MRT.Morphometrics.R

Administrator

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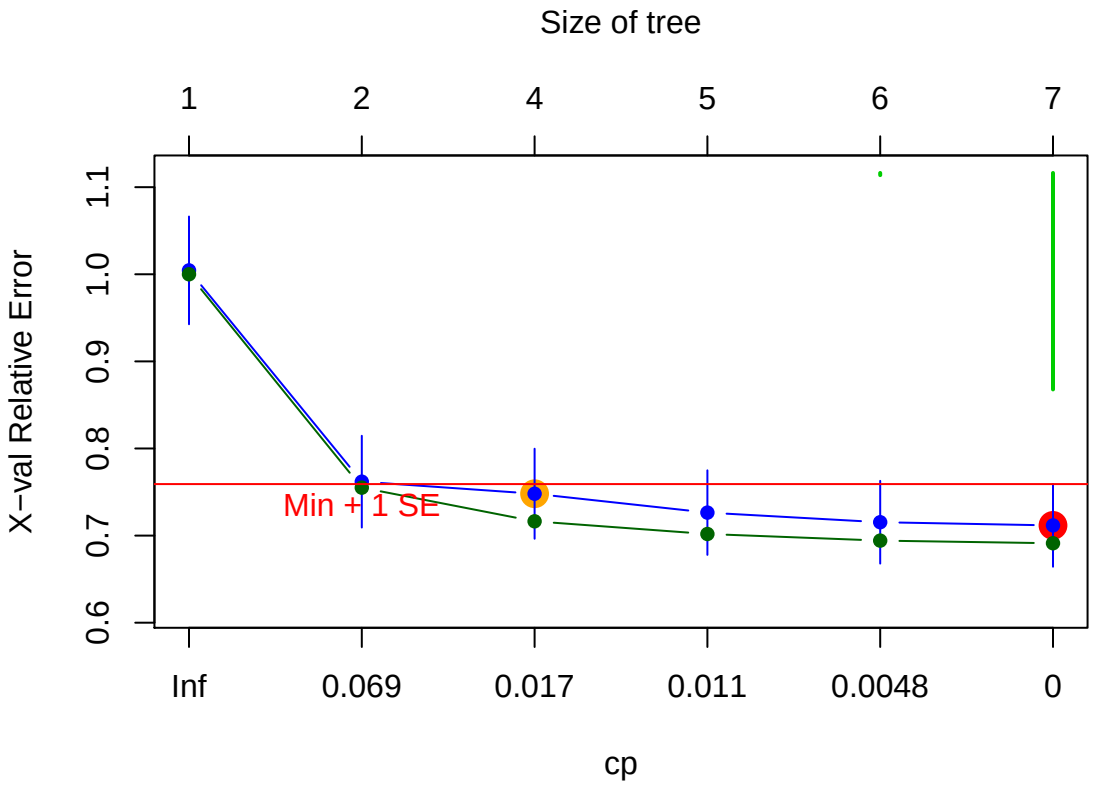
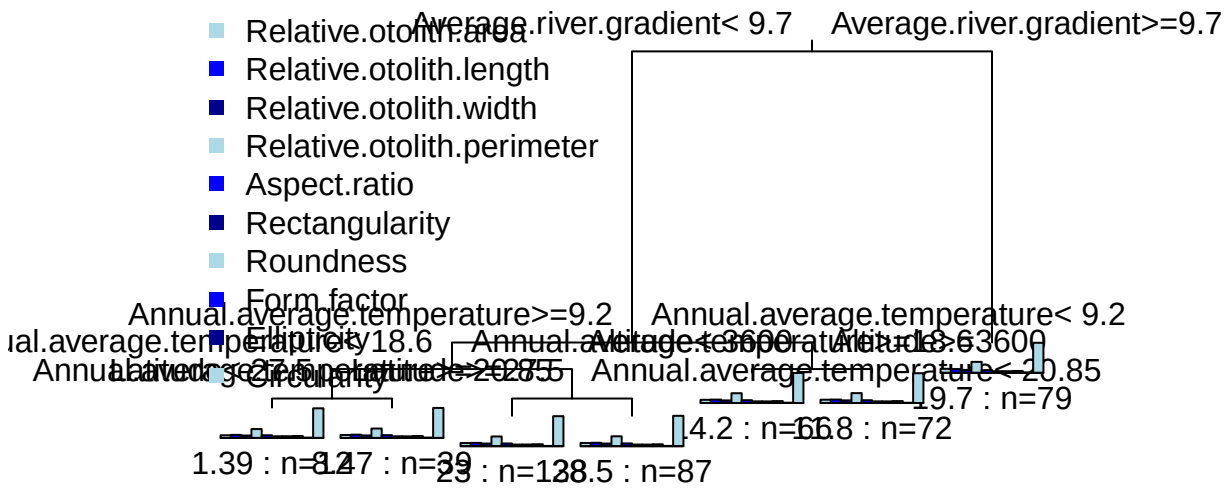
```
library(ade4)
library(vegan)
library(mvpart)
library(MVPARTwrap)
library(FactoMineR)
library(MASS)
source("D:\\Project\\Data\\MRTG.R")
tt=read.csv("D:\\Project\\Data\\Morphometrics.csv",
            header = T)
s.auto <- mvpart(data.matrix(tt[,4:13])~Average.river.gradient+Altitude+Annual.average.temperature+Lati
```

```
## X-Val rep : 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25
## Minimum tree sizes
## tabmins
##  6  7
##  1 99
```



