R_KNN

Ulises Jose Bustamante Mora

2023-10-25

Importing libraries

```
#install.packages("ISLR")
library(ISLR)
```

Dataset details

```
str(Caravan)
```

```
## 'data.frame':    5822 obs. of  86 variables:
##  $ MOSTYPE : num  33 37 37 9 40 23 39 33 33 11 ...
##  $ MAANTHUI: num  1 1 1 1 1 1 2 1 1 2 ...
##  $ MGEMOMV : num  3 2 2 3 4 2 3 2 2 3 ...
##  $ MGEMLEEF: num  2 2 2 3 2 1 2 3 4 3 ...
##  $ MOSHOOFD: num  8 8 8 3 10 5 9 8 8 3 ...
##  $ MGODRK  : num  0 1 0 2 1 0 2 0 0 3 ...
##  $ MGODPR  : num  5 4 4 3 4 5 2 7 1 5 ...
##  $ MGODOV  : num  1 1 2 2 1 0 0 0 3 0 ...
##  $ MGODGE  : num  3 4 4 4 4 5 5 2 6 2 ...
##  $ MRELGE  : num  7 6 3 5 7 0 7 7 6 7 ...
##  $ MRELSA  : num  0 2 2 2 1 6 2 2 0 0 ...
##  $ MRELOV  : num  2 2 4 2 2 3 0 0 3 2 ...
##  $ MFALLEEN: num  1 0 4 2 2 3 0 0 3 2 ...
##  $ MFGEKIND: num  2 4 4 3 4 5 3 5 3 2 ...
##  $ MFWEKIND: num  6 5 2 4 4 2 6 4 3 6 ...
##  $ MOPLHOOG: num  1 0 0 3 5 0 0 0 0 0 ...
##  $ MOPLMIDD: num  2 5 5 4 4 5 4 3 1 4 ...
##  $ MOPLLAAG: num  7 4 4 2 0 4 5 6 8 5 ...
##  $ MBERHOOG: num  1 0 0 4 0 2 0 2 1 2 ...
##  $ MBERZELF: num  0 0 0 0 5 0 0 0 1 0 ...
##  $ MBERBOER: num  1 0 0 0 4 0 0 0 0 0 ...
##  $ MBERMIDD: num  2 5 7 3 0 4 4 2 1 3 ...
##  $ MBERARBG: num  5 0 0 1 0 2 1 5 8 3 ...
##  $ MBERARBO: num  2 4 2 2 0 2 5 2 1 3 ...
##  $ MSKA    : num  1 0 0 3 9 2 0 2 1 1 ...
##  $ MSKB1   : num  1 2 5 2 0 2 1 1 1 2 ...
##  $ MSKB2   : num  2 3 0 1 0 2 4 2 0 1 ...
##  $ MSKC    : num  6 5 4 4 0 4 5 5 8 4 ...
##  $ MSKD    : num  1 0 0 0 0 2 0 2 1 2 ...
##  $ MHHUUR  : num  1 2 7 5 4 9 6 0 9 0 ...
##  $ MHKOOP  : num  8 7 2 4 5 0 3 9 0 9 ...
```

```
##  $ MAUT1   : num  8 7 7 9 6 5 8 4 5 6 ...
##  $ MAUT2   : num  0 1 0 0 2 3 0 4 2 1 ...
##  $ MAUT0   : num  1 2 2 0 1 3 1 2 3 2 ...
##  $ MZFONDS : num  8 6 9 7 5 9 9 6 7 6 ...
##  $ MZPART  : num  1 3 0 2 4 0 0 3 2 3 ...
##  $ MINKM30 : num  0 2 4 1 0 5 4 2 7 2 ...
##  $ MINK3045: num  4 0 5 5 0 2 3 5 2 3 ...
##  $ MINK4575: num  5 5 0 3 9 3 3 3 1 3 ...
##  $ MINK7512: num  0 2 0 0 0 0 0 0 0 1 ...
##  $ MINK123M: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ MINKGEM : num  4 5 3 4 6 3 3 3 2 4 ...
##  $ MKOOPKLA: num  3 4 4 4 3 3 5 3 3 7 ...
##  $ PWAPART : num  0 2 2 0 0 0 0 0 0 2 ...
##  $ PWABEDR : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PWALAND : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PPERSAUT: num  6 0 6 6 0 6 6 0 5 0 ...
