0 ...
## $ Int'l Plan    : int 0 0 0 1 1 1 0 1 0 1 ...
## $ VMail Plan    : int 1 1 0 0 0 0 1 0 0 1 ...
## $ Day Calls     : int 110 123 114 71 113 98 88 79 97 84 ...
## $ Day Charge    : num 45.1 27.5 41.4 50.9 28.3 ...
## $ Eve Calls     : int 99 103 110 88 122 101 108 94 80 111 ...
## $ Eve Charge    : num 16.78 16.62 10.3 5.26 12.61 ...
## $ Night Calls   : int 91 103 104 89 121 118 118 96 90 97 ...
## $ Night Charge  : num 11.01 11.45 7.32 8.86 8.41 ...
## $ Intl Calls    : int 3 3 5 7 3 6 7 6 4 5 ...
## $ Intl Charge   : num 2.7 3.7 3.29 1.78 2.73 1.7 2.03 1.92 2.35 3.02 ...
## $ Area Code     : int 415 415 415 408 415 510 510 415 408 415 ...
## $ Churn         : int 0 0 0 0 0 0 0 0 0 0 ...
## - attr(*, "spec")=List of 2
## ..$ cols      :List of 19
## .. ..$ Account Length: list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ VMail Message : list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ Day Mins      : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"
## .. ..$ Eve Mins      : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"
## .. ..$ Night Mins    : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"
## .. ..$ Intl Mins     : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"
## .. ..$ CustServ Calls: list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ Int'l Plan    : list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ VMail Plan    : list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ Day Calls     : list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ Day Charge    : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"
## .. ..$ Eve Calls     : list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ Eve Charge    : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"
## .. ..$ Night Calls   : list()
## .. .. ..- attr(*, "class")= chr "collector_integer" "collector"
## .. ..$ Night Charge  : list()
## .. .. ..- attr(*, "class")= chr "collector_double" "collector"

```

```
## ..$ Intl Calls      : list()
## .. ..- attr(*, "class")= chr "collector_integer" "collector"
## ..$ Intl Charge      : list()
## .. ..- attr(*, "class")= chr "collector_double" "collector"
## ..$ Area Code        : list()
## .. ..- attr(*, "class")= chr "collector_integer" "collector"
## ..$ Churn            : list()
## .. ..- attr(*, "class")= chr "collector_integer" "collector"
## ..$ default: list()
## .. ..- attr(*, "class")= chr "collector_guess" "collector"
## ..- attr(*, "class")= chr "col_spec"
```

```
str(mydata_n)
```

```
## 'data.frame': 3333 obs. of 19 variables:
## $ Account.Length: num 0.525 0.438 0.562 0.343 0.306 ...
## $ VMail.Message : num 0.49 0.51 0 0 0 ...
## $ Day.Mins : num 0.756 0.461 0.694 0.853 0.475 ...
## $ Eve.Mins : num 0.543 0.538 0.333 0.17 0.408 ...
## $ Night.Mins : num 0.596 0.622 0.375 0.467 0.44 ...
## $ Intl.Mins : num 0.5 0.685 0.61 0.33 0.505 0.315 0.375 0.355 0.435
0.56 ...
## $ CustServ.Calls: num 0.111 0.111 0 0.222 0.333 ...
## $ Int.l.Plan : num 0 0 0 1 1 1 0 1 0 1 ...
## $ VMail.Plan : num 1 1 0 0 0 0 1 0 0 1 ...
## $ Day.Calls : num 0.667 0.745 0.691 0.43 0.685 ...
## $ Day.Charge : num 0.756 0.461 0.694 0.853 0.475 ...
## $ Eve.Calls : num 0.582 0.606 0.647 0.518 0.718 ...
## $ Eve.Charge : num 0.543 0.538 0.333 0.17 0.408 ...
## $ Night.Calls : num 0.408 0.493 0.5 0.394 0.62 ...
## $ Night.Charge : num 0.596 0.622 0.375 0.467 0.441 ...
## $ Intl.Calls : num 0.15 0.15 0.25 0.35 0.15 0.3 0.35 0.3 0.2 0.25 ...
## $ Intl.Charge : num 0.5 0.685 0.609 0.33 0.506 ...
## $ Area.Code : num 0.0686 0.0686 0.0686 0 0.0686 ...
## $ Churn : num 0 0 0 0 0 0 0 0 0 0 ...
```

