Def_red_mes RESULTS

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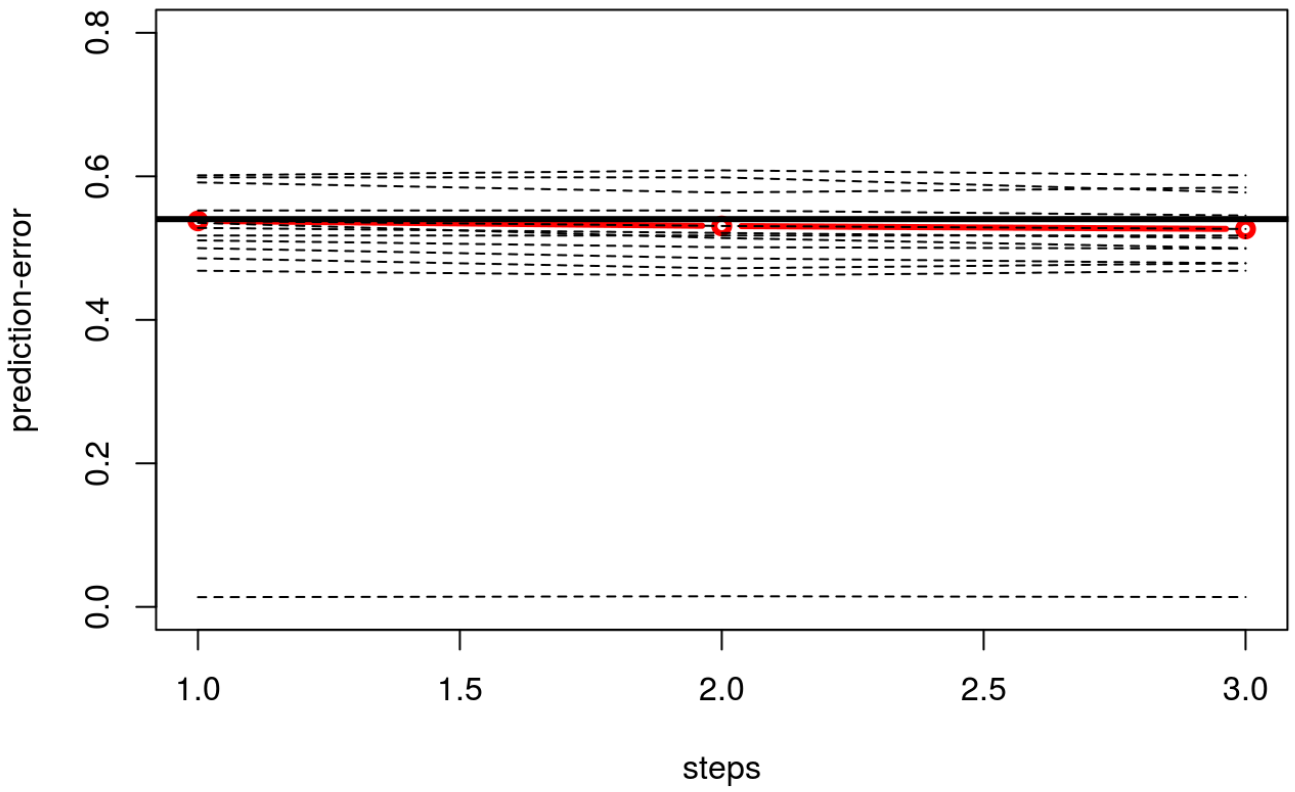
This compares the results of the forward stepwise selection for the macro scale GL1 and analyses the difference that stem from applying different measures of similarity, overall user accuracy, kappa, tau and quality.

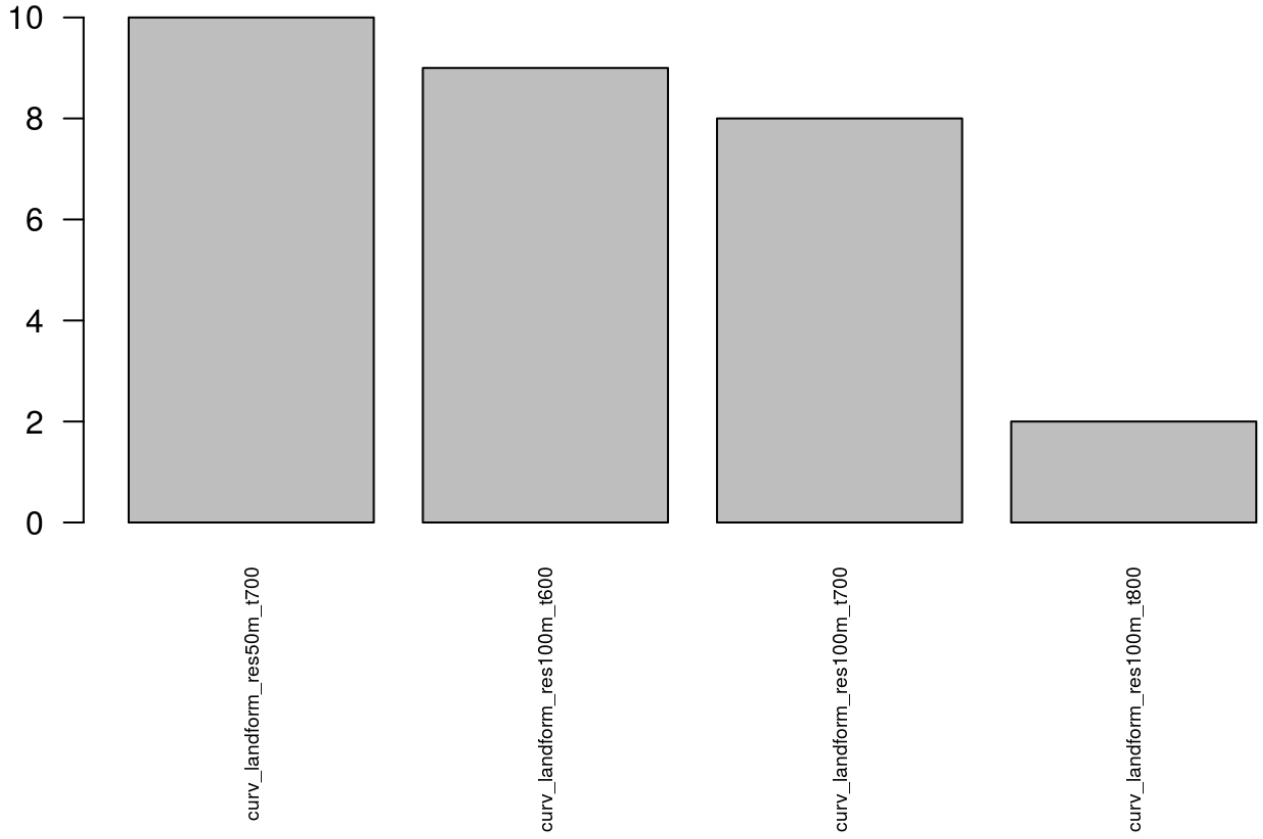
```
source("/media/fabs/Volume/Data/temp_delilah/DISS_new/neueszupaper1/fabians_and
_rossiters_functions.R")
load("/media/fabs/Volume/Data/temp_delilah/DISS_new/neueszupaper1/FWCV/mesoredd
ata_andpredlists.RData")
relief_defredmes <- mesoreddata[c("Def_red_mes","AufID")]
defredmes_ID <- mesoreddata$AufID
load("/media/fabs/Volume/01_PAPERZEUG/paper1_lenny/model_IDs.RData")
load("/media/fabs/Volume/01_PAPERZEUG/paper1_lenny/mesomakrolegends.RData")
```

Dikau's Curvature Classification

```
## [1] "USER'S ACCURACY"
```

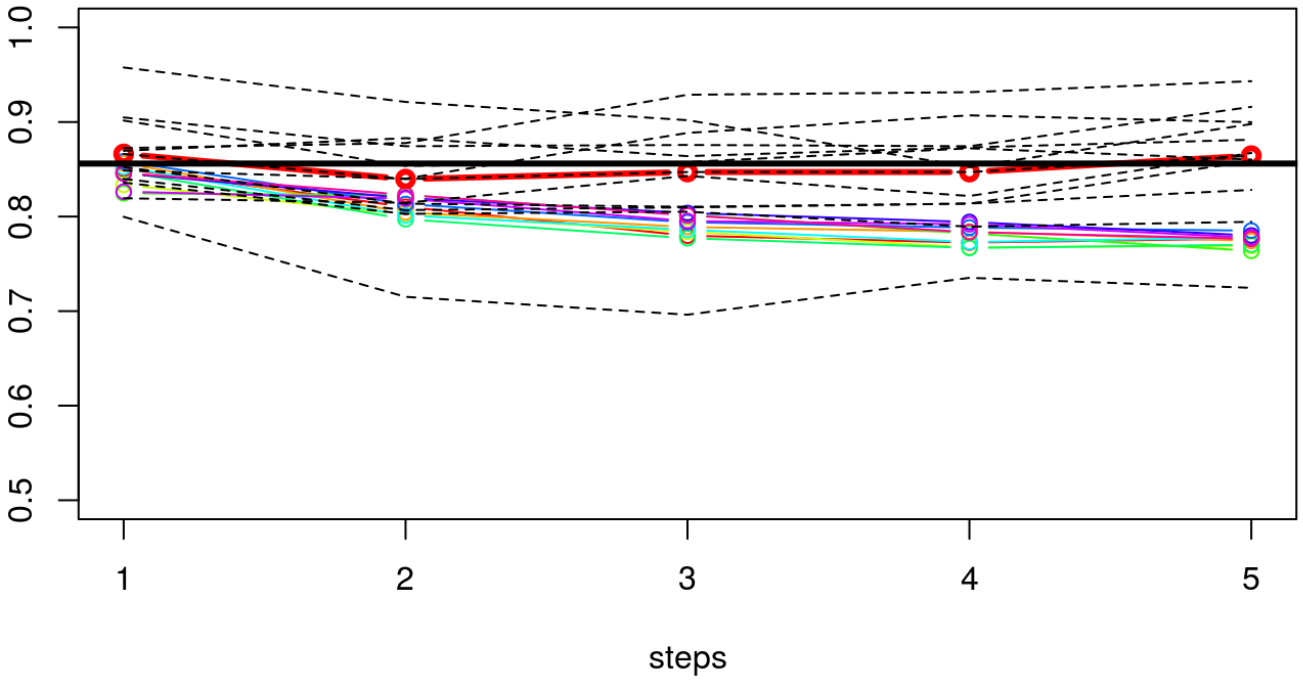


```
##                          k 1                          k 2
## 1  curv_landform_res50m_t700   curv_landform_res50m_t700
## 2 curv_landform_res100m_t600  curv_landform_res100m_t800
## 3 curv_landform_res100m_t700 curv_landform_res100m_t1000
##                          k 3                          k 4
## 1  curv_landform_res50m_t700  curv_landform_res50m_t700
## 2 curv_landform_res100m_t800 curv_landform_res100m_t600
## 3 curv_landform_res100m_t600 curv_landform_res100m_t700
##                          k 5                          k 6
## 1  curv_landform_res50m_t700  curv_landform_res50m_t700
## 2 curv_landform_res100m_t700 curv_landform_res100m_t600
## 3 curv_landform_res100m_t600 curv_landform_res100m_t700
##                          k 7                          k 8
## 1  curv_landform_res50m_t700  curv_landform_res50m_t700
## 2 curv_landform_res100m_t600 curv_landform_res100m_t600
## 3 curv_landform_res100m_t700 curv_landform_res100m_t700
##                          k 9                         k 10
## 1  curv_landform_res50m_t700  curv_landform_res50m_t700
## 2 curv_landform_res100m_t700 curv_landform_res100m_t600
## 3 curv_landform_res100m_t600 curv_landform_res100m_t700
```

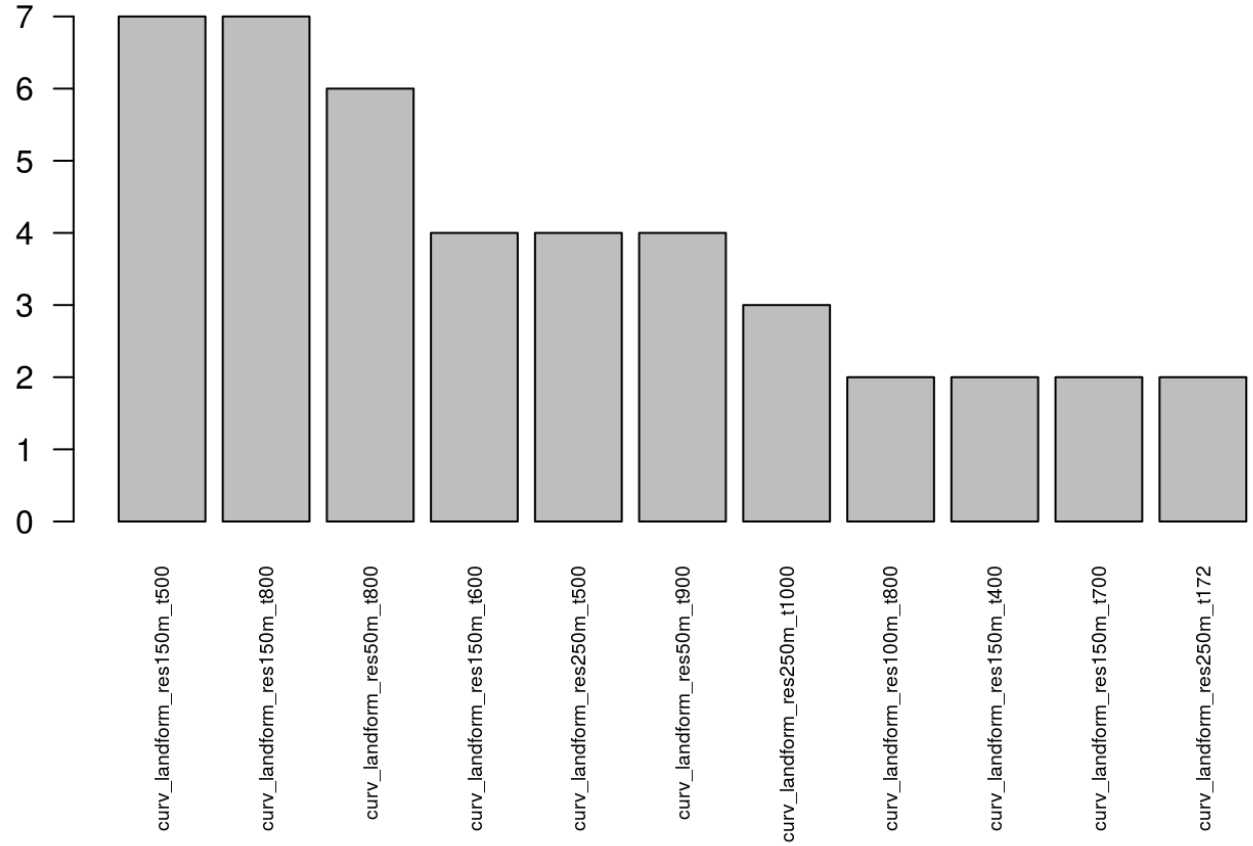



```
##                    allchosen Freq
## 5  curv_landform_res50m_t700   10
## 2 curv_landform_res100m_t600    9
## 3 curv_landform_res100m_t700    8
## 4 curv_landform_res100m_t800    2
```

```
## [1] "KAPPA"
```

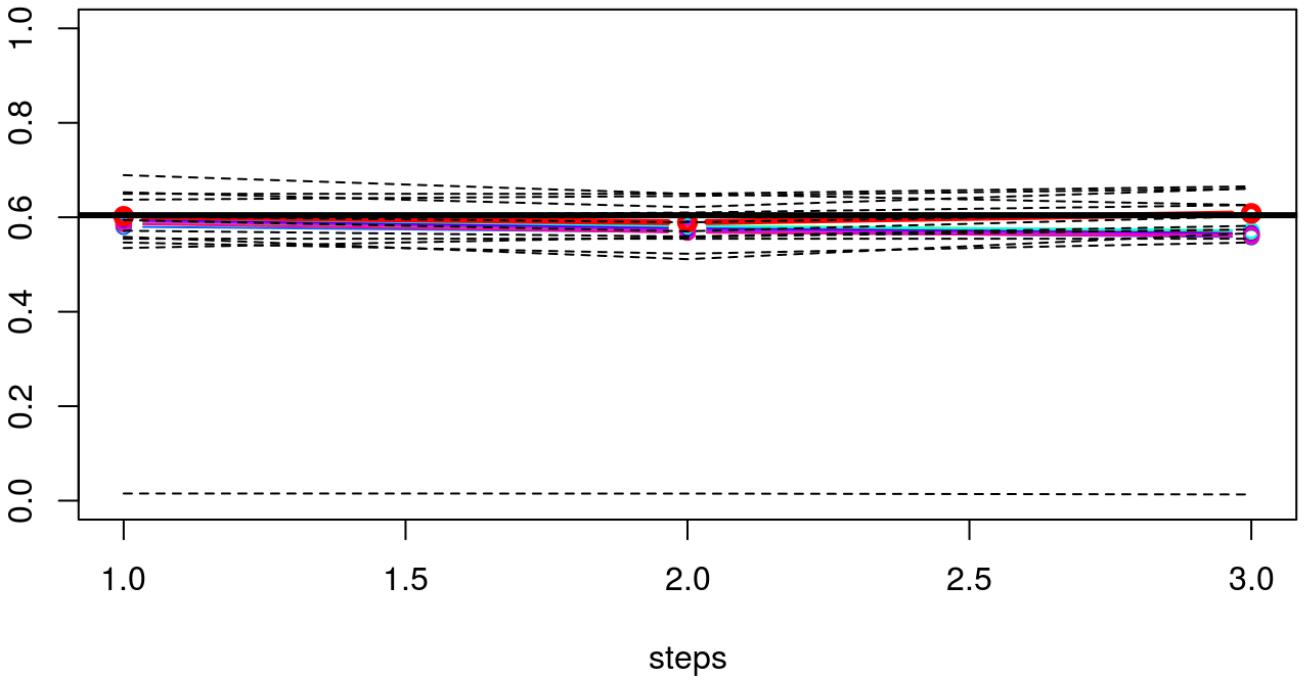


```
##                          k 1                          k 2
## 1  curv_landform_res50m_t800  curv_landform_res50m_t800
## 2 curv_landform_res150m_t500 curv_landform_res150m_t500
## 3 curv_landform_res150m_t700 curv_landform_res250m_t179
## 4  curv_landform_res250m_t62 curv_landform_res150m_t800
## 5 curv_landform_res150m_t800  curv_landform_res250m_t74
##                          k 3                           k 4
## 1  curv_landform_res50m_t800   curv_landform_res50m_t900
## 2 curv_landform_res150m_t500  curv_landform_res150m_t400
## 3 curv_landform_res150m_t800  curv_landform_res100m_t800
## 4 curv_landform_res250m_t500  curv_landform_res250m_t169
## 5 curv_landform_res150m_t600 curv_landform_res250m_t1000
##                          k 5                          k 6
## 1  curv_landform_res50m_t800  curv_landform_res50m_t800
## 2 curv_landform_res150m_t500 curv_landform_res150m_t500
## 3 curv_landform_res150m_t800 curv_landform_res150m_t800
## 4 curv_landform_res250m_t500 curv_landform_res250m_t500
## 5 curv_landform_res150m_t600 curv_landform_res250m_t195
##                          k 7                          k 8
## 1  curv_landform_res50m_t800  curv_landform_res50m_t900
## 2 curv_landform_res150m_t500 curv_landform_res150m_t400
## 3 curv_landform_res150m_t800 curv_landform_res100m_t800
## 4 curv_landform_res250m_t500 curv_landform_res250m_t172
## 5 curv_landform_res150m_t600 curv_landform_res150m_t700
##                           k 9                          k 10
## 1   curv_landform_res50m_t900   curv_landform_res50m_t900
## 2  curv_landform_res100m_t600  curv_landform_res150m_t500
## 3  curv_landform_res250m_t172  curv_landform_res150m_t800
## 4  curv_landform_res150m_t600   curv_landform_res250m_t37
## 5 curv_landform_res250m_t1000 curv_landform_res250m_t1000
```

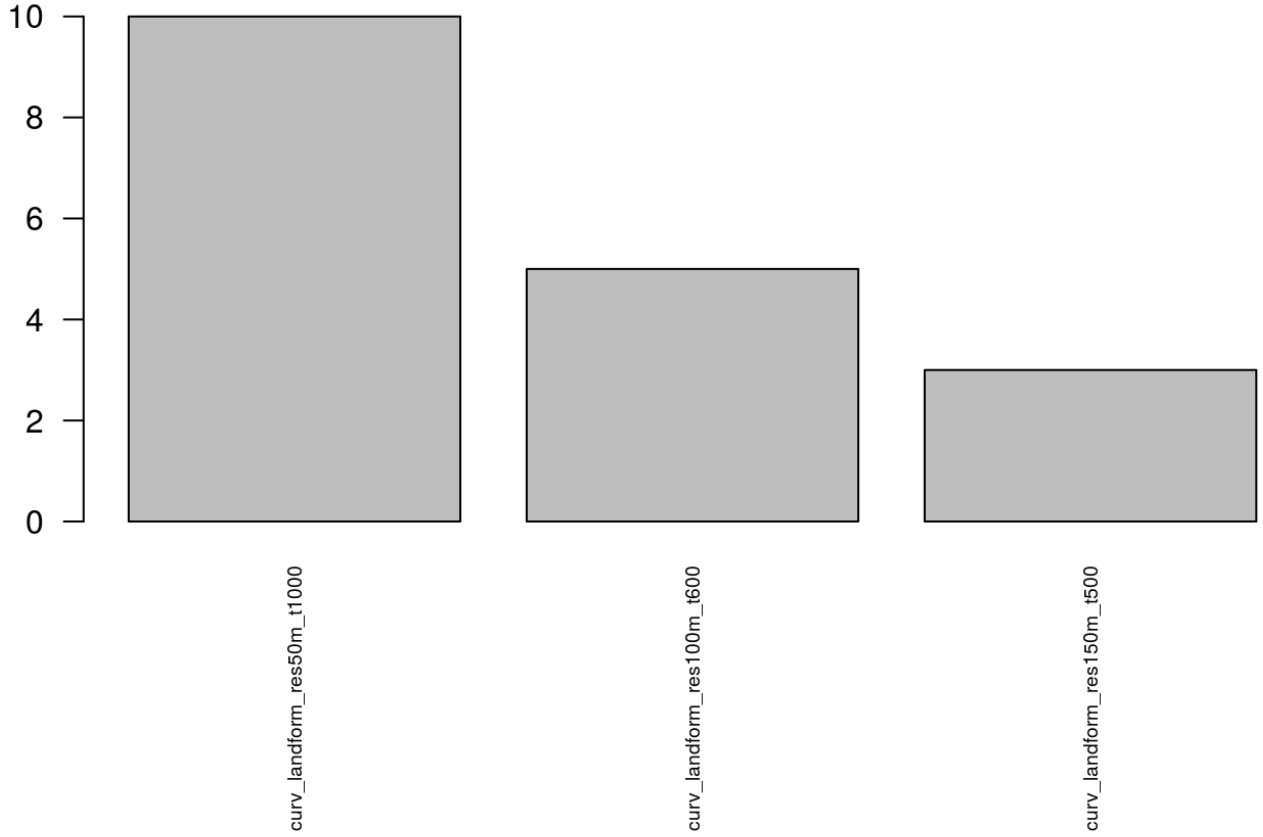



```
##                      allchosen Freq
## 4   curv_landform_res150m_t500    7
## 7   curv_landform_res150m_t800    7
## 17   curv_landform_res50m_t800    6
## 5   curv_landform_res150m_t600    4
## 14  curv_landform_res250m_t500    4
## 18   curv_landform_res50m_t900    4
## 8  curv_landform_res250m_t1000    3
## 2   curv_landform_res100m_t800    2
## 3   curv_landform_res150m_t400    2
## 6   curv_landform_res150m_t700    2
## 10  curv_landform_res250m_t172    2
```