##  $ PBESAUT : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PMOTSCO : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PVRAAUT : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PAANHANG: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PTRACTOR: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PWERKT  : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PBROM   : num  0 0 0 0 0 0 0 3 0 0 ...
##  $ PLEVEN  : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PPERSONG: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PGEZONG : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PWAOREG : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PBRAND  : num  5 2 2 2 6 0 0 0 0 3 ...
##  $ PZEILPL : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PPLEZIER: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PFIETS  : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PINBOED : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ PBYSTAND: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AWAPART : num  0 2 1 0 0 0 0 0 0 1 ...
##  $ AWABEDR : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AWALAND : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ APERSAUT: num  1 0 1 1 0 1 1 0 1 0 ...
##  $ ABESAUT : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AMOTSCO : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AVRAAUT : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AAANHANG: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ ATRACTOR: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AWERKT  : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ ABROM   : num  0 0 0 0 0 0 0 1 0 0 ...
##  $ ALEVEN  : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ APERSONG: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AGEZONG : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AWAOREG : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ ABRAND  : num  1 1 1 1 1 0 0 0 0 1 ...
##  $ AZEILPL : num  0 0 0 0 0 0 0 0 0 0 ...
```

```
##  $ APLEZIER: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AFIETS  : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ AINBOED : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ ABYSTAND: num  0 0 0 0 0 0 0 0 0 0 ...
##  $ Purchase: Factor w/ 2 levels "No","Yes": 1 1 1 1 1 1 1 1 1 1 ...
```

```
summary(Caravan$Purchase)
```

```
##   No  Yes
## 5474  348
```

NA/NULL values checking

```
any(is.na(Caravan))
```

```
## [1] FALSE
```

Standardizing the dataset values

```
purchase = Caravan[,86]
standCaravan = scale(Caravan[,-86])
```

Starting with the ML KNN model

Splitting the dataset

```
testIndex = 1:1000
testData = standCaravan[testIndex,]
testPurchase = purchase[testIndex]