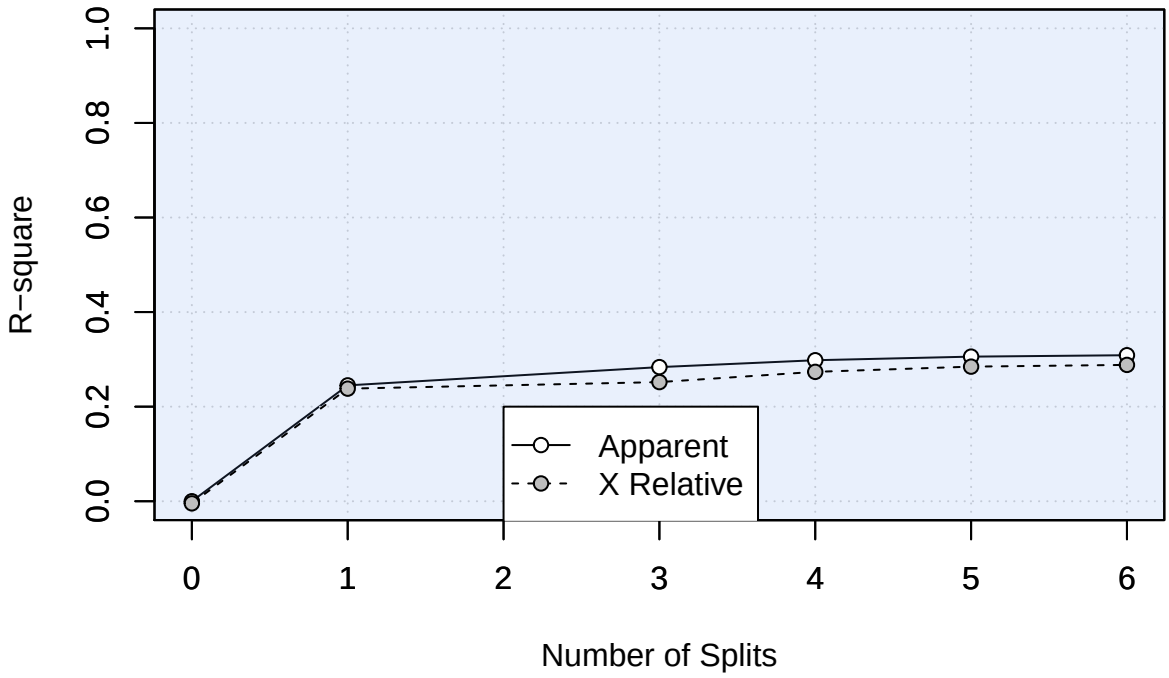


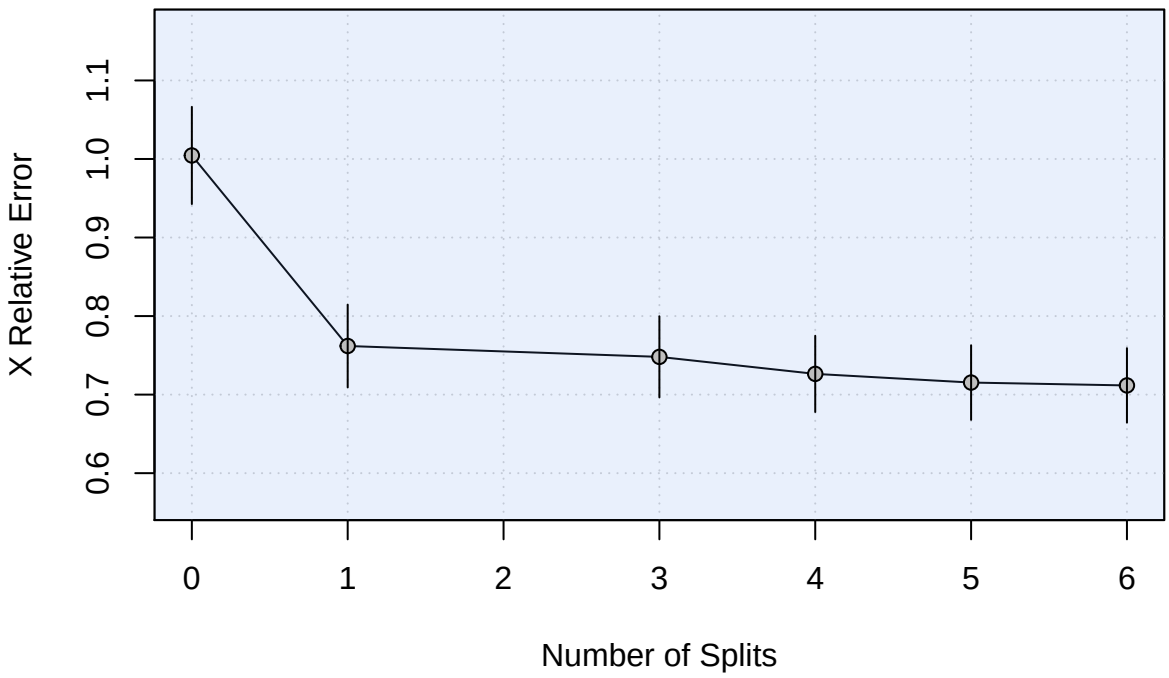
Error : 0.691 CV Error : 0.712 SE : 0.0474

```
s.auto$cptable
```

```
##            CP nsplit rel error    xerror       xstd
## 1 0.244974258      0 1.0000000 1.0044686 0.06184540
## 2 0.019315052      1 0.7550257 0.7619055 0.05267036
## 3 0.014549232      3 0.7163956 0.7480458 0.05167761
## 4 0.007607839      4 0.7018464 0.7263982 0.04852668
## 5 0.003012868      5 0.6942386 0.7153580 0.04752031
## 6 0.000000000      6 0.6912257 0.7116910 0.04744584
```

```
rsqrpart(s.auto)
```

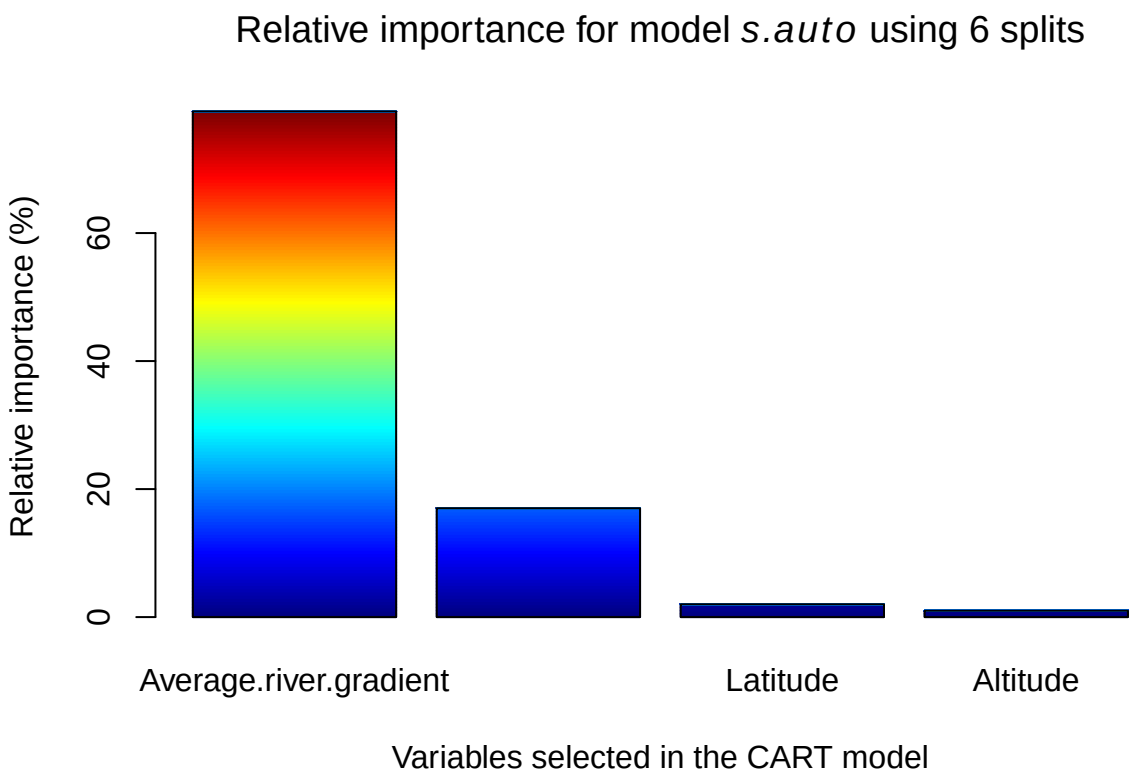

R−square
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
Number of Splits
Apparent
X Relative




```
(R2<-abs(diff(s.auto$cptable[,3])))
```

```
##           2           3           4           5           6
## 0.244974258 0.038630104 0.014549232 0.007607839 0.003012868
```

```
importance<-VarImp(s.auto, pretty=T)
```