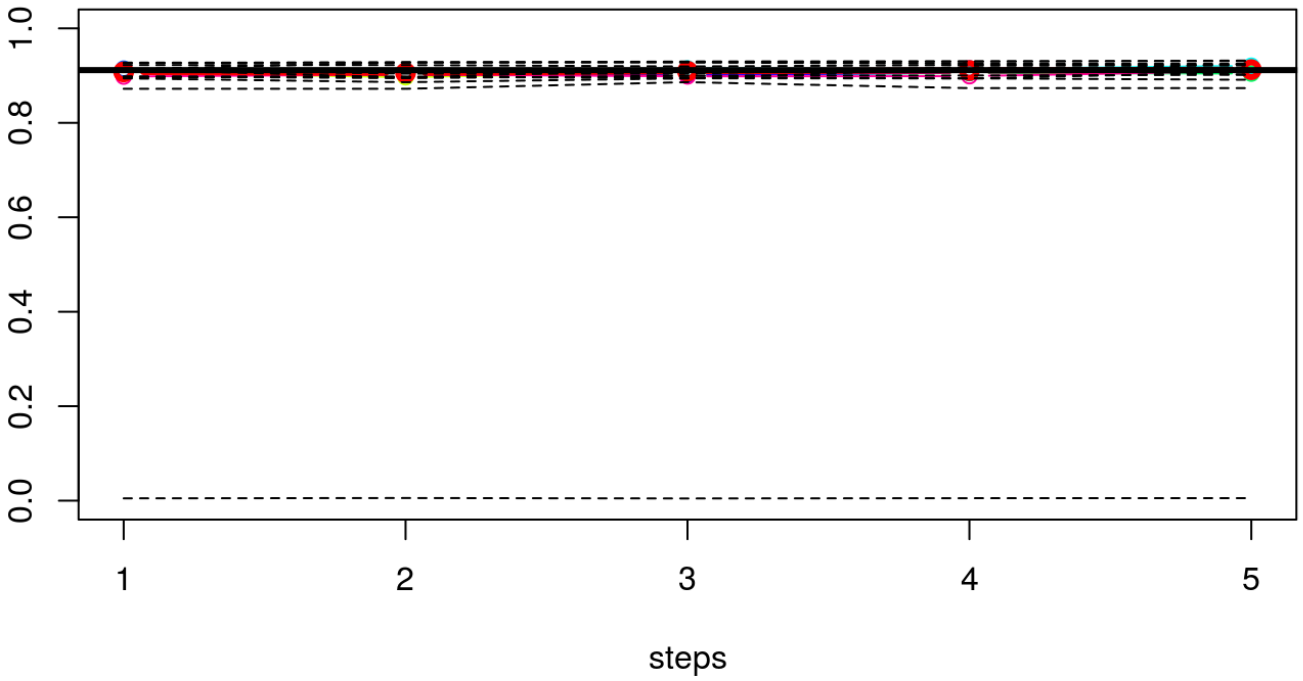
```
## [1] "TAU"
```



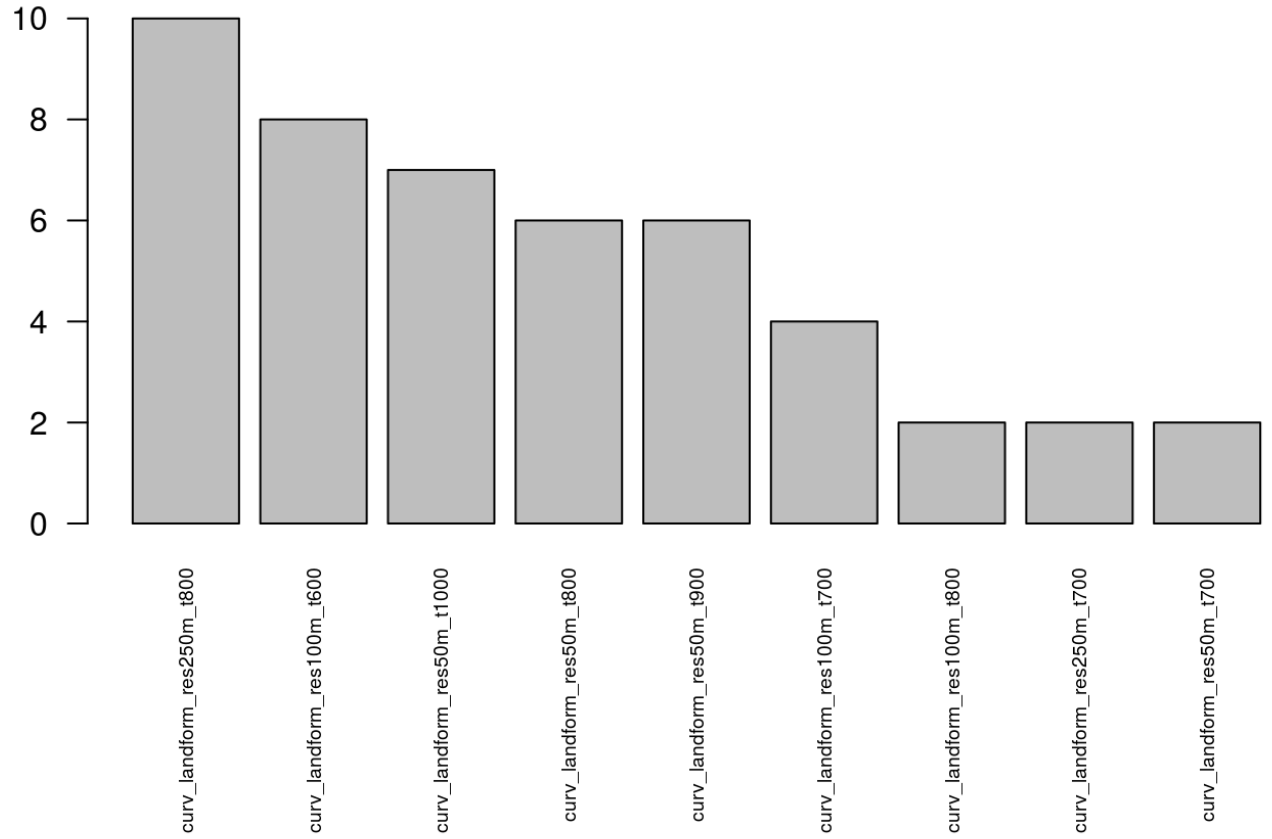

```
##                           k 1                           k 2
## 1 curv_landform_res50m_t1000 curv_landform_res50m_t1000
## 2 curv_landform_res150m_t500 curv_landform_res150m_t500
## 3 curv_landform_res250m_t149 curv_landform_res250m_t103
##                           k 3                            k 4
## 1 curv_landform_res50m_t1000  curv_landform_res50m_t1000
## 2 curv_landform_res100m_t600 curv_landform_res100m_t1000
## 3 curv_landform_res150m_t124  curv_landform_res150m_t137
##                           k 5                           k 6
## 1 curv_landform_res50m_t1000 curv_landform_res50m_t1000
## 2 curv_landform_res150m_t500 curv_landform_res100m_t600
## 3 curv_landform_res100m_t139  curv_landform_res150m_t16
##                           k 7                           k 8
## 1 curv_landform_res50m_t1000 curv_landform_res50m_t1000
## 2 curv_landform_res100m_t600 curv_landform_res100m_t600
## 3 curv_landform_res150m_t700  curv_landform_res150m_t67
##                           k 9                          k 10
## 1 curv_landform_res50m_t1000 curv_landform_res50m_t1000
## 2 curv_landform_res100m_t600 curv_landform_res150m_t400
## 3 curv_landform_res250m_t101  curv_landform_res250m_t97
```




```
##                     allchosen Freq
## 15 curv_landform_res50m_t1000   10
## 3  curv_landform_res100m_t600    5
## 8  curv_landform_res150m_t500    3
```


1.0
0.8
0.6
0.4
0.2
0.0
1
2
3
4
5
steps

```
##                           k 1                           k 2
## 1 curv_landform_res50m_t1000 curv_landform_res50m_t1000
## 2 curv_landform_res250m_t800 curv_landform_res100m_t600
## 3  curv_landform_res50m_t900  curv_landform_res50m_t900
## 4 curv_landform_res100m_t600 curv_landform_res250m_t800
## 5 curv_landform_res250m_t700 curv_landform_res100m_t700
##                           k 3                           k 4
## 1 curv_landform_res50m_t1000  curv_landform_res50m_t900
## 2 curv_landform_res250m_t800 curv_landform_res100m_t700
## 3  curv_landform_res50m_t900 curv_landform_res250m_t800
## 4 curv_landform_res100m_t600 curv_landform_res100m_t600
## 5  curv_landform_res50m_t700  curv_landform_res50m_t700
##                           k 5                           k 6
## 1  curv_landform_res50m_t800  curv_landform_res50m_t800
## 2 curv_landform_res100m_t600 curv_landform_res100m_t600
## 3 curv_landform_res250m_t800 curv_landform_res250m_t800
## 4 curv_landform_res50m_t1000  curv_landform_res50m_t900
## 5 curv_landform_res100m_t700 curv_landform_res100m_t700
##                           k 7                           k 8
## 1  curv_landform_res50m_t800  curv_landform_res50m_t800
## 2 curv_landform_res250m_t800 curv_landform_res100m_t600
## 3 curv_landform_res100m_t800 curv_landform_res250m_t800
## 4 curv_landform_res50m_t1000 curv_landform_res50m_t1000
## 5 curv_landform_res100m_t900 curv_landform_res100m_t800
##                           k 9                          k 10
## 1 curv_landform_res50m_t1000  curv_landform_res50m_t900
## 2    curv_landform_res10m_t1 curv_landform_res250m_t800
## 3   curv_landform_res10m_t33 curv_landform_res100m_t600
## 4  curv_landform_res50m_t800  curv_landform_res50m_t800
## 5 curv_landform_res250m_t800 curv_landform_res250m_t700
```




```
##                      allchosen Freq
## 8  curv_landform_res250m_t800   10
## 1  curv_landform_res100m_t600    8
## 9  curv_landform_res50m_t1000    7
## 11  curv_landform_res50m_t800    6
## 12  curv_landform_res50m_t900    6
## 2  curv_landform_res100m_t700    4
## 3  curv_landform_res100m_t800    2
## 7  curv_landform_res250m_t700    2
## 10  curv_landform_res50m_t700    2
```

- UA: one parameter sufficient:curv_landform_res50m_t700 (allways)
- KAPPA: two parameter better :(:curv_landform_res50m_t800 (6x, plus 4x curv_landform_res50m_t900) AND curv_landform_res150m_t400 or 500
- TAU: one sufficient: curv_landform_res50m_t1000 ten times
- QUALITY:SINNLOS DA immer nur t1000

```
## Loading required package: e1071
```

```
## [1] "10fold cv-error:  0.54002808988764  for predictors curv_landform_res50m
_t700"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   1  27   3  24   1  17   5   3  12
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  20  77  58  76  69 583  46  76 198
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   1   0   1   2  30  11  26  57
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4684 , 0.0132 , 2.8
## [1] 95 % confidence limits for accuracy: 0.4421 ... 0.4947
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.2903    NaN    NaN    NaN 0.4846    NaN    NaN 0.4453
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.2571 0.0000 0.0000 0.0000 0.9254 0.0000 0.0000 0.2135
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1207 , 0.0137 , 11.3
## [1] 95 % confidence limits for kappa: 0.0936 ... 0.1478
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.2338    NaN    NaN    NaN 0.0757    NaN    NaN 0.3173
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0485    NaN    NaN    NaN 0.0100    NaN    NaN 0.0514
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 20.8  NaN  NaN  NaN 13.3  NaN  NaN 16.2
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.2052 0.0000 0.0000 0.0000 0.5193 0.0000 0.0000 0.1358
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0432 0.0000 0.0000 0.0000 0.0591 0.0000 0.0000 0.0238
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 21.1  NaN  NaN  NaN 11.4  NaN  NaN 17.5
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0653 0.0000 0.0000 0.0000 0.8448 0.0000 0.0000 0.0899
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4019 , 0.012 , 3
## [1] 95% confidence limits for tau:0.378...0.4259
## [1] "mean quality =  0.0881037544551715"
```

```
## [1] "The quality of the modeled TP is  0.0881037544551715"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.537219101123595  for predictors curv_landform_res50
m_t800"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   1  25   1  18   1  10   5   3  10
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  20  74  60  79  65 547  42  67 157
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   6   0   4   6  73  15  35 100
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4719 , 0.0132 , 2.8
## [1] 95 % confidence limits for accuracy: 0.4456 ... 0.4982
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3378    NaN    NaN    NaN 0.4923    NaN    NaN 0.4184
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.2381 0.0000 0.0000 0.0000 0.8683 0.0000 0.0000 0.3745
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1476 , 0.0154 , 10.5
## [1] 95 % confidence limits for kappa: 0.117 ... 0.1782
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.2851    NaN    NaN    NaN 0.0896    NaN    NaN 0.2842
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0574    NaN    NaN    NaN 0.0125    NaN    NaN 0.0354
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 20.1  NaN  NaN  NaN 14.0  NaN  NaN 12.5
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1963 0.0000 0.0000 0.0000 0.4006 0.0000 0.0000 0.2484
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0415 0.0000 0.0000 0.0000 0.0516 0.0000 0.0000 0.0315
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 21.1  NaN  NaN  NaN 12.9  NaN  NaN 12.7
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0520 0.0000 0.0000 0.0000 0.7802 0.0000 0.0000 0.1678
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.4059 , 0.0121 , 3
## [1] 95% confidence limits for tau:0.3818...0.43
## [1] "mean quality =  0.0963074482395224"
## [1] "The quality of the modeled TP is  0.0963074482395224"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.536516853932584  for predictors curv_landform_res50
m_t1000"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   1  20   0   8   1   3   3   3   6
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  20  82  61  90  67 577  47  77 184
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   3   0   3   4  50  12  25  77
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4733 , 0.0132 , 2.8
## [1] 95 % confidence limits for accuracy: 0.447 ... 0.4996
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.4444    NaN    NaN    NaN 0.4788    NaN    NaN 0.4425
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1905 0.0000 0.0000 0.0000 0.9159 0.0000 0.0000 0.2884
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1228 , 0.0144 , 11.7
## [1] 95 % confidence limits for kappa: 0.0942 ... 0.1513
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.4002    NaN    NaN    NaN 0.0653    NaN    NaN 0.3139
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0786    NaN    NaN    NaN 0.0100    NaN    NaN 0.0432
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 19.6  NaN  NaN  NaN 15.2  NaN  NaN 13.8
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1641 0.0000 0.0000 0.0000 0.4530 0.0000 0.0000 0.1893
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0373 0.0000 0.0000 0.0000 0.0618 0.0000 0.0000 0.0275
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 22.7  NaN  NaN  NaN 13.7  NaN  NaN 14.5
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0316 0.0000 0.0000 0.0000 0.8462 0.0000 0.0000 0.1222
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.4075 , 0.0121 , 3
## [1] 95% confidence limits for tau:0.3835...0.4315
## [1] "mean quality =  0.0915610180316063"
## [1] "The quality of the modeled TP is  0.0915610180316063"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.549859550561798  for predictors curv_landform_res50
m_t800"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   1  25   1  18   1  10   5   3  10
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  20  74  60  79  65 547  42  67 157
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   6   0   4   6  73  15  35 100
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4719 , 0.0132 , 2.8
## [1] 95 % confidence limits for accuracy: 0.4456 ... 0.4982
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3378    NaN    NaN    NaN 0.4923    NaN    NaN 0.4184
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.2381 0.0000 0.0000 0.0000 0.8683 0.0000 0.0000 0.3745
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1476 , 0.0154 , 10.5
## [1] 95 % confidence limits for kappa: 0.117 ... 0.1782
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.2851    NaN    NaN    NaN 0.0896    NaN    NaN 0.2842
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0574    NaN    NaN    NaN 0.0125    NaN    NaN 0.0354
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 20.1  NaN  NaN  NaN 14.0  NaN  NaN 12.5
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1963 0.0000 0.0000 0.0000 0.4006 0.0000 0.0000 0.2484
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0415 0.0000 0.0000 0.0000 0.0516 0.0000 0.0000 0.0315
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 21.1  NaN  NaN  NaN 12.9  NaN  NaN 12.7
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0520 0.0000 0.0000 0.0000 0.7802 0.0000 0.0000 0.1678
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.4059 , 0.0121 , 3
## [1] 95% confidence limits for tau:0.3818...0.43
## [1] "mean quality =  0.0963074482395224"
## [1] "The quality of the modeled TP is  0.0963074482395224"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.554775280898876  for predictors curv_landform_res15
0m_t400"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   0   0   0   0   0   0   0   0   0
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  21  93  57  91  69 606  56  96 232
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0  12   4  10   3  24   6   9  35
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4501 , 0.0132 , 2.9
## [1] 95 % confidence limits for accuracy: 0.4239 ... 0.4763
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN    NaN    NaN    NaN 0.4587    NaN    NaN 0.3398
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.0000 0.0000 0.0000 0.9619 0.0000 0.0000 0.1311
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.0454 , 0.0098 , 21.5
## [1] 95 % confidence limits for kappa: 0.0259 ... 0.0649
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN    NaN    NaN    NaN 0.0293    NaN    NaN 0.1875
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN    NaN    NaN    NaN 0.0064    NaN    NaN 0.0549
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN  NaN  NaN  NaN  NaN 21.8  NaN  NaN 29.3
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.0000 0.0000 0.0000 0.4733 0.0000 0.0000 0.0633
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.0000 0.0000 0.0000 0.0918 0.0000 0.0000 0.0192
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN  NaN  NaN  NaN  NaN 19.4  NaN  NaN 30.4
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.0000 0.0000 0.0000 0.9277 0.0000 0.0000 0.0723
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

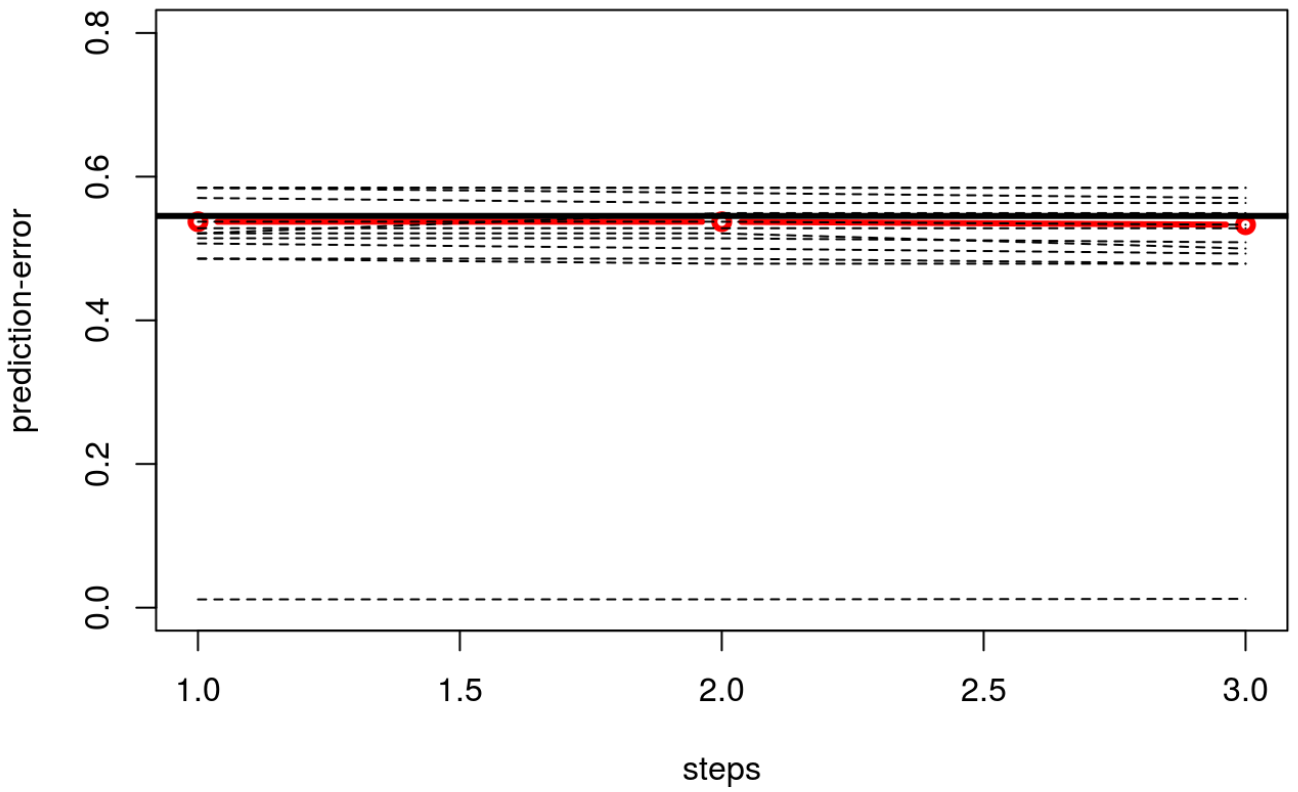
```
## [1] Tau, stdev, & CV%: 0.3814 , 0.012 , 3.2
## [1] 95% confidence limits for tau:0.3575...0.4054
## [1] "mean quality =  0.0616705814175714"
## [1] "The quality of the modeled TP is  0.0616705814175714"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

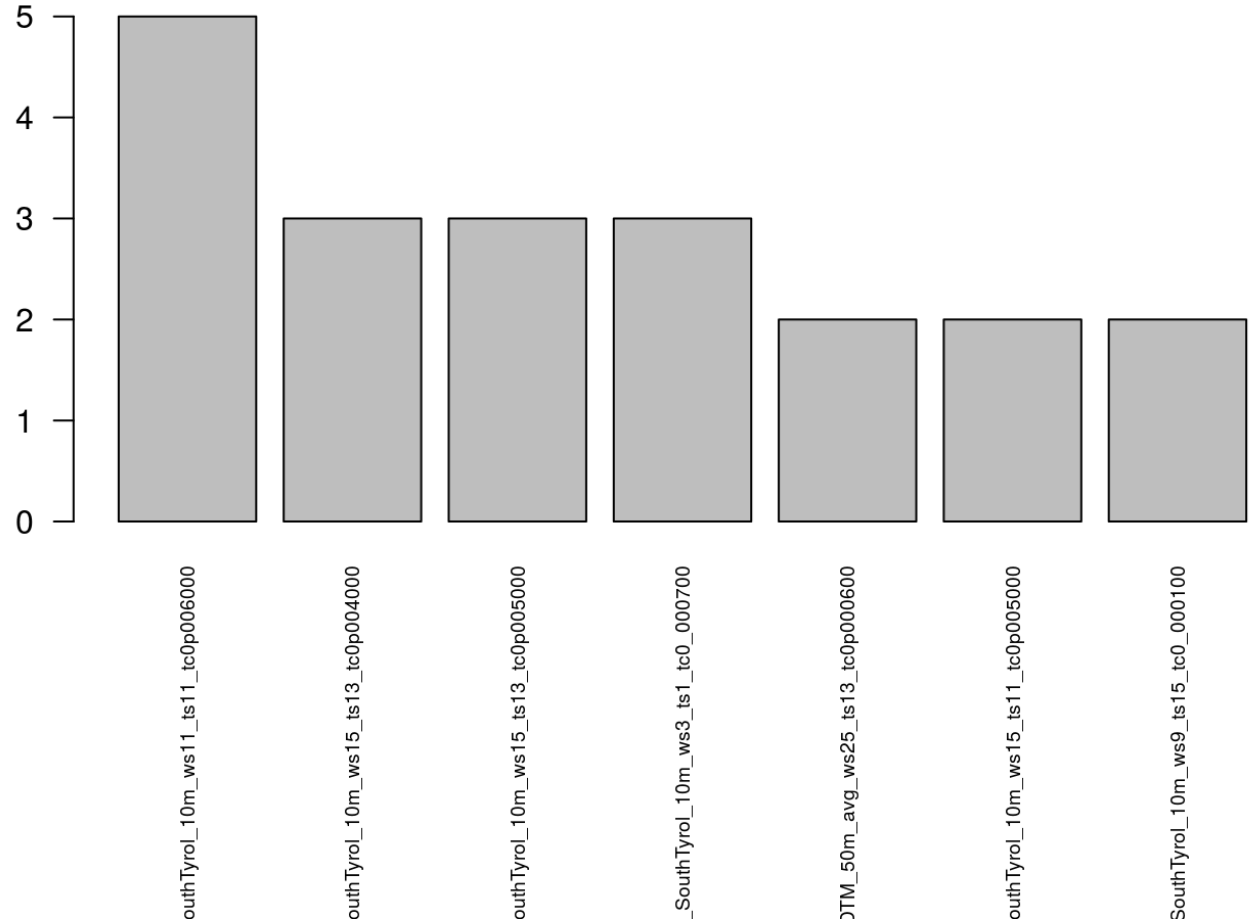
```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
```

Woods morphometric features

```
## [1] "USER'S ACCURACY"
```

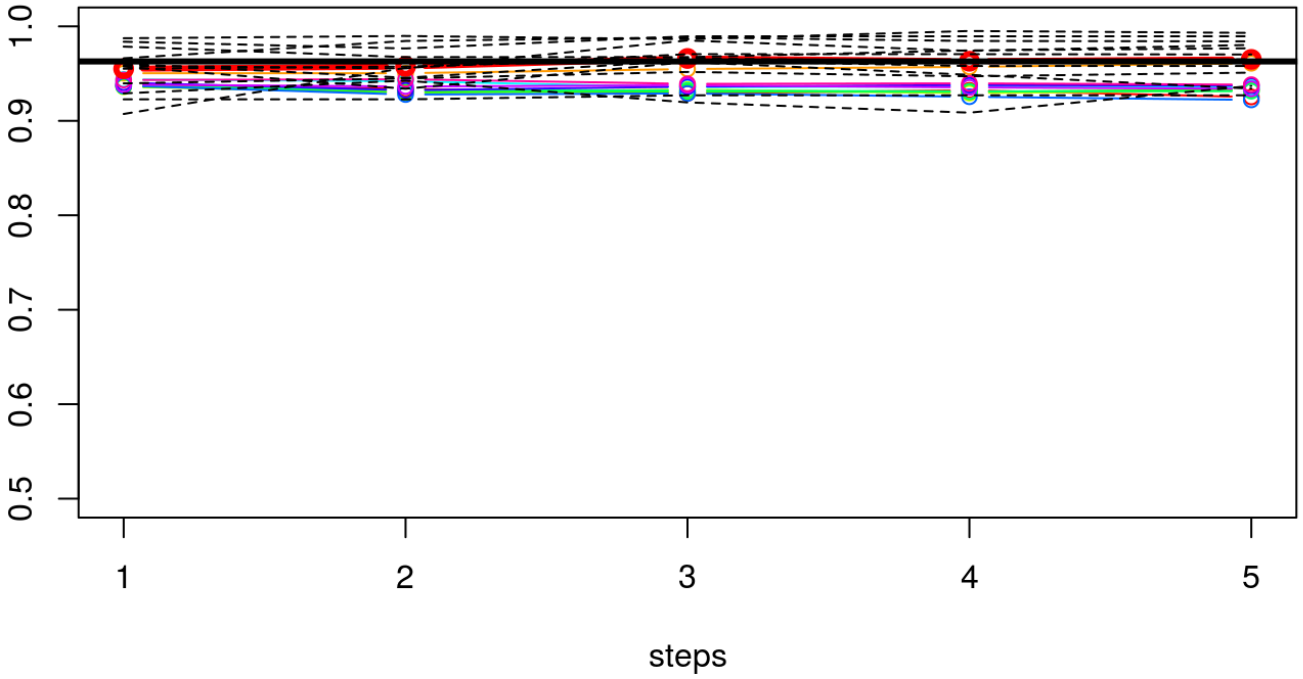


```
##                                                 k 1
## 1 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p004000
## 2        feature_DTM_50m_avg_ws25_ts13_tc0p000600
## 3 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p005000
##                                                 k 2
## 1 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p004000
## 2 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000200
## 3 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p005000
##                                                 k 3
## 1 feature_DTM_SouthTyrol_10m_ws15_ts11_tc0p005000
## 2 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p004000
## 3  feature_DTM_SouthTyrol_10m_ws9_ts15_tc0_000100
##                                                 k 4
## 1 feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000
## 2  feature_DTM_SouthTyrol_10m_ws3_ts15_tc0_000010
## 3         feature_DTM_50m_avg_ws7_ts12_tc0p003000
##                                                 k 5
## 1 feature_DTM_SouthTyrol_10m_ws15_ts11_tc0p005000
## 2  feature_DTM_SouthTyrol_10m_ws9_ts11_tc0_000300
## 3  feature_DTM_SouthTyrol_10m_ws9_ts15_tc0_000100
##                                                 k 6
## 1 feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000
## 2        feature_DTM_50m_avg_ws29_ts15_tc0p000500
## 3         feature_DTM_50m_avg_ws7_ts14_tc0p003000
##                                                 k 7
## 1 feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000
## 2   feature_DTM_SouthTyrol_10m_ws3_ts1_tc0_000700
## 3         feature_DTM_50m_avg_ws7_ts10_tc0p003000
##                                                 k 8
## 1 feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000
## 2   feature_DTM_SouthTyrol_10m_ws3_ts1_tc0_000700
## 3 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p005000
##                                                 k 9
## 1 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0p004000
## 2        feature_DTM_50m_avg_ws25_ts13_tc0p000600
## 3         feature_DTM_50m_avg_ws7_ts13_tc0p003000
##                                                k 10
## 1 feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000
## 2   feature_DTM_SouthTyrol_10m_ws3_ts1_tc0_000700
## 3          feature_DTM_50m_avg_ws7_ts1_tc0p003000
```