head(testData)
```

```
##       MOSTYPE   MAANTHUI    MGEMOMV    MGEMLEEF   MOSHOOFD     MGODRK
## 1  0.68084775 -0.2725565  0.4066617 -1.21685949  0.7793384 -0.6942510
## 2  0.99221162 -0.2725565 -0.8594262 -1.21685949  0.7793384  0.3025256
## 3  0.99221162 -0.2725565 -0.8594262 -1.21685949  0.7793384 -0.6942510
## 4 -1.18733547 -0.2725565  0.4066617  0.01075374 -0.9708962  1.2993023
## 5  1.22573452 -0.2725565  1.6727497 -1.21685949  1.4794323  0.3025256
## 6 -0.09756193 -0.2725565 -0.8594262 -2.44447272 -0.2708024 -0.6942510
##       MGODPR      MGODOV     MGODGE      MRELGE     MRELSA     MRELOV
## 1  0.2174254 -0.06870474 -0.1618019  0.42763309 -0.9147152 -0.1686070
## 2 -0.3653787 -0.06870474  0.4641188 -0.09606902  1.1558416 -0.1686070
## 3 -0.3653787  0.91409379  0.4641188 -1.66717535  1.1558416  0.9923984
## 4 -0.9481828  0.91409379  0.4641188 -0.61977113  1.1558416 -0.1686070
## 5 -0.3653787 -0.06870474  0.4641188  0.42763309  0.1205632 -0.1686070
## 6  0.2174254 -1.05150327  1.0900394 -3.23828168  5.2969552  0.4118957
##      MFALLEEN   MFGEKIND   MFWEKIND   MOPLHOOG   MOPLMIDD  MOPLLAAG
MBERHOOG
## 1 -0.49316828 -0.7594776  0.8476406 -0.2840537 -0.7672994  1.056303 -
0.49771599
## 2 -1.04874601  0.4751109  0.3489579 -0.9002091  0.9362281 -0.249109 -
```

```
1.05379016
## 3  1.17356491  0.4751109 -1.1470900 -0.9002091  0.9362281 -0.249109 -
1.05379016
## 4  0.06240945 -0.1421834 -0.1497247  0.9482569  0.3683856 -1.119384
1.17050651
## 5  0.06240945  0.4751109 -0.1497247  2.1805675  0.3683856 -1.989658 -
1.05379016
## 6  0.61798718  1.0924051 -1.1470900 -0.9002091  0.9362281 -0.249109
0.05835818
##     MBERZELF   MBERBOER    MBERMIDD   MBERARBG   MBERARBO       MSKA
MSKB1
## 1 -0.5134655  0.4519435 -0.48867535  1.6062403 -0.1810114 -0.3602967 -
0.4560402
## 2 -0.5134655 -0.4941964  1.14204755 -1.2825312  1.0004331 -0.9407194
0.2954645
## 3 -0.5134655 -0.4941964  2.22919616 -1.2825312 -0.1810114 -0.9407194
2.5499783
## 4 -0.5134655 -0.4941964  0.05489895 -0.7047769 -0.1810114  0.8005486
0.2954645
## 5  5.9375404  3.2903633 -1.57582395 -1.2825312 -1.3624559  4.2830845 -
1.2075448
## 6 -0.5134655 -0.4941964  0.59847325 -0.1270226 -0.1810114  0.2201259
0.2954645
##       MSKB2       MSKC        MSKD      MHHUUR      MHKOOP       MAUT1
## 1 -0.132417  1.1579679 -0.05166673 -1.04776437  1.04480336  1.26200191
## 2  0.521469  0.6413238 -0.81902318 -0.72406662  0.72116169  0.61800374
## 3 -1.440189  0.1246797 -0.81902318  0.89442215 -0.89704665  0.61800374
## 4 -0.786303  0.1246797 -0.81902318  0.24702664 -0.24976331  1.90600008
## 5 -1.440189 -1.9418969 -0.81902318 -0.07667111  0.07387835 -0.02599443
## 6 -0.132417  0.1246797  0.71568971  1.54181766 -1.54432999 -0.66999260
##        MAUT2       MAUT0    MZFONDS     MZPART    MINKM30   MINK3045
MINK4575
