Factors Affecting CPC

Code

4.Make a data model to predict the factors affecting CPC.

The aim was to build a data model for feature selection. Methods Used: 1. Using Step wise regression 2.Random Forest (Limitation can only perform feature selection till 53 levels but Region and city indicator had more levels. In order to continue withthe model removed region and city indicators) 3.Decision Trees(Same limitation as Random Forest) 4.Boruta

Conclusion: As per the data models top 5 predictors are: a) CTR b) Clicks c) CPV d) Total_Spend e) CPCV

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```
Data<-read.csv('D:/Rutgers Study Material/MultivariateData1.csv')
# top 5 columns of the dataset
head(Data)
```

	ï..Region <fctr>	Region_Indicators <int>	City <fctr>	City_indicators <int>	SupplyVendor <fctr>	SupplyVendors_Indi
1	Hawaii	60	'Aiea	2208	beanstock	
2	Hawaii	60	'Aiea	2208	brightroll	
3	Hawaii	60	'Aiea	2208	brightroll	
4	Hawaii	60	'Aiea	2208	brightroll	
5	Hawaii	60	'Aiea	2208	brightroll	
6	Hawaii	60	'Aiea	2208	brightroll	

6 rows | 1-7 of 23 columns

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```
# Removing the extra columns
drops <- c("ï..Region","City","SupplyVendor","OS","Browser","DeviceType","Impression_Time")
New_data<-Data[ , !(names(Data) %in% drops)]
dim(New_data)
```

```
[1] 472666     16
```

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```
New_data$CPV[ is.na(New_data$CPV)] <- 0
New_data$CPC[ is.na(New_data$CPC)] <- 0
New_data$CPCV[ is.na(New_data$CPCV)] <- 0
```

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```
# Model fitting
fit<- lm(CPC~., data=New_data)
summary(fit)
```

```
Call:
lm(formula = CPC ~ ., data = New_data)

Residuals:
      Min        1Q    Median        3Q       Max
-0.012169 -0.000021  0.000005  0.000021  0.039840

Coefficients:
                           Estimate Std. Error t value Pr(>|t|)
(Intercept)              -1.280e-04  4.415e-06 -28.983  < 2e-16
Region_Indicators        -2.602e-09  3.041e-08  -0.086  0.93181
City_indicators           5.898e-10  4.249e-10   1.388  0.16511
SupplyVendors_Indicators  3.216e-07  9.976e-08   3.224  0.00126
OS_Indicators             6.012e-07  1.090e-07   5.513 3.53e-08
Browser_Indicators        2.395e-06  2.633e-07   9.096  < 2e-16
DeviceType_Indicators    -5.771e-06  8.246e-07  -6.998 2.60e-12
Impression_Day           -4.916e-07  2.676e-07  -1.837  0.06618
Impressions               1.176e-05  2.890e-06   4.070 4.71e-05
Clicks                    3.144e-04  3.416e-05   9.204  < 2e-16
CTR                       1.197e-02  3.508e-05 341.272  < 2e-16
VCR                       2.566e-05  5.627e-06   4.560 5.12e-06
CPV                      -1.365e-03  2.936e-04  -4.650 3.33e-06
Completes                -2.073e-05  4.521e-06  -4.586 4.51e-06
Total_Spend               1.190e-02  3.480e-04  34.186  < 2e-16
CPCV                     -1.321e-03  2.639e-04  -5.004 5.60e-07

(Intercept)              ***
Region_Indicators
City_indicators
SupplyVendors_Indicators **
OS_Indicators            ***
Browser_Indicators       ***
DeviceType_Indicators    ***
Impression_Day           .
Impressions              ***
Clicks                   ***
CTR                      ***
VCR                      ***
CPV                      ***
Completes                ***
Total_Spend              ***
CPCV                     ***
---
Signif. codes:  0 □***□ 0.001 □**□ 0.01 □*□ 0.05 □.□ 0.1 □ □ 1

Residual standard error: 0.0003526 on 472650 degrees of freedom
Multiple R-squared:  0.8855,    Adjusted R-squared:  0.8855
F-statistic: 2.437e+05 on 15 and 472650 DF,  p-value: < 2.2e-16
```

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```
# Step wise Regression
model1<- step(fit)
```

```
Start:  AIC=-7515546
CPC ~ Region_Indicators + City_indicators + SupplyVendors_Indicators +
    OS_Indicators + Browser_Indicators + DeviceType_Indicators +
    Impression_Day + Impressions + Clicks + CTR + VCR + CPV +
    Completes + Total_Spend + CPCV