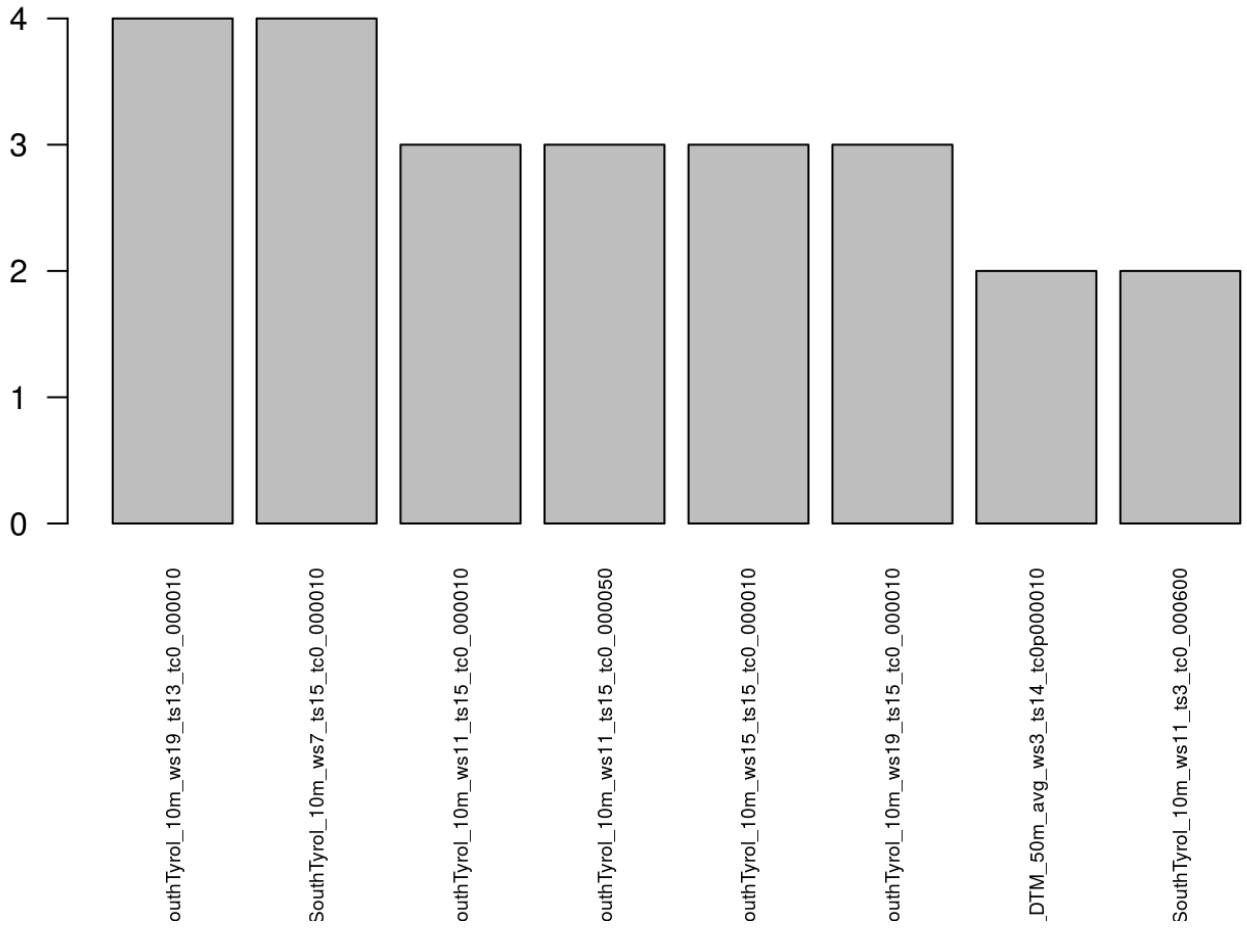

```
##                                              allchosen Freq
## 8  feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000    5
## 10 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p004000    3
## 11 feature_DTM_SouthTyrol_10m_ws15_ts13_tc0p005000    3
## 15   feature_DTM_SouthTyrol_10m_ws3_ts1_tc0_000700    3
## 1         feature_DTM_50m_avg_ws25_ts13_tc0p000600    2
## 9  feature_DTM_SouthTyrol_10m_ws15_ts11_tc0p005000    2
## 17  feature_DTM_SouthTyrol_10m_ws9_ts15_tc0_000100    2
```

```
## [1] "KAPPA"
```


1.0
0.9
0.8
0.7
0.6
0.5
1
2
3
4
5
steps

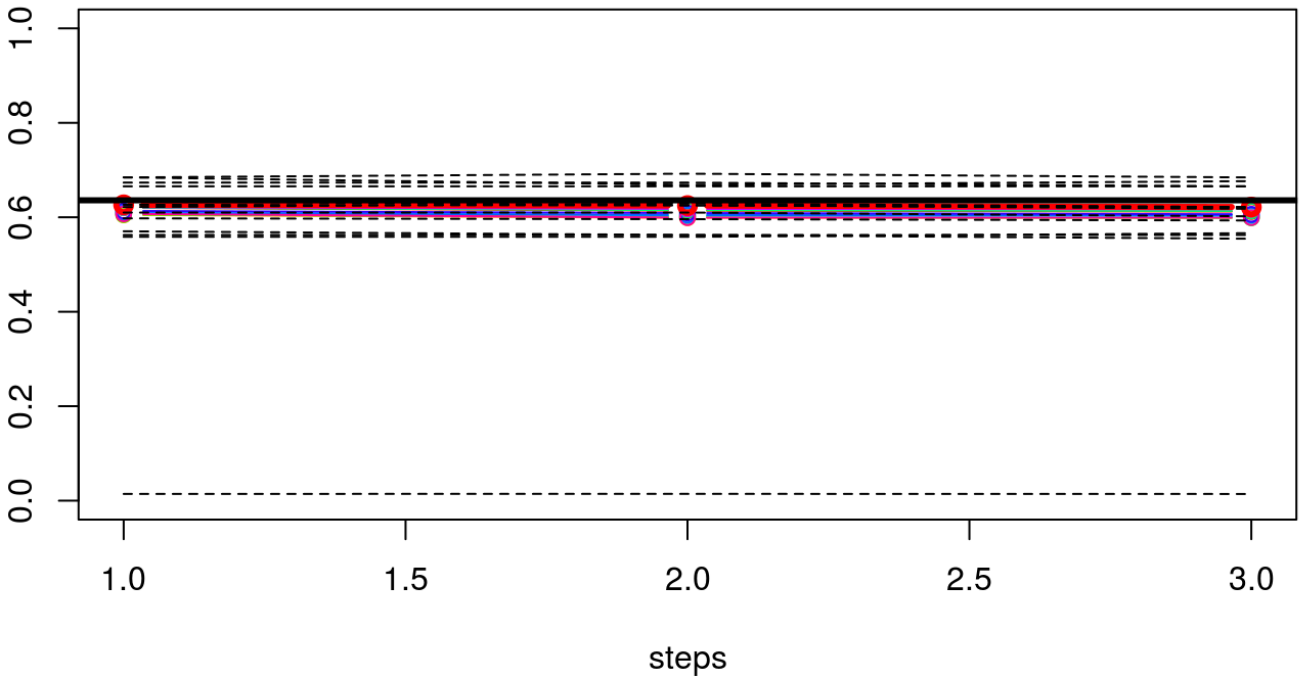
```
##                                                 k 1
## 1 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000010
## 2  feature_DTM_SouthTyrol_10m_ws11_ts3_tc0_000600
## 3  feature_DTM_SouthTyrol_10m_ws5_ts15_tc0_000050
## 4  feature_DTM_SouthTyrol_10m_ws7_ts15_tc0_000010
## 5  feature_DTM_SouthTyrol_10m_ws3_ts15_tc0_000010
##                                       k 2
## 1 feature_DTM_50m_avg_ws5_ts14_tc0p000010
## 2 feature_DTM_50m_avg_ws5_ts15_tc0p000010
## 3 feature_DTM_50m_avg_ws5_ts14_tc0p000100
## 4 feature_DTM_50m_avg_ws5_ts14_tc0p000050
## 5 feature_DTM_50m_avg_ws5_ts14_tc0p000200
##                                                 k 3
## 1 feature_DTM_SouthTyrol_10m_ws19_ts15_tc0_000010
## 2  feature_DTM_SouthTyrol_10m_ws7_ts11_tc0_000010
## 3 feature_DTM_SouthTyrol_10m_ws19_ts15_tc0_000050
## 4   feature_DTM_SouthTyrol_10m_ws7_ts1_tc0_000600
## 5 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000010
##                                                 k 4
## 1 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000010
## 2  feature_DTM_SouthTyrol_10m_ws9_ts11_tc0_000010
## 3 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000050
## 4 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000010
## 5 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000400
##                                                 k 5
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2 feature_DTM_SouthTyrol_10m_ws19_ts11_tc0_000010
## 3 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000010
## 4  feature_DTM_SouthTyrol_10m_ws9_ts15_tc0_000400
## 5 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000100
##                                                 k 6
## 1 feature_DTM_SouthTyrol_10m_ws19_ts15_tc0_000010
## 2         feature_DTM_50m_avg_ws3_ts14_tc0p000010
## 3  feature_DTM_SouthTyrol_10m_ws11_ts1_tc0_000700
## 4         feature_DTM_50m_avg_ws3_ts15_tc0p000010
## 5 feature_DTM_SouthTyrol_10m_ws19_ts13_tc0_000010
##                                                 k 7
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000010
## 2  feature_DTM_SouthTyrol_10m_ws11_ts3_tc0_000600
## 3 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 4 feature_DTM_SouthTyrol_10m_ws19_ts13_tc0_000010
## 5          feature_DTM_50m_avg_ws5_ts1_tc0p000100
##                                                 k 8
## 1  feature_DTM_SouthTyrol_10m_ws7_ts15_tc0_000010
## 2         feature_DTM_50m_avg_ws3_ts14_tc0p000010
## 3 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000200
## 4  feature_DTM_SouthTyrol_10m_ws9_ts15_tc0_000050
## 5  feature_DTM_SouthTyrol_10m_ws31_ts1_tc0_000100
##                                                 k 9
## 1 feature_DTM_SouthTyrol_10m_ws19_ts15_tc0_000010
## 2  feature_DTM_SouthTyrol_10m_ws9_ts15_tc0_000010
## 3 feature_DTM_SouthTyrol_10m_ws19_ts13_tc0_000010
## 4   feature_DTM_SouthTyrol_10m_ws9_ts1_tc0_000400
```

```
## 5  feature_DTM_SouthTyrol_10m_ws7_ts15_tc0_000010
##                                                 k 10
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2 feature_DTM_SouthTyrol_10m_ws19_ts13_tc0_000010
## 3  feature_DTM_SouthTyrol_10m_ws11_ts1_tc0_000500
## 4  feature_DTM_SouthTyrol_10m_ws7_ts15_tc0_000010
## 5         feature_DTM_50m_avg_ws3_ts14_tc0p000050
```

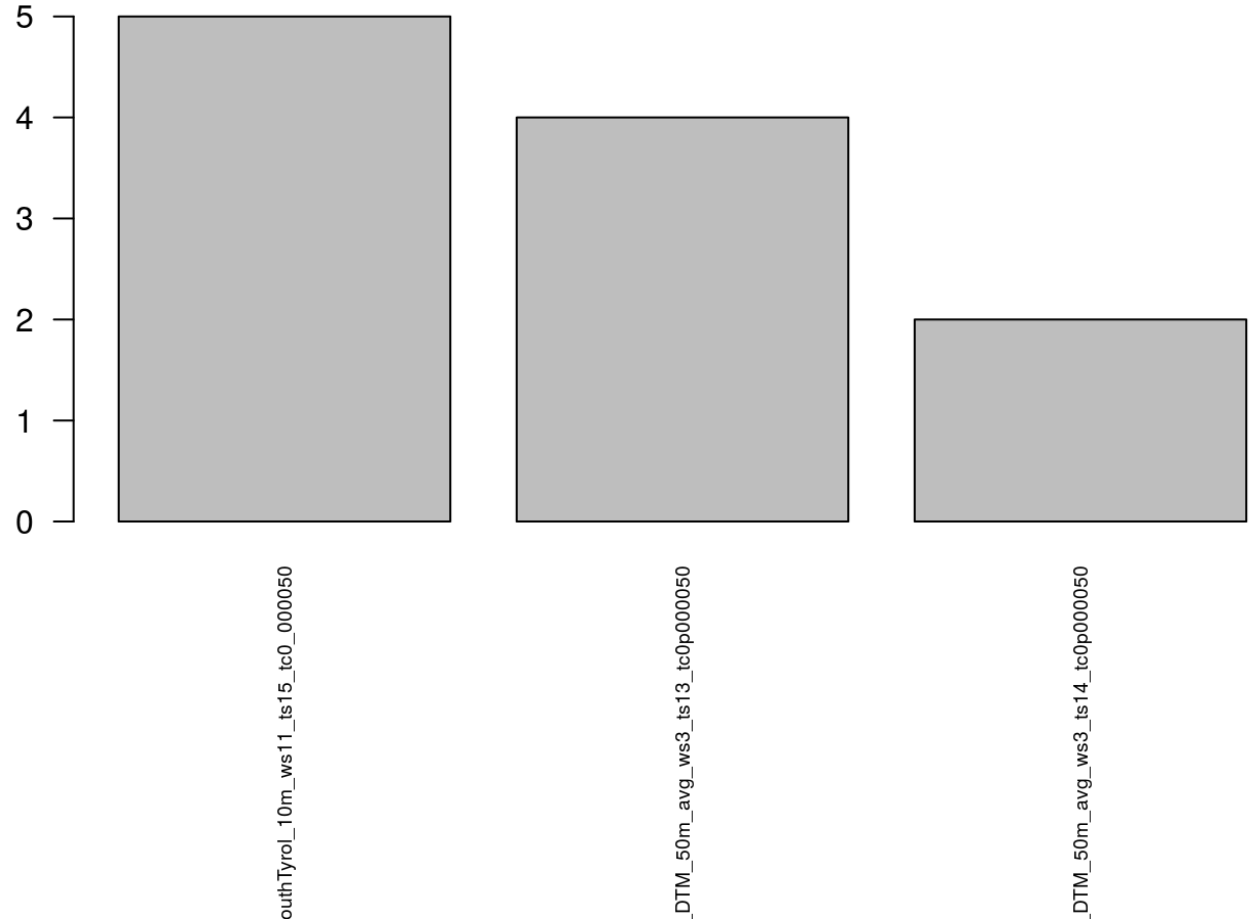



```
##                                           allchosen Freq
## 21 feature_DTM_SouthTyrol_10m_ws19_ts13_tc0_000010    4
## 28  feature_DTM_SouthTyrol_10m_ws7_ts15_tc0_000010    4
## 10 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000010    3
## 11 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050    3
## 17 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000010    3
## 22 feature_DTM_SouthTyrol_10m_ws19_ts15_tc0_000010    3
## 1          feature_DTM_50m_avg_ws3_ts14_tc0p000010    2
## 16  feature_DTM_SouthTyrol_10m_ws11_ts3_tc0_000600    2
```

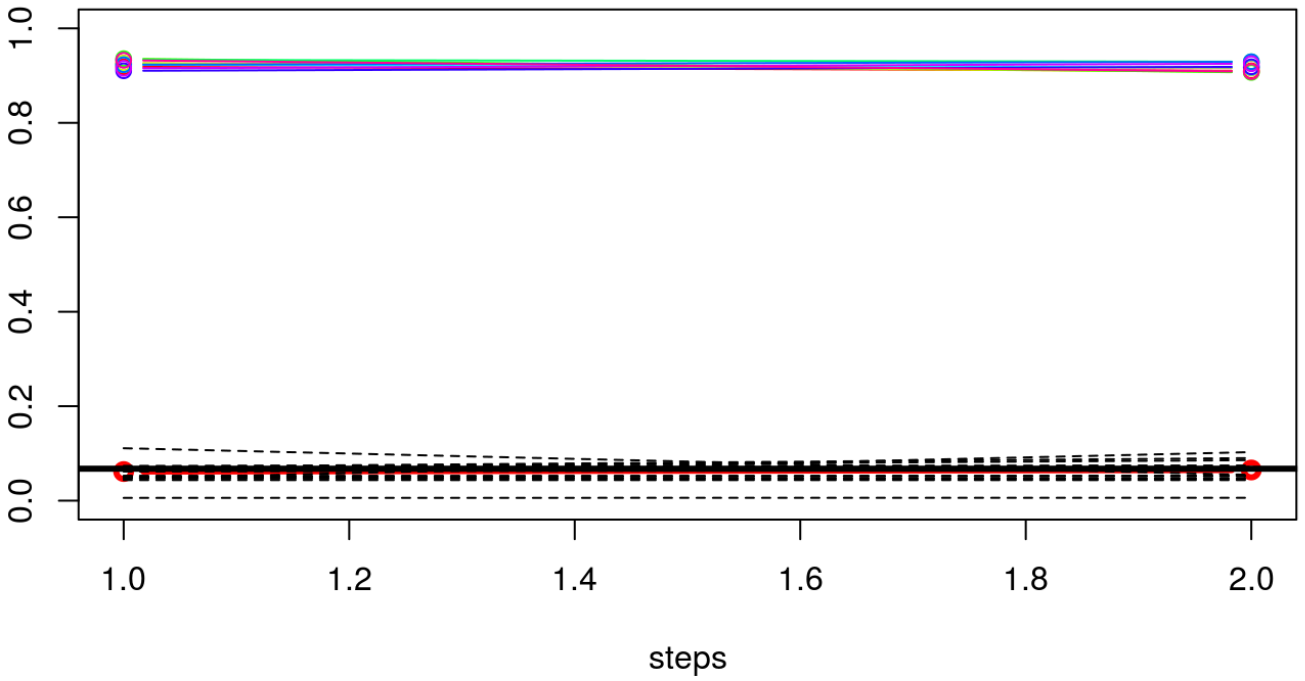
```
## [1] "TAU"
```


1.0
0.8
0.6
0.4
0.2
0.0
1.0
1.5
2.0
2.5
3.0
steps

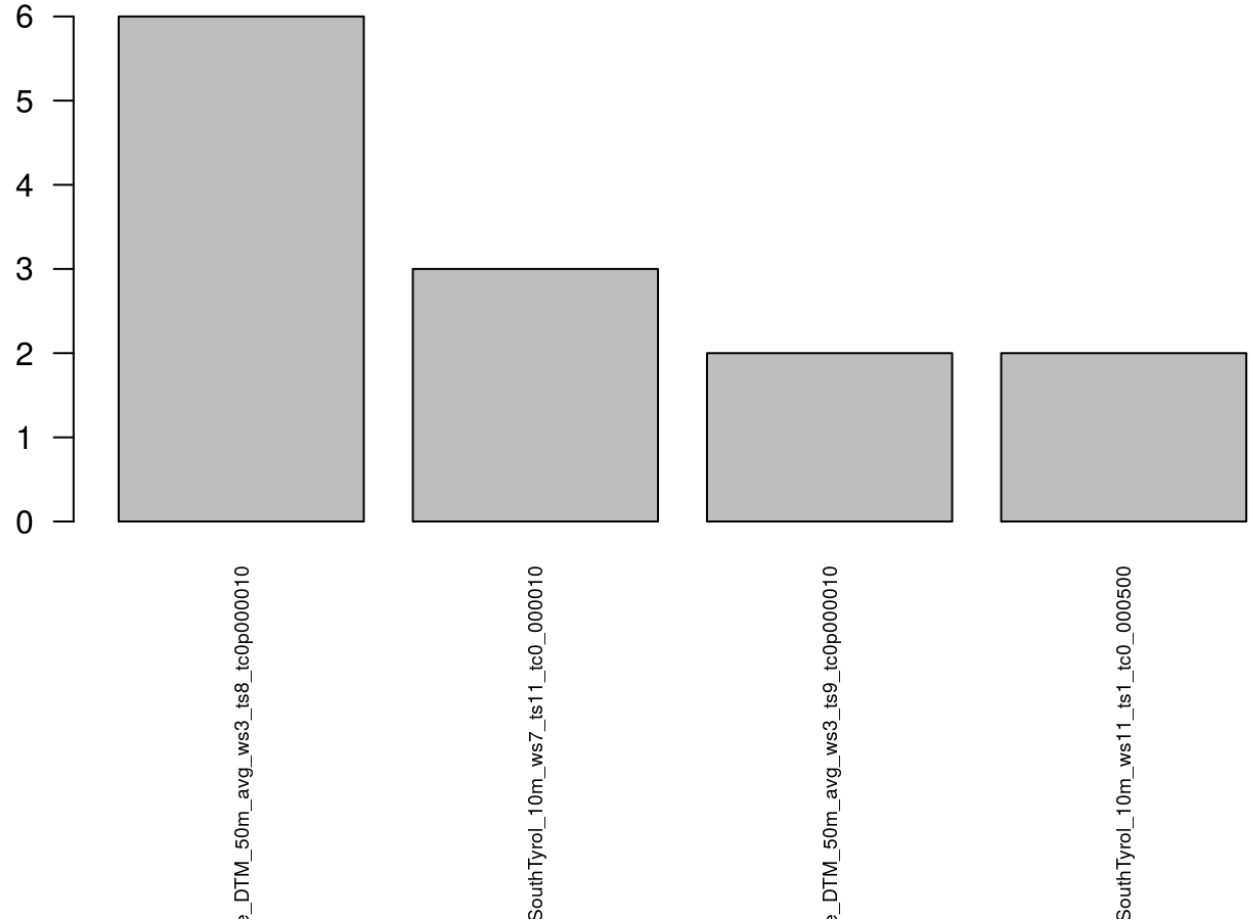
```
##                                                 k 1
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2 feature_DTM_SouthTyrol_10m_ws19_ts11_tc0_000010
## 3  feature_DTM_SouthTyrol_10m_ws3_ts15_tc0_000050
##                                                 k 2
## 1         feature_DTM_50m_avg_ws3_ts13_tc0p000050
## 2  feature_DTM_SouthTyrol_10m_ws3_ts15_tc0_000400
## 3 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
##                                                 k 3
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2   feature_DTM_SouthTyrol_10m_ws7_ts9_tc0_000300
## 3 feature_DTM_SouthTyrol_10m_ws23_ts15_tc0_000010
##                                                k 4
## 1        feature_DTM_50m_avg_ws3_ts14_tc0p000050
## 2 feature_DTM_SouthTyrol_10m_ws9_ts11_tc0_000100
## 3        feature_DTM_50m_avg_ws5_ts14_tc0p000010
##                                                 k 5
## 1  feature_DTM_SouthTyrol_10m_ws7_ts11_tc0_000010
## 2 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000200
## 3 feature_DTM_SouthTyrol_10m_ws19_ts15_tc0_000010
##                                                 k 6
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2  feature_DTM_SouthTyrol_10m_ws31_ts1_tc0_000600
## 3   feature_DTM_SouthTyrol_10m_ws7_ts1_tc0_000400
##                                           k 7
## 1 feature_DTM_50m_avg_ws3_ts13_tc0p000050
## 2  feature_DTM_50m_avg_ws5_ts1_tc0p000200
## 3 feature_DTM_50m_avg_ws3_ts14_tc0p000050
##                                                 k 8
## 1         feature_DTM_50m_avg_ws3_ts13_tc0p000050
## 2 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000100
## 3  feature_DTM_SouthTyrol_10m_ws3_ts15_tc0_000010
##                                           k 9
## 1 feature_DTM_50m_avg_ws3_ts13_tc0p000050
## 2  feature_DTM_50m_avg_ws3_ts9_tc0p000400
## 3 feature_DTM_50m_avg_ws5_ts12_tc0p000010
##                                                k 10
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2 feature_DTM_SouthTyrol_10m_ws19_ts11_tc0_000050
## 3         feature_DTM_50m_avg_ws3_ts15_tc0p000200
```




```
##                                          allchosen Freq
## 8 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050    5
## 1         feature_DTM_50m_avg_ws3_ts13_tc0p000050    4
## 2         feature_DTM_50m_avg_ws3_ts14_tc0p000050    2
```


1.0
0.8
0.6
0.4
0.2
0.0
1.0
1.2
1.4
1.6
1.8
2.0
steps

```
##                                                 k 1
## 1 feature_DTM_SouthTyrol_10m_ws7_ts11_tc0_000010
## 2        feature_DTM_50m_avg_ws3_ts10_tc0p000010
##                                                  k 2
## 1          feature_DTM_50m_avg_ws3_ts8_tc0p000010
## 2 feature_DTM_SouthTyrol_10m_ws15_ts11_tc0_000010
##                                                 k 3
## 1         feature_DTM_50m_avg_ws3_ts8_tc0p000010
## 2 feature_DTM_SouthTyrol_10m_ws15_ts1_tc0_000700
##                                                 k 4
## 1 feature_DTM_SouthTyrol_10m_ws7_ts11_tc0_000010
## 2         feature_DTM_50m_avg_ws3_ts9_tc0p000010
##                                                  k 5
## 1 feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
## 2 feature_DTM_SouthTyrol_10m_ws19_ts11_tc0_000010
##                                           k 6
## 1  feature_DTM_50m_avg_ws3_ts8_tc0p000010
## 2 feature_DTM_50m_avg_ws3_ts13_tc0p000010
##                                                 k 7
## 1 feature_DTM_SouthTyrol_10m_ws7_ts11_tc0_000010
## 2         feature_DTM_50m_avg_ws3_ts9_tc0p000010
##                                                 k 8
## 1         feature_DTM_50m_avg_ws3_ts8_tc0p000010
## 2 feature_DTM_SouthTyrol_10m_ws11_ts1_tc0_000500
##                                                  k 9
## 1          feature_DTM_50m_avg_ws3_ts8_tc0p000010
## 2 feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000200
##                                                k 10
## 1         feature_DTM_50m_avg_ws3_ts8_tc0p000010
## 2 feature_DTM_SouthTyrol_10m_ws11_ts1_tc0_000500
```




```
##                                          allchosen Freq
## 3          feature_DTM_50m_avg_ws3_ts8_tc0p000010    6
## 11 feature_DTM_SouthTyrol_10m_ws7_ts11_tc0_000010    3
## 4          feature_DTM_50m_avg_ws3_ts9_tc0p000010    2
## 6  feature_DTM_SouthTyrol_10m_ws11_ts1_tc0_000500    2
```