## 1 -1.0941870 -0.59977226  0.8707582 -0.8723778 -1.2337313  0.2464230
1.1768383
## 2 -0.2629818  0.02533947 -0.1400192  0.1367586 -0.2750042 -1.8782344
1.1768383
## 3 -1.0941870  0.02533947  1.3761469 -1.3769460  0.6837229  0.7775874 -
1.4168748
## 4 -1.0941870 -1.22488399  0.3653695 -0.3678096 -0.7543677  0.7775874
0.1393531
## 5  0.5682234 -0.59977226 -0.6454080  0.6413268 -1.2337313 -1.8782344
3.2518088
## 6  1.3994286  0.65045120  1.3761469 -1.3769460  1.1630865 -0.8159057
0.1393531
##     MINK7512   MINK123M    MINKGEM   MKOOPKLA    PWAPART    PWABEDR
PWALAND
## 1 -0.6846389 -0.3674677  0.1635790 -0.6159702 -0.8045004 -0.1103469 -
0.1432555
## 2  1.0353041 -0.3674677  0.9224293 -0.1177515  1.2818254 -0.1103469 -
0.1432555
```

```
## 3 -0.6846389 -0.3674677 -0.5952712 -0.1177515  1.2818254 -0.1103469 -
0.1432555
## 4 -0.6846389 -0.3674677  0.1635790 -0.1177515 -0.8045004 -0.1103469 -
0.1432555
## 5 -0.6846389 -0.3674677  1.6812795 -0.6159702 -0.8045004 -0.1103469 -
0.1432555
## 6 -0.6846389 -0.3674677 -0.5952712 -0.6159702 -0.8045004 -0.1103469 -
0.1432555
##    PPERSAUT     PBESAUT    PMOTSCO     PVRAAUT    PAANHANG   PTRACTOR
## 1  1.037277 -0.09083565 -0.1954581 -0.03861003 -0.09850147 -0.1535128
## 2 -1.017047 -0.09083565 -0.1954581 -0.03861003 -0.09850147 -0.1535128
## 3  1.037277 -0.09083565 -0.1954581 -0.03861003 -0.09850147 -0.1535128
## 4  1.037277 -0.09083565 -0.1954581 -0.03861003 -0.09850147 -0.1535128
## 5 -1.017047 -0.09083565 -0.1954581 -0.03861003 -0.09850147 -0.1535128
## 6  1.037277 -0.09083565 -0.1954581 -0.03861003 -0.09850147 -0.1535128
##        PWERKT      PBROM     PLEVEN    PPERSONG     PGEZONG
PWAOREG
## 1 -0.05702754 -0.2644663 -0.2168784 -0.06566456 -0.07942413 -
0.06270462
## 2 -0.05702754 -0.2644663 -0.2168784 -0.06566456 -0.07942413 -
0.06270462
## 3 -0.05702754 -0.2644663 -0.2168784 -0.06566456 -0.07942413 -
0.06270462
## 4 -0.05702754 -0.2644663 -0.2168784 -0.06566456 -0.07942413 -
0.06270462
## 5 -0.05702754 -0.2644663 -0.2168784 -0.06566456 -0.07942413 -
0.06270462
## 6 -0.05702754 -0.2644663 -0.2168784 -0.06566456 -0.07942413 -
0.06270462
##        PBRAND     PZEILPL   PPLEZIER     PFIETS     PINBOED   PBYSTAND
## 1  1.68801918 -0.01975991 -0.0692012 -0.1609305 -0.07640984 -0.1163233
## 2  0.09167162 -0.01975991 -0.0692012 -0.1609305 -0.07640984 -0.1163233
## 3  0.09167162 -0.01975991 -0.0692012 -0.1609305 -0.07640984 -0.1163233
## 4  0.09167162 -0.01975991 -0.0692012 -0.1609305 -0.07640984 -0.1163233
## 5  2.22013503 -0.01975991 -0.0692012 -0.1609305 -0.07640984 -0.1163233
## 6 -0.97256008 -0.01975991 -0.0692012 -0.1609305 -0.07640984 -0.1163233
##      AWAPART    AWABEDR    AWALAND   APERSAUT     ABESAUT    AMOTSCO
## 1 -0.8179643 -0.1101261 -0.1450573  0.7239515 -0.08060189 -0.1792835
## 2  3.2418723 -0.1101261 -0.1450573 -0.9295776 -0.08060189 -0.1792835
## 3  1.2119540 -0.1101261 -0.1450573  0.7239515 -0.08060189 -0.1792835
## 4 -0.8179643 -0.1101261 -0.1450573  0.7239515 -0.08060189 -0.1792835
## 5 -0.8179643 -0.1101261 -0.1450573 -0.9295776 -0.08060189 -0.1792835
## 6 -0.8179643 -0.1101261 -0.1450573  0.7239515 -0.08060189 -0.1792835
##       AVRAAUT    AAANHANG   ATRACTOR     AWERKT      ABROM     ALEVEN
## 1 -0.03554514 -0.09969096 -0.1398328 -0.0497904 -0.2656327 -0.2028925
## 2 -0.03554514 -0.09969096 -0.1398328 -0.0497904 -0.2656327 -0.2028925
## 3 -0.03554514 -0.09969096 -0.1398328 -0.0497904 -0.2656327 -0.2028925
## 4 -0.03554514 -0.09969096 -0.1398328 -0.0497904 -0.2656327 -0.2028925
## 5 -0.03554514 -0.09969096 -0.1398328 -0.0497904 -0.2656327 -0.2028925
## 6 -0.03554514 -0.09969096 -0.1398328 -0.0497904 -0.2656327 -0.2028925
```

```
##      APERSONG     AGEZONG     AWAOREG    ABRAND     AZEILPL
APLEZIER
## 1 -0.07315883 -0.08104764 -0.05991487  0.764905 -0.02270383 -
0.07364394
## 2 -0.07315883 -0.08104764 -0.05991487  0.764905 -0.02270383 -
0.07364394
## 3 -0.07315883 -0.08104764 -0.05991487  0.764905 -0.02270383 -
0.07364394
## 4 -0.07315883 -0.08104764 -0.05991487  0.764905 -0.02270383 -
0.07364394
## 5 -0.07315883 -0.08104764 -0.05991487  0.764905 -0.02270383 -
0.07364394
## 6 -0.07315883 -0.08104764 -0.05991487 -1.014271 -0.02270383 -
0.07364394
##       AFIETS     AINBOED   ABYSTAND
## 1 -0.1506075 -0.08734022 -0.1188063
## 2 -0.1506075 -0.08734022 -0.1188063
## 3 -0.1506075 -0.08734022 -0.1188063
## 4 -0.1506075 -0.08734022 -0.1188063
## 5 -0.1506075 -0.08734022 -0.1188063
## 6 -0.1506075 -0.08734022 -0.1188063

trainData <- standCaravan[-testIndex,]
trainPurchase = purchase[-testIndex]
head(trainData)

##        MOSTYPE   MAANTHUI    MGEMOMV    MGEMLEEF    MOSHOOFD
MGODRK
## 1001  1.225735 -0.2725565  2.9388376  0.01075374  1.47943227
0.3025256
## 1002  0.135961 -0.2725565 -2.1255142  2.46598020  0.07924456 -
0.6942510
## 1003 -1.109495 -0.2725565  1.6727497 -1.21685949 -0.97089622
1.2993023
## 1004  1.070053 -0.2725565 -0.8594262 -1.21685949  1.12938535 -
0.6942510
## 1005  1.147894  2.1914562  0.4066617  0.01075374  1.12938535
0.3025256
## 1006 -1.187335 -0.2725565  1.6727497 -1.21685949 -0.97089622
1.2993023
##          MGODPR      MGODOV     MGODGE      MRELGE     MRELSA
MRELOV
## 1001 -2.1137909  3.86248938 -0.1618019  1.47503731 -0.9147152 -
1.3296124
## 1002 -0.3653787  0.91409379  0.4641188 -1.66717535 -0.9147152
2.1534038