                          Df Sum of Sq      RSS      AIC
- Region_Indicators        1 0.0000000 0.058762 -7515548
- City_indicators          1 0.0000002 0.058763 -7515546
<none>                                 0.058762 -7515546
- Impression_Day           1 0.0000004 0.058763 -7515544
- SupplyVendors_Indicators  1 0.0000013 0.058764 -7515537
- Impressions              1 0.0000021 0.058764 -7515531
- VCR                      1 0.0000026 0.058765 -7515527
- Completes                1 0.0000026 0.058765 -7515526
- CPV                      1 0.0000027 0.058765 -7515526
- CPCV                     1 0.0000031 0.058765 -7515522
- OS_Indicators            1 0.0000038 0.058766 -7515517
- DeviceType_Indicators    1 0.0000061 0.058768 -7515499
- Browser_Indicators       1 0.0000103 0.058773 -7515465
- Clicks                   1 0.0000105 0.058773 -7515463
- Total_Spend              1 0.0001453 0.058908 -7514380
- CTR                      1 0.0144797 0.073242 -7411434

Step:  AIC=-7515548
CPC ~ City_indicators + SupplyVendors_Indicators + OS_Indicators +
    Browser_Indicators + DeviceType_Indicators + Impression_Day +
    Impressions + Clicks + CTR + VCR + CPV + Completes + Total_Spend +
    CPCV

                          Df Sum of Sq      RSS      AIC
<none>                                 0.058762 -7515548
- City_indicators          1 0.0000003 0.058763 -7515547
- Impression_Day           1 0.0000004 0.058763 -7515546
- SupplyVendors_Indicators  1 0.0000013 0.058764 -7515539
- Impressions              1 0.0000021 0.058764 -7515533
- VCR                      1 0.0000026 0.058765 -7515529
- Completes                1 0.0000026 0.058765 -7515528
- CPV                      1 0.0000027 0.058765 -7515528
- CPCV                     1 0.0000031 0.058765 -7515524
- OS_Indicators            1 0.0000038 0.058766 -7515519
- DeviceType_Indicators    1 0.0000061 0.058768 -7515501
- Browser_Indicators       1 0.0000104 0.058773 -7515466
- Clicks                   1 0.0000105 0.058773 -7515465
- Total_Spend              1 0.0001453 0.058908 -7514382
- CTR                      1 0.0144840 0.073246 -7411408
```

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```
summary(model1)
```

```
Call:
lm(formula = CPC ~ City_indicators + SupplyVendors_Indicators + 
    OS_Indicators + Browser_Indicators + DeviceType_Indicators + 
    Impression_Day + Impressions + Clicks + CTR + VCR + CPV + 
    Completes + Total_Spend + CPCV, data = New_data)

Residuals:
      Min        1Q    Median        3Q       Max 
-0.012169 -0.000021  0.000005  0.000021  0.039840 

Coefficients:
                           Estimate Std. Error t value Pr(>|t|)
(Intercept)              -1.280e-04  4.399e-06 -29.092  < 2e-16
City_indicators           5.781e-10  4.023e-10   1.437  0.15068
SupplyVendors_Indicators  3.216e-07  9.976e-08   3.224  0.00127
OS_Indicators             6.011e-07  1.090e-07   5.512 3.54e-08
Browser_Indicators        2.392e-06  2.620e-07   9.131  < 2e-16
DeviceType_Indicators    -5.770e-06  8.246e-07  -6.998 2.61e-12
Impression_Day           -4.916e-07  2.676e-07  -1.837  0.06618
Impressions               1.176e-05  2.890e-06   4.070 4.70e-05
Clicks                    3.145e-04  3.416e-05   9.207  < 2e-16
CTR                       1.197e-02  3.507e-05 341.323  < 2e-16
VCR                       2.565e-05  5.626e-06   4.559 5.13e-06
CPV                      -1.365e-03  2.936e-04  -4.651 3.31e-06
Completes                -2.074e-05  4.521e-06  -4.587 4.51e-06
Total_Spend               1.190e-02  3.480e-04  34.186  < 2e-16
CPCV                     -1.321e-03  2.639e-04  -5.004 5.62e-07

(Intercept)              ***
City_indicators          
SupplyVendors_Indicators **
OS_Indicators            ***
Browser_Indicators       ***
DeviceType_Indicators    ***
Impression_Day           .
Impressions              ***
Clicks                   ***
CTR                      ***
VCR                      ***
CPV                      ***
Completes                ***
Total_Spend              ***
CPCV                     ***
---
Signif. codes:  0 □***□ 0.001 □**□ 0.01 □*□ 0.05 □.□ 0.1 □ □ 1

Residual standard error: 0.0003526 on 472651 degrees of freedom
Multiple R-squared:  0.8855,    Adjusted R-squared:  0.8855 
F-statistic: 2.611e+05 on 14 and 472651 DF,  p-value: < 2.2e-16
```