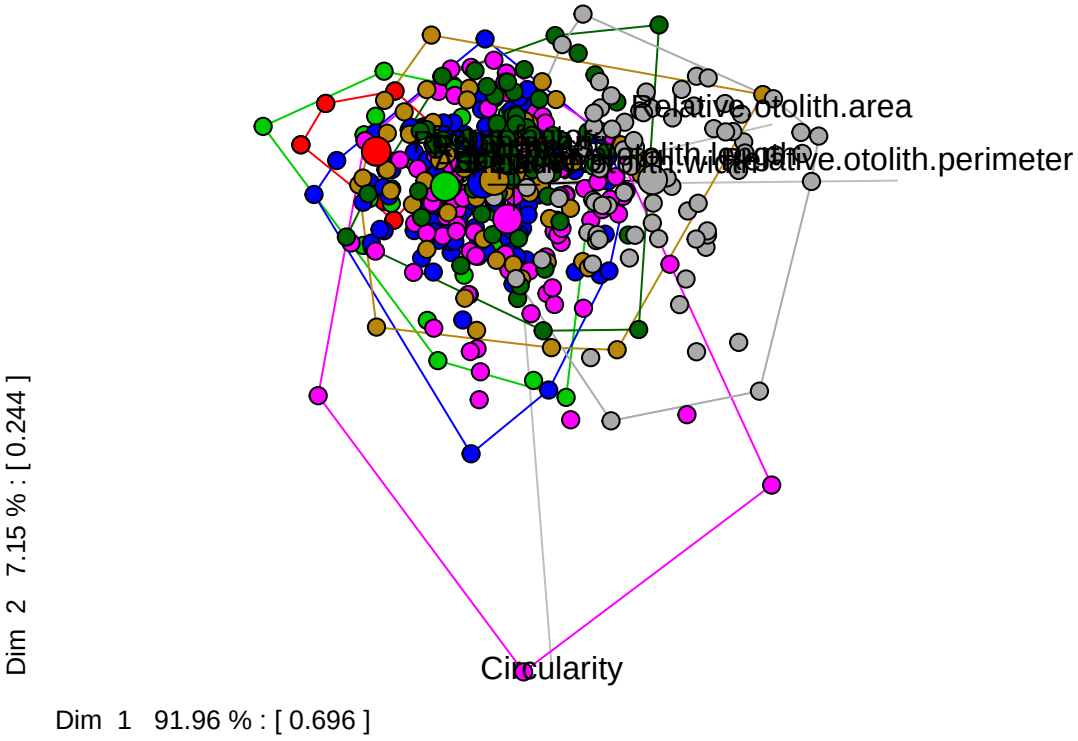



```
## Variance explained by model s.auto = 30.87743 %
```

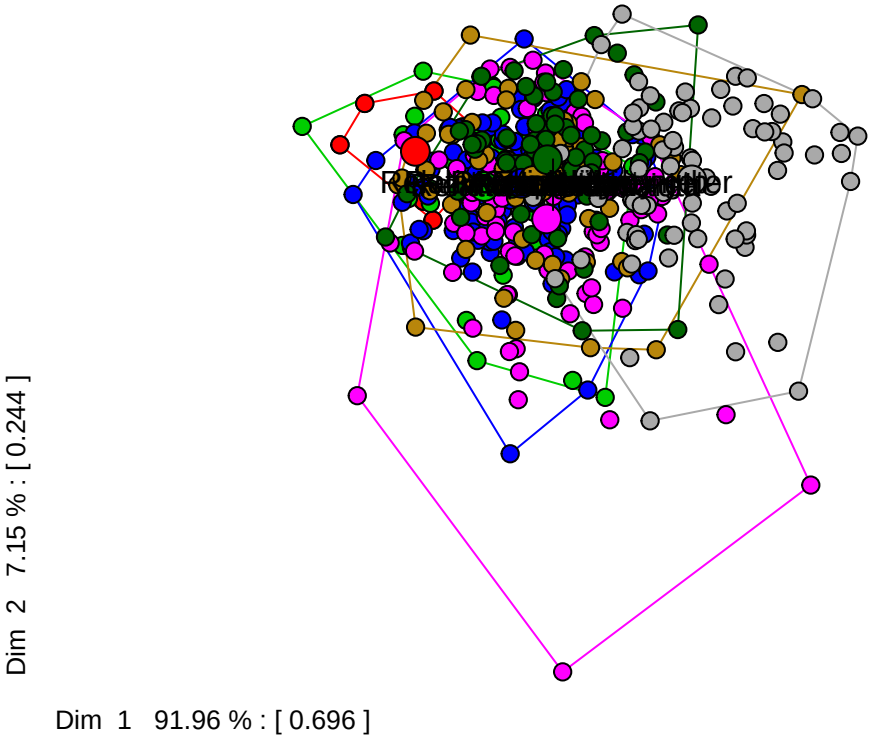
```
importance$Relative
```

```
##                     Variables Importance
## 1     Average.river.gradient  79.337645
## 3 Annual.average.temperature  17.222721
## 4                   Latitude   2.463883
## 2                   Altitude   0.975751
```