## 1003  0.8002294 -1.05150327 -0.1618019 -0.09606902  0.1205632
0.4118957
## 1004 -0.3653787  0.91409379  0.4641188  0.42763309  0.1205632 -
0.1686070
```

```
## 1005  0.2174254 -1.05150327 -0.1618019  0.42763309  0.1205632 -
0.1686070
## 1006 -0.9481828 -0.06870474  1.0900394  0.42763309 -0.9147152 -
0.1686070
##        MFALLEEN   MFGEKIND   MFWEKIND   MOPLHOOG   MOPLMIDD   MOPLLAAG
## 1001 -1.0487460 -1.3767718  1.8450059 -0.9002091  1.5040706 -0.6842463
## 1002  2.2847204 -0.7594776 -1.6457726 -0.2840537 -1.3351419  1.0563029
## 1003 -0.4931683 -1.9940661  1.8450059  0.3321016  1.5040706 -1.1193836
## 1004  0.6179872  0.4751109 -0.6484074 -0.2840537 -1.3351419  1.4914402
## 1005 -0.4931683 -0.7594776  0.8476406 -0.2840537  0.3683856  0.1860283
## 1006 -0.4931683 -0.7594776  1.3463232  0.3321016  0.9362281 -0.6842463
##         MBERHOOG   MBERZELF   MBERBOER    MBERMIDD   MBERARBG
MBERARBO
## 1001 -0.49771599 -0.5134655  5.1826432  0.05489895 -1.2825312 -
1.3624559
## 1002 -1.05379016 -0.5134655  1.3980834 -0.48867535  1.0284860 -
0.1810114
## 1003  0.05835818  0.7767357 -0.4941964  1.14204755 -1.2825312
0.4097108
## 1004 -0.49771599 -0.5134655 -0.4941964  0.05489895  2.1839946 -
1.3624559
## 1005  0.05835818  0.7767357 -0.4941964  0.05489895 -0.1270226
0.4097108
## 1006  0.05835818 -0.5134655 -0.4941964  0.59847325 -0.7047769
0.4097108
##            MSKA      MSKB1     MSKB2       MSKC        MSKD
MHHUUR
## 1001  0.8005486 -0.4560402  2.483127 -1.9418969 -0.81902318 -
1.37146213
## 1002 -0.9407194 -0.4560402  1.175355  0.6413238 -0.81902318
1.21811991
## 1003  0.2201259  1.0469691  0.521469 -0.9086086 -0.05166673 -
0.07667111
## 1004 -0.3602967 -0.4560402 -0.786303  2.1912562 -0.81902318 -
0.40036886
## 1005 -0.3602967  1.0469691 -0.132417  0.1246797 -0.05166673 -
0.40036886
## 1006 -0.3602967  1.0469691 -0.786303  0.1246797  0.71568971
1.54181766
##           MHKOOP       MAUT1      MAUT2       MAUT0    MZFONDS
MZPART
## 1001  1.36844503 -0.02599443  1.3994286 -1.22488399  1.3761469 -
1.3769460
## 1002 -1.22068832 -1.95798893 -1.0941870  2.52578638  1.3761469 -
1.3769460
## 1003  0.07387835 -0.66999260  0.5682234  0.02533947 -0.6454080
0.6413268
## 1004  0.39752002  0.61800374 -0.2629818 -0.59977226  0.8707582 -
0.8723778
## 1005  0.39752002 -0.02599443  0.5682234  0.02533947 -0.1400192
```

```
0.1367586
## 1006 -1.54432999 -1.31399077  1.3994286  0.02533947 -0.1400192
0.1367586
