Linear regression_KDD

Bhargavi

September 13, 2017

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
knitr::opts_chunk$set(echo = TRUE)



my_data_KDD = read.csv("PVAslice.csv", sep =",", header = TRUE, skipNul = TRUE)
dim(my_data_KDD)
```

```
## [1] 4999  481
```

```
#the number of people who made atleast some gift
summary(my_data_KDD$TARGET_D)
```

```
##     Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
##   0.0000   0.0000   0.0000   0.7954   0.0000 100.0000
```

```
sum(my_data_KDD$TARGET_D > 0)
```

```
## [1] 268
```

```
my_data_KDD$TARGET_D > 0
```

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## [4610] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4621] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4632]  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4643] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4654] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4665] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4676] FALSE FALSE FALSE  TRUE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE
## [4687] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4698] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4709] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4720] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4731] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4742] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4753] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4764] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4775] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4786] FALSE  TRUE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4797] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
## [4808] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4819] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4830] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4841] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4852] FALSE FALSE FALSE FALSE FALSE  TRUE  TRUE FALSE FALSE FALSE FALSE
## [4863] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4874] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4885] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4896] FALSE FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [4907] FALSE FALSE FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE
## [4918]  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE  TRUE
## [4929] FALSE FALSE FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE
## [4940] FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4951] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4962] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4973] FALSE FALSE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [4984] FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
```

```
## [4995] FALSE FALSE FALSE FALSE FALSE
```

```
# To get the column names
KDD_data_column_names <- names(my_data_KDD)
print(KDD_data_column_names)
```

```
##   [1] "ODATEDW"  "OSOURCE"  "TCODE"    "STATE"    "ZIP"      "MAILCODE"
##   [7] "PVASTATE" "DOB"      "NOEXCH"   "RECINHSE" "RECP3"    "RECPGVG"
##  [13] "RECSWEEP" "MDMAUD"   "DOMAIN"   "CLUSTER"  "AGE"      "AGEFLAG"
##  [19] "HOMEOWNR" "CHILD03"  "CHILD07"  "CHILD12"  "CHILD18"  "NUMCHLD"
##  [25] "INCOME"   "GENDER"   "WEALTH1"  "HIT"      "MBCRAFT"  "MBGARDEN"
##  [31] "MBBOOKS"  "MBCOLECT" "MAGFAML"  "MAGFEM"   "MAGMALE"  "PUBGARDN"
##  [37] "PUBCULIN" "PUBHLTH"  "PUBDOITY" "PUBNEWFN" "PUBPHOTO" "PUBOPP"
##  [43] "DATASRCE" "MALEMILI" "MALEVET"  "VIETVETS" "WWIIVETS" "LOCALGOV"
##  [49] "STATEGOV" "FEDGOV"   "SOLP3"    "SOLIH"    "MAJOR"    "WEALTH2"
##  [55] "GEOCODE"  "COLLECT1" "VETERANS" "BIBLE"    "CATLG"    "HOMEE"
##  [61] "PETS"     "CDPLAY"   "STEREO"   "PCOWNERS" "PHOTO"    "CRAFTS"
##  [67] "FISHER"   "GARDENIN" "BOATS"    "WALKER"   "KIDSTUFF" "CARDS"
##  [73] "PLATES"   "LIFESRC"  "PEPSTRFL" "POP901"   "POP902"   "POP903"
##  [79] "POP90C1"  "POP90C2"  "POP90C3"  "POP90C4"  "POP90C5"  "ETH1"
##  [85] "ETH2"     "ETH3"     "ETH4"     "ETH5"     "ETH6"     "ETH7"
##  [91] "ETH8"     "ETH9"     "ETH10"    "ETH11"    "ETH12"    "ETH13"
##  [97] "ETH14"    "ETH15"    "ETH16"    "AGE901"   "AGE902"   "AGE903"
## [103] "AGE904"   "AGE905"   "AGE906"   "AGE907"   "CHIL1"    "CHIL2"
## [109] "CHIL3"    "AGEC1"    "AGEC2"    "AGEC3"    "AGEC4"    "AGEC5"
## [115] "AGEC6"    "AGEC7"    "CHILC1"   "CHILC2"   "CHILC3"   "CHILC4"
## [121] "CHILC5"   "HHAGE1"   "HHAGE2"   "HHAGE3"   "HHN1"     "HHN2"
## [127] "HHN3"     "HHN4"     "HHN5"     "HHN6"     "MARR1"    "MARR2"
## [133] "MARR3"    "MARR4"    "HHP1"     "HHP2"     "DW1"      "DW2"
## [139] "DW3"      "DW4"      "DW5"      "DW6"      "DW7"      "DW8"
## [145] "DW9"      "HV1"      "HV2"      "HV3"      "HV4"      "HU1"
## [151] "HU2"      "HU3"      "HU4"      "HU5"      "HHD1"     "HHD2"
## [157] "HHD3"     "HHD4"     "HHD5"     "HHD6"     "HHD7"     "HHD8"
## [163] "HHD9"     "HHD10"    "HHD11"    "HHD12"    "ETHC1"    "ETHC2"
## [169] "ETHC3"    "ETHC4"    "ETHC5"    "ETHC6"    "HVP1"     "HVP2"
## [175] "HVP3"     "HVP4"     "HVP5"     "HVP6"     "HUR1"     "HUR2"
## [181] "RHP1"     "RHP2"     "RHP3"     "RHP4"     "HUPA1"    "HUPA2"
## [187] "HUPA3"    "HUPA4"    "HUPA5"    "HUPA6"    "HUPA7"    "RP1"
## [193] "RP2"      "RP3"      "RP4"      "MSA"      "ADI"      "DMA"
## [199] "IC1"      "IC2"      "IC3"      "IC4"      "IC5"      "IC6"
## [205] "IC7"      "IC8"      "IC9"      "IC10"     "IC11"     "IC12"
## [211] "IC13"     "IC14"     "IC15"     "IC16"     "IC17"     "IC18"
## [217] "IC19"     "IC20"     "IC21"     "IC22"     "IC23"     "HHAS1"
## [223] "HHAS2"    "HHAS3"    "HHAS4"    "MC1"      "MC2"      "MC3"
## [229] "TPE1"     "TPE2"     "TPE3"     "TPE4"     "TPE5"     "TPE6"
## [235] "TPE7"     "TPE8"     "TPE9"     "PEC1"     "PEC2"     "TPE10"
## [241] "TPE11"    "TPE12"    "TPE13"    "LFC1"     "LFC2"     "LFC3"
## [247] "LFC4"     "LFC5"     "LFC6"     "LFC7"     "LFC8"     "LFC9"
## [253] "LFC10"    "OCC1"     "OCC2"     "OCC3"     "OCC4"     "OCC5"
## [259] "OCC6"     "OCC7"     "OCC8"     "OCC9"     "OCC10"    "OCC11"
## [265] "OCC12"    "OCC13"    "EIC1"     "EIC2"     "EIC3"     "EIC4"
## [271] "EIC5"     "EIC6"     "EIC7"     "EIC8"     "EIC9"     "EIC10"
## [277] "EIC11"    "EIC12"    "EIC13"    "EIC14"    "EIC15"    "EIC16"
## [283] "OEDC1"    "OEDC2"    "OEDC3"    "OEDC4"    "OEDC5"    "OEDC6"
## [289] "OEDC7"    "EC1"      "EC2"      "EC3"      "EC4"      "EC5"
```

```
## [295] "EC6"      "EC7"      "EC8"      "SEC1"     "SEC2"     "SEC3"
## [301] "SEC4"     "SEC5"     "AFC1"     "AFC2"     "AFC3"     "AFC4"
## [307] "AFC5"     "AFC6"     "VC1"      "VC2"      "VC3"      "VC4"
## [313] "ANC1"     "ANC2"     "ANC3"     "ANC4"     "ANC5"     "ANC6"
## [319] "ANC7"     "ANC8"     "ANC9"     "ANC10"    "ANC11"    "ANC12"
## [325] "ANC13"    "ANC14"    "ANC15"    "POBC1"    "POBC2"    "LSC1"
## [331] "LSC2"     "LSC3"     "LSC4"     "VOC1"     "VOC2"     "VOC3"
## [337] "HC1"      "HC2"      "HC3"      "HC4"      "HC5"      "HC6"
## [343] "HC7"      "HC8"      "HC9"      "HC10"     "HC11"     "HC12"
## [349] "HC13"     "HC14"     "HC15"     "HC16"     "HC17"     "HC18"
## [355] "HC19"     "HC20"     "HC21"     "MHUC1"    "MHUC2"    "AC1"
## [361] "AC2"      "ADATE_2"  "ADATE_3"  "ADATE_4"  "ADATE_5"  "ADATE_6"
## [367] "ADATE_7"  "ADATE_8"  "ADATE_9"  "ADATE_10" "ADATE_11" "ADATE_12"
## [373] "ADATE_13" "ADATE_14" "ADATE_15" "ADATE_16" "ADATE_17" "ADATE_18"
## [379] "ADATE_19" "ADATE_20" "ADATE_21" "ADATE_22" "ADATE_23" "ADATE_24"
## [385] "RFA_2"    "RFA_3"    "RFA_4"    "RFA_5"    "RFA_6"    "RFA_7"
## [391] "RFA_8"    "RFA_9"    "RFA_10"   "RFA_11"   "RFA_12"   "RFA_13"
## [397] "RFA_14"   "RFA_15"   "RFA_16"   "RFA_17"   "RFA_18"   "RFA_19"
## [403] "RFA_20"   "RFA_21"   "RFA_22"   "RFA_23"   "RFA_24"   "CARDPROM"
## [409] "MAXADATE" "NUMPROM"  "CARDPM12" "NUMPRM12" "RDATE_3"  "RDATE_4"
## [415] "RDATE_5"  "RDATE_6"  "RDATE_7"  "RDATE_8"  "RDATE_9"  "RDATE_10"
## [421] "RDATE_11" "RDATE_12" "RDATE_13" "RDATE_14" "RDATE_15" "RDATE_16"
## [427] "RDATE_17" "RDATE_18" "RDATE_19" "RDATE_20" "RDATE_21" "RDATE_22"
## [433] "RDATE_23" "RDATE_24" "RAMNT_3"  "RAMNT_4"  "RAMNT_5"  "RAMNT_6"
## [439] "RAMNT_7"  "RAMNT_8"  "RAMNT_9"  "RAMNT_10" "RAMNT_11" "RAMNT_12"
## [445] "RAMNT_13" "RAMNT_14" "RAMNT_15" "RAMNT_16" "RAMNT_17" "RAMNT_18"
## [451] "RAMNT_19" "RAMNT_20" "RAMNT_21" "RAMNT_22" "RAMNT_23" "RAMNT_24"
## [457] "RAMNTALL" "NGIFTALL" "CARDGIFT" "MINRAMNT" "MINRDATE" "MAXRAMNT"
## [463] "MAXRDATE" "LASTGIFT" "LASTDATE" "FISTDATE" "NEXTDATE" "TIMELAG"
## [469] "AVGGIFT"  "CONTROLN" "TARGET_B" "TARGET_D" "HPHONE_D" "RFA_2R"
## [475] "RFA_2F"   "RFA_2A"   "MDMAUD_R" "MDMAUD_F" "MDMAUD_A" "CLUSTER2"
## [481] "GEOCODE2"
```

```
# To get the names of the column which contain the word TARGET

grep("TARGET_D", KDD_data_column_names)
```

```
## [1] 472
```

```
# to get the columns of the predictor variable- HVP1

grep("HVP1",KDD_data_column_names)
```

```
## [1] 173
```

```
# to get the columns of the predictor variable- HVP6

grep("HVP6", KDD_data_column_names)
```

```
## [1] 178
```

```
mydata_model <- my_data_KDD[my_data_KDD$TARGET_D >0 ,c(472, 173:178)]
dim(mydata_model)
```

```
## [1] 268   7
```

```r
# build linear regression model


mylm_KDD <- lm(TARGET_D ~ ., data = mydata_model)
mylm_KDD
```

```
##
## Call:
## lm(formula = TARGET_D ~ ., data = mydata_model)
##
## Coefficients:
## (Intercept)         HVP1         HVP2         HVP3         HVP4
##   13.098232    -0.291808     0.182650    -0.002954    -0.005968
##        HVP5         HVP6
##    0.008317     0.229684
```