- UA: one parameter: 5x feature_DTM_SouthTyrol_10m_ws11_ts11_tc0p006000
- KAPPA: one parameter sufficient but even unclearer: feature_DTM_SouthTyrol_10m_ws15_ts15_tc0_000010 (2x)
- TAU: one parameter sufficient:5x feature_DTM_SouthTyrol_10m_ws11_ts15_tc0_000050
- QUALITY: feature_DTM_50m_avg_ws3_ts8_tc0p000010 (6x)

```
## [1] "10fold cv-error:  0.525280898876405  for predictors feature_DTM_SouthTy
rol_10m_ws11_ts11_tc0p006000"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   1  41   2  19   1  16   6   3   8
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  20  61  59  79  70 567  50  80 191
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   3   0   3   1  47   6  22  68
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4747 , 0.0132 , 2.8
## [1] 95 % confidence limits for accuracy: 0.4484 ... 0.501
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.4227    NaN    NaN    NaN 0.4817    NaN    NaN 0.4533
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.3905 0.0000 0.0000 0.0000 0.9000 0.0000 0.0000 0.2547
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1382 , 0.0151 , 10.9
## [1] 95 % confidence limits for kappa: 0.1083 ... 0.1682
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3767    NaN    NaN    NaN 0.0705    NaN    NaN 0.3272
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0520    NaN    NaN    NaN 0.0107    NaN    NaN 0.0471
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 13.8  NaN  NaN  NaN 15.2  NaN  NaN 14.4
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.3459 0.0000 0.0000 0.0000 0.4235 0.0000 0.0000 0.1669
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0488 0.0000 0.0000 0.0000 0.0586 0.0000 0.0000 0.0258
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 14.1  NaN  NaN  NaN 13.8  NaN  NaN 15.5
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0681 0.0000 0.0000 0.0000 0.8265 0.0000 0.0000 0.1053
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4091 , 0.0121 , 3
## [1] 95% confidence limits for tau:0.3849...0.4332
## [1] "mean quality =  0.10075098405401"
```

```
## [1] "The quality of the modeled TP is  0.10075098405401"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.553370786516854  for predictors feature_DTM_SouthTy
rol_10m_ws15_ts15_tc0_000010"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   0   0   0   0   0   0   0   0   0
##    DA  10  10  13   7   4   3   1   5   7
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS   9  95  46  94  66 625  61  97 254
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   2   0   2   0   2   2   0   3   6
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4522 , 0.0132 , 2.9
## [1] 95 % confidence limits for accuracy: 0.426 ... 0.4784
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN 0.2167    NaN    NaN 0.4640    NaN    NaN 0.3529
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.2131 0.0000 0.0000 0.9921 0.0000 0.0000 0.0225
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.0515 , 0.0077 , 15
## [1] 95 % confidence limits for kappa: 0.0359 ... 0.067
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN 0.1816    NaN    NaN 0.0387    NaN    NaN 0.2036
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN 0.0538    NaN    NaN 0.0054    NaN    NaN 0.1417
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN  NaN 29.6  NaN  NaN 13.9  NaN  NaN 69.6
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.1785 0.0000 0.0000 0.8532 0.0000 0.0000 0.0107
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.0530 0.0000 0.0000 0.0631 0.0000 0.0000 0.0078
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN  NaN 29.7  NaN  NaN  7.4  NaN  NaN 73.4
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0000 0.0421 0.0000 0.0000 0.9459 0.0000 0.0000 0.0119
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.3838 , 0.012 , 3.1
## [1] 95% confidence limits for tau:0.36...0.4076
## [1] "mean quality =  0.0671368011880217"
## [1] "The quality of the modeled TP is  0.0671368011880217"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.55126404494382  for predictors feature_DTM_50m_avg_
ws3_ts8_tc0p000010"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   9   4   2   2   1   0   0   1   3
##    LO   0   0   0   0   0   0   0   0   0
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  12 101  59  99  71 630  62 104 264
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   0   0   0   0   0   0   0   0
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4487 , 0.0132 , 2.9
## [1] 95 % confidence limits for accuracy: 0.4226 ... 0.4749
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4091    NaN    NaN    NaN    NaN 0.4494    NaN    NaN    NaN
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4286 0.0000 0.0000 0.0000 0.0000 1.0000 0.0000 0.0000 0.0000
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.0229 , 0.0055 , 24.1
## [1] 95 % confidence limits for kappa: 0.0117 ... 0.0341
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4002    NaN    NaN    NaN    NaN 0.0125    NaN    NaN    NaN
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1054    NaN    NaN    NaN    NaN 0.0027    NaN    NaN    NaN
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 26.3  NaN  NaN  NaN  NaN 21.6  NaN  NaN  NaN
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4196 0.0000 0.0000 0.0000 0.0000 1.0000 0.0000 0.0000 0.0000
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1088 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.9  NaN  NaN  NaN  NaN  0.0  NaN  NaN  NaN
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0154 0.0000 0.0000 0.0000 0.0000 0.9846 0.0000 0.0000 0.0000
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

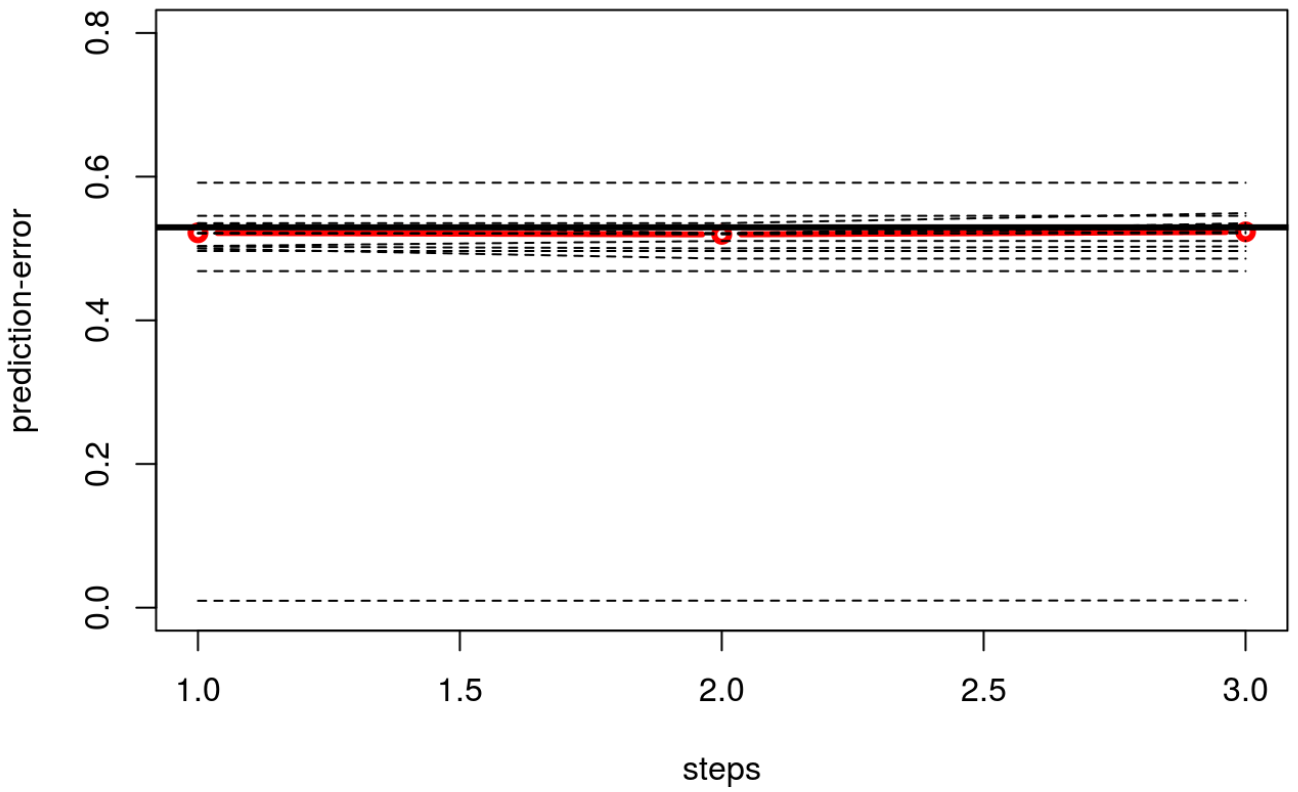
```
## [1] Tau, stdev, & CV%: 0.3798 , 0.0121 , 3.2
## [1] 95% confidence limits for tau:0.3559...0.4038
## [1] "mean quality =  0.0793404380297055"
## [1] "The quality of the modeled TP is  0.0793404380297055"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

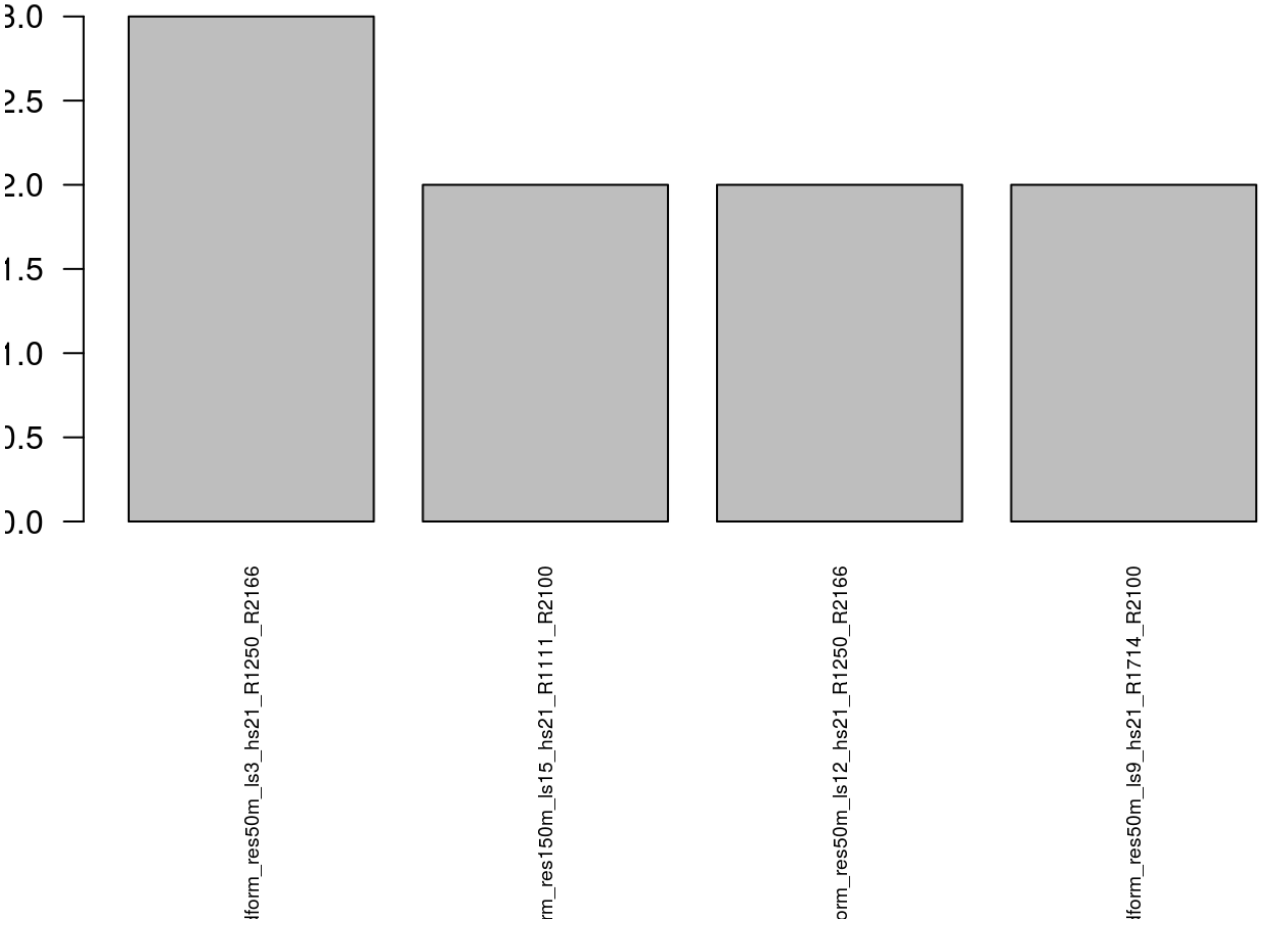
```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
#############################"
```

Schmidt's fuzzy elements

```
## [1] "USER'S ACCURACY"
```



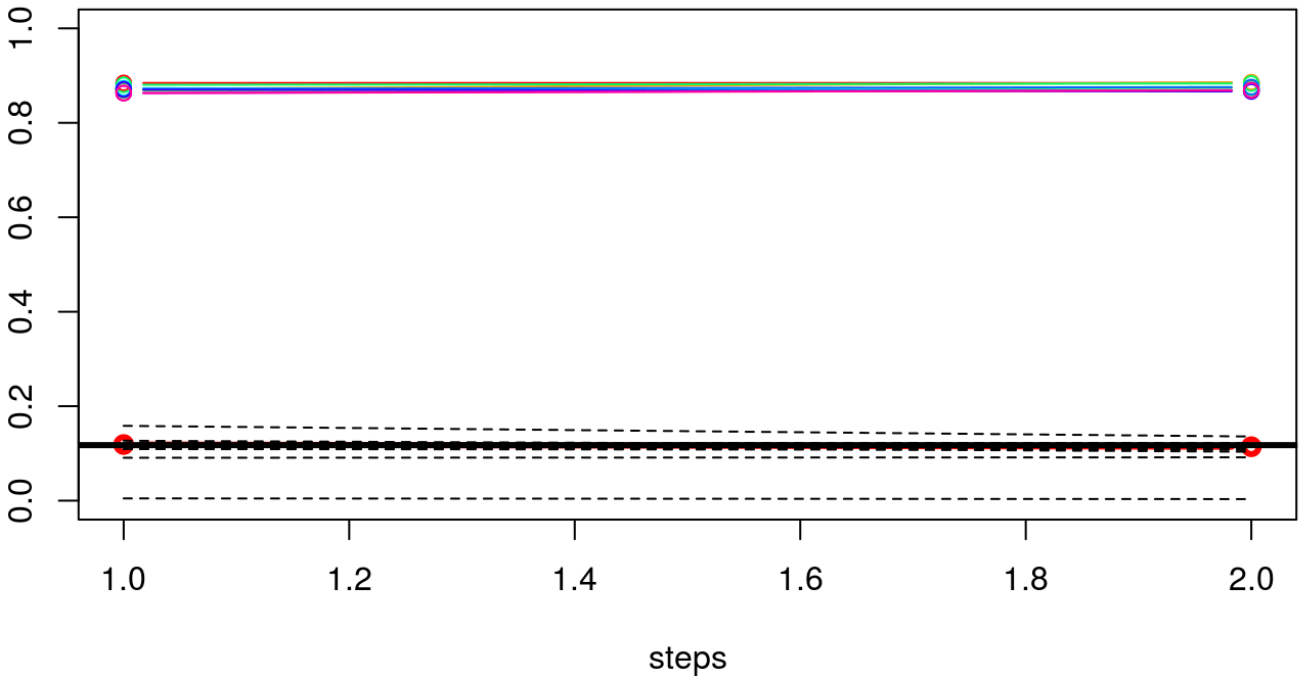
```
##                                          k 1
## 1  Fuzzylandform_res50m_ls3_hs21_R1250_R2166
## 2 Fuzzylandform_res150m_ls9_hs12_R1200_R2111
## 3 Fuzzylandform_res50m_ls9_hs21_R11000_R2142
##                                           k 2
## 1  Fuzzylandform_res50m_ls12_hs21_R1250_R2166
## 2 Fuzzylandform_res150m_ls15_hs21_R1111_R2100
## 3 Fuzzylandform_res250m_ls3_hs21_R11000_R2100
##                                           k 3
## 1  Fuzzylandform_res50m_ls9_hs21_R11000_R2111
## 2 Fuzzylandform_res50m_ls9_hs21_R119230_R2166
## 3 Fuzzylandform_res100m_ls12_hs21_R1111_R2100
##                                          k 4
## 1  Fuzzylandform_res50m_ls3_hs21_R1250_R2166
## 2 Fuzzylandform_res150m_ls9_hs12_R1333_R2111
## 3  Fuzzylandform_res50m_ls9_hs15_R1333_R2200
##                                         k 5
## 1 Fuzzylandform_res50m_ls3_hs21_R1200_R2166
## 2 Fuzzylandform_res50m_ls9_hs15_R1250_R2142
## 3 Fuzzylandform_res50m_ls3_hs21_R1250_R2200
##                                           k 6
## 1     Fuzzylandform_res50m_ls9_hs21_R1714_R2100
## 2   Fuzzylandform_res150m_ls15_hs21_R1111_R2100
## 3 Fuzzylandform_res50m_ls12_hs21_R1500000_R2250
##                                          k 7
## 1  Fuzzylandform_res50m_ls9_hs21_R1714_R2100
## 2  Fuzzylandform_res50m_ls9_hs21_R1555_R2111
## 3 Fuzzylandform_res50m_ls12_hs21_R1166_R2125
##                                           k 8
## 1   Fuzzylandform_res50m_ls3_hs12_R1714_R2166
## 2 Fuzzylandform_res50m_ls15_hs18_R11000_R2111
## 3  Fuzzylandform_res50m_ls9_hs15_R12500_R2500
##                                          k 9
## 1  Fuzzylandform_res50m_ls3_hs21_R1250_R2166
## 2  Fuzzylandform_res50m_ls6_hs18_R1200_R2166
## 3 Fuzzylandform_res50m_ls12_hs15_R1250_R2200
##                                          k 10
## 1  Fuzzylandform_res50m_ls12_hs21_R1250_R2166
## 2 Fuzzylandform_res150m_ls15_hs21_R1166_R2125
## 3  Fuzzylandform_res250m_ls3_hs6_R11000_R2100
```



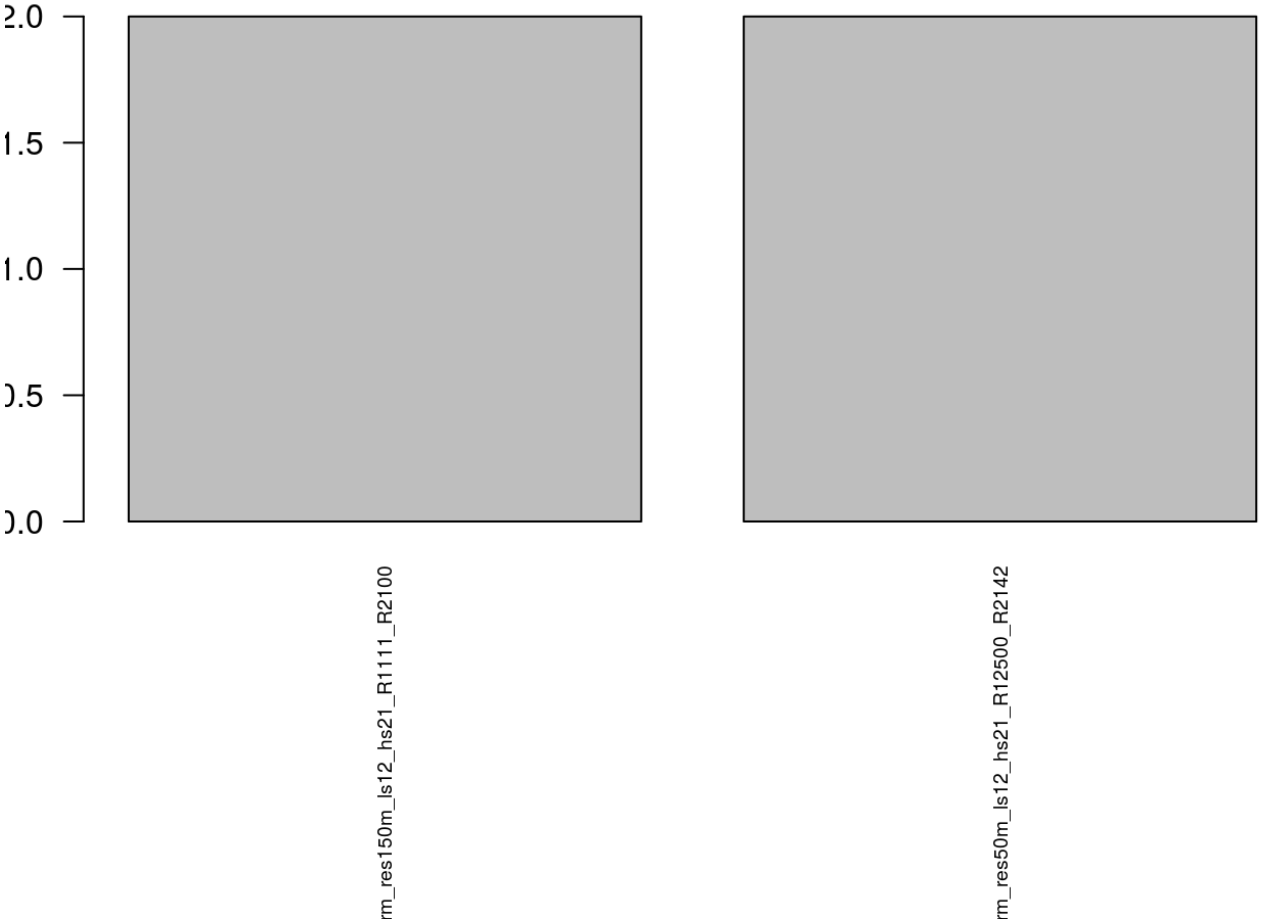

```
##                                       allchosen Freq
## 15   Fuzzylandform_res50m_ls3_hs21_R1250_R2166    3
## 2  Fuzzylandform_res150m_ls15_hs21_R1111_R2100    2
## 10  Fuzzylandform_res50m_ls12_hs21_R1250_R2166    2
## 25   Fuzzylandform_res50m_ls9_hs21_R1714_R2100    2
```

```
## [1] "KAPPA, achtung geht noch nicht, im moment will ich aber nur UA und ev.
QA"
```

```
## [1] "TAU"
```


1.0
0.8
0.6
0.4
0.2
0.0
1.0
1.2
1.4
1.6
1.8
2.0
steps

```
##                                          k 1
## 1 Fuzzylandform_res50m_ls6_hs21_R1250_R2200
## 2 Fuzzylandform_res50m_ls9_hs15_R1333_R2200
##                                           k 2
## 1   Fuzzylandform_res50m_ls3_hs21_R1500_R2166
## 2 Fuzzylandform_res50m_ls12_hs15_R11250_R2125
##                                           k 3
## 1 Fuzzylandform_res50m_ls12_hs21_R12500_R2142
## 2   Fuzzylandform_res50m_ls3_hs9_R12500_R2142
##                                             k 4
## 1 Fuzzylandform_res50m_ls12_hs21_R1500000_R2125
## 2   Fuzzylandform_res50m_ls12_hs21_R11666_R2125
##                                          k 5
## 1 Fuzzylandform_res50m_ls12_hs21_R1200_R2166
## 2  Fuzzylandform_res50m_ls6_hs21_R1333_R2200
##                                           k 6
## 1   Fuzzylandform_res50m_ls9_hs18_R1333_R2200
## 2 Fuzzylandform_res150m_ls12_hs18_R1111_R2100
##                                          k 7
## 1 Fuzzylandform_res50m_ls9_hs21_R1200_R2166
## 2 Fuzzylandform_res50m_ls6_hs21_R1200_R2166
##                                           k 8
## 1  Fuzzylandform_res50m_ls12_hs21_R1714_R2166
## 2 Fuzzylandform_res150m_ls15_hs21_R1111_R2100
##                                           k 9
## 1 Fuzzylandform_res50m_ls12_hs21_R12500_R2142
## 2 Fuzzylandform_res150m_ls12_hs21_R1111_R2100
##                                           k 10
## 1  Fuzzylandform_res50m_ls12_hs21_R1250_R2166
## 2 Fuzzylandform_res150m_ls12_hs21_R1111_R2100
```




```
##                                     allchosen Freq
## 2 Fuzzylandform_res150m_ls12_hs21_R1111_R2100    2
## 7 Fuzzylandform_res50m_ls12_hs21_R12500_R2142    2
```

- UA: one predictor sufficient (not clear): Fuzzylandform_res50m_ls3_hs21_R1250_R2166 (3x)
- QUALITY: sehr unsicher, 2x nr1 = Fuzzylandform_res150m_ls12_hs21_R1111_R2100; auch so ein bisserl ein mittelwert, zumindest bei slope

```
## [1] "10fold cv-error:  0.509831460674157  for predictors Fuzzylandform_res50
m_ls3_hs21_R1250_R2166"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO  12  50  11  18   5  12   5   6  12
##    DA   0   0   0   0   0   0   0   0   0
##    FS   1   3   1  12   1   6   1   2   4
##    SF   0   0   0   0   0   0   0   0   0
##    BS   8  46  49  68  64 568  49  69 182
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   6   0   3   2  44   7  28  69
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4909 , 0.0132 , 2.7
## [1] 95 % confidence limits for accuracy: 0.4646 ... 0.5172
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3817    NaN 0.3871    NaN 0.5150    NaN    NaN 0.4340
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.4762 0.0000 0.1188 0.0000 0.9016 0.0000 0.0000 0.2584
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1894 , 0.0155 , 8.2
## [1] 95 % confidence limits for kappa: 0.1586 ... 0.2201
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3325    NaN 0.3403    NaN 0.1301    NaN    NaN 0.3033
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0432    NaN 0.0929    NaN 0.0130    NaN    NaN 0.0453
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 13.0  NaN 27.3  NaN 10.0  NaN  NaN 14.9
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.4231 0.0000 0.0992 0.0000 0.5634 0.0000 0.0000 0.1652
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0516 0.0000 0.0309 0.0000 0.0465 0.0000 0.0000 0.0262
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 12.2  NaN 31.2  NaN  8.3  NaN  NaN 15.9
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0920 0.0000 0.0218 0.0000 0.7746 0.0000 0.0000 0.1117
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4272 , 0.012 , 2.8
## [1] 95% confidence limits for tau:0.4033...0.4511
## [1] "mean quality =  0.116627573699346"
```

```
## [1] "The quality of the modeled TP is  0.116627573699346"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.557584269662921  for predictors Fuzzylandform_res15
0m_ls12_hs21_R1111_R2100"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   0   0   0   0   0   0   0   0   0
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  21 105  61 101  72 630  62 105 267
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   0   0   0   0   0   0   0   0
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4424 , 0.0132 , 3
## [1] 95 % confidence limits for accuracy: 0.4163 ... 0.4686
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN    NaN    NaN    NaN    NaN 0.4424    NaN    NaN    NaN
## [1] Producer's reliability:
## FL LO DA FS SF BS SS SH RI
##  0  0  0  0  0  1  0  0  0
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0 , 0 , Inf
## [1] 95 % confidence limits for kappa: -4e-04 ... 4e-04
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##  FL  LO  DA  FS  SF  BS  SS  SH  RI
## NaN NaN NaN NaN NaN   0 NaN NaN NaN
##  FL  LO  DA  FS  SF  BS  SS  SH  RI
## NaN NaN NaN NaN NaN   0 NaN NaN NaN
##  FL  LO  DA  FS  SF  BS  SS  SH  RI
## NaN NaN NaN NaN NaN NaN NaN NaN NaN
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##  FL  LO  DA  FS  SF  BS  SS  SH  RI
##   0   0   0   0   0 NaN   0   0   0
##  FL  LO  DA  FS  SF  BS  SS  SH  RI
##   0   0   0   0   0 NaN   0   0   0
##  FL  LO  DA  FS  SF  BS  SS  SH  RI
## NaN NaN NaN NaN NaN NaN NaN NaN NaN
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
## FL LO DA FS SF BS SS SH RI
##  0  0  0  0  0  1  0  0  0
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

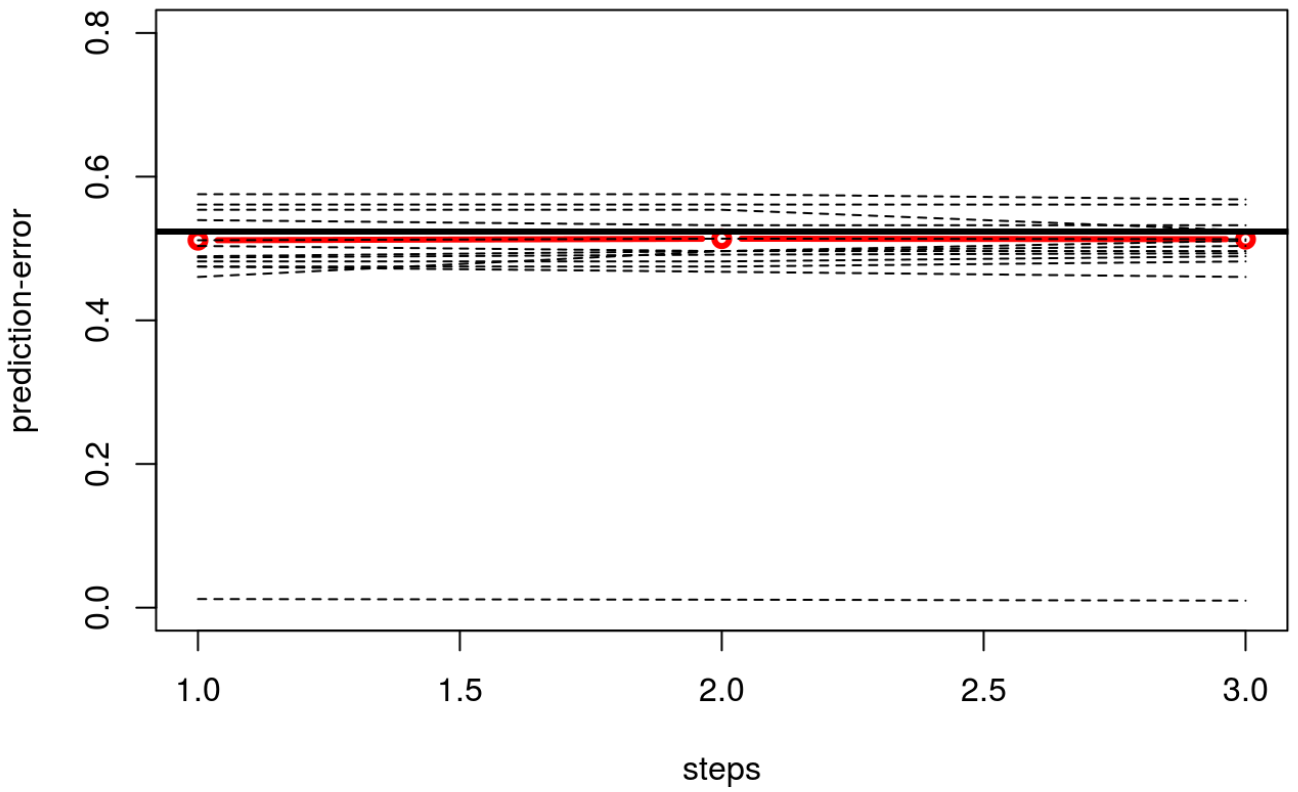
```
## [1] Tau, stdev, & CV%: 0.3727 , 0.0121 , 3.2
## [1] 95% confidence limits for tau:0.3487...0.3967
## [1] "mean quality =  0.0491573033707865"
## [1] "The quality of the modeled TP is  0.0491573033707865"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