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```
drops <- c("Region_Indicators","City_indicators")
RF<-New_data[ , !(names(New_data) %in% drops)]
```

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```
dt<-sort(sample(nrow(RF),nrow(RF)*.8))
train<-RF[dt,]
test<-RF[-dt,]
library(randomForest)
```

```
package <U+393C><U+3E31>randomForest<U+393C><U+3E32> was built under R version 3.4.3randomForest
4.6-12
Type rfNews() to see new features/changes/bug fixes.
```

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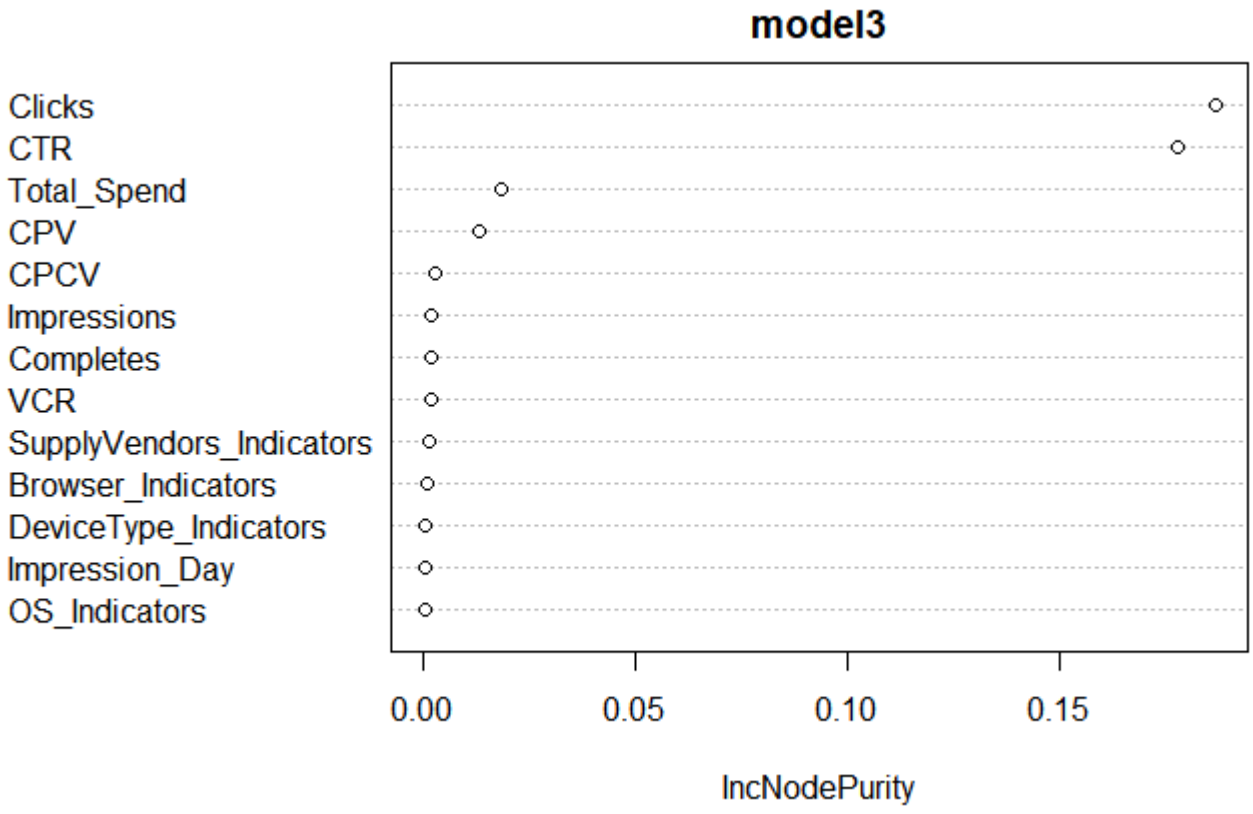
```
model3 <- randomForest(CPC~., train, ntree=50)
varImpPlot(model3)
```



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```
library(rpart)
```

```
package <U+393C><U+3E31>rpart<U+393C><U+3E32> was built under R version 3.4.3
```

Hide