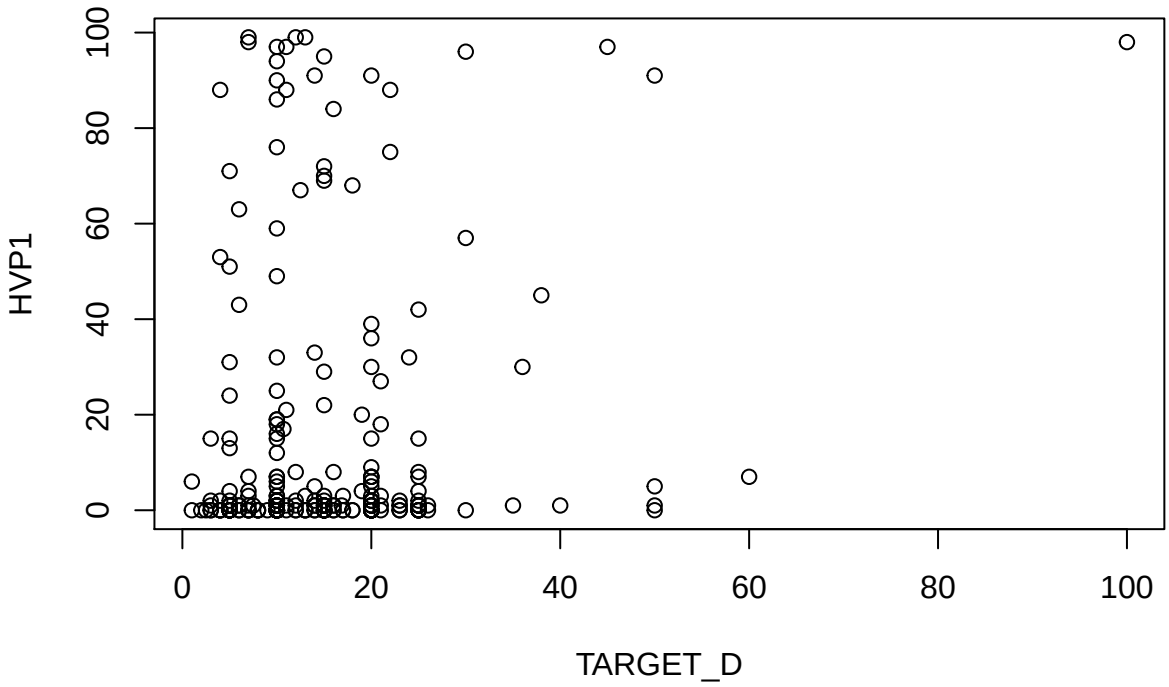
```r
# plot the graph
mylmsummary_KDD <- summary(mylm_KDD)
mylmsummary_KDD
```

```
##
## Call:
## lm(formula = TARGET_D ~ ., data = mydata_model)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -18.21  -6.44  -2.67   5.66  76.12
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 13.098232   2.186264   5.991 6.88e-09 ***
## HVP1        -0.291808   0.129120  -2.260  0.02465 *
## HVP2         0.182650   0.112153   1.629  0.10461
## HVP3        -0.002954   0.084480  -0.035  0.97213
## HVP4        -0.005968   0.072862  -0.082  0.93478
## HVP5         0.008317   0.051129   0.163  0.87091
## HVP6         0.229684   0.084824   2.708  0.00722 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 10.23 on 261 degrees of freedom
## Multiple R-squared:  0.05664,    Adjusted R-squared:  0.03495
## F-statistic: 2.612 on 6 and 261 DF,  p-value: 0.01782
```

```r
names(mylmsummary_KDD)
```

```
##  [1] "call"          "terms"         "residuals"     "coefficients"
##  [5] "aliased"       "sigma"         "df"            "r.squared"
##  [9] "adj.r.squared" "fstatistic"    "cov.unscaled"
```

```r
# plot a graph of response variable vs one of the predictors HVP1
with(mydata_model, plot(TARGET_D, HVP1))
```