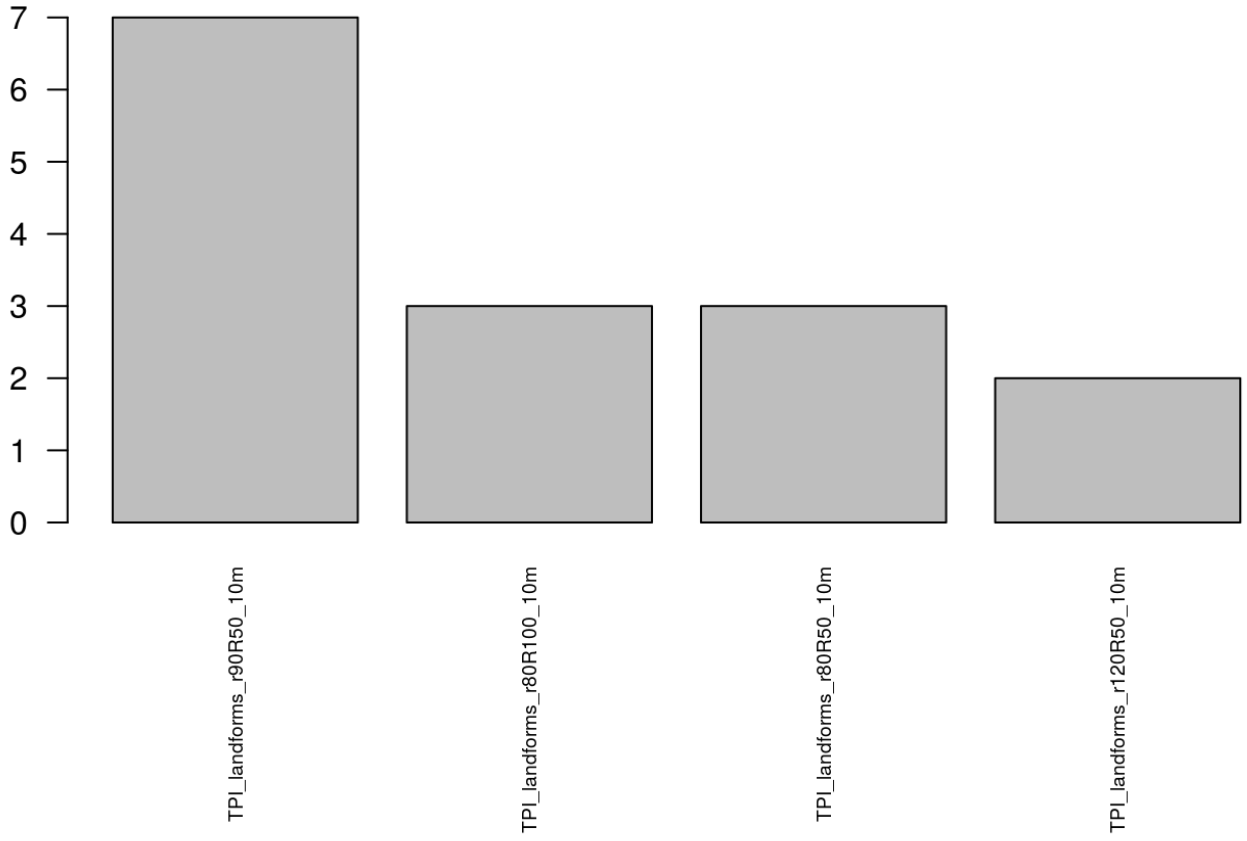
```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
```

TPI-based landform classification

```
## [1] "USER'S ACCURACY"
```

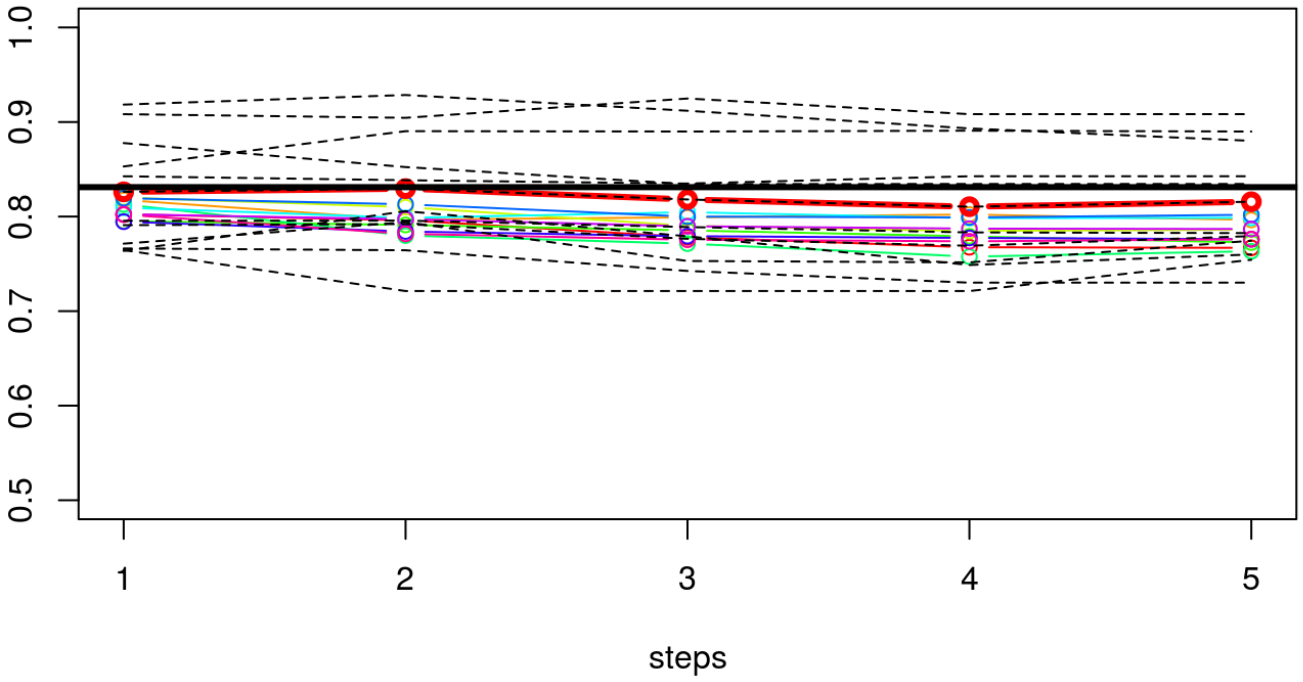


```
##                         k 1                         k 2
## 1 TPI_landforms_r80R50_10m TPI_landforms_r90R50_10m
## 2 TPI_landforms_r90R50_10m   TPI_landforms_r100R950
## 3 TPI_landforms_r1300R1700  TPI_landforms_r100R1000
##                         k 3                          k 4
## 1 TPI_landforms_r90R50_10m TPI_landforms_r80R100_10m
## 2 TPI_landforms_r50R50_10m  TPI_landforms_r80R50_10m
## 3   TPI_landforms_r50R1850  TPI_landforms_r90R50_10m
##                          k 5                          k 6
## 1 TPI_landforms_r80R250_10m  TPI_landforms_r120R50_10m
## 2 TPI_landforms_r90R450_10m      TPI_landforms_r50R850
## 3 TPI_landforms_r90R250_10m TPI_landforms_r130R350_10m
##                          k 7                          k 8
## 1  TPI_landforms_r90R50_10m TPI_landforms_r80R100_10m
## 2 TPI_landforms_r80R450_10m    TPI_landforms_r50R1000
## 3    TPI_landforms_r50R1050 TPI_landforms_r10R100_10m
##                         k 9                         k 10
## 1  TPI_landforms_r90R50_10m TPI_landforms_r80R100_10m
## 2  TPI_landforms_r80R50_10m  TPI_landforms_r90R50_10m
## 3 TPI_landforms_r120R50_10m    TPI_landforms_r200R650
```

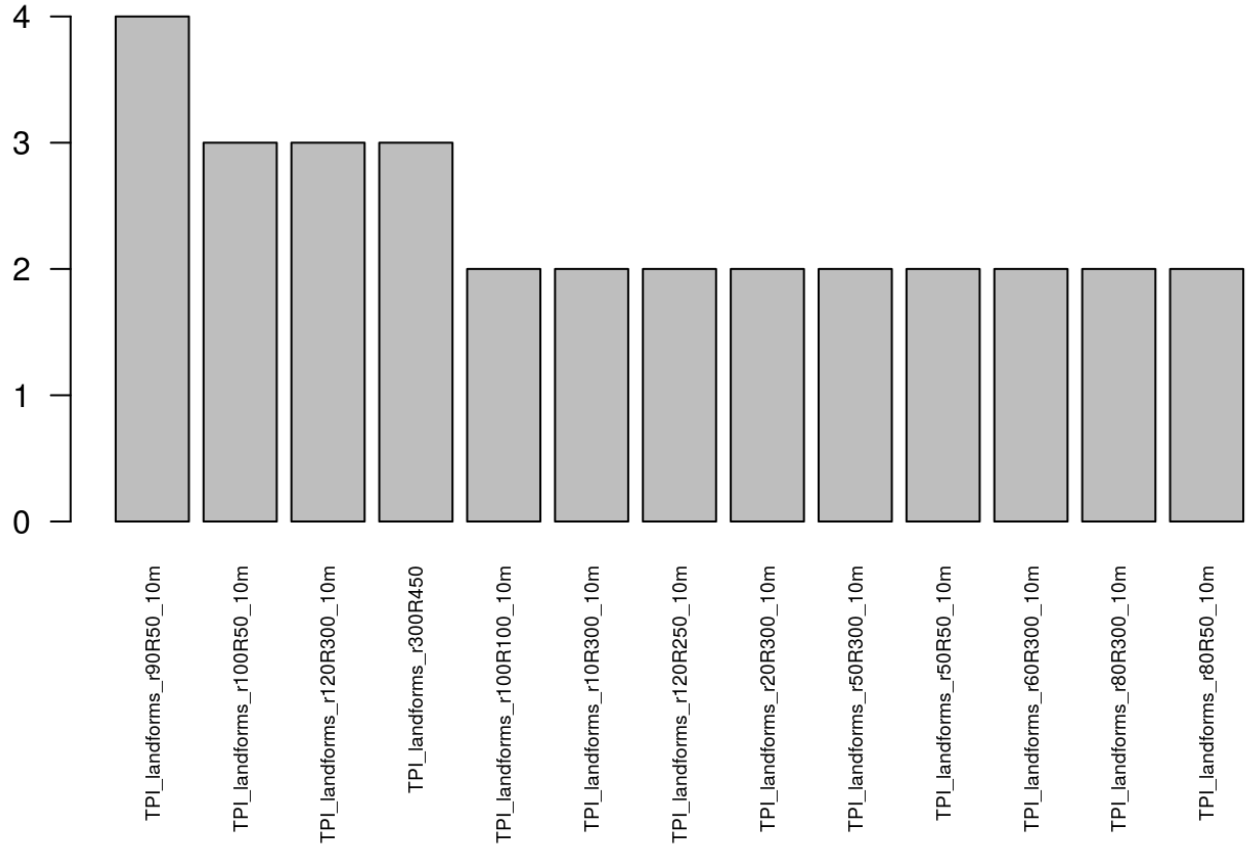



```
##                    allchosen Freq
## 19  TPI_landforms_r90R50_10m    7
## 13 TPI_landforms_r80R100_10m    3
## 16  TPI_landforms_r80R50_10m    3
## 4  TPI_landforms_r120R50_10m    2
```

```
## [1] "KAPPA"
```

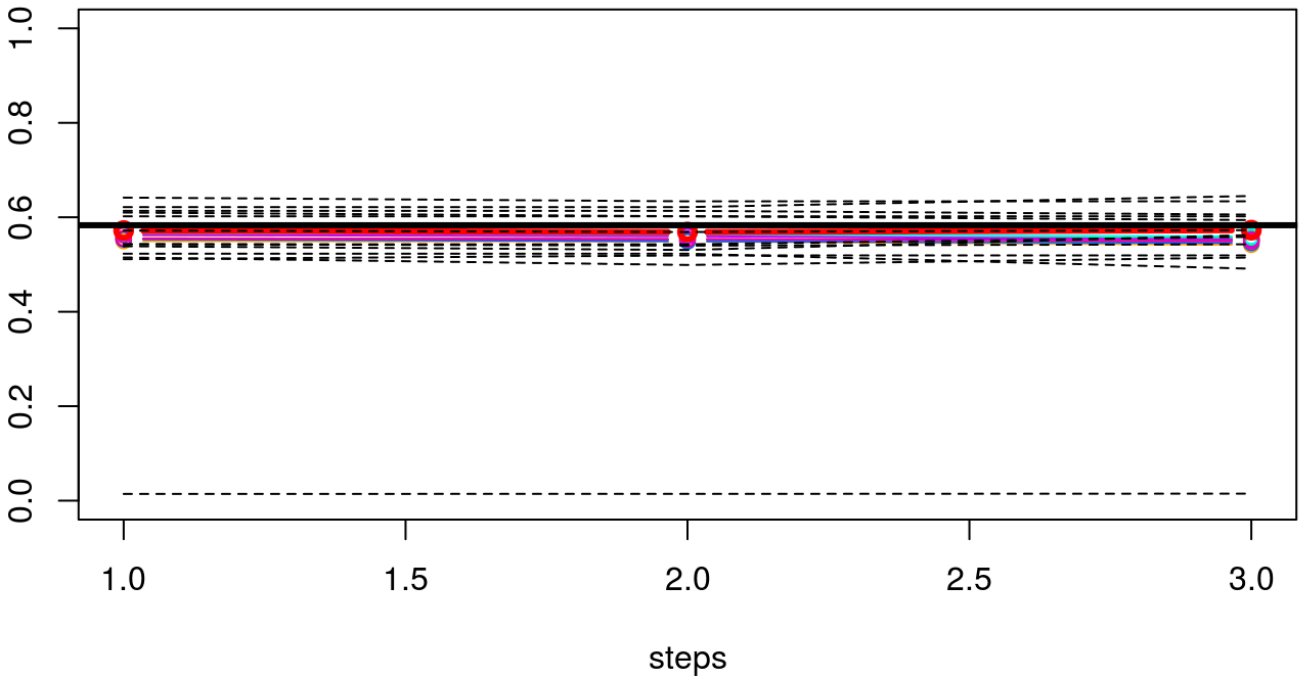


```
##                          k 1                          k 2
## 1  TPI_landforms_r90R50_10m TPI_landforms_r120R250_10m
## 2    TPI_landforms_r200R700   TPI_landforms_r50R50_10m
## 3 TPI_landforms_r80R300_10m  TPI_landforms_r20R200_10m
## 4    TPI_landforms_r250R850   TPI_landforms_r90R50_10m
## 5    TPI_landforms_r250R350     TPI_landforms_r300R450
##                          k 3                          k 4
## 1 TPI_landforms_r100R50_10m  TPI_landforms_r60R300_10m
## 2    TPI_landforms_r200R450 TPI_landforms_r120R250_10m
## 3  TPI_landforms_r90R50_10m  TPI_landforms_r10R300_10m
## 4 TPI_landforms_r80R250_10m  TPI_landforms_r50R100_10m
## 5 TPI_landforms_r20R450_10m     TPI_landforms_r300R450
##                          k 5                          k 6
## 1  TPI_landforms_r90R50_10m  TPI_landforms_r60R300_10m
## 2    TPI_landforms_r300R450   TPI_landforms_r50R50_10m
## 3 TPI_landforms_r80R300_10m TPI_landforms_r120R300_10m
## 4    TPI_landforms_r300R750  TPI_landforms_r50R300_10m
## 5 TPI_landforms_r40R450_10m TPI_landforms_r100R100_10m
##                          k 7                          k 8
## 1 TPI_landforms_r100R50_10m  TPI_landforms_r100R50_10m
## 2     TPI_landforms_r50R350  TPI_landforms_r10R200_10m
## 3    TPI_landforms_r200R300 TPI_landforms_r120R200_10m
## 4 TPI_landforms_r10R100_10m   TPI_landforms_r80R50_10m
## 5  TPI_landforms_r80R50_10m  TPI_landforms_r20R300_10m
##                           k 9                          k 10
## 1 TPI_landforms_r120R300_10m  TPI_landforms_r50R250_10m
## 2 TPI_landforms_r100R100_10m TPI_landforms_r100R300_10m
## 3  TPI_landforms_r50R300_10m  TPI_landforms_r20R300_10m
## 4   TPI_landforms_r70R50_10m   TPI_landforms_r30R50_10m
## 5  TPI_landforms_r10R300_10m TPI_landforms_r120R300_10m
```

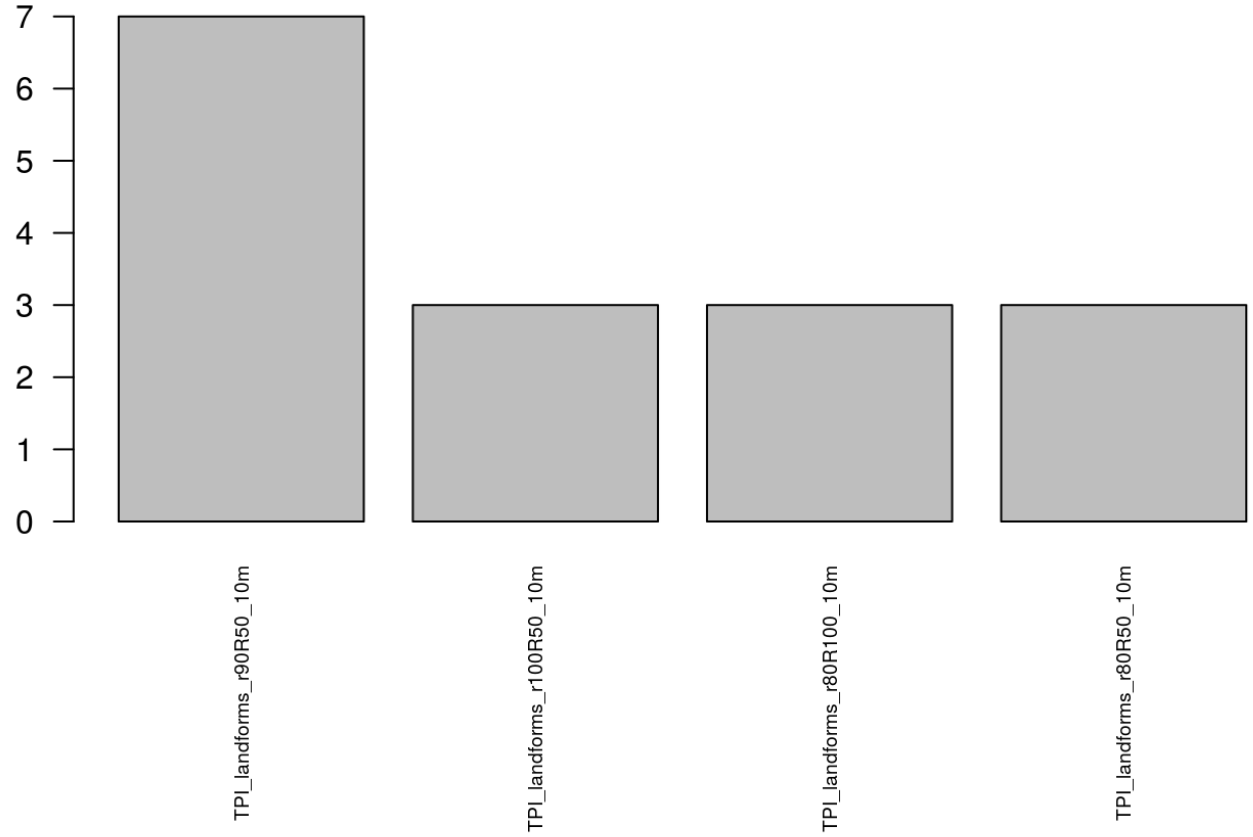



```
##                     allchosen Freq
## 32   TPI_landforms_r90R50_10m    4
## 3   TPI_landforms_r100R50_10m    3
## 9  TPI_landforms_r120R300_10m    3
## 18     TPI_landforms_r300R450    3
## 1  TPI_landforms_r100R100_10m    2
## 6   TPI_landforms_r10R300_10m    2
## 8  TPI_landforms_r120R250_10m    2
## 14  TPI_landforms_r20R300_10m    2
## 24  TPI_landforms_r50R300_10m    2
## 26   TPI_landforms_r50R50_10m    2
## 27  TPI_landforms_r60R300_10m    2
## 30  TPI_landforms_r80R300_10m    2
## 31   TPI_landforms_r80R50_10m    2
```

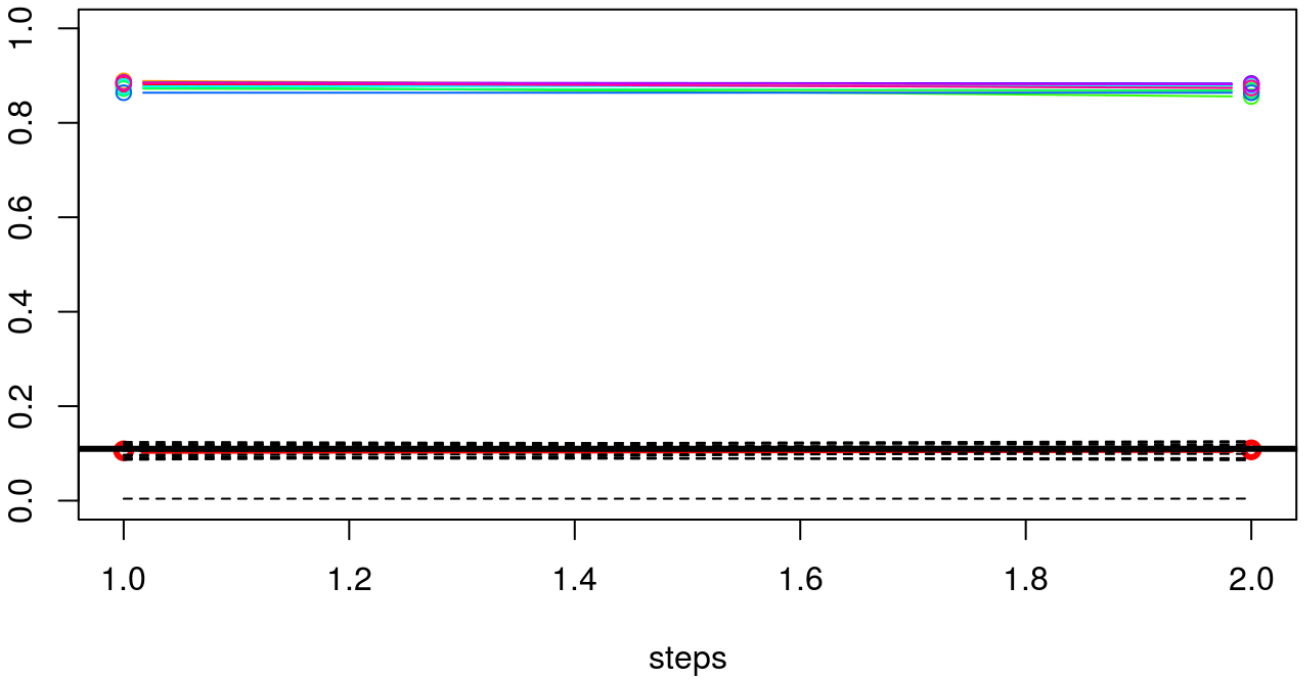
```
## [1] "TAU"
```



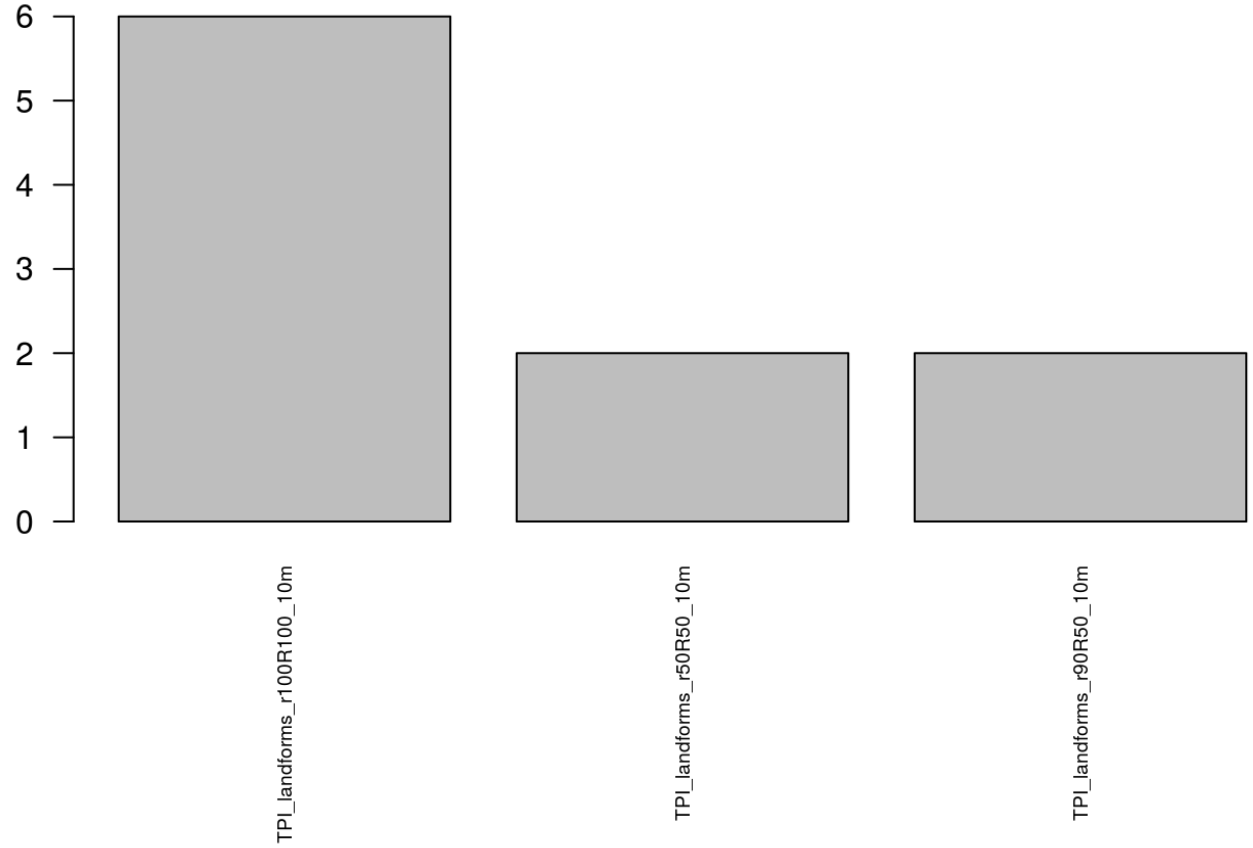

```
##                         k 1                         k 2
## 1 TPI_landforms_r90R50_10m  TPI_landforms_r90R50_10m
## 2 TPI_landforms_r80R50_10m TPI_landforms_r100R50_10m
## 3    TPI_landforms_r50R350    TPI_landforms_r200R450
##                         k 3                         k 4
## 1  TPI_landforms_r90R50_10m  TPI_landforms_r90R50_10m
## 2 TPI_landforms_r80R100_10m TPI_landforms_r100R50_10m
## 3   TPI_landforms_r200R1850    TPI_landforms_r200R350
##                         k 5                         k 6
## 1  TPI_landforms_r80R50_10m TPI_landforms_r80R100_10m
## 2 TPI_landforms_r100R50_10m  TPI_landforms_r80R50_10m
## 3     TPI_landforms_r50R400    TPI_landforms_r200R700
##                         k 7                         k 8
## 1 TPI_landforms_r80R100_10m  TPI_landforms_r90R50_10m
## 2    TPI_landforms_r50R1950 TPI_landforms_r30R100_10m
## 3 TPI_landforms_r80R250_10m  TPI_landforms_r40R50_10m
##                         k 9                        k 10
## 1  TPI_landforms_r90R50_10m  TPI_landforms_r90R50_10m
## 2 TPI_landforms_r80R450_10m TPI_landforms_r120R50_10m
## 3   TPI_landforms_r250R1950    TPI_landforms_r200R550
```




```
##                    allchosen Freq
## 18  TPI_landforms_r90R50_10m    7
## 1  TPI_landforms_r100R50_10m    3
## 14 TPI_landforms_r80R100_10m    3
## 17  TPI_landforms_r80R50_10m    3
```




```
##                         k 1                          k 2
## 1 TPI_landforms_r90R50_10m     TPI_landforms_r150R750
## 2  TPI_landforms_r100R1250 TPI_landforms_r100R100_10m
##                           k 3                           k 4
## 1 TPI_landforms_r100R100_10m TPI_landforms_r100R100_10m
## 2     TPI_landforms_r200R700  TPI_landforms_r80R300_10m
##                           k 5                          k 6
## 1 TPI_landforms_r100R100_10m TPI_landforms_r50R300_10m
## 2   TPI_landforms_r50R50_10m TPI_landforms_r20R100_10m
##                           k 7                          k 8
## 1 TPI_landforms_r100R100_10m TPI_landforms_r40R200_10m
## 2   TPI_landforms_r50R50_10m TPI_landforms_r50R200_10m
##                         k 9                         k 10
## 1 TPI_landforms_r90R50_10m TPI_landforms_r100R100_10m
## 2  TPI_landforms_r100R1200     TPI_landforms_r200R800
```




```
##                     allchosen Freq
## 1  TPI_landforms_r100R100_10m    6
## 11   TPI_landforms_r50R50_10m    2
## 13   TPI_landforms_r90R50_10m    2
```