```
library(rpart.plot)
```

```
package <U+393C><U+3E31>rpart.plot<U+393C><U+3E32> was built under R version 3.4.3
```

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```
library(caret)
```

```
package <U+393C><U+3E31>caret<U+393C><U+3E32> was built under R version 3.4.3Loading required pa
ckage: lattice
Loading required package: ggplot2

Attaching package: <U+393C><U+3E31>ggplot2<U+393C><U+3E32>

The following object is masked from <U+393C><U+3E31>package:randomForest<U+393C><U+3E32>:

    margin
```

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```
pred2 <- predict(model3, test)
confusionMatrix(pred2, test$CPC)
```

```
Error in confusionMatrix.default(pred2, test$CPC) :
  the data cannot have more levels than the reference
```

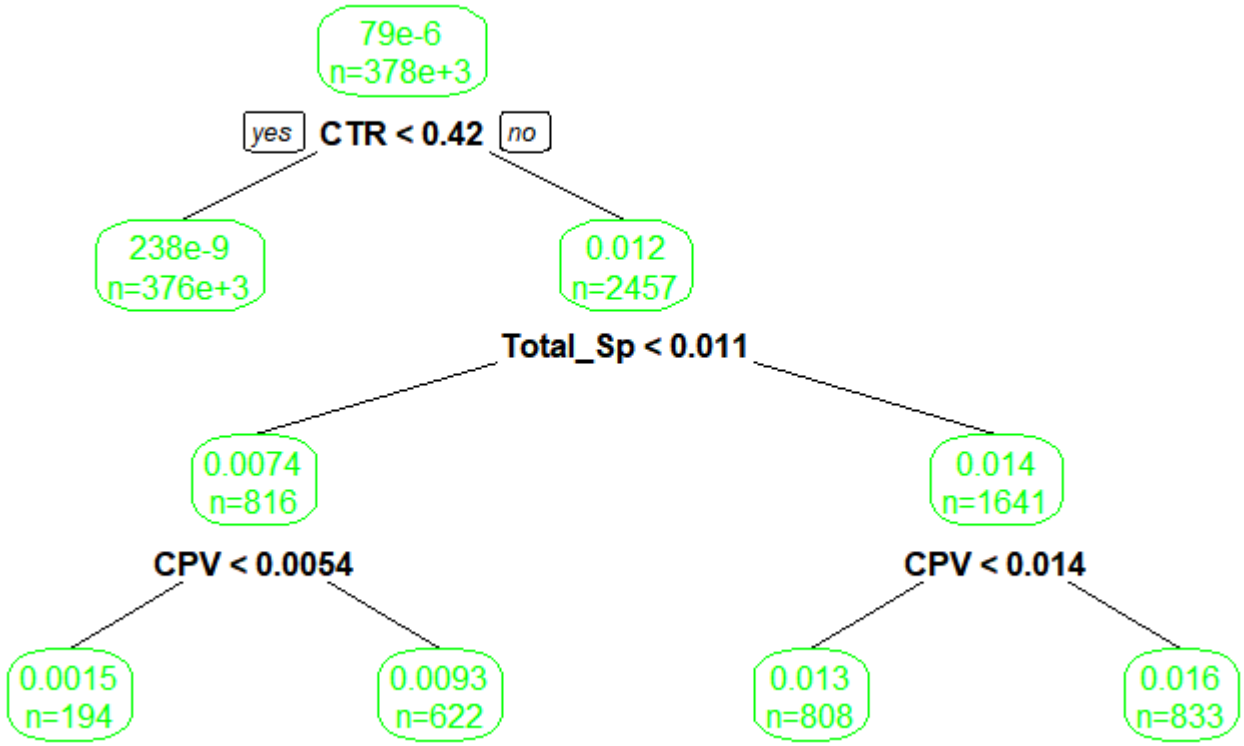
Hide