##         MINKM30   MINK3045   MINK4575   MINK7512   MINK123M    MINKGEM
## 1001 -0.7543677  1.3087517  0.1393531 -0.6846389 -0.3674677 -0.5952712
## 1002 -0.2750042  0.7775874 -0.3793896  0.1753326 -0.3674677  0.1635790
## 1003 -0.2750042 -0.2847413  0.6580957  0.1753326  1.4455805  0.9224293
## 1004 -1.2337313  1.8399161 -0.3793896 -0.6846389 -0.3674677  0.1635790
## 1005 -0.2750042  0.2464230  0.1393531  0.1753326  1.4455805  0.1635790
## 1006  0.6837229 -0.2847413 -0.3793896  0.1753326 -0.3674677 -0.5952712
##        MKOOPKLA    PWAPART    PWABEDR    PWALAND   PPERSAUT
PBESAUT
## 1001 -0.6159702 -0.8045004 -0.1103469  7.8570677  1.0372771 -
0.09083565
## 1002 -1.6124077 -0.8045004 -0.1103469 -0.1432555  1.0372771 -
0.09083565
## 1003  1.8751235 -0.8045004 -0.1103469 -0.1432555  0.6948898 -
0.09083565
## 1004 -0.1177515 -0.8045004 -0.1103469 -0.1432555 -1.0170467 -
0.09083565
## 1005  0.3804673 -0.8045004 -0.1103469 -0.1432555  1.0372771 -
0.09083565
## 1006 -0.1177515  1.2818254 -0.1103469 -0.1432555  1.0372771 -
0.09083565
##         PMOTSCO     PVRAAUT    PAANHANG   PTRACTOR      PWERKT
PBROM
## 1001 -0.1954581 -0.03861003 -0.09850147  4.8209870 -0.05702754 -
0.2644663
## 1002 -0.1954581 -0.03861003 -0.09850147 -0.1535128 -0.05702754 -
0.2644663
## 1003 -0.1954581 -0.03861003 -0.09850147 -0.1535128 -0.05702754 -
0.2644663
## 1004 -0.1954581 -0.03861003 -0.09850147 -0.1535128 -0.05702754
3.4249658
## 1005 -0.1954581 -0.03861003 -0.09850147 -0.1535128 -0.05702754 -
0.2644663
## 1006  4.2627472 -0.03861003 -0.09850147 -0.1535128 -0.05702754 -
0.2644663
##          PLEVEN    PPERSONG     PGEZONG     PWAOREG     PBRAND
PZEILPL
## 1001 -0.2168784 -0.06566456 -0.07942413 -0.06270462  1.1559033 -
0.01975991
## 1002 -0.2168784 -0.06566456 -0.07942413 -0.06270462  0.6237875 -
0.01975991
## 1003 -0.2168784 -0.06566456 -0.07942413 -0.06270462 -0.9725601 -
0.01975991
## 1004 -0.2168784 -0.06566456 -0.07942413 -0.06270462 -0.9725601 -
0.01975991
## 1005 -0.2168784 -0.06566456 -0.07942413 -0.06270462 -0.9725601 -
0.01975991
```

```
## 1006 -0.2168784 -0.06566456 -0.07942413 -0.06270462  0.6237875 -
0.01975991
##        PPLEZIER     PFIETS     PINBOED   PBYSTAND    AWAPART
AWABEDR
## 1001 -0.0692012 -0.1609305 -0.07640984 -0.1163233 -0.8179643 -
0.1101261
## 1002 -0.0692012 -0.1609305 -0.07640984 -0.1163233 -0.8179643 -
0.1101261
## 1003 -0.0692012 -0.1609305 -0.07640984 -0.1163233 -0.8179643 -
0.1101261
## 1004 -0.0692012 -0.1609305 -0.07640984 -0.1163233 -0.8179643 -
0.1101261
## 1005 -0.0692012 -0.1609305 -0.07640984 -0.1163233 -0.8179643 -
0.1101261
## 1006 -0.0692012 -0.1609305 -0.07640984 -0.1163233  1.2119540 -
0.1101261
##         AWALAND   APERSAUT     ABESAUT    AMOTSCO     AVRAAUT
AAANHANG
## 1001  6.8926414  0.7239515 -0.08060189 -0.1792835 -0.03554514 -
0.09969096
## 1002 -0.1450573  0.7239515 -0.08060189 -0.1792835 -0.03554514 -
0.09969096
## 1003 -0.1450573  0.7239515 -0.08060189 -0.1792835 -0.03554514 -
0.09969096