- UA: one parameter sufficient: TPI_landforms_r90R50_10m (7x)
- KAPPA: same as UA
- TAU: same as UA
- QUALITY: TPI_landforms_r100R100_10m ??? aber 90m50m kommt auch vor

```
## [1] "10fold cv-error:  0.500702247191011  for predictors TPI_landforms_r90R5
0_10m"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   6   3   2   0   0   2   0   1   1
##    LO   1  33   2  13   1   5   1   1   6
##    DA   0   0   0   0   0   0   0   0   0
##    FS   1   8   2  13   1   7   2   0   3
##    SF   0   0   0   0   0   0   0   0   0
##    BS  13  59  55  73  69 589  52  71 179
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   2   0   2   1  27   7  32  78
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5049 , 0.0132 , 2.6
## [1] 95 % confidence limits for accuracy: 0.4786 ... 0.5312
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4000 0.5238    NaN 0.3514    NaN 0.5078    NaN    NaN 0.5235
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.2857 0.3143 0.0000 0.1287 0.0000 0.9349 0.0000 0.0000 0.2921
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1946 , 0.0155 , 8
## [1] 95 % confidence limits for kappa: 0.1639 ... 0.2253
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.3910 0.4859    NaN 0.3018    NaN 0.1172    NaN    NaN 0.4135
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1276 0.0665    NaN 0.0831    NaN 0.0114    NaN    NaN 0.0478
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 32.6 13.7  NaN 27.5  NaN  9.7  NaN  NaN 11.5
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.2781 0.2825 0.0000 0.1055 0.0000 0.6490 0.0000 0.0000 0.2094
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0986 0.0450 0.0000 0.0322 0.0000 0.0481 0.0000 0.0000 0.0270
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 35.4 15.9  NaN 30.5  NaN  7.4  NaN  NaN 12.9
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0105 0.0442 0.0000 0.0260 0.0000 0.8146 0.0000 0.0000 0.1046
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.443 , 0.0119 , 2.7
## [1] 95% confidence limits for tau:0.4193...0.4668
## [1] "mean quality =  0.141070924593545"
```

```
## [1] "The quality of the modeled TP is  0.141070924593545"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##########################################################################
############################"
## [1] "10fold cv-error:  0.507022471910112  for predictors TPI_landforms_r100R
100_10m"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   6   3   2   0   0   2   0   1   1
##    LO   2  41   6  27   2  15   4   1   8
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  13  59  53  73  69 587  51  68 186
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   2   0   1   1  26   7  35  72
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4958 , 0.0132 , 2.7
## [1] 95 % confidence limits for accuracy: 0.4695 ... 0.5221
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4000 0.3868    NaN    NaN    NaN 0.5065    NaN    NaN 0.5000
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.2857 0.3905 0.0000 0.0000 0.0000 0.9317 0.0000 0.0000 0.2697
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1806 , 0.015 , 8.3
## [1] 95 % confidence limits for kappa: 0.1508 ... 0.2103
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.3910 0.3380    NaN    NaN    NaN 0.1149    NaN    NaN 0.3846
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1276 0.0487    NaN    NaN    NaN 0.0114    NaN    NaN 0.0486
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 32.6 14.4  NaN  NaN  NaN 10.0  NaN  NaN 12.6
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.2781 0.3415 0.0000 0.0000 0.0000 0.6332 0.0000 0.0000 0.1875
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0986 0.0491 0.0000 0.0000 0.0000 0.0488 0.0000 0.0000 0.0262
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 35.4 14.4  NaN  NaN  NaN  7.7  NaN  NaN 14.0
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0105 0.0744 0.0000 0.0000 0.0000 0.8139 0.0000 0.0000 0.1011
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

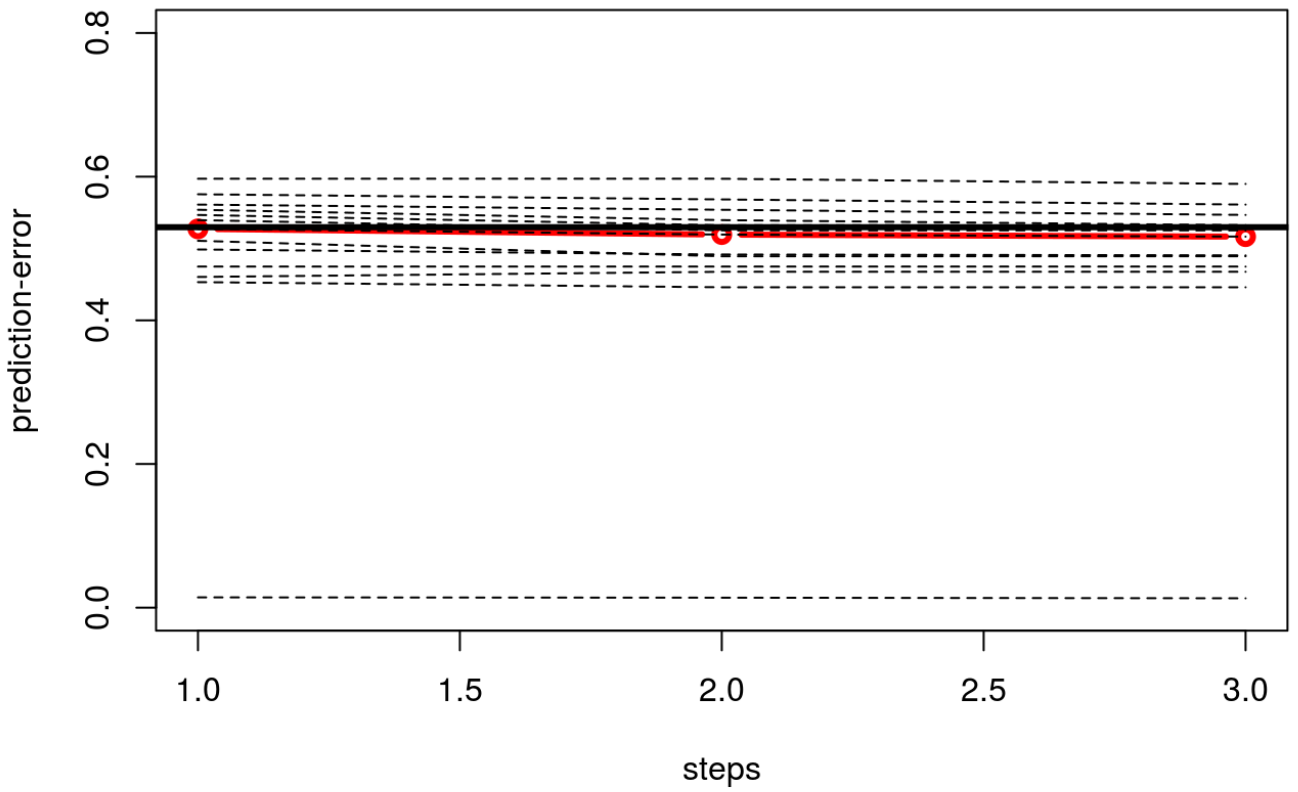
```
## [1] Tau, stdev, & CV%: 0.4328 , 0.0119 , 2.8
## [1] 95% confidence limits for tau:0.409...0.4565
## [1] "mean quality =  0.126879844060389"
## [1] "The quality of the modeled TP is  0.126879844060389"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

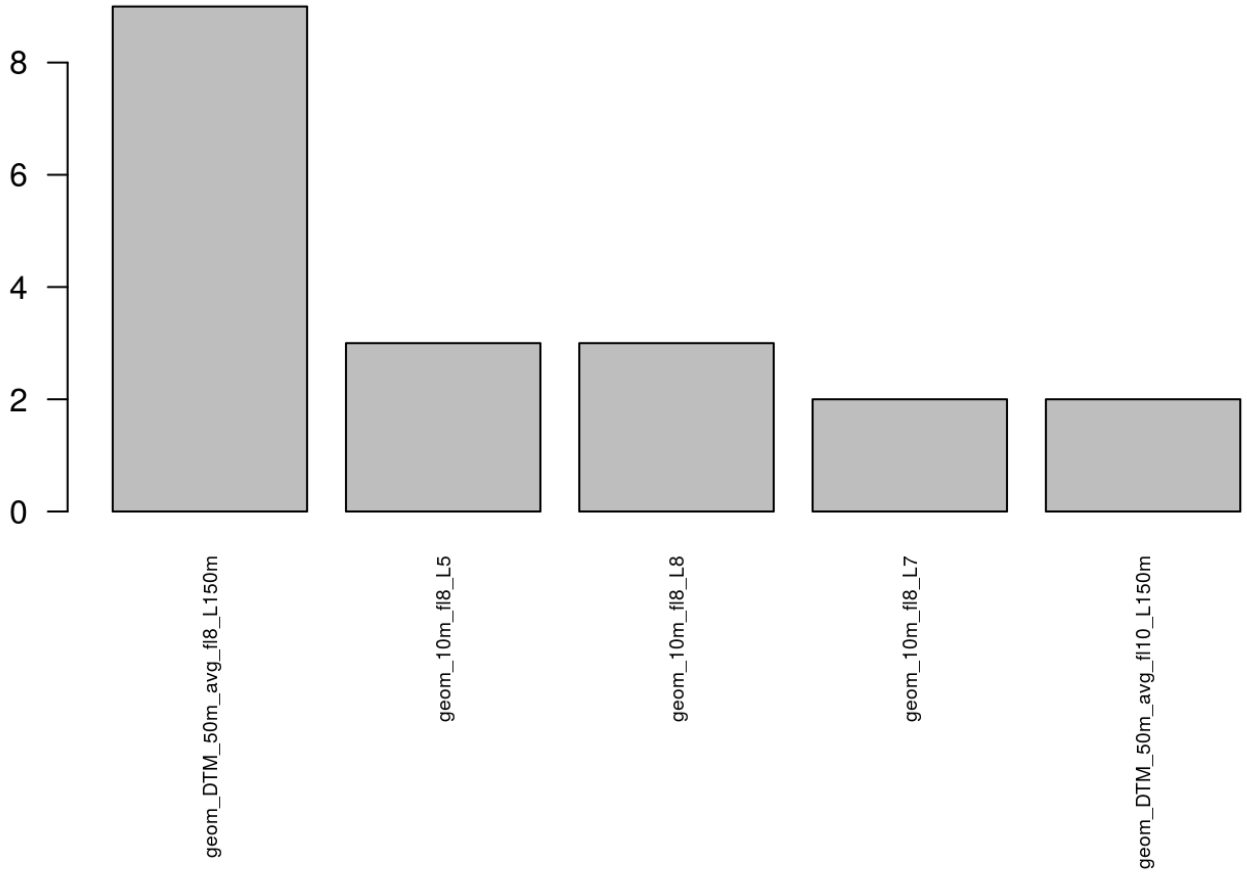
```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
#############################"
```

Geomorphon-based landforms

```
## [1] "USER'S ACCURACY"
```

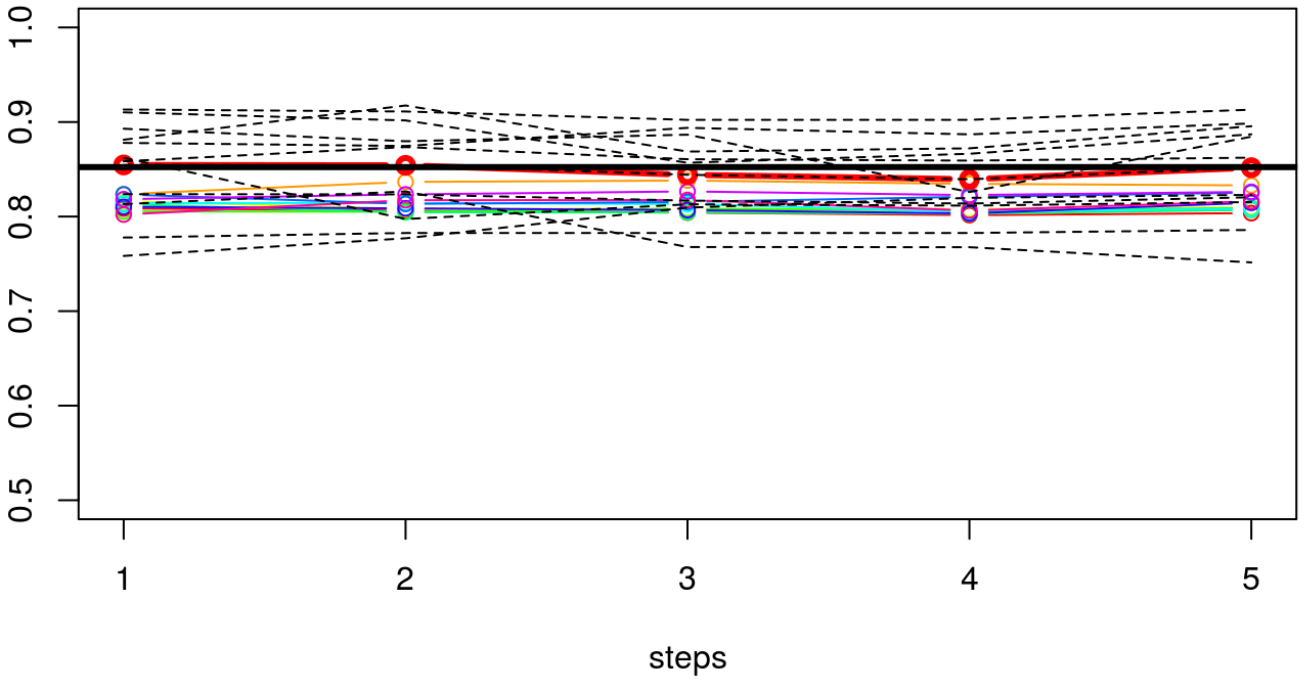


```
##                            k 1                            k 2
## 1              geom_10m_fl4_L4              geom_10m_fl8_L7
## 2            geom_10m_fl1_L22 geom_DTM_50m_avg_fl10_L150m
## 3 geom_DTM_50m_avg_fl8_L150m  geom_DTM_50m_avg_fl8_L600m
##                            k 3                            k 4
## 1              geom_10m_fl8_L5     geom_dtm_10m_hyd_fl5_L7
## 2 geom_DTM_50m_avg_fl2_L200m  geom_DTM_50m_avg_fl8_L150m
## 3 geom_DTM_50m_avg_fl8_L150m geom_DTM_50m_avg_fl8_L1500m
##                            k 5                            k 6
## 1              geom_10m_fl8_L7              geom_10m_fl8_L8
## 2 geom_DTM_50m_avg_fl2_L150m geom_DTM_50m_avg_fl8_L150m
## 3 geom_DTM_50m_avg_fl8_L150m            geom_10m_fl4_L14
##                            k 7                            k 8
## 1              geom_10m_fl8_L5              geom_10m_fl8_L5
## 2 geom_DTM_50m_avg_fl8_L150m geom_DTM_50m_avg_fl8_L150m
## 3            geom_10m_fl4_L17 geom_DTM_50m_avg_fl1_L200m
##                             k 9                            k 10
## 1               geom_10m_fl8_L8              geom_10m_fl8_L8
## 2  geom_DTM_50m_avg_fl8_L150m geom_DTM_50m_avg_fl1_L150m
## 3 geom_DTM_50m_avg_fl10_L150m geom_DTM_50m_avg_fl8_L150m
```

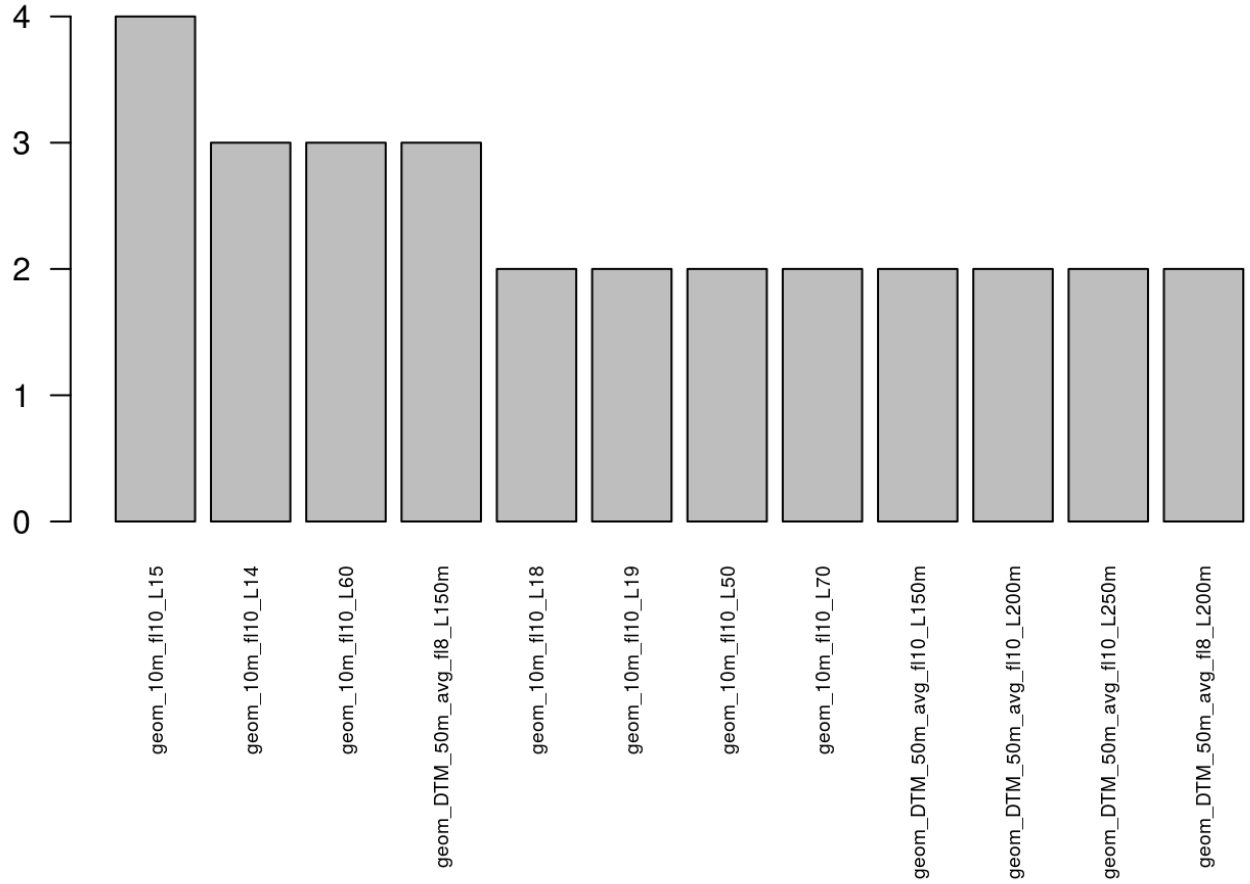


```
##                       allchosen Freq
## 15  geom_DTM_50m_avg_fl8_L150m    9
## 5               geom_10m_fl8_L5    3
## 7               geom_10m_fl8_L8    3
## 6               geom_10m_fl8_L7    2
## 9  geom_DTM_50m_avg_fl10_L150m    2
```

```
## [1] "KAPPA"
```

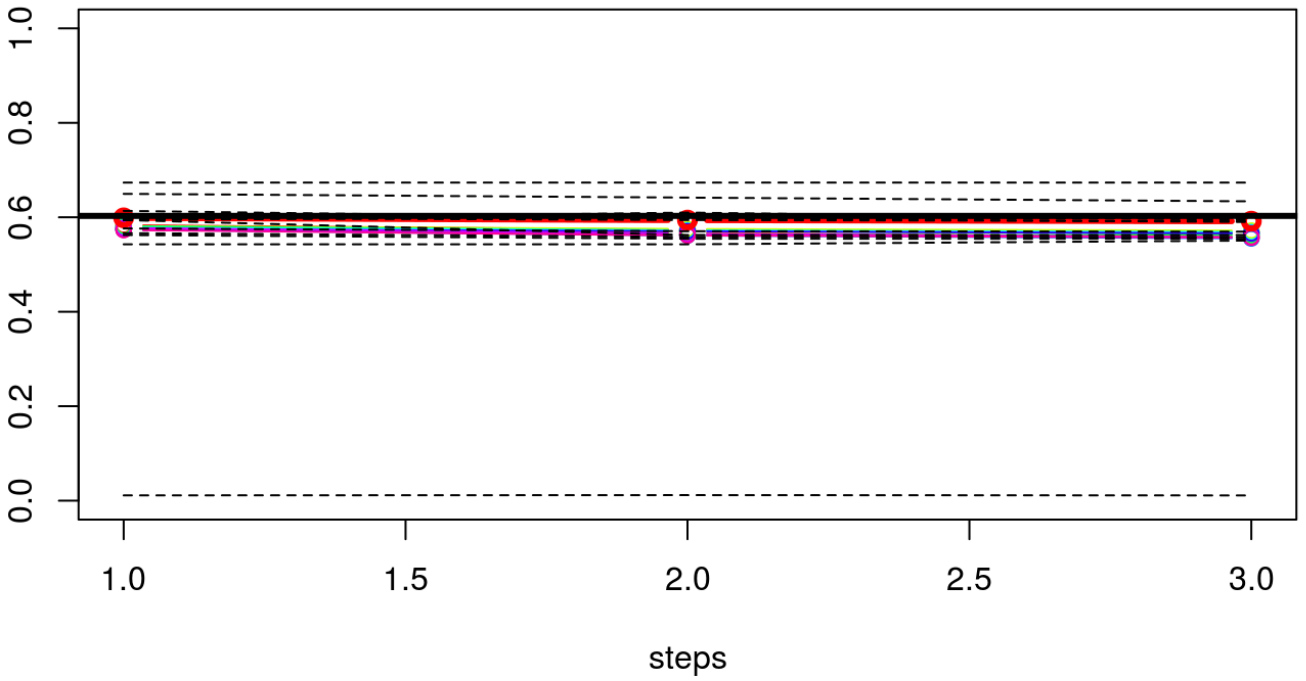


```
##                            k 1                 k 2
## 1             geom_10m_fl8_L15 geom_10m_fl10_L14
## 2            geom_10m_fl10_L19  geom_10m_fl10_L6
## 3           geom_10m_fl10_L120  geom_10m_fl10_L9
## 4 geom_DTM_50m_avg_fl10_L600m geom_10m_fl10_L70
## 5            geom_10m_fl10_L50 geom_10m_fl10_L60
##                            k 3                  k 4
## 1  geom_DTM_50m_avg_fl8_L150m  geom_10m_fl10_L14
## 2            geom_10m_fl10_L18  geom_10m_fl10_L11
## 3  geom_DTM_50m_avg_fl8_L250m  geom_10m_fl10_L50
## 4 geom_DTM_50m_avg_fl10_L150m geom_10m_fl10_L150
## 5 geom_DTM_50m_avg_fl10_L900m  geom_10m_fl10_L17
##                            k 5                            k 6
## 1            geom_10m_fl10_L15 geom_DTM_50m_avg_fl10_L200m
## 2 geom_DTM_50m_avg_fl10_L500m geom_DTM_50m_avg_fl10_L400m
## 3  geom_DTM_50m_avg_fl8_L150m  geom_DTM_50m_avg_fl8_L200m
## 4  geom_DTM_50m_avg_fl8_L500m           geom_10m_fl10_L15
## 5  geom_DTM_50m_avg_fl8_L200m             geom_10m_fl4_L3
##                           k 7                      k 8
## 1           geom_10m_fl10_L15       geom_10m_fl10_L19
## 2           geom_10m_fl10_L60       geom_10m_fl10_L60
## 3           geom_10m_fl10_L14       geom_10m_fl10_L16
## 4           geom_10m_fl10_L70 geom_dtm_10m_hyd_fl5_L5
## 5 geom_DTM_50m_avg_fl8_L150m       geom_10m_fl10_L15
##                            k 9                         k 10
## 1 geom_DTM_50m_avg_fl10_L250m geom_DTM_50m_avg_fl10_L250m
## 2 geom_DTM_50m_avg_fl10_L150m geom_DTM_50m_avg_fl10_L200m
## 3             geom_10m_fl8_L13           geom_10m_fl10_L18
## 4              geom_10m_fl8_L3  geom_DTM_50m_avg_fl8_L400m
## 5             geom_10m_fl1_L80            geom_10m_fl1_L32
```