```
str(train)
```

```
'data.frame':   378132 obs. of  14 variables:
 $ SupplyVendors_Indicators: int  3 4 4 4 4 4 4 4 4 4 ...
 $ OS_Indicators           : int  1 8 9 11 12 12 12 13 1 1 ...
 $ Browser_Indicators      : int  4 1 1 1 1 1 1 1 1 1 ...
 $ DeviceType_Indicators   : int  1 1 1 1 1 1 1 1 1 1 ...
 $ Impression_Day          : int  1 3 5 4 4 5 5 4 4 4 ...
 $ Impressions             : int  1 1 1 1 1 1 1 1 1 1 ...
 $ Clicks                  : int  0 0 0 0 0 0 0 0 0 0 ...
 $ CTR                     : num  0 0 0 0 0 0 0 0 0 0 ...
 $ CPC                     : num  0 0 0 0 0 0 0 0 0 0 ...
 $ VCR                     : num  0 1 0 1 1 0 0 1 1 1 ...
 $ CPV                     : num  0.01271 0.00997 0.00941 0.01025 0.00968 ...
 $ Completes               : int  0 1 0 1 1 0 0 1 1 1 ...
 $ Total_Spend             : num  0.01271 0.00997 0.00941 0.01025 0.00968 ...
 $ CPCV                    : num  0 0.00997 0 0.01025 0.00968 ...
```

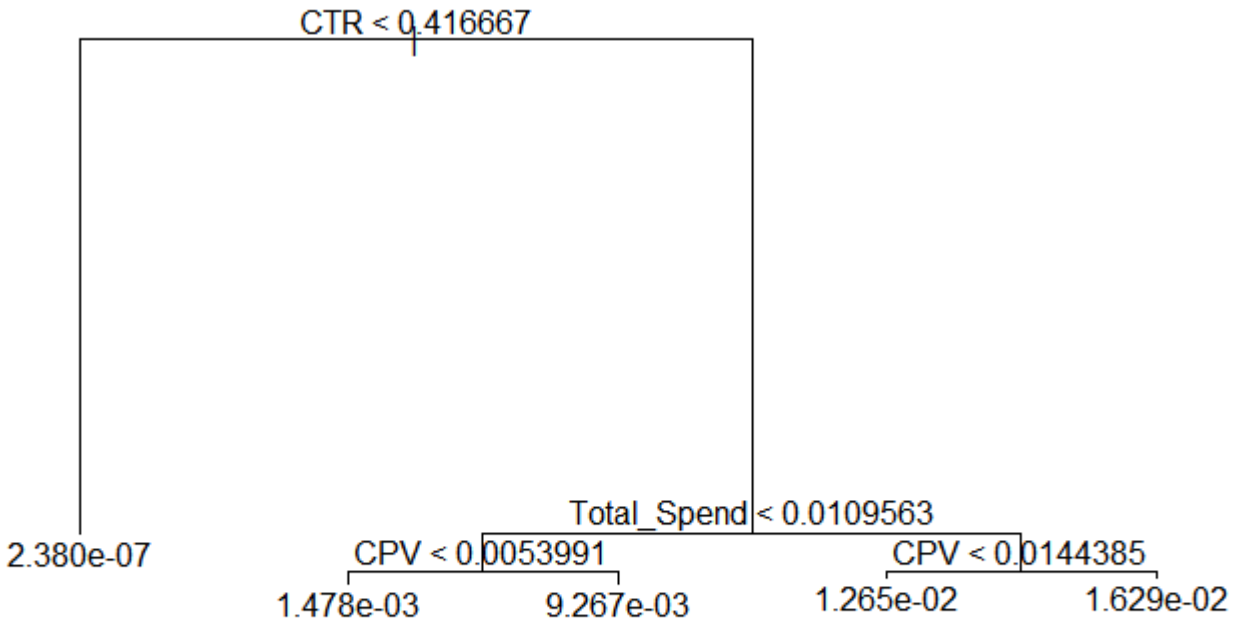
Hide

```
model <- rpart(CPC~.,data=train)
prp(model, type=2, extra=1, col="green")
```



Hide

```
library(tree)
model1<-tree(CPC~.,train)
plot(model1)
text(model1,pretty=0)
```



Hide

```
boruta_output <- Boruta(CPC ~ .,  doTrace=2,data=New_data)
```

```
 1. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 32 seconds.
Growing trees.. Progress: 50%. Estimated remaining time: 1 minute, 2 seconds.
Growing trees.. Progress: 75%. Estimated remaining time: 30 seconds.
Computing permutation importance.. Progress: 40%. Estimated remaining time: 46 seconds.
Computing permutation importance.. Progress: 71%. Estimated remaining time: 25 seconds.
```

```
 2. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 33 seconds.
Growing trees.. Progress: 50%. Estimated remaining time: 1 minute, 1 seconds.
Growing trees.. Progress: 77%. Estimated remaining time: 27 seconds.
Computing permutation importance.. Progress: 34%. Estimated remaining time: 1 minute, 0 seconds.
Computing permutation importance.. Progress: 68%. Estimated remaining time: 28 seconds.
```

```
 3. run of importance source...
```

```
Growing trees.. Progress: 26%. Estimated remaining time: 1 minute, 29 seconds.
Growing trees.. Progress: 51%. Estimated remaining time: 59 seconds.
Growing trees.. Progress: 78%. Estimated remaining time: 26 seconds.
Computing permutation importance.. Progress: 38%. Estimated remaining time: 53 seconds.
Computing permutation importance.. Progress: 68%. Estimated remaining time: 30 seconds.
```