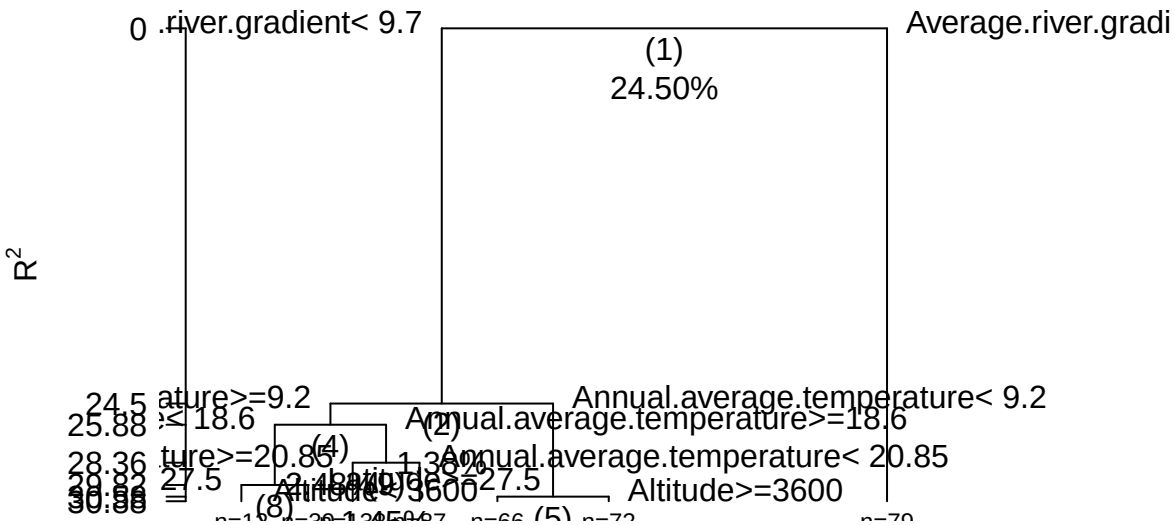
```
rpart.pca(s.auto)
```



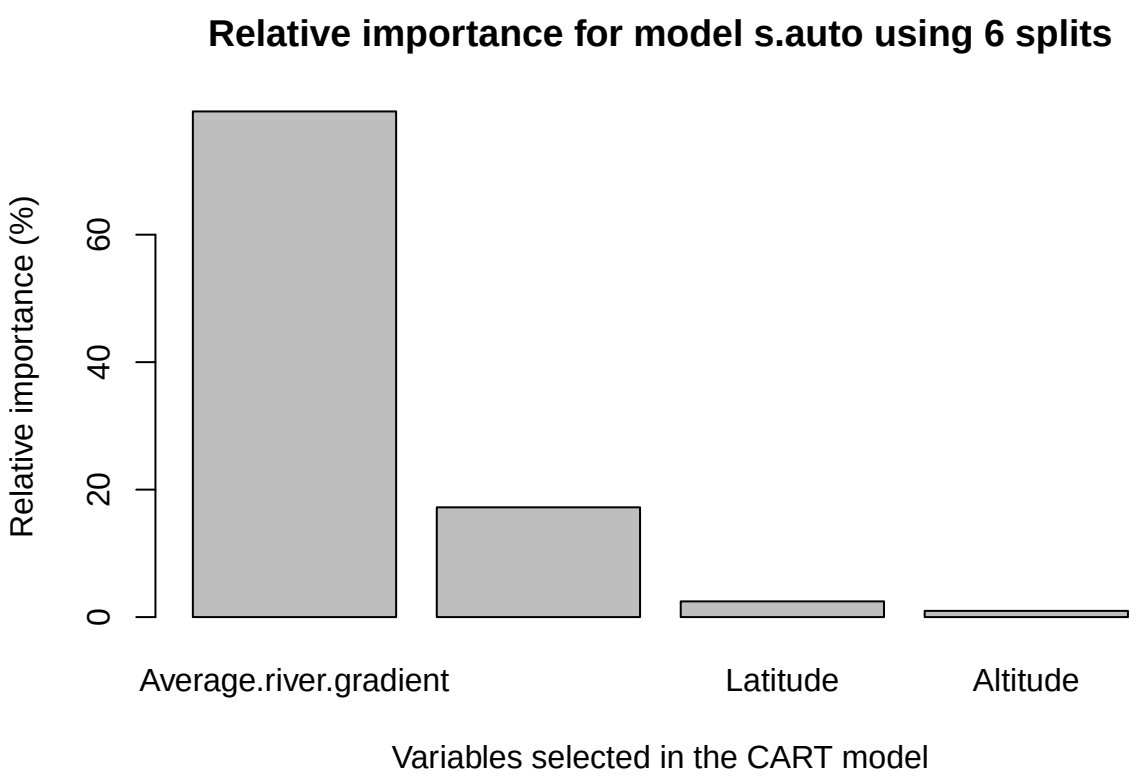

```
rpart.pca(s.auto,wgt.ave=TRUE,interact=TRUE)
```




```
res<-MRT(s.auto,10)
plot(res, Cex=1,widthtree=10, heighttree=10,lwd=2)
```




```
importance<-VarImp(s.auto, pretty=F)
```




```
## Variance explained by model s.auto = 30.87743 %
```

```
importance$Relative
```

```
##                     Variables Importance
## 1     Average.river.gradient  79.337645
## 3 Annual.average.temperature  17.222721
## 4                   Latitude   2.463883
## 2                   Altitude   0.975751
```

```
########################
df11<-tt[,4:13]
df1<- decostand(df11, "hellinger")
names(df1)
```

```
##  [1] "Relative.otolith.area"      "Relative.otolith.length"
##  [3] "Relative.otolith.width"     "Relative.otolith.perimeter"
##  [5] "Aspect.ratio"               "Rectangularity"
##  [7] "Roundness"                  "Form.factor"
##  [9] "Ellipticity"                "Circularity"
```

```
df2<-tt[,14:17]
names(df2)
```

```
## [1] "Altitude"                  "Average.river.gradient"
## [3] "Latitude"                  "Annual.average.temperature"
```

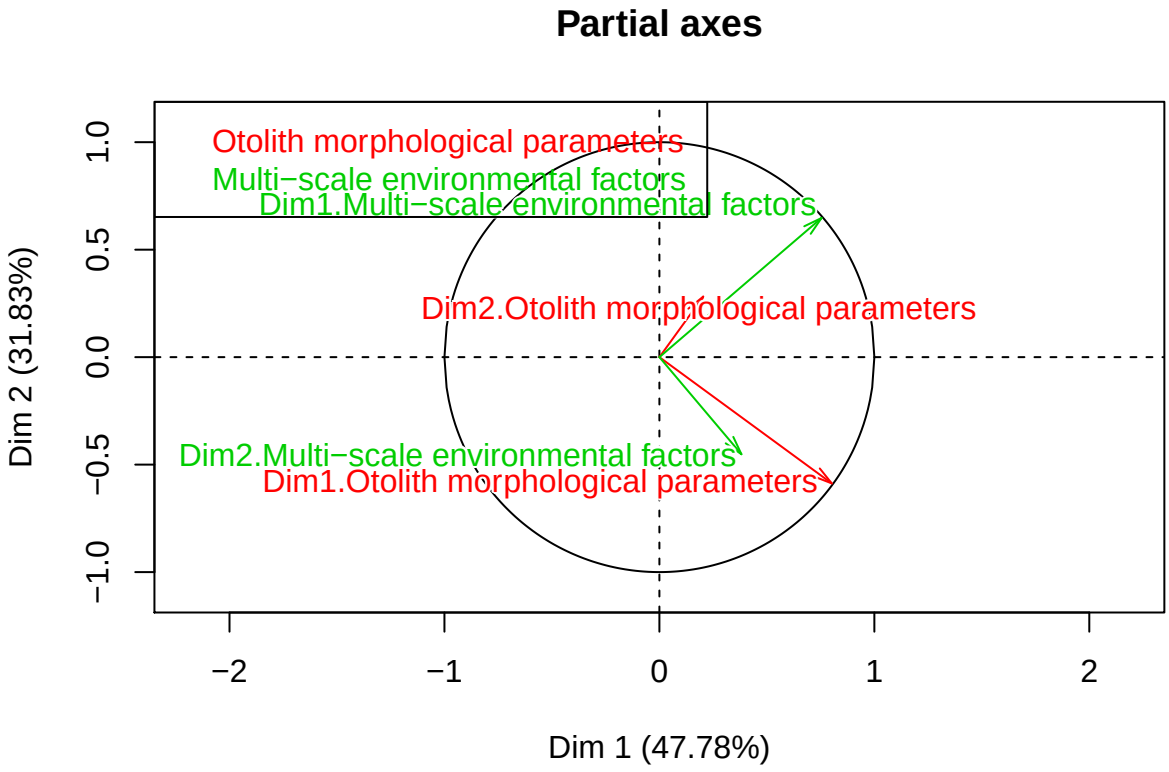
```
tab2 <- data.frame(df1,df2)
dim(tab2)
```