```
names(mydata_n)
```

```
## [1] "Account.Length" "VMail.Message" "Day.Mins" "Eve.Mins"
## [5] "Night.Mins" "Intl.Mins" "CustServ.Calls" "Int.l.Plan"
## [9] "VMail.Plan" "Day.Calls" "Day.Charge" "Eve.Calls"
## [13] "Eve.Charge" "Night.Calls" "Night.Charge" "Intl.Calls"
## [17] "Intl.Charge" "Area.Code" "Churn"
```

```
library(neuralnet)
```

```
set.seed(12345)
```

```
train1<-mydata_n[1:2800,]
```

```
test1<-mydata_n[2801:3033,]
```

```
str(test1)
```

```

## 'data.frame': 233 obs. of 19 variables:
## $ Account.Length: num 0.21074 0.00826 0.15289 0.42562 0.10744 ...
## $ VMail.Message : num 0 0 0 0 0 ...
## $ Day.Mins : num 0.717 0.396 0.334 0.753 0.235 ...
## $ Eve.Mins : num 0.541 0.689 0.574 0.363 0.561 ...
## $ Night.Mins : num 0.454 0.707 0.485 0.416 0.541 ...
## $ Intl.Mins : num 0.55 0.305 0.72 0.53 0.455 0.57 0.68 0.59 0.58
0.175 ...
## $ CustServ.Calls: num 0 0.444 0.222 0.333 0.111 ...
## $ Int.l.Plan : num 1 0 0 0 0 1 0 0 0 0 ...
## $ VMail.Plan : num 0 0 0 0 0 1 0 0 1 0 ...
## $ Day.Calls : num 0.715 0.6 0.691 0.655 0.636 ...
## $ Day.Charge : num 0.717 0.396 0.334 0.753 0.235 ...
## $ Eve.Calls : num 0.471 0.635 0.618 0.441 0.582 ...
## $ Eve.Charge : num 0.541 0.689 0.574 0.364 0.561 ...
## $ Night.Calls : num 0.141 0.38 0.458 0.408 0.627 ...
## $ Night.Charge : num 0.454 0.708 0.485 0.416 0.541 ...
## $ Intl.Calls : num 0.1 0.15 0.1 0.4 0.2 0.25 0.4 0.2 0.25 0.15 ...
## $ Intl.Charge : num 0.55 0.306 0.72 0.53 0.456 ...
## $ Area.Code : num 1 0 0.0686 0.0686 0 ...
## $ Churn : num 1 0 0 0 0 0 0 0 0 0 ...

mydata_model<-neuralnet(Churn~ Account.Length+VMail.Message+Day.Mins+
Eve.Mins+Night.Mins+Intl.Mins+CustServ.Calls+Int.l.Plan+VMail.Plan+Day.Calls+
Day.Charge+Eve.Calls+Eve.Charge+Night.Calls+Night.Charge+Intl.Calls+Intl.Char
ge+Area.Code,data= train1)
plot(mydata_model)
model_results<-compute(mydata_model,test1[,c(1:18)])
predicted_churn<-model_results$net.result
nrow(predicted_churn)