```
 4. run of importance source...
```

```
Growing trees.. Progress: 26%. Estimated remaining time: 1 minute, 28 seconds.
Growing trees.. Progress: 51%. Estimated remaining time: 58 seconds.
Growing trees.. Progress: 79%. Estimated remaining time: 25 seconds.
Computing permutation importance.. Progress: 40%. Estimated remaining time: 53 seconds.
Computing permutation importance.. Progress: 73%. Estimated remaining time: 24 seconds.
```

```
 5. run of importance source...
```

```
Growing trees.. Progress: 21%. Estimated remaining time: 1 minute, 56 seconds.
Growing trees.. Progress: 42%. Estimated remaining time: 1 minute, 27 seconds.
Growing trees.. Progress: 63%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 83%. Estimated remaining time: 24 seconds.
Computing permutation importance.. Progress: 31%. Estimated remaining time: 1 minute, 9 seconds.
Computing permutation importance.. Progress: 58%. Estimated remaining time: 44 seconds.
Computing permutation importance.. Progress: 91%. Estimated remaining time: 9 seconds.
```

```
 6. run of importance source...
```

```
Growing trees.. Progress: 20%. Estimated remaining time: 2 minutes, 5 seconds.
Growing trees.. Progress: 39%. Estimated remaining time: 1 minute, 38 seconds.
Growing trees.. Progress: 57%. Estimated remaining time: 1 minute, 11 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 31 seconds.
Computing permutation importance.. Progress: 31%. Estimated remaining time: 1 minute, 7 seconds.
Computing permutation importance.. Progress: 64%. Estimated remaining time: 35 seconds.
Computing permutation importance.. Progress: 96%. Estimated remaining time: 3 seconds.
```

```
 7. run of importance source...
```

```
Growing trees.. Progress: 27%. Estimated remaining time: 1 minute, 25 seconds.
Growing trees.. Progress: 52%. Estimated remaining time: 58 seconds.
Growing trees.. Progress: 77%. Estimated remaining time: 28 seconds.
Computing permutation importance.. Progress: 41%. Estimated remaining time: 44 seconds.
Computing permutation importance.. Progress: 81%. Estimated remaining time: 14 seconds.
```

```
 8. run of importance source...
```

```
Growing trees.. Progress: 28%. Estimated remaining time: 1 minute, 20 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 22 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 43 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 12 seconds.
```

```
 9. run of importance source...
```

```
Growing trees.. Progress: 27%. Estimated remaining time: 1 minute, 25 seconds.
Growing trees.. Progress: 52%. Estimated remaining time: 58 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 23 seconds.
Computing permutation importance.. Progress: 41%. Estimated remaining time: 45 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 12 seconds.
```

```
 10. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 31 seconds.
Growing trees.. Progress: 52%. Estimated remaining time: 57 seconds.
Growing trees.. Progress: 78%. Estimated remaining time: 26 seconds.
Computing permutation importance.. Progress: 40%. Estimated remaining time: 47 seconds.
Computing permutation importance.. Progress: 81%. Estimated remaining time: 14 seconds.
```

```
 11. run of importance source...
```

```
Growing trees.. Progress: 27%. Estimated remaining time: 1 minute, 22 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 81%. Estimated remaining time: 21 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 42 seconds.
Computing permutation importance.. Progress: 85%. Estimated remaining time: 11 seconds.
```

```
After 11 iterations, +39 mins:
 confirmed 9 attributes: Browser_Indicators, Clicks, CPV, CTR, DeviceType_Indicators and 4 more;
 still have 6 attributes left.

 12. run of importance source...
```

```
Growing trees.. Progress: 28%. Estimated remaining time: 1 minute, 19 seconds.
Growing trees.. Progress: 55%. Estimated remaining time: 50 seconds.
Growing trees.. Progress: 81%. Estimated remaining time: 21 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 42 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 12 seconds.
```

```
 13. run of importance source...
```

```
Growing trees.. Progress: 28%. Estimated remaining time: 1 minute, 20 seconds.
Growing trees.. Progress: 54%. Estimated remaining time: 52 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 22 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 42 seconds.
Computing permutation importance.. Progress: 84%. Estimated remaining time: 11 seconds.
```

```
 14. run of importance source...
```

```
Growing trees.. Progress: 26%. Estimated remaining time: 1 minute, 27 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 23 seconds.
Computing permutation importance.. Progress: 41%. Estimated remaining time: 44 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 13 seconds.
```

```
 15. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 34 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 23 seconds.
Computing permutation importance.. Progress: 40%. Estimated remaining time: 46 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 13 seconds.
```

```
After 15 iterations, +52 mins:
 confirmed 4 attributes: Completes, CPCV, Impressions, VCR;
 still have 2 attributes left.