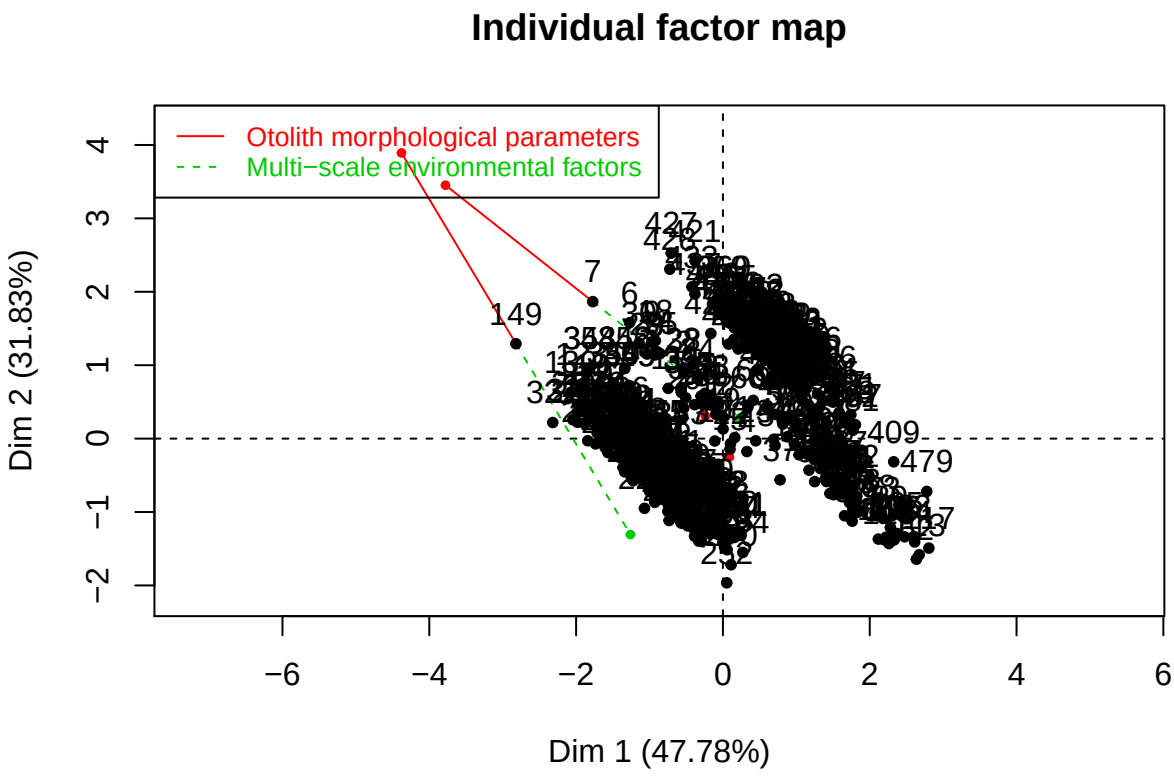
```
## [1] 493  14
```

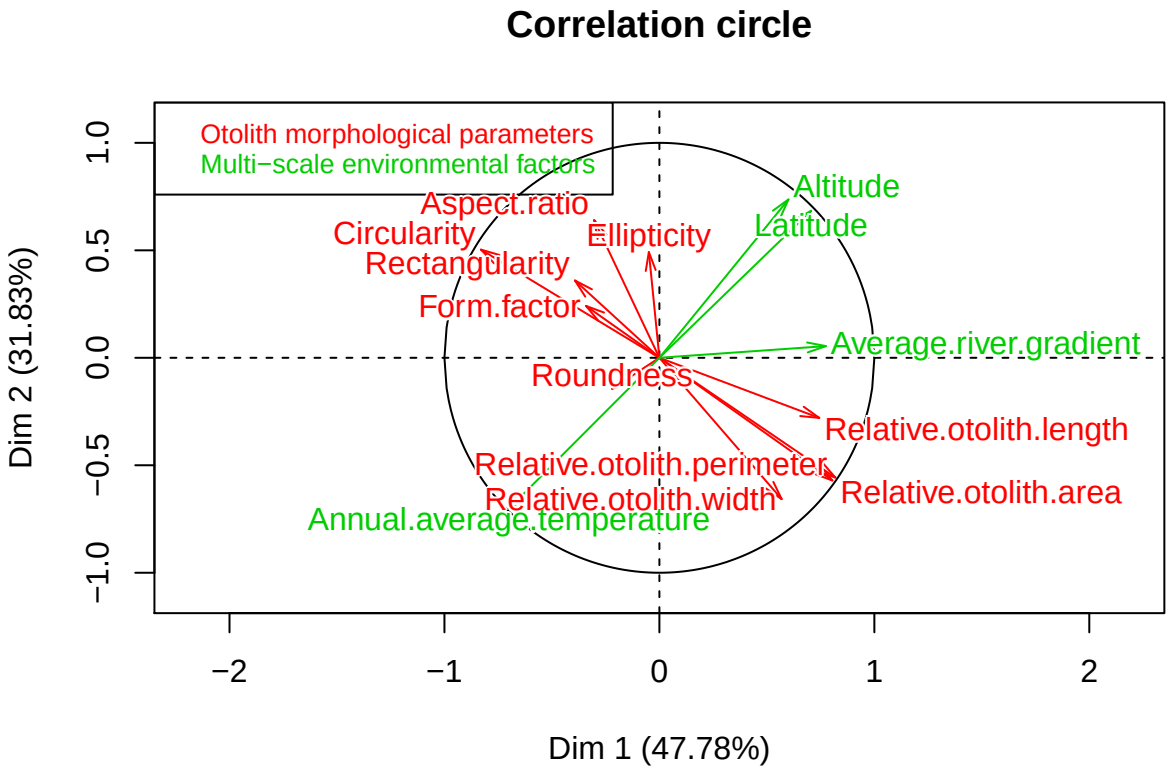
```
(num <- c(ncol(df1), ncol(df2)))
```