## 1004 -0.1450573 -0.9295776 -0.08060189 -0.1792835 -0.03554514 -
0.09969096
## 1005 -0.1450573  0.7239515 -0.08060189 -0.1792835 -0.03554514 -
0.09969096
## 1006 -0.1450573  0.7239515 -0.08060189  4.1880316 -0.03554514 -
0.09969096
##        ATRACTOR     AWERKT      ABROM     ALEVEN    APERSONG
AGEZONG
## 1001  4.0137727 -0.0497904 -0.2656327 -0.2028925 -0.07315883 -
0.08104764
## 1002 -0.1398328 -0.0497904 -0.2656327 -0.2028925 -0.07315883 -
0.08104764
## 1003 -0.1398328 -0.0497904 -0.2656327 -0.2028925 -0.07315883 -
0.08104764
## 1004 -0.1398328 -0.0497904  3.5063514 -0.2028925 -0.07315883 -
0.08104764
## 1005 -0.1398328 -0.0497904 -0.2656327 -0.2028925 -0.07315883 -
0.08104764
## 1006 -0.1398328 -0.0497904 -0.2656327 -0.2028925 -0.07315883 -
0.08104764
##          AWAOREG    ABRAND     AZEILPL    APLEZIER     AFIETS
AINBOED
## 1001 -0.05991487  0.764905 -0.02270383 -0.07364394 -0.1506075 -
0.08734022
## 1002 -0.05991487  0.764905 -0.02270383 -0.07364394 -0.1506075 -
0.08734022
```

```
## 1003 -0.05991487 -1.014271 -0.02270383 -0.07364394 -0.1506075 -
0.08734022
## 1004 -0.05991487 -1.014271 -0.02270383 -0.07364394 -0.1506075 -
0.08734022
## 1005 -0.05991487 -1.014271 -0.02270383 -0.07364394 -0.1506075 -
0.08734022
## 1006 -0.05991487  0.764905 -0.02270383 -0.07364394 -0.1506075 -
0.08734022
##        ABYSTAND
## 1001 -0.1188063
## 1002 -0.1188063
## 1003 -0.1188063
## 1004 -0.1188063
## 1005 -0.1188063
## 1006 -0.1188063
```

Training the model (without knowning the best k value)

```
library(class)

prePurchase = knn(trainData, testData, trainPurchase, k = 1)
head(prePurchase)
```

```
## [1] No No No No No No
## Levels: No Yes
```

Getting the model performance

```
misclassError1 = mean(testPurchase != prePurchase)
print(paste0("The error chance is for ", misclassError1))
```

```
## [1] "The error chance is for 0.115"
```

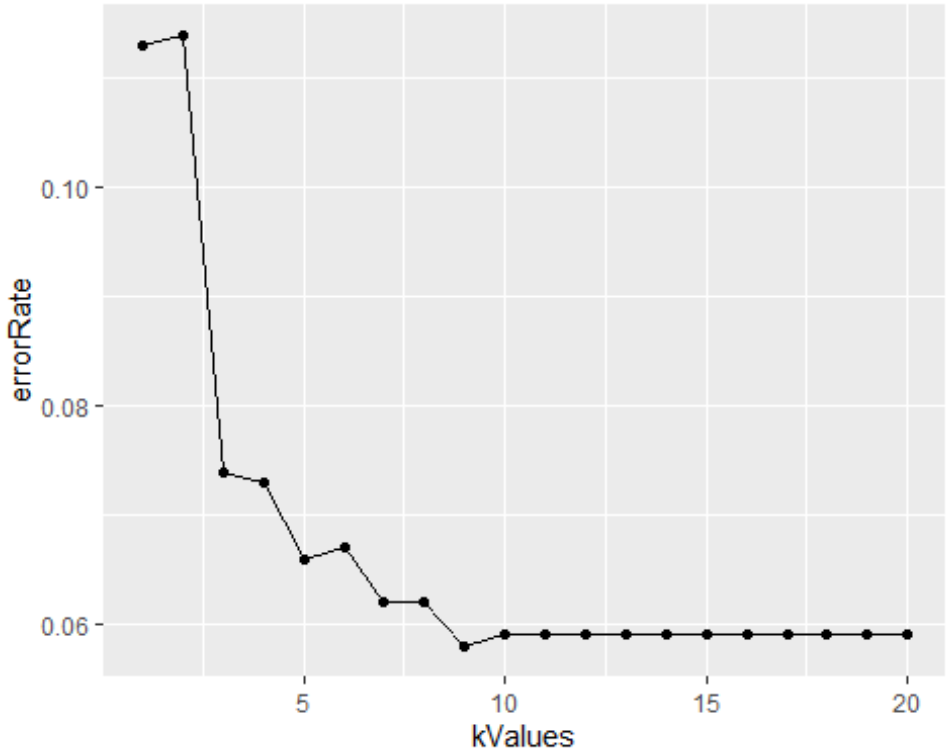
Choosing the best K value

```
prePurchase = NULL
errorRate = NULL

for (i in 1:20){
  prePurchase = knn(trainData, testData, trainPurchase, k = i)
  errorRate[i] = mean(testPurchase != prePurchase)
}
print(errorRate)
```

```
##  [1] 0.113 0.114 0.074 0.073 0.066 0.067 0.062 0.062 0.058 0.059 0.059
0.059
## [13] 0.059 0.059 0.059 0.059 0.059 0.059 0.059 0.059
```

Visualizing the best K elbow method

```
library(ggplot2)
kValues = 1:20
errorDf = data.frame(errorRate, kValues)

ggplot(errorDf, aes(kValues, errorRate)) + geom_point() + geom_line()
```



KNN model with the right K value

```
prePurchase = knn(trainData, testData, trainPurchase, k = 9)
misclassError2 = mean(testPurchase != prePurchase)
print(paste0("The error chance is for ", misclassError2))

## [1] "The error chance is for 0.058"
```