 16. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 32 seconds.
Growing trees.. Progress: 52%. Estimated remaining time: 58 seconds.
Growing trees.. Progress: 78%. Estimated remaining time: 26 seconds.
Computing permutation importance.. Progress: 39%. Estimated remaining time: 47 seconds.
Computing permutation importance.. Progress: 81%. Estimated remaining time: 14 seconds.
```

```
 17. run of importance source...
```

```
Growing trees.. Progress: 27%. Estimated remaining time: 1 minute, 22 seconds.
Growing trees.. Progress: 55%. Estimated remaining time: 50 seconds.
Growing trees.. Progress: 82%. Estimated remaining time: 19 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 42 seconds.
Computing permutation importance.. Progress: 84%. Estimated remaining time: 11 seconds.
```

```
 18. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 32 seconds.
Growing trees.. Progress: 51%. Estimated remaining time: 59 seconds.
Growing trees.. Progress: 78%. Estimated remaining time: 25 seconds.
Computing permutation importance.. Progress: 40%. Estimated remaining time: 45 seconds.
Computing permutation importance.. Progress: 82%. Estimated remaining time: 13 seconds.
```

```
 19. run of importance source...
```

```
Growing trees.. Progress: 29%. Estimated remaining time: 1 minute, 14 seconds.
Growing trees.. Progress: 57%. Estimated remaining time: 46 seconds.
Growing trees.. Progress: 85%. Estimated remaining time: 16 seconds.
Computing permutation importance.. Progress: 43%. Estimated remaining time: 41 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 12 seconds.
```

```
 20. run of importance source...
```

```
Growing trees.. Progress: 26%. Estimated remaining time: 1 minute, 28 seconds.
Growing trees.. Progress: 44%. Estimated remaining time: 1 minute, 19 seconds.
Growing trees.. Progress: 69%. Estimated remaining time: 41 seconds.
Growing trees.. Progress: 96%. Estimated remaining time: 4 seconds.
Computing permutation importance.. Progress: 41%. Estimated remaining time: 44 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 12 seconds.
```

```
 21. run of importance source...
```

```
Growing trees.. Progress: 27%. Estimated remaining time: 1 minute, 24 seconds.
Growing trees.. Progress: 54%. Estimated remaining time: 52 seconds.
Growing trees.. Progress: 80%. Estimated remaining time: 22 seconds.
Computing permutation importance.. Progress: 41%. Estimated remaining time: 44 seconds.
Computing permutation importance.. Progress: 84%. Estimated remaining time: 11 seconds.
```

```
 22. run of importance source...
```

```
Growing trees.. Progress: 28%. Estimated remaining time: 1 minute, 19 seconds.
Growing trees.. Progress: 56%. Estimated remaining time: 49 seconds.
Growing trees.. Progress: 82%. Estimated remaining time: 20 seconds.
Computing permutation importance.. Progress: 43%. Estimated remaining time: 40 seconds.
Computing permutation importance.. Progress: 84%. Estimated remaining time: 11 seconds.
```

```
After 22 iterations, +1.3 hours:
 confirmed 1 attribute: City_indicators;
 still have 1 attribute left.

 23. run of importance source...
```

```
Growing trees.. Progress: 28%. Estimated remaining time: 1 minute, 21 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 81%. Estimated remaining time: 21 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 43 seconds.
Computing permutation importance.. Progress: 84%. Estimated remaining time: 12 seconds.
```