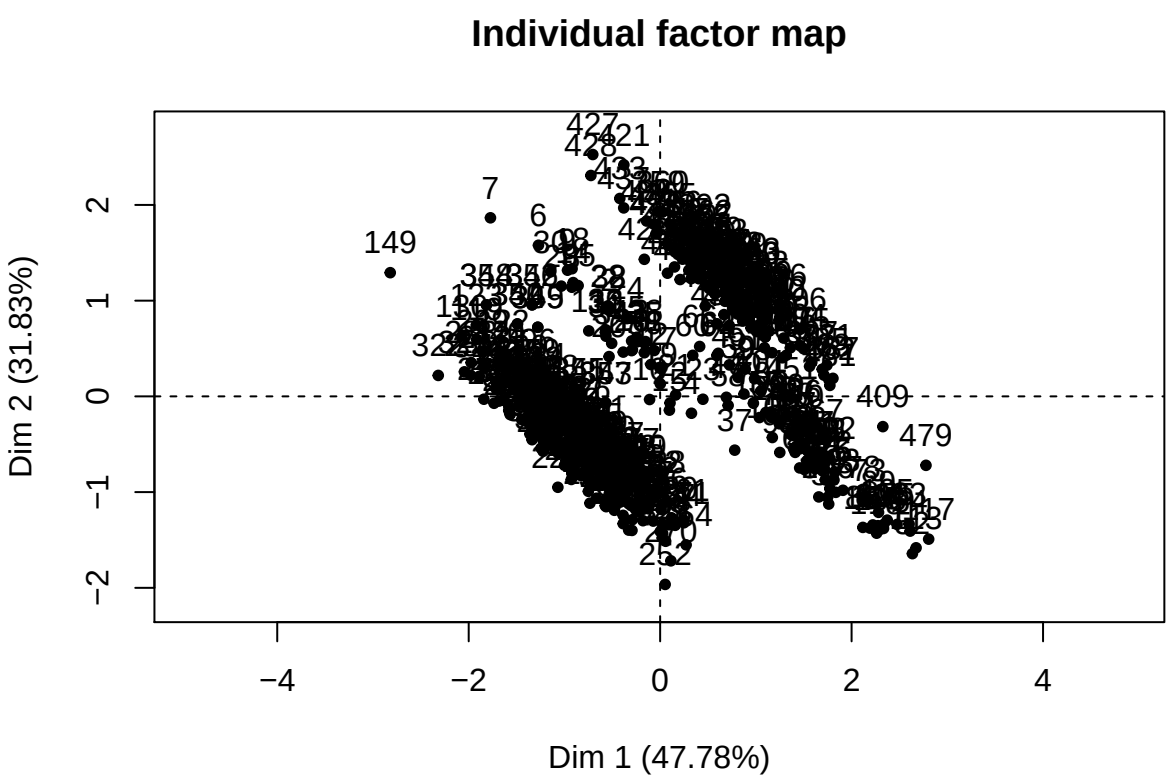
```
## [1] 10  4
```

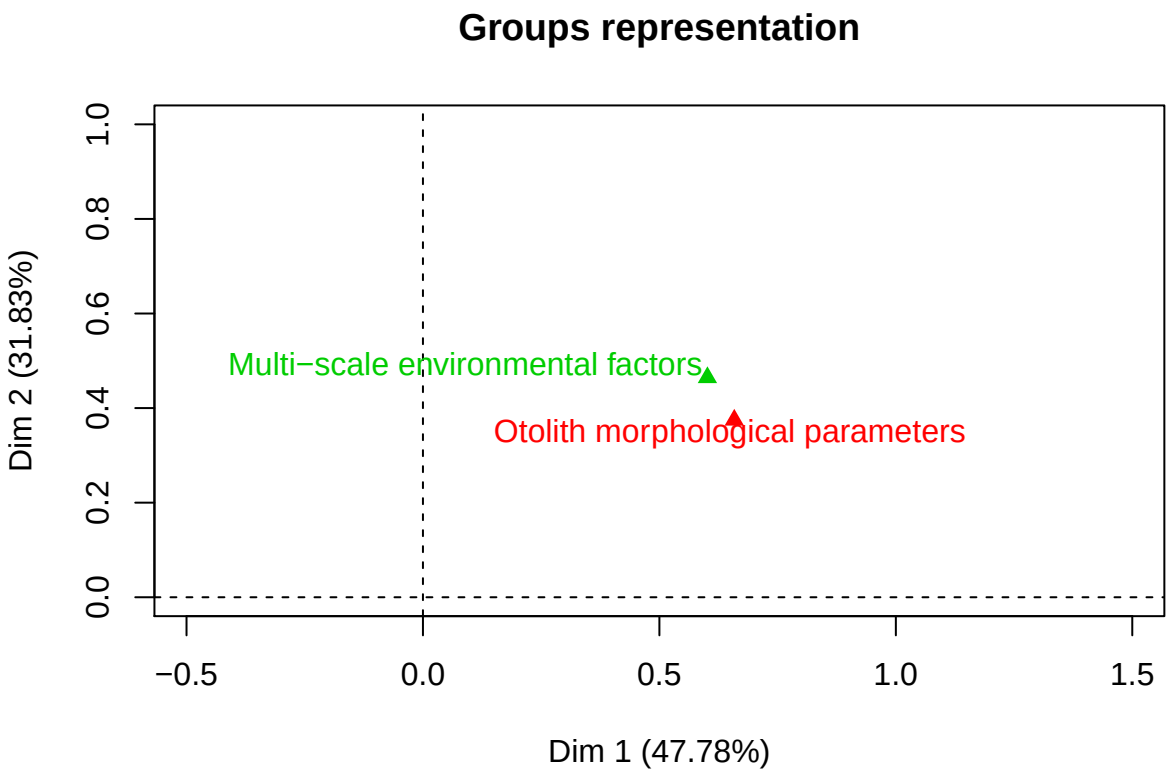
```
# Compute the MFA with multiple plots
# graphics.off()  # Close the previous graphic windows
t2.mfa <- MFA(tab2, group=num, type=c("c","s"), ncp=2,
              name.group=c("Otolith morphological parameters ","Multi-scale environmental factors"))
```




Individual factor map
Otolith morphological parameters
Multi−scale environmental factors
Dim 2 (31.83%)
Dim 1 (47.78%)
149
7
6
409
479
−6
−4
−2
0
2
4
6
−2
−1
0
1
2
3
4


Correlation circle
Otolith morphological parameters
Multi−scale environmental factors
Aspect.ratio
Circularity
Rectangularity
Form.factor
Ellipticity
Roundness
Altitude
Latitude
Average.river.gradient
Relative.otolith.length
Relative.otolith.perimeter
Relative.otolith.width
Relative.otolith.area
Annual.average.temperature
Dim 2 (31.83%)
Dim 1 (47.78%)
1.0
0.5
0.0
−0.5
−1.0
−2
−1
0
1
2

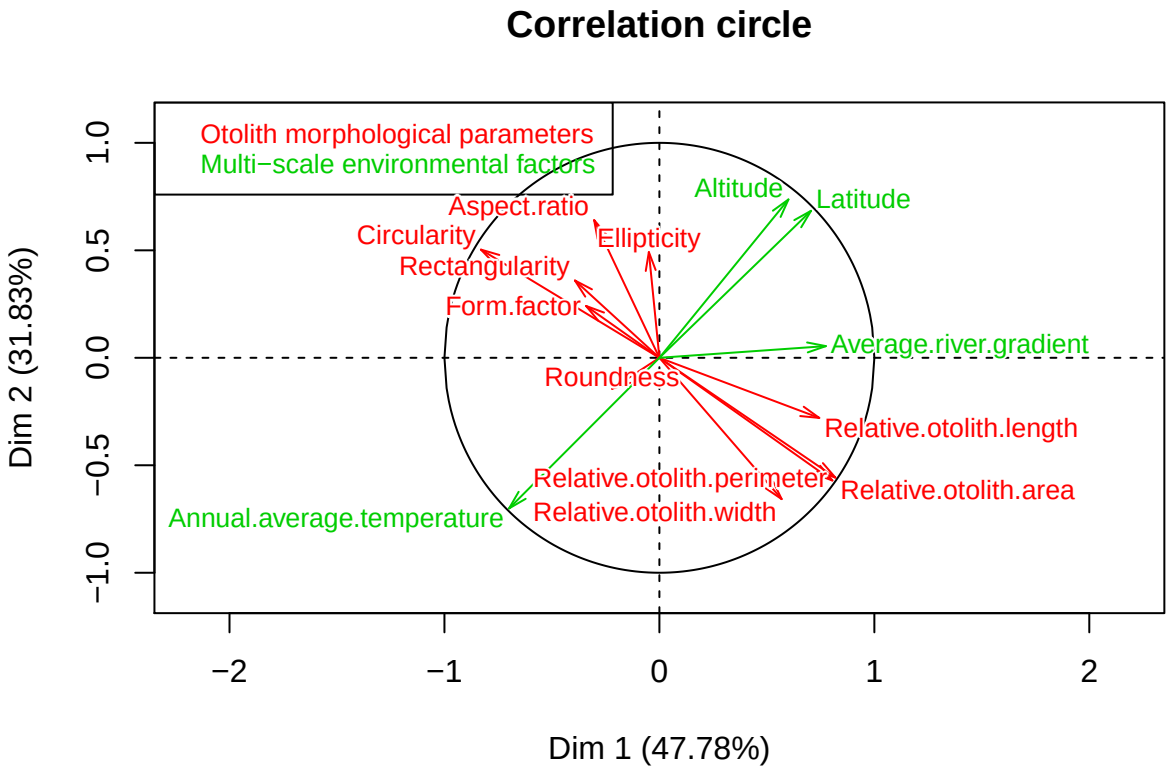

Individual factor map
Dim 2 (31.83%)
Dim 1 (47.78%)
149
7
6
409
479
−4
−2
0
2
4
−2
−1
0
1
2




```
t2.mfa
```

```
## **Results of the Multiple Factor Analysis (MFA)**
## The analysis was performed on 493 individuals, described by 14 variables
## *Results are available in the following objects :
##
##   name                 description
## 1 "$eig"               "eigenvalues"
## 2 "$separate.analyses" "separate analyses for each group of variables"
## 3 "$group"             "results for all the groups"
## 4 "$partial.axes"      "results for the partial axes"
## 5 "$inertia.ratio"     "inertia ratio"
## 6 "$ind"               "results for the individuals"
## 7 "$quanti.var"        "results for the quantitative variables"
## 8 "$summary.quanti"    "summary for the quantitative variables"
## 9 "$global.pca"        "results for the global PCA"
```

```
#customize image
plot(t2.mfa, choix="var", habillage="group",axes = 1:2,cex=0.8,shadow=T)
```




```
(rvp <- t2.mfa$group$RV)
```