Note that the `echo = TRUE` parameter was added to the code chunk to print R code that generated the plot.

The R-squared statistic provides a measure of how well the model is fitting the actual data. It takes the form of a proportion of variance. This is a measure of the linear relationship between our predictor variable and our response / target variable . In our example, we get 0.05664. Or roughly 5% of the variance found in the response variable can be explained by the predictor variables.

There is no evidence of a good linear fit since the Multiple R-squared is 0.05 which is very less.

Also, F statistic is 2.612 which suggests that there is weak relationship between predictor and response variables.

Other variables need to analyzed as predictors of donor quantity. They are:

“ODATEDW”, “OSOURCE”, “STATE”, “ZIP”, “PVASTATE”, “DOB”, “RECINHSE”, “MDMAUD”, “DOMAIN”, “CLUSTER”, “AGE”, “HOMEOWNR”, “INCOME”, , “WEALTH1”, “HIT”,“COLLECT1”, “VETERANS”, “BIBLE”, “CATLG”, “HOMEE”, “PETS”, “CDPLAY”, “STEREO”, “PCOWNERS”, “PHOTO”, “CRAFTS”, “FISHER”, “GARDENIN”, “BOATS”, “WALKER”, “KIDSTUFF”, “CARDS”, “PLATES”, “PEPSTRFL”,“CARDPROM”, “MAXADATE”, “NUMPROM”, “CARDPM12”, “NUMPRM12”, “RAMNTALL”, “NGIFTALL”, “CARDGIFT”, “MINRAMNT”, “MAXRAMNT”, “LASTGIFT”, “LASTDATE”, “FISTDATE”, “TIMELAG”, “AVGGIFT”“RFA_2F”, “RFA_2A”, “MDMAUD_R”, “MDMAUD_F”, “MDMAUD_A