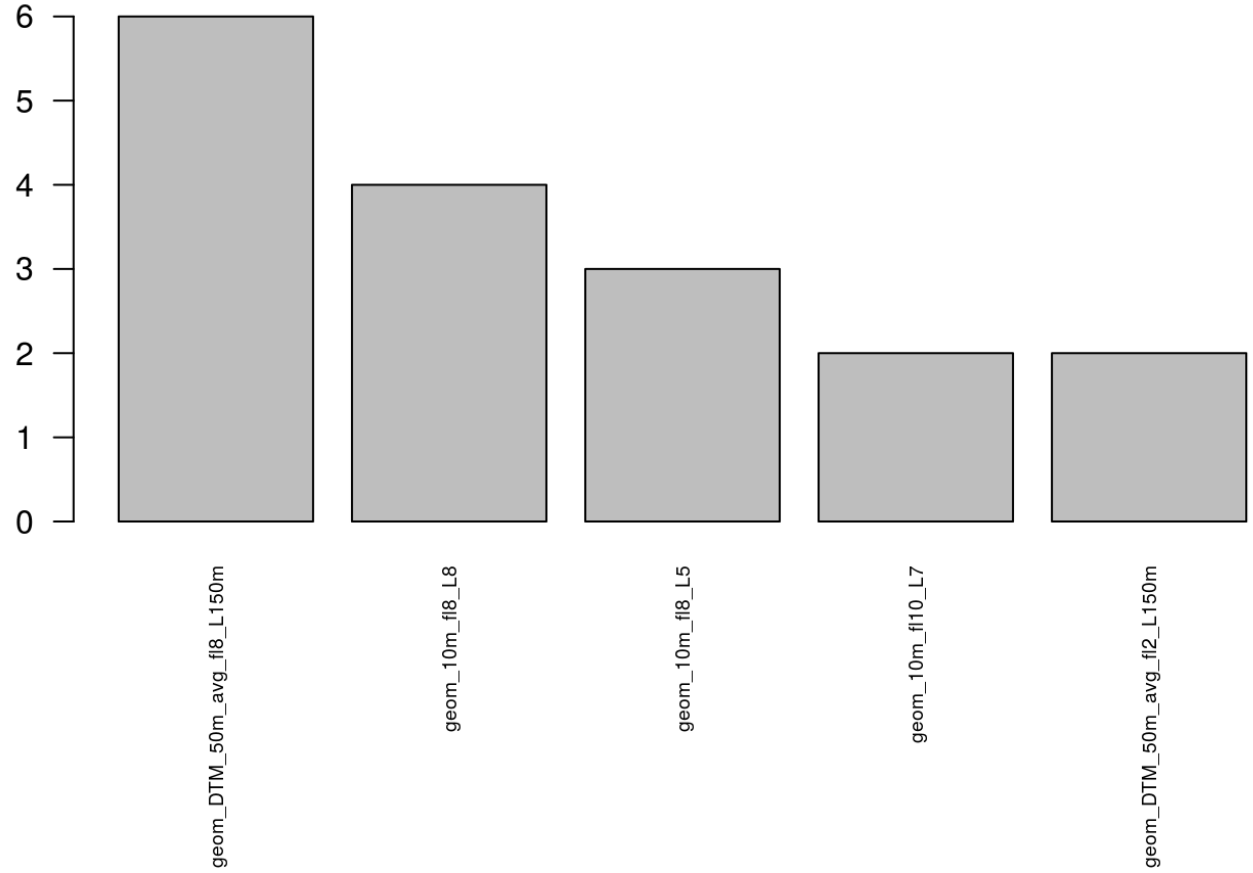



```
##                     allchosen Freq
## 4             geom_10m_fl10_L15    4
## 3             geom_10m_fl10_L14    3
## 12            geom_10m_fl10_L60    3
## 29  geom_DTM_50m_avg_fl8_L150m    3
## 8             geom_10m_fl10_L18    2
## 9             geom_10m_fl10_L19    2
## 10            geom_10m_fl10_L50    2
## 13            geom_10m_fl10_L70    2
## 22 geom_DTM_50m_avg_fl10_L150m    2
## 23 geom_DTM_50m_avg_fl10_L200m    2
## 24 geom_DTM_50m_avg_fl10_L250m    2
## 30  geom_DTM_50m_avg_fl8_L200m    2
```

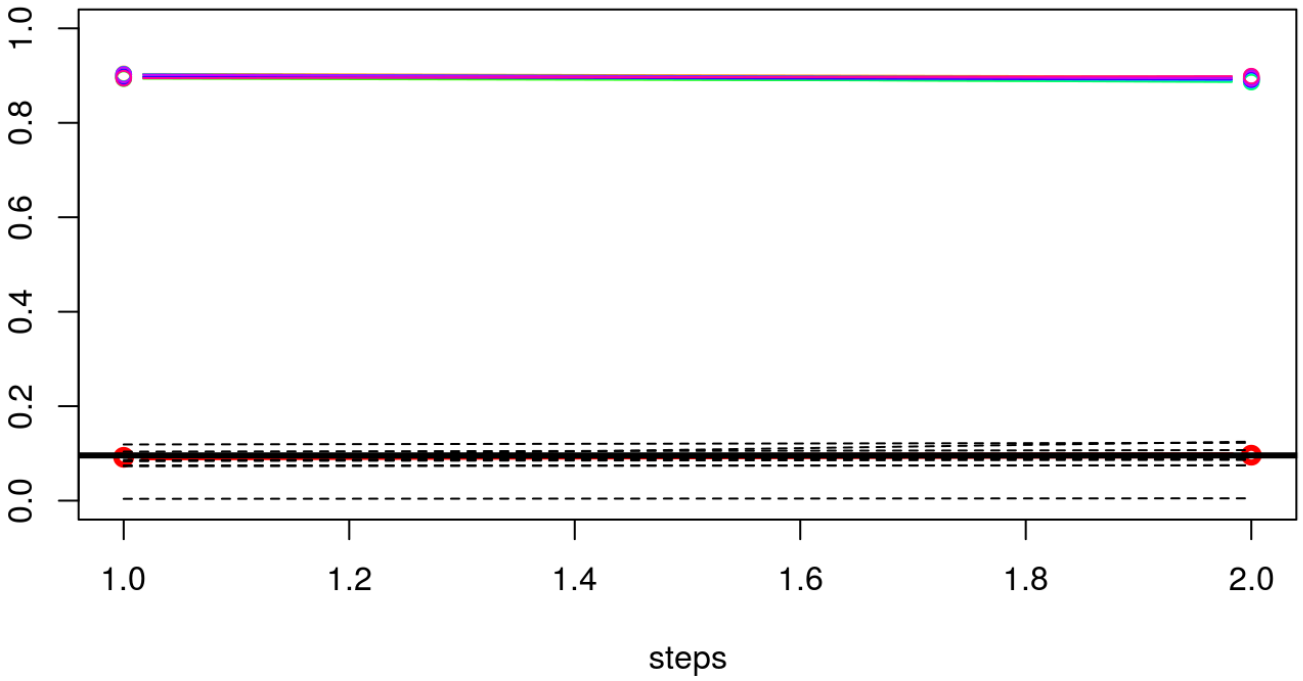
```
## [1] "TAU"
```



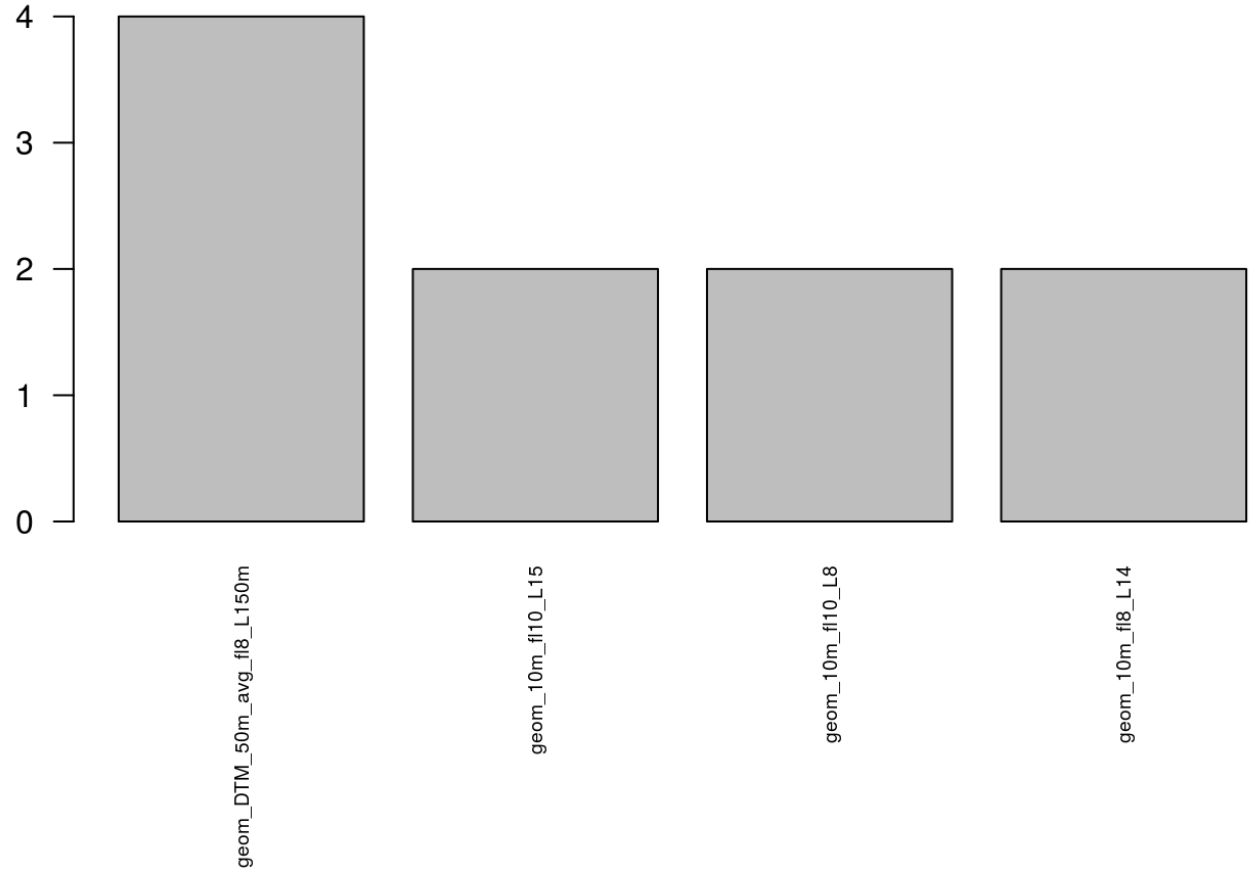

```
##                             k 1                             k 2
## 1              geom_10m_fl8_L5             geom_10m_fl8_L8
## 2 geom_DTM_50m_avg_fl10_L150m geom_DTM_50m_avg_fl8_L150m
## 3 geom_DTM_50m_avg_fl3_L1200m geom_DTM_50m_avg_fl2_L150m
##                   k 3                             k 4                          k 5
## 1   geom_10m_fl10_L7             geom_10m_fl8_L8             geom_10m_fl8_L5
## 2 geom_10m_fl10_L120 geom_DTM_50m_avg_fl8_L150m geom_DTM_50m_avg_fl8_L150m
## 3   geom_10m_fl10_L9            geom_10m_fl1_L15 geom_DTM_50m_avg_fl3_L150m
##                             k 6                             k 7
## 1              geom_10m_fl8_L5             geom_10m_fl3_L4
## 2  geom_DTM_50m_avg_fl8_L200m geom_DTM_50m_avg_fl8_L150m
## 3 geom_DTM_50m_avg_fl10_L250m            geom_10m_fl1_L14
##                   k 8                             k 9                          k 10
## 1   geom_10m_fl10_L7             geom_10m_fl8_L8           geom_10m_fl10_L15
## 2 geom_10m_fl10_L130 geom_DTM_50m_avg_fl8_L150m geom_DTM_50m_avg_fl8_L150m
## 3    geom_10m_fl8_L8 geom_DTM_50m_avg_fl2_L150m    geom_dtm_10m_hyd_fl5_L4
```




```
##                     allchosen Freq
## 17 geom_DTM_50m_avg_fl8_L150m    6
## 10            geom_10m_fl8_L8    4
## 9             geom_10m_fl8_L5    3
## 4            geom_10m_fl10_L7    2
## 14 geom_DTM_50m_avg_fl2_L150m    2
```




```
##                  k 1                          k 2                           k 3
## 1 geom_10m_fl10_L15           geom_10m_fl10_L8  geom_DTM_50m_avg_fl8_L150m
## 2  geom_10m_fl8_L16 geom_DTM_50m_avg_fl2_L200m geom_DTM_50m_avg_fl10_L400m
##                  k 4                          k 5                          k 6
## 1 geom_10m_fl10_L15           geom_10m_fl10_L8 geom_DTM_50m_avg_fl8_L150m
## 2 geom_10m_fl4_L150 geom_DTM_50m_avg_fl1_L150m           geom_10m_fl8_L14
##                           k 7                           k 8
## 1            geom_10m_fl8_L7 geom_DTM_50m_avg_fl10_L150m
## 2 geom_DTM_50m_avg_fl8_L150m    geom_dtm_10m_hyd_fl5_L12
##                           k 9                          k 10
## 1 geom_DTM_50m_avg_fl8_L150m geom_DTM_50m_avg_fl10_L200m
## 2           geom_10m_fl8_L14     geom_dtm_10m_hyd_fl5_L4
```




```
##                     allchosen Freq
## 14 geom_DTM_50m_avg_fl8_L150m    4
## 1            geom_10m_fl10_L15    2
## 2             geom_10m_fl10_L8    2
## 4             geom_10m_fl8_L14    2
```

- UA: only 1 predictor necessary :3x geom_10m_fl8_L8 (aber representativ)
- KAPPA: only 1 predictor necessary :geom_10m_fl10_L15 (4x) aber auch ganz represantiv
- TAU: only 1 predictor necessary :geom_DTM_50m_avg_fl8_L150m , kommt auch bei den anderen vor
- QUALITY: sehr ähnliche werte

```
## [1] "10fold cv-error:  0.514747191011236  for predictors geom_10m_fl8_L8"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   8  19   3   9   1   2   0   1   2
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  12  82  55  89  67 575  60  75 167
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   1   4   3   3   4  53   2  29  98
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.486 , 0.0132 , 2.7
## [1] 95 % confidence limits for accuracy: 0.4596 ... 0.5123
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.4222    NaN    NaN    NaN 0.4865    NaN    NaN 0.4975
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1810 0.0000 0.0000 0.0000 0.9127 0.0000 0.0000 0.3670
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1496 , 0.0151 , 10.1
## [1] 95 % confidence limits for kappa: 0.1198 ... 0.1795
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3762    NaN    NaN    NaN 0.0790    NaN    NaN 0.3815
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0780    NaN    NaN    NaN 0.0106    NaN    NaN 0.0407
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 20.7  NaN  NaN  NaN 13.5  NaN  NaN 10.7
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1542 0.0000 0.0000 0.0000 0.4863 0.0000 0.0000 0.2654
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0365 0.0000 0.0000 0.0000 0.0574 0.0000 0.0000 0.0302
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 23.7  NaN  NaN  NaN 11.8  NaN  NaN 11.4
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0316 0.0000 0.0000 0.0000 0.8301 0.0000 0.0000 0.1383
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4217 , 0.012 , 2.9
## [1] 95% confidence limits for tau:0.3978...0.4456
## [1] "mean quality =  0.0975146674728672"
## [1] "The quality of the modeled TP is  0.0975146674728672"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
## [1] "10fold cv-error:  0.528089887640449  for predictors geom_DTM_50m_avg_fl
8_L150m"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO   1  43   4  33   4  18   5   3  12
##    DA   2   2   7   3   0   3   0   1   2
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS   9  48  44  63  63 556  51  61 177
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   9  12   6   2   5  53   6  40  76
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4789 , 0.0132 , 2.8
## [1] 95 % confidence limits for accuracy: 0.4526 ... 0.5052
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3496 0.3500    NaN    NaN 0.5187    NaN    NaN 0.3636
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.4095 0.1148 0.0000 0.0000 0.8825 0.0000 0.0000 0.2846
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.1761 , 0.0153 , 8.7
## [1] 95 % confidence limits for kappa: 0.1458 ... 0.2065
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.2978 0.3209    NaN    NaN 0.1367    NaN    NaN 0.2168
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0438 0.1104    NaN    NaN 0.0138    NaN    NaN 0.0373
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 14.7 34.4  NaN  NaN 10.1  NaN  NaN 17.2
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.3537 0.1021 0.0000 0.0000 0.5248 0.0000 0.0000 0.1616
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0502 0.0399 0.0000 0.0000 0.0452 0.0000 0.0000 0.0283
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 14.2 39.0  NaN  NaN  8.6  NaN  NaN 17.5
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0864 0.0140 0.0000 0.0000 0.7528 0.0000 0.0000 0.1468
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.4138 , 0.012 , 2.9
## [1] 95% confidence limits for tau:0.3899...0.4377
## [1] "mean quality =  0.111354757899261"
## [1] "The quality of the modeled TP is  0.111354757899261"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
## [1] "10fold cv-error:  0.523876404494382  for predictors geom_10m_fl10_L15"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   0   0   0   0   0   0   0   0   0
##    LO  10  45  10  24   5  27   3   4  17
##    DA   0   0   0   0   0   0   0   0   0
##    FS   0   0   0   0   0   0   0   0   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS  11  55  49  73  61 553  55  67 159
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   0   0
##    RI   0   5   2   4   6  50   4  34  91
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.4838 , 0.0132 , 2.7
## [1] 95 % confidence limits for accuracy: 0.4575 ... 0.5102
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.3103    NaN    NaN    NaN 0.5106    NaN    NaN 0.4643
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.4286 0.0000 0.0000 0.0000 0.8778 0.0000 0.0000 0.3408
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.181 , 0.0155 , 8.6
## [1] 95 % confidence limits for kappa: 0.1502 ... 0.2118
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.2554    NaN    NaN    NaN 0.1223    NaN    NaN 0.3407
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
##    NaN 0.0386    NaN    NaN    NaN 0.0134    NaN    NaN 0.0405
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 15.1  NaN  NaN  NaN 11.0  NaN  NaN 11.9
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.3638 0.0000 0.0000 0.0000 0.4896 0.0000 0.0000 0.2356
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.0515 0.0000 0.0000 0.0000 0.0470 0.0000 0.0000 0.0295
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
##  NaN 14.2  NaN  NaN  NaN  9.6  NaN  NaN 12.5
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0000 0.1018 0.0000 0.0000 0.0000 0.7605 0.0000 0.0000 0.1376
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4193 , 0.012 , 2.9
```

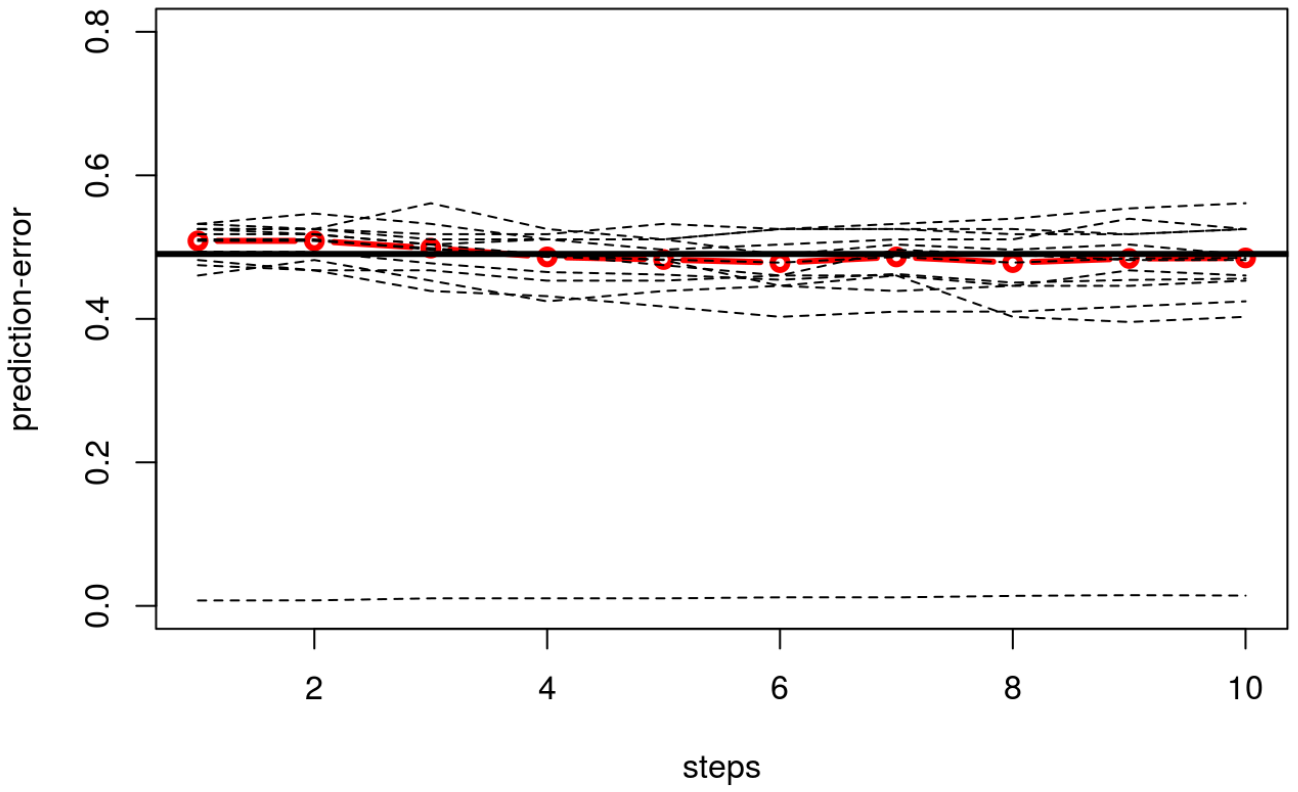
```
## [1] 95% confidence limits for tau:0.3954...0.4433
## [1] "mean quality =  0.104539998774107"
## [1] "The quality of the modeled TP is  0.104539998774107"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
```

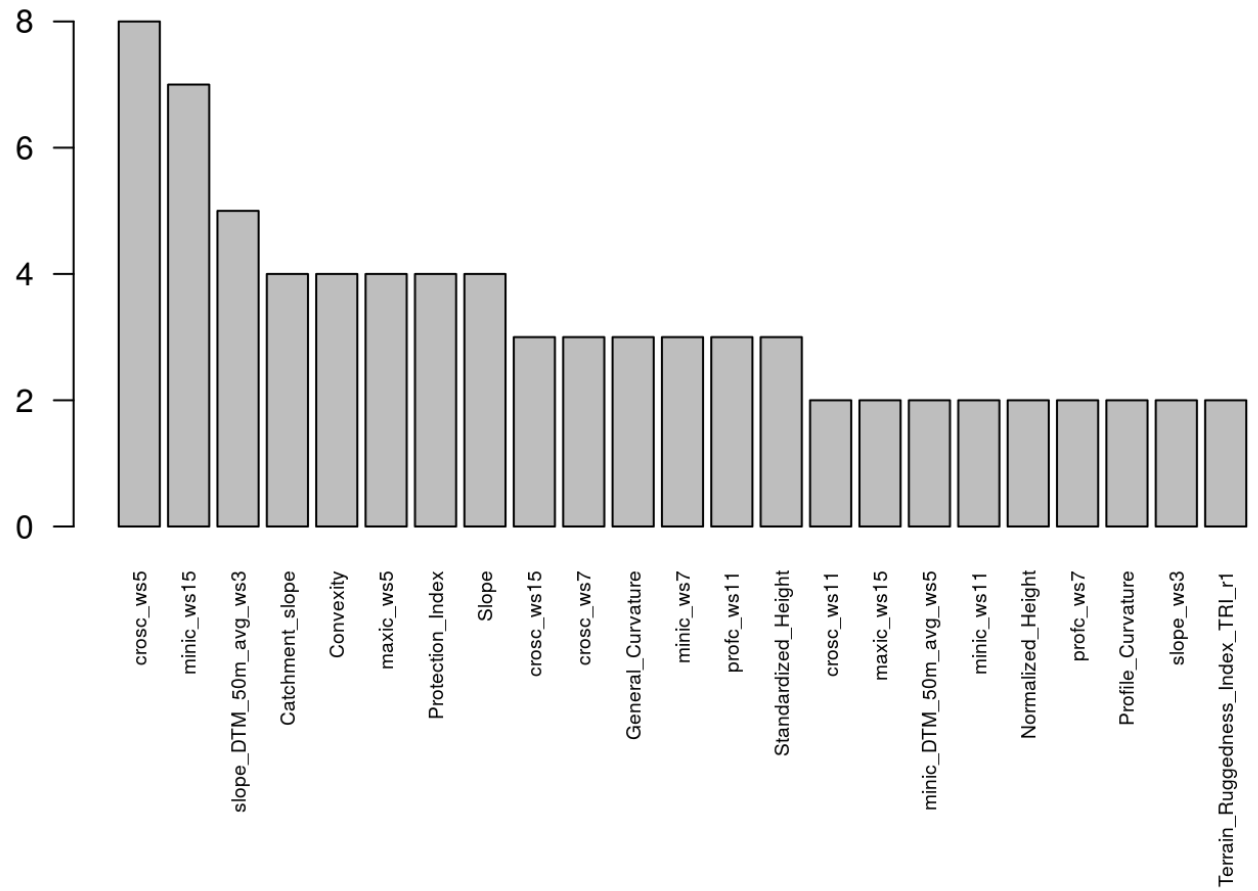
Terrain parameter based model of topographic position

```
## [1] "USER'S ACCURACY"
```



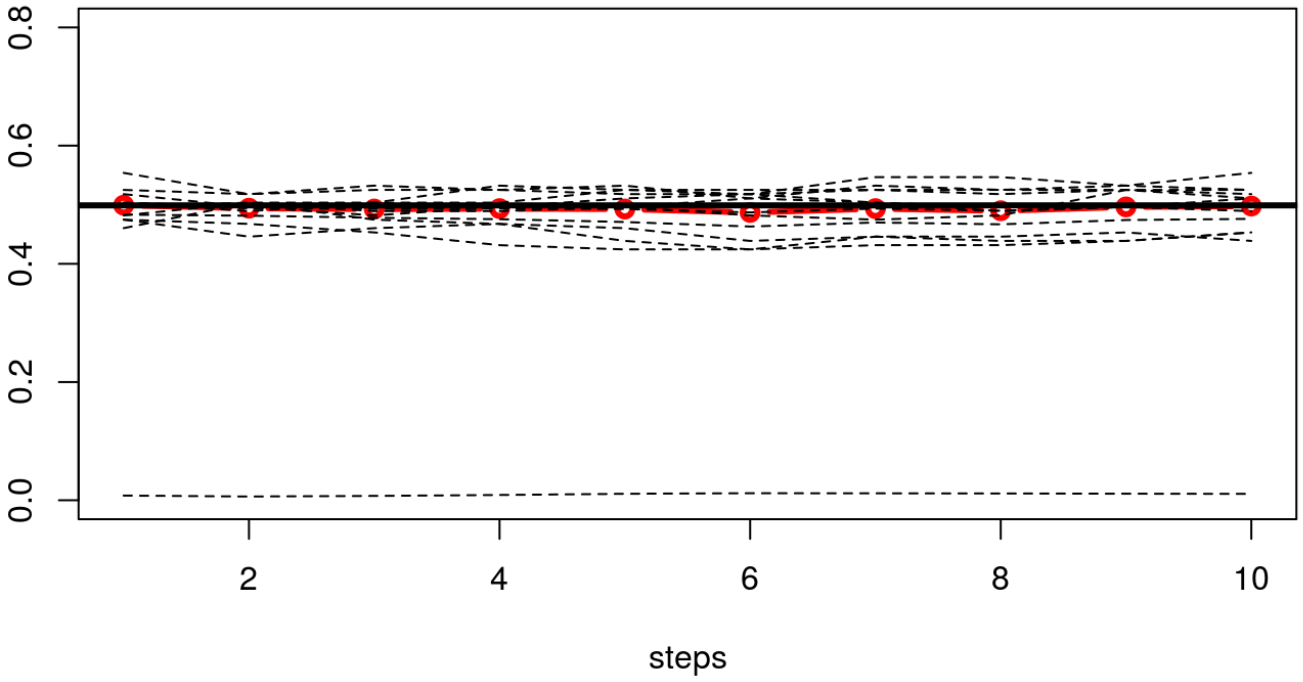
```
##                      k 1                           k 2
## 1              crosc_ws5                     crosc_ws7
## 2             minic_ws15                     profc_ws7
## 3  slope_DTM_50m_avg_ws3                Protection_Index
## 4              maxic_ws5 Terrain_Ruggedness_Index_TRI_r1
## 5              longc_ws5          aspect_DTM_50m_avg_ws7
## 6       Protection_Index             Standardized_Height
## 7  longc_DTM_50m_avg_ws5           slope_DTM_50m_avg_ws5
## 8  minic_DTM_50m_avg_ws5                     minic_ws15
## 9              Convexity      Channel_Network_Base_Level
## 10             slope_ws3                 Catchment_slope
##                      k 3                   k 4
## 1              crosc_ws5             crosc_ws5
## 2      General_Curvature            profc_ws11
## 3                  Slope slope_DTM_50m_avg_ws3
## 4             minic_ws15   Standardized_Height
## 5      Normalized_Height             profc_ws7
## 6              maxic_ws5            crosc_ws11
## 7        Total_Curvature     Minimal_Curvature
## 8             maxic_ws15             minic_ws7
## 9              crosc_ws7       Catchment_slope
## 10 crosc_DTM_50m_avg_ws5            crosc_ws15
##                                k 5                   k 6
## 1                       crosc_ws5             crosc_ws5
## 2                  General_Curvature     General_Curvature
## 3             slope_DTM_50m_avg_ws3                 Slope
## 4                         longc_ws11            profc_ws11
## 5                  Protection_Index            minic_ws15
## 6                         crosc_ws15      Protection_Index
## 7             slope_DTM_50m_avg_ws7 planc_DTM_50m_avg_ws3
## 8                   Catchment_slope             Convexity
## 9  Terrain_Ruggedness_Index_TRI_r1             minic_ws5
## 10                        profc_ws11            crosc_ws11
##                     k 7                    k 8                   k 9
## 1             crosc_ws5              crosc_ws5             crosc_ws7
## 2        Plan_Curvature             planc_ws15                 Slope
## 3            crosc_ws15 slope_DTM_50m_avg_ws3 longc_DTM_50m_avg_ws7
## 4                 Slope          Slope_Height             minic_ws7
## 5     Normalized_Height             minic_ws11   Standardized_Height
## 6     Profile_Curvature              maxic_ws5            minic_ws15
## 7              maxic_ws3              slope_ws3       Catchment_slope
## 8                Texture     Profile_Curvature             slope_ws7
## 9             maxic_ws15             minic_ws15 minic_DTM_50m_avg_ws3
## 10 Tangential_Curvature              Convexity            minic_ws11
##                      k 10
## 1               crosc_ws5
## 2               minic_ws7
## 3               maxic_ws5
## 4   slope_DTM_50m_avg_ws3
## 5   minic_DTM_50m_avg_ws5
## 6              minic_ws15
## 7  aspect_DTM_50m_avg_ws3
## 8               Convexity
```

```
## 9               longc_ws15
## 10  crosc_DTM_50m_avg_ws7
```