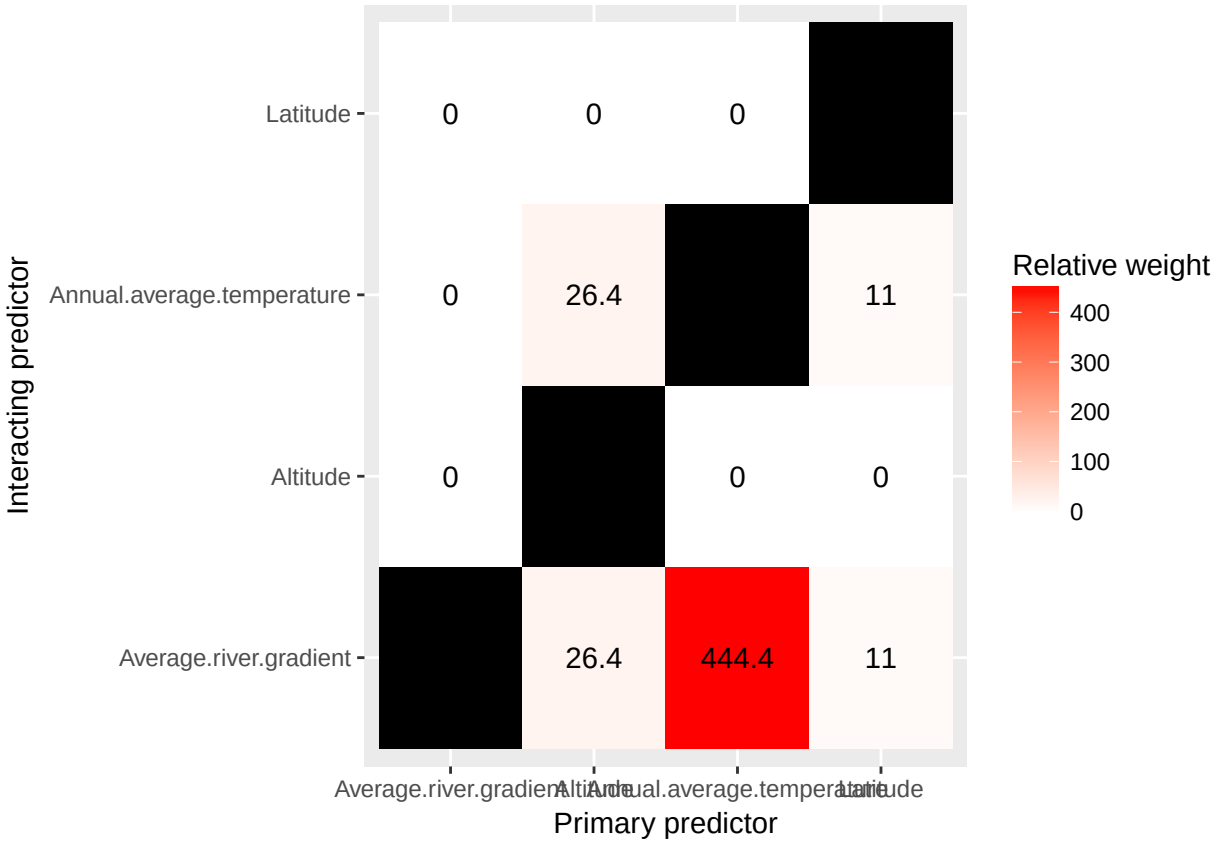
```
##                                    Otolith morphological parameters
## Otolith morphological parameters                       1.000000e+00
## Multi-scale environmental factors                      5.929983e-05
## MFA                                                    9.999999e-01
##                                    Multi-scale environmental factors
## Otolith morphological parameters                       5.929983e-05
## Multi-scale environmental factors                      1.000000e+00
## MFA                                                    5.515075e-04
##                                                  MFA
## Otolith morphological parameters  0.9999998789
## Multi-scale environmental factors 0.0005515075
## MFA                               1.0000000000
```

```
rvp[1,2] <- coeffRV(df11,scale(df2))$p.value
rvp[1,2]
```

```
## [1] 6.549485e-17
```

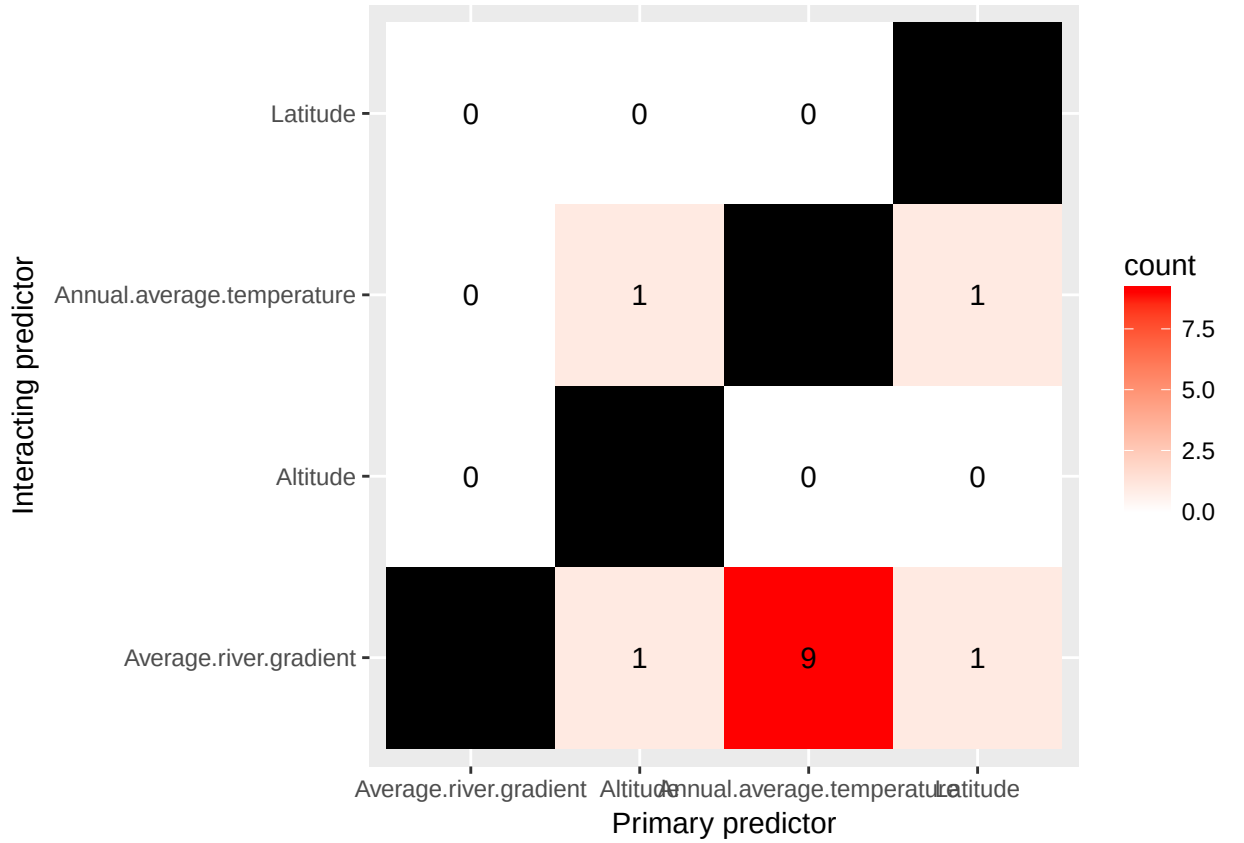
```
##################
MCC(s.auto,standard = F)
```

```
## Warning: Ignoring unknown aesthetics: fill
```