```
 24. run of importance source...
```

```
Growing trees.. Progress: 26%. Estimated remaining time: 1 minute, 26 seconds.
Growing trees.. Progress: 53%. Estimated remaining time: 54 seconds.
Growing trees.. Progress: 79%. Estimated remaining time: 24 seconds.
Computing permutation importance.. Progress: 42%. Estimated remaining time: 42 seconds.
Computing permutation importance.. Progress: 83%. Estimated remaining time: 13 seconds.
```

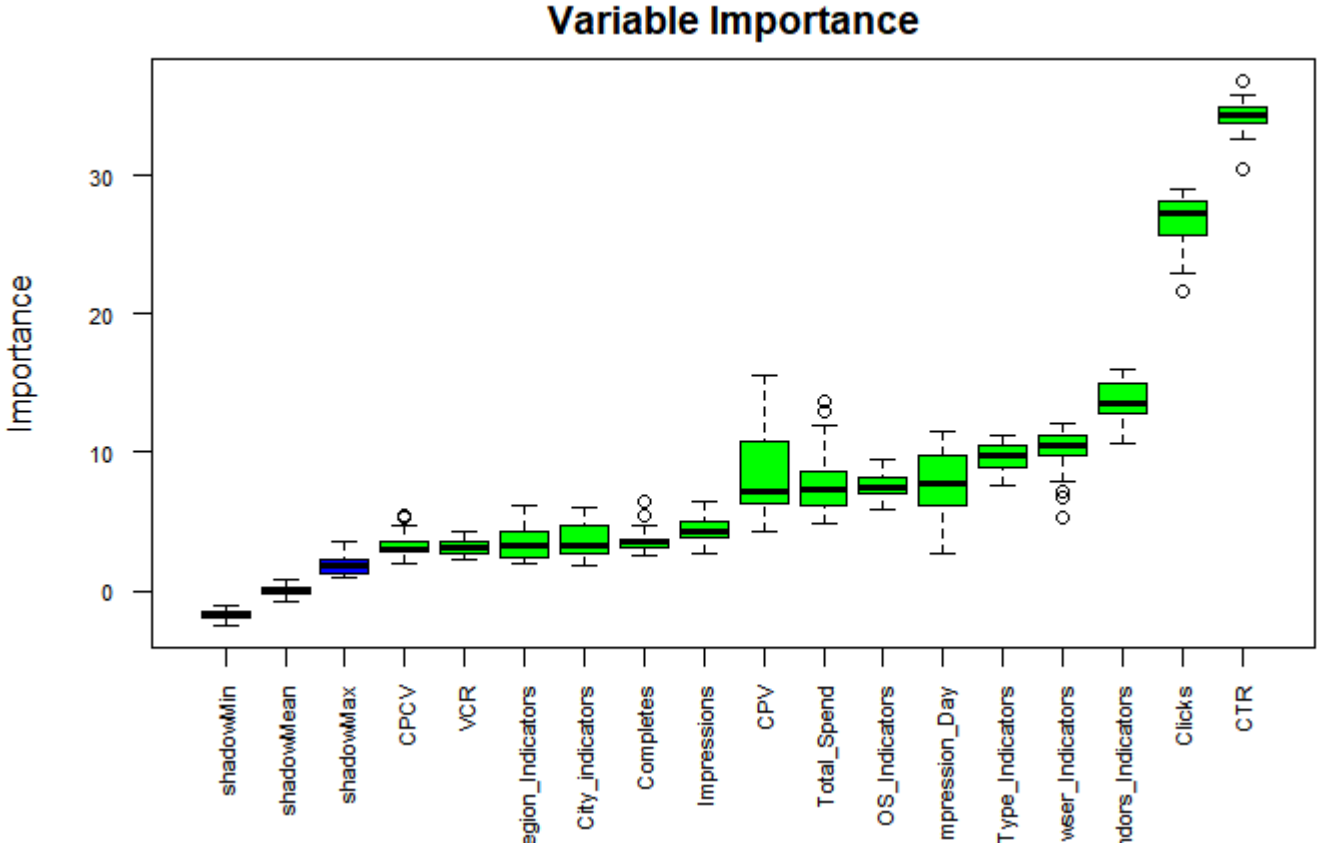
```
 25. run of importance source...
```

```
Growing trees.. Progress: 25%. Estimated remaining time: 1 minute, 33 seconds.
Growing trees.. Progress: 51%. Estimated remaining time: 58 seconds.
Growing trees.. Progress: 78%. Estimated remaining time: 27 seconds.
Computing permutation importance.. Progress: 40%. Estimated remaining time: 46 seconds.
Computing permutation importance.. Progress: 76%. Estimated remaining time: 19 seconds.
```

```
After 25 iterations, +1.4 hours:
 confirmed 1 attribute: Region_Indicators;
 no more attributes left.
```

Hide

```
boruta_signif <- names(boruta_output$finalDecision[boruta_output$finalDecision %in% c("Confirme
d", "Tentative")])
plot(boruta_output, cex.axis=.7, las=2, xlab="", main="Variable Importance")
```


Variable Importance
Importance
30
20
10
0
shadowMin
shadowMean
shadowMax
CPCV
VCR
egion_Indicators
City_indicators
Completes
Impressions
CPV
Total_Spend
OS_Indicators
mpression_Day
Type_Indicators
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