## [1] 233

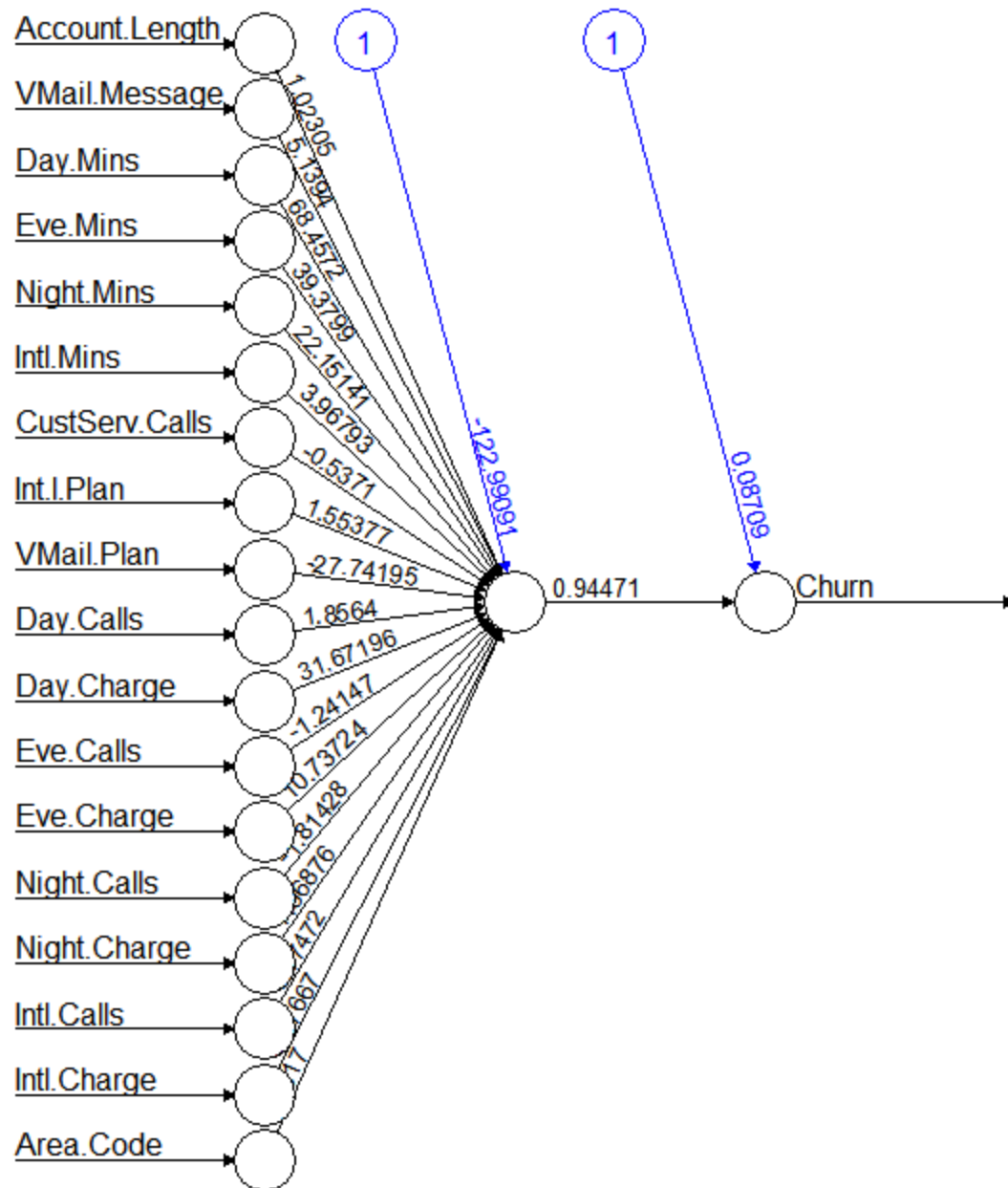
head(predicted_churn)

## [,1]
## 2801 0.15089979881
## 2802 0.08709130719
## 2803 0.08709130718
## 2804 0.08709989962
## 2805 0.08709130718
## 2806 0.08709130718

round(cor( predicted_churn,test1$Churn),2)

## [,1]
## [1,] 0.64

```



```
mydata_model1<-neuralnet(Churn~Account.Length+VMail.Message+Day.Mins+
Eve.Mins+Night.Mins+Intl.Mins+CustServ.Calls+Intl.Plan+VMail.Plan+Day.Calls+
Day.Charge+Eve.Calls+Eve.Charge+Night.Calls+Night.Charge+Intl.Calls+Intl.Char
ge+Area.Code,data= train1,hidden=5)
plot(mydata_model1)
model_results1<-compute(mydata_model1,test1[,c(3:18)])
predicted_churn1<-model_results1$net.result
```

```

nrow(predicted_churn1)
head(predicted_churn1)
round(cor( predicted_churn1,test1$Churn),2)

predicted_churn1<-model_results1$net.result
> nrow(predicted_churn1)
[1] 233
> head(predicted_churn1)
      [,1]
2801 0.29230686249
2802 0.02425699408
2803 0.02402882618
2804 0.02402869226
2805 0.02402882618
2806 0.27888153738

> round(cor( predicted_churn1,test1$Churn),2)
      [,1]
[1,] 0.76 ( improved from 0.64 to 0.76)

```