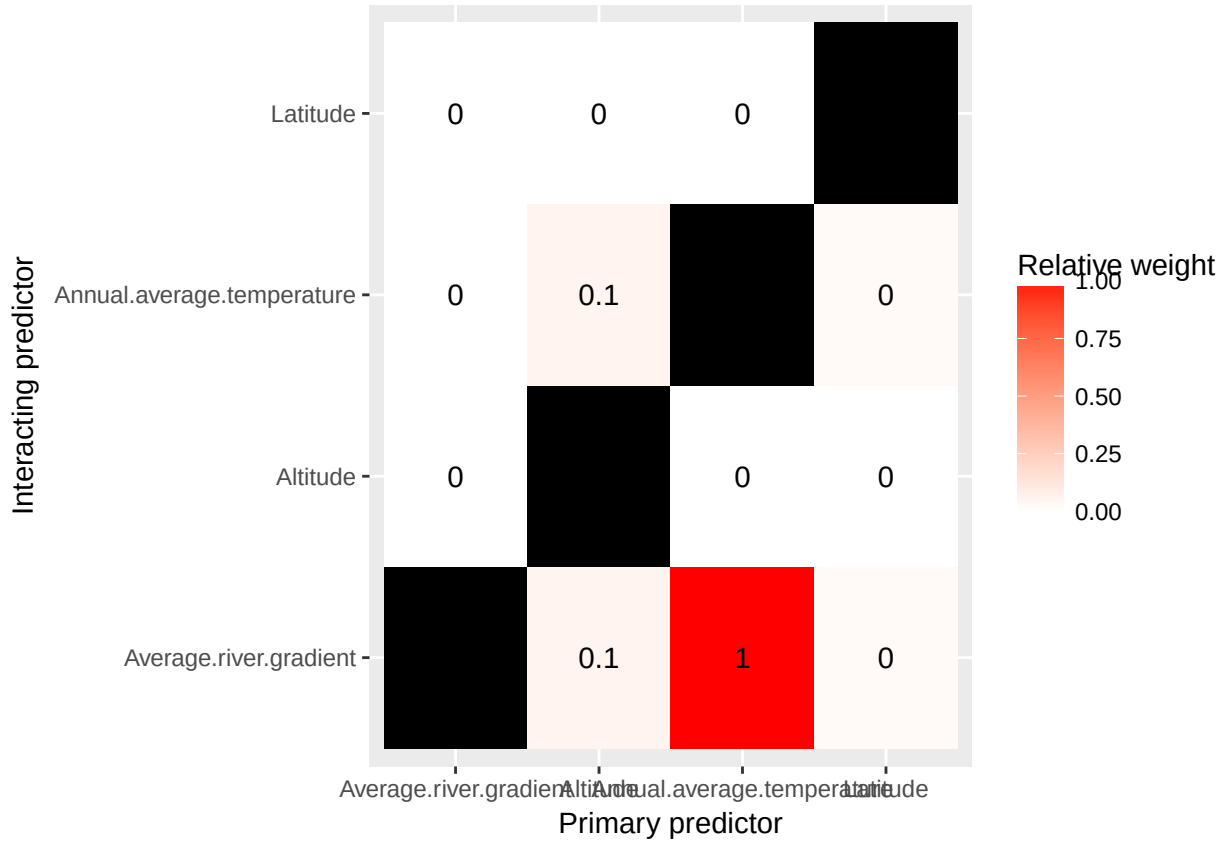

```
MCC(s.auto,weight = F)
```

```
## Warning: Ignoring unknown aesthetics: fill
```




```
Interaction <- MCC(s.auto ,weight=T)
```

```
## Warning: Ignoring unknown aesthetics: fill
```




```
Interaction$interact
```

```
##                             Average.river.gradient Altitude
## Average.river.gradient                          NA        0
## Altitude                                0.05948117       NA
## Annual.average.temperature              1.00000000        0
## Latitude                                0.02482987        0
##                             Annual.average.temperature Latitude
## Average.river.gradient                      0.00000000        0
## Altitude                                    0.05948117        0
## Annual.average.temperature                          NA        0
## Latitude                                    0.02482987       NA
```

```
s.auto$frame
```

```
##                            var   n  wt        dev     yval  complexity
## 1      Average.river.gradient 493 493 154.807508 2.695264 0.244974258
## 2  Annual.average.temperature 414 414  97.229078 2.673183 0.019315052
## 4  Annual.average.temperature 276 276  68.654604 2.668793 0.019315052
## 8                    Latitude  51  51  11.034036 2.622010 0.007607839
## 16                     <leaf>  12  12   1.390896 2.566144 0.000000000
## 17                     <leaf>  39  39   8.465389 2.639200 0.000000000
## 9  Annual.average.temperature 225 225  53.782236 2.679397 0.014549232
## 18                     <leaf> 138 138  23.049342 2.665662 0.000000000
## 19                     <leaf>  87  87  28.480564 2.701185 0.000000000
## 5                    Altitude 138 138  26.432576 2.681963 0.003012868
## 10                     <leaf>  66  66  14.173947 2.679330 0.000000000
```

```
## 11                    <leaf>  72  72  11.792215 2.684377 0.000000000
## 3                     <leaf>  79  79  19.654575 2.810978 0.000000000
##    ncompete nsurrogate    yval2.1    yval2.2    yval2.3    yval2.4
## 1         3          0  1.5489275  1.6040822  1.2473418  4.6534136
## 2         3          0  1.4845114  1.5720552  1.2224879  4.5592956
## 4         3          0  1.4643087  1.5573825  1.2217343  4.5336591
## 8         3          0  1.3534186  1.5072474  1.1650598  4.3462093
## 16        0          0  1.2492678  1.4292678  1.1333712  4.1564899
## 17        0          0  1.3854650  1.5312411  1.1748101  4.4045845
## 9         2          0  1.4894438  1.5687465  1.2345805  4.5761478
## 18        0          0  1.4739883  1.5511660  1.2341659  4.5425312
## 19        0          0  1.5139595  1.5966327  1.2352382  4.6294706
## 5         3          0  1.5249167  1.6014005  1.2239950  4.6105686
## 10        0          0  1.5017708  1.5962379  1.2151470  4.5821115
## 11        0          0  1.5461338  1.6061330  1.2321058  4.6366542
## 3         0          0  1.8865006  1.7719202  1.3775892  5.1466394
##       yval2.5    yval2.6    yval2.7    yval2.8    yval2.9   yval2.10
## 1   1.2885123  0.7709947  0.7646996  0.8945972  0.1250967 14.0549730
## 2   1.2883373  0.7708404  0.7646098  0.8949265  0.1250490 14.0497190
## 4   1.2773406  0.7679701  0.7684335  0.8928255  0.1208036 14.0834737
## 8   1.2969582  0.7695472  0.7592315  0.8983417  0.1280242 13.9960652
## 16  1.2641430  0.7702415  0.7793925  0.9070968  0.1154103 13.8567549
## 17  1.3070552  0.7693336  0.7530281  0.8956478  0.1319054 14.0389300
## 9   1.2728940  0.7676126  0.7705193  0.8915752  0.1191669 14.1032862
## 18  1.2590764  0.7686780  0.7800226  0.8955090  0.1138148 14.0376647
## 19  1.2948115  0.7659227  0.7554450  0.8853353  0.1276565 14.2073756
## 5   1.3103306  0.7765809  0.7569624  0.8991284  0.1335398 13.9822095
## 10  1.3151377  0.7725839  0.7502742  0.8961740  0.1353824 14.0284767
## 11  1.3059240  0.7802448  0.7630933  0.9018366  0.1318508 13.9397980
## 3   1.2894296  0.7718034  0.7651704  0.8928716  0.1253463 14.0825068
```