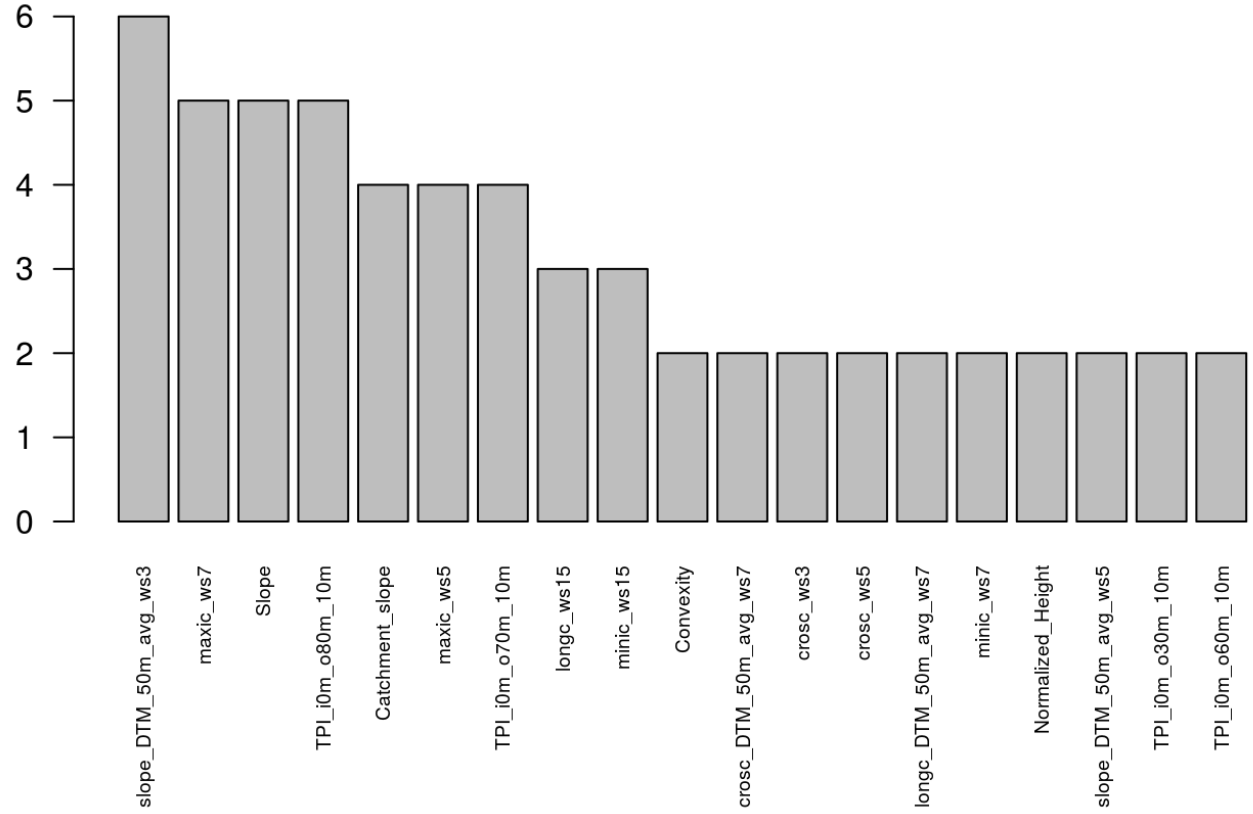



```
##                          allchosen Freq
## 10                       crosc_ws5    8
## 24                      minic_ws15    7
## 37           slope_DTM_50m_avg_ws3    5
## 3                  Catchment_slope    4
## 5                        Convexity    4
## 20                       maxic_ws5    4
## 35                 Protection_Index    4
## 36                             Slope    4
## 9                       crosc_ws15    3
## 11                       crosc_ws7    3
## 12               General_Curvature    3
## 26                       minic_ws7    3
## 32                      profc_ws11    3
## 43             Standardized_Height    3
## 8                       crosc_ws11    2
## 18                      maxic_ws15    2
## 22           minic_DTM_50m_avg_ws5    2
## 23                      minic_ws11    2
## 28               Normalized_Height    2
## 33                       profc_ws7    2
## 34               Profile_Curvature    2
## 41                       slope_ws3    2
## 45 Terrain_Ruggedness_Index_TRI_r1    2
```

```
## [1] "mit tpis:"
```

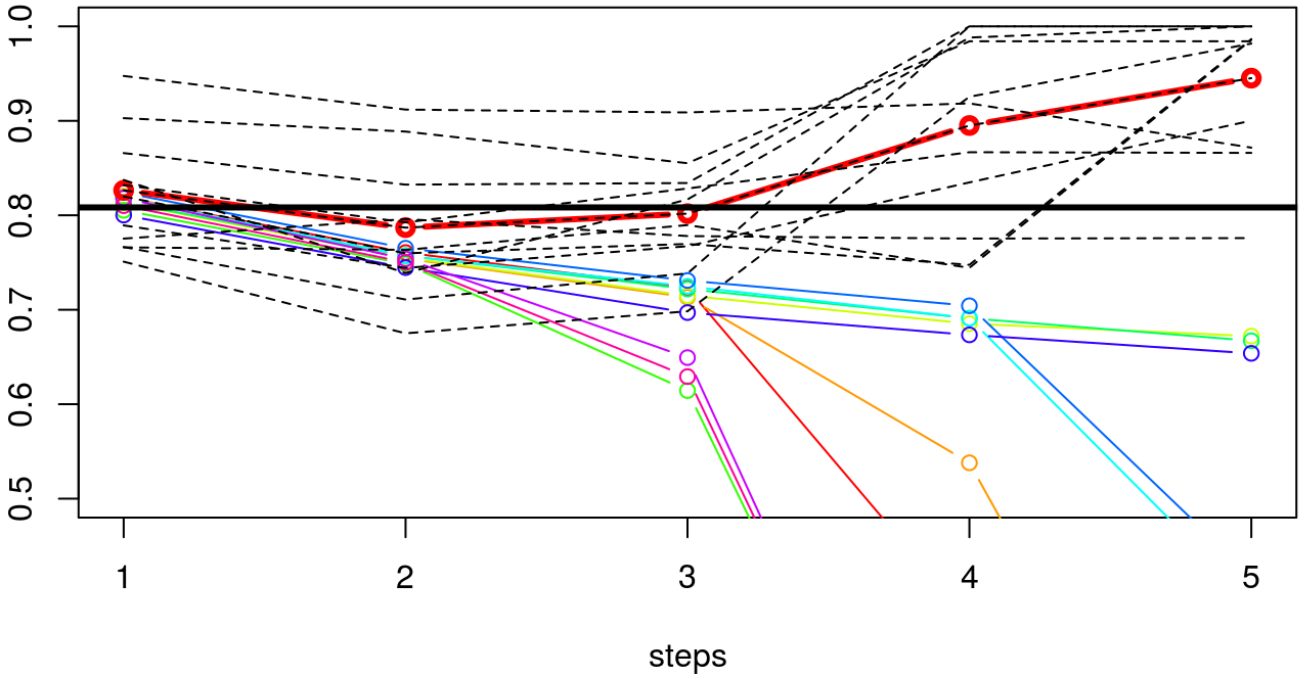


```
##                       k 1                              k 2
## 1       TPI_i0m_o80m_10m                TPI_i0m_o70m_10m
## 2  slope_DTM_50m_avg_ws3          Modified_Catchment_Area
## 3       TPI_i0m_o70m_10m                           Slope
## 4              maxic_ws7                Normalized_Height
## 5        Catchment_slope                        maxic_ws7
## 6             longc_ws15                Mid_Slope_Positon
## 7      TPI_i0m_o400m_10m Vector_Terrain_Ruggedness_VRM_r1
## 8  slope_DTM_50m_avg_ws7             profc_DTM_50m_avg_ws5
## 9         TPI_i0m_o1100m                           Convexity
## 10             Convexity                            elev_ws5
##                                 k 3                k 4                   k 5
## 1                TPI_i0m_o60m_10m  TPI_i0m_o80m_10m      TPI_i0m_o70m_10m
## 2            slope_DTM_50m_avg_ws3         slope_ws5 slope_DTM_50m_avg_ws3
## 3                         crosc_ws7         crosc_ws3             maxic_ws5
## 4                Normalized_Height    TPI_i0m_o1150m        TPI_i0m_o1000m
## 5  Terrain_Ruggedness_Index_TRI_r1  TPI_i0m_o20m_10m            crosc_ws15
## 6                        minic_ws15         crosc_ws5            longc_ws15
## 7            longc_DTM_50m_avg_ws7 Minimal_Curvature slope_DTM_50m_avg_ws5
## 8    sagaTopographic_Wetness_Index             Slope crosc_DTM_50m_avg_ws7
## 9                        profc_ws15         maxic_ws5            profc_ws11
## 10                        minic_ws7   Catchment_slope      Protection_Index
##                         k 6                    k 7                   k 8
## 1          TPI_i0m_o80m_10m      TPI_i0m_o80m_10m      TPI_i0m_o60m_10m
## 2     slope_DTM_50m_avg_ws3                 Slope slope_DTM_50m_avg_ws3
## 3                 crosc_ws5             maxic_ws7             maxic_ws5
## 4           TPI_i100m_o150m       TPI_i150m_o200m    Closed_Depressions
## 5                 maxic_ws7      TPI_i200m_o1350m planc_DTM_50m_avg_ws5
## 6            TPI_i0m_o1300m slope_DTM_50m_avg_ws5 crosc_DTM_50m_avg_ws7
## 7  Tangential_Curvature_10m           aspect_ws15             minic_ws5
## 8                      Slope maxic_DTM_50m_avg_ws3            slope_ws15
## 9          TPI_i0m_o90m_10m longc_DTM_50m_avg_ws7             minic_ws7
## 10        Profile_Curvature    Mass_Balance_Index             maxic_ws7
##                       k 9                   k 10
## 1       TPI_i0m_o70m_10m      TPI_i0m_o80m_10m
## 2                  Slope slope_DTM_50m_avg_ws3
## 3              planc_ws5             maxic_ws5
## 4        Catchment_slope            minic_ws15
## 5          Plan_Curvature            longc_ws15
## 6       TPI_i0m_o30m_10m       Catchment_slope
## 7       TPI_i0m_o40m_10m             crosc_ws3
## 8             minic_ws15       TPI_i100m_o850m
## 9  planc_DTM_50m_avg_ws3        TPI_i0m_o1250m
## 10 crosc_DTM_50m_avg_ws3      TPI_i0m_o30m_10m
```

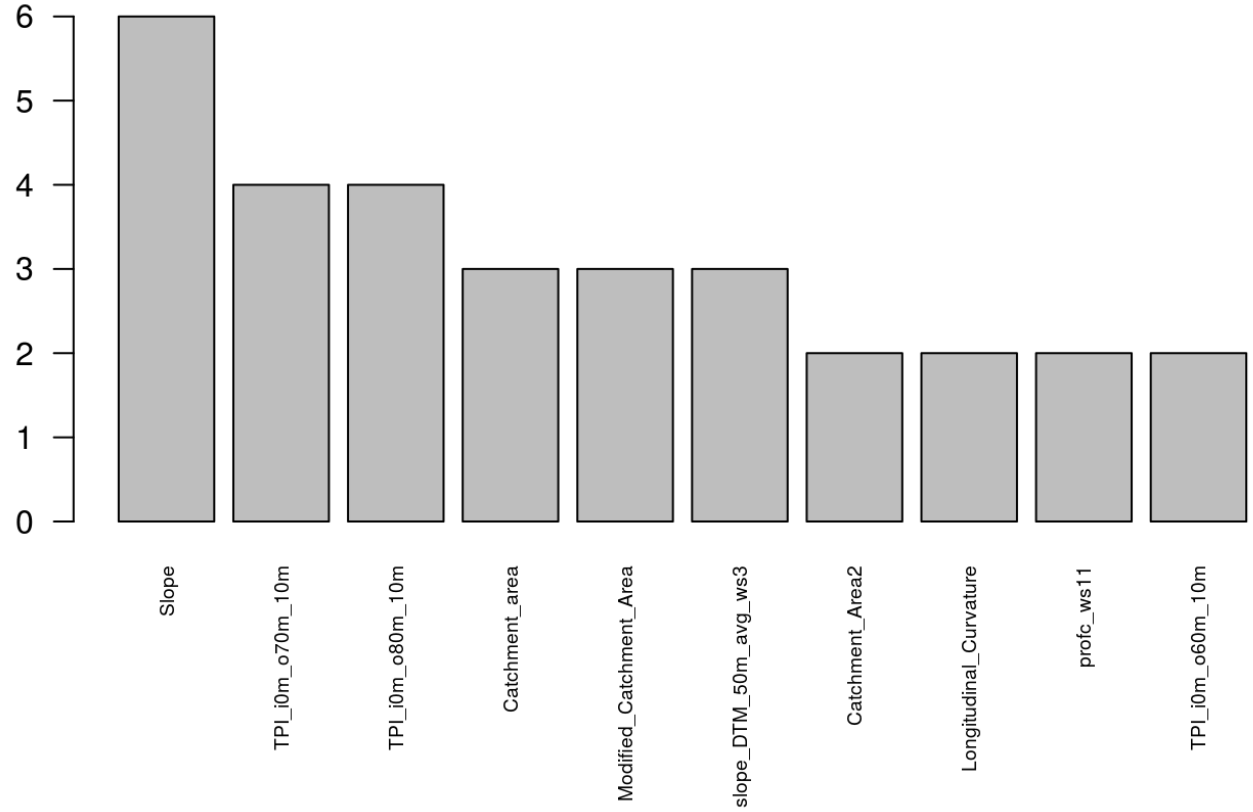



```
##                allchosen Freq
## 36 slope_DTM_50m_avg_ws3    6
## 17             maxic_ws7    5
## 35                 Slope    5
## 54      TPI_i0m_o80m_10m    5
## 2        Catchment_slope    4
## 16             maxic_ws5    4
## 53      TPI_i0m_o70m_10m    4
## 13            longc_ws15    3
## 19            minic_ws15    3
## 4              Convexity    2
## 6  crosc_DTM_50m_avg_ws7    2
## 8              crosc_ws3    2
## 9              crosc_ws5    2
## 12 longc_DTM_50m_avg_ws7    2
## 21             minic_ws7    2
## 24     Normalized_Height    2
## 37 slope_DTM_50m_avg_ws5    2
## 49      TPI_i0m_o30m_10m    2
## 52      TPI_i0m_o60m_10m    2
```

```
## [1] "KAPPA"
```

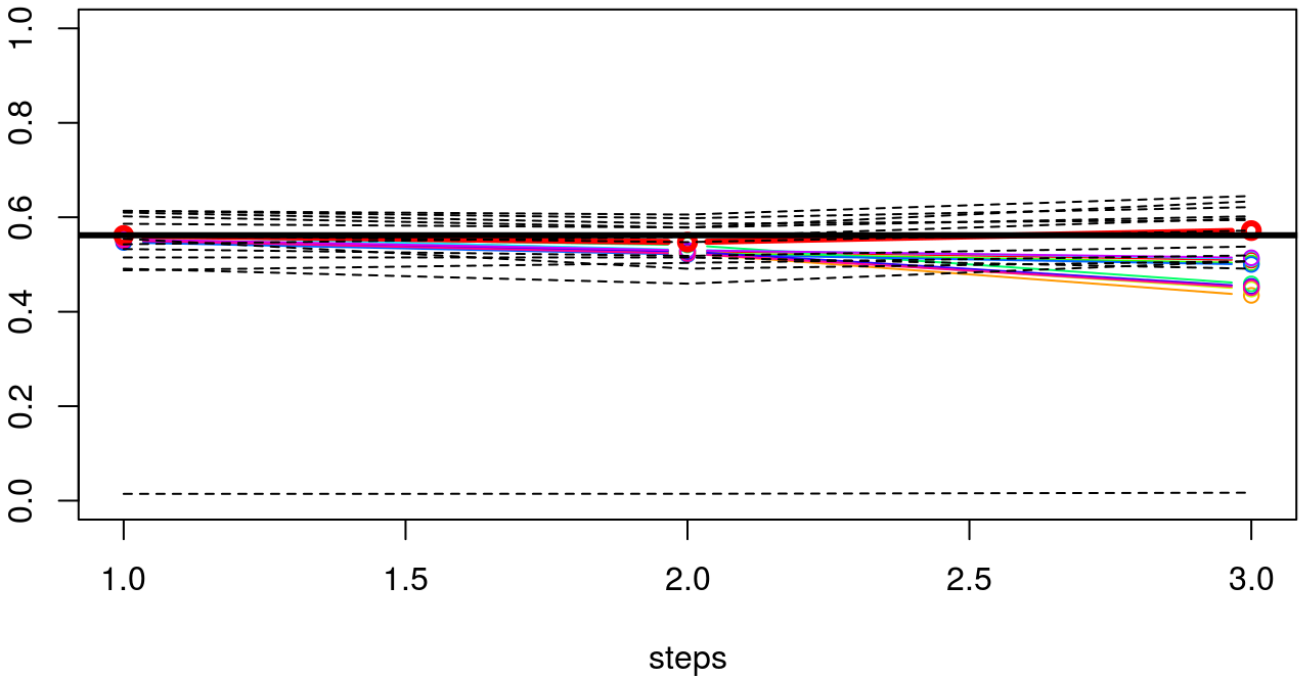

1.0
0.9
0.8
0.7
0.6
0.5
1
2
3
4
5
steps

```
##                             k 1                             k 2
## 1              TPI_i0m_o70m_10m              TPI_i0m_o80m_10m
## 2                         Slope                         Slope
## 3 valleydepth_vr1000_hr1500_t25               TPI_i150m_o450m
## 4 valleydepth_vr1250_hr500_t250 hillheight_vr500_hr1500_t125
## 5                Catchment_Area2               Catchment_Area2
##                             k 3                             k 4
## 1              TPI_i0m_o70m_10m              TPI_i0m_o80m_10m
## 2                    slope_ws15         slope_DTM_50m_avg_ws3
## 3                    longc_ws15 valleydepth_vr1000_hr250_t100
## 4 valleydepth_vr500_hr1000_t200                 Catchment_area
## 5         crosc_DTM_50m_avg_ws7       Modified_Catchment_Area
##                           k 5                             k 6
## 1           TPI_i0m_o80m_10m              TPI_i0m_o80m_10m
## 2                      Slope                         Slope
## 3    Longitudinal_Curvature                     profc_ws11
## 4                 elev_ws11 valleydepth_vr1000_hr1500_t75
## 5 sindex_vr1250_hr1500_t200   hillheight_vr250_hr1000_t75
##                             k 7                     k 8
## 1              TPI_i0m_o70m_10m       TPI_i0m_o70m_10m
## 2                         Slope                   Slope
## 3                    longc_ws11 Longitudinal_Curvature
## 4 valleydepth_vr1250_hr1500_t25  planc_DTM_50m_avg_ws5
## 5       sindex_vr250_hr250_t175              profc_ws11
##                             k 9                        k 10
## 1            TPI_i0m_o60m_10m            TPI_i0m_o60m_10m
## 2       slope_DTM_50m_avg_ws3       slope_DTM_50m_avg_ws3
## 3 hillheight_vr750_hr250_t500 hillheight_vr250_hr250_t125
## 4              Catchment_area     Modified_Catchment_Area
## 5     Modified_Catchment_Area              Catchment_area
```

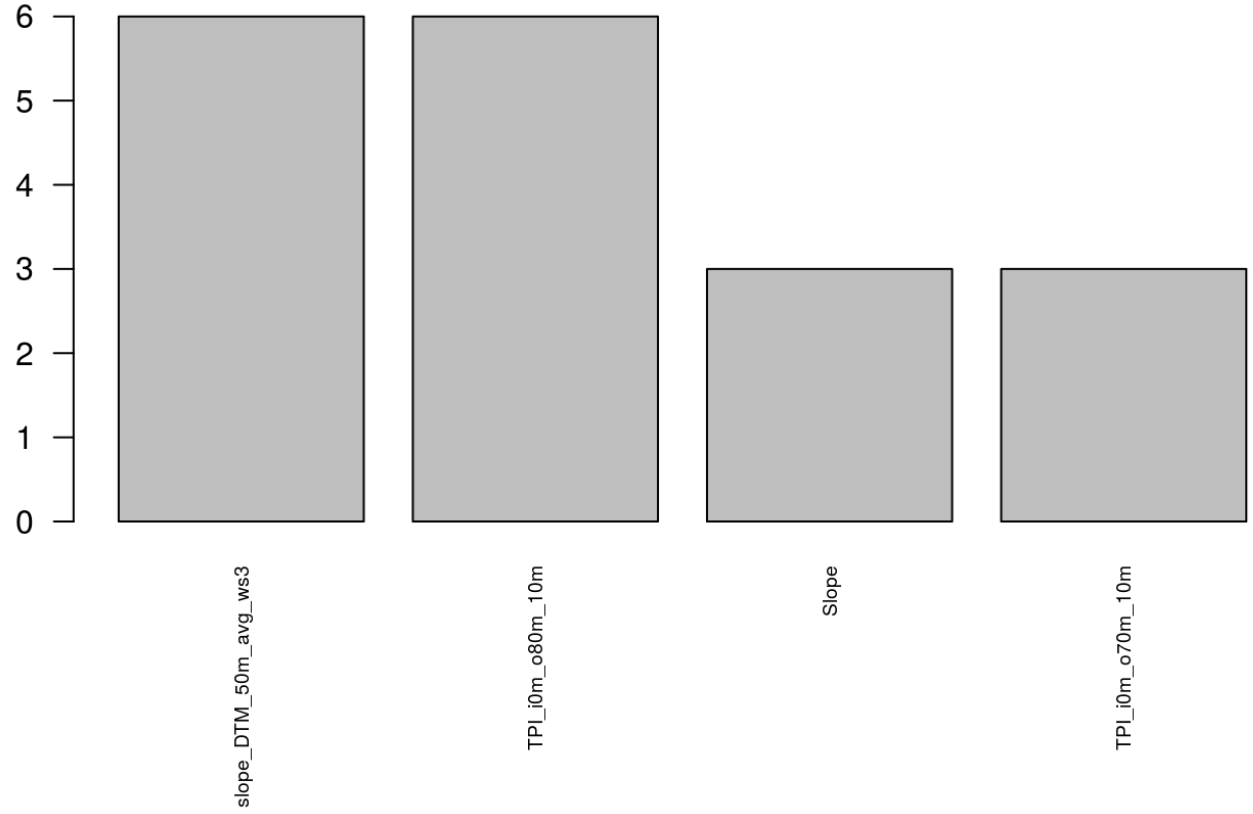



```
##                  allchosen Freq
## 17                   Slope    6
## 21        TPI_i0m_o70m_10m    4
## 22        TPI_i0m_o80m_10m    4
## 1           Catchment_area    3
## 12 Modified_Catchment_Area    3
## 18   slope_DTM_50m_avg_ws3    3
## 2          Catchment_Area2    2
## 11  Longitudinal_Curvature    2
## 14              profc_ws11    2
## 20        TPI_i0m_o60m_10m    2
```

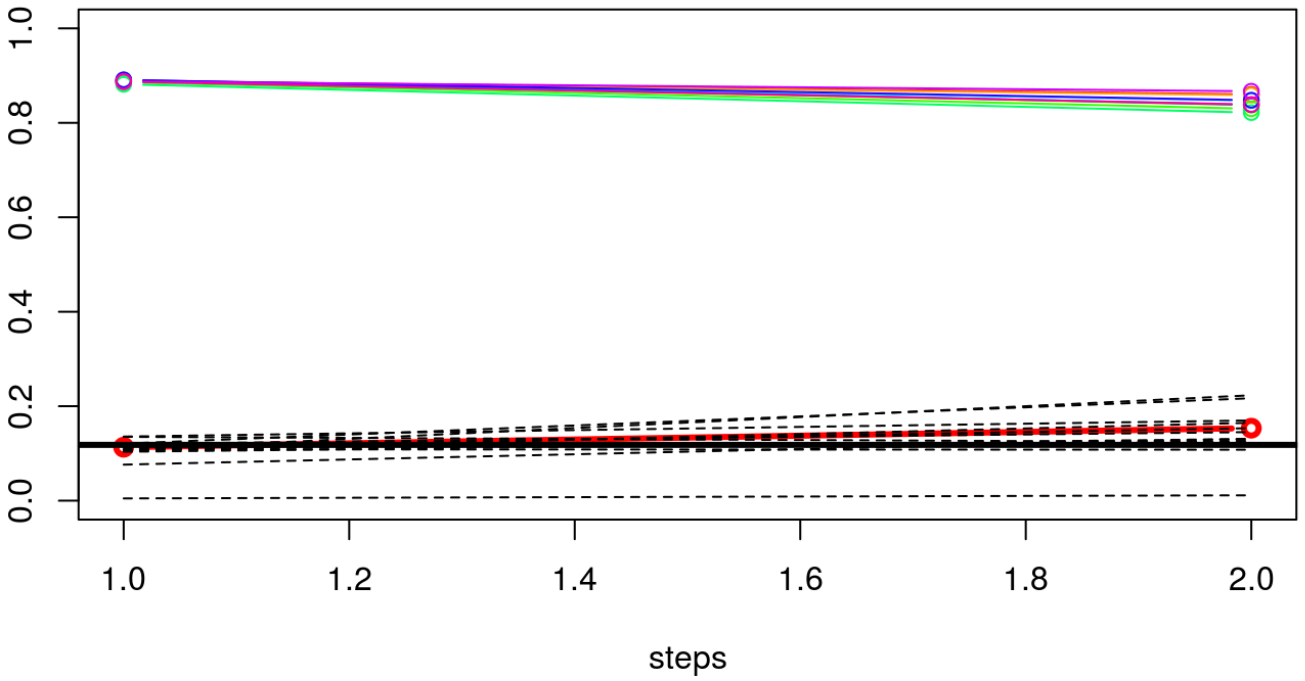
```
## [1] "TAU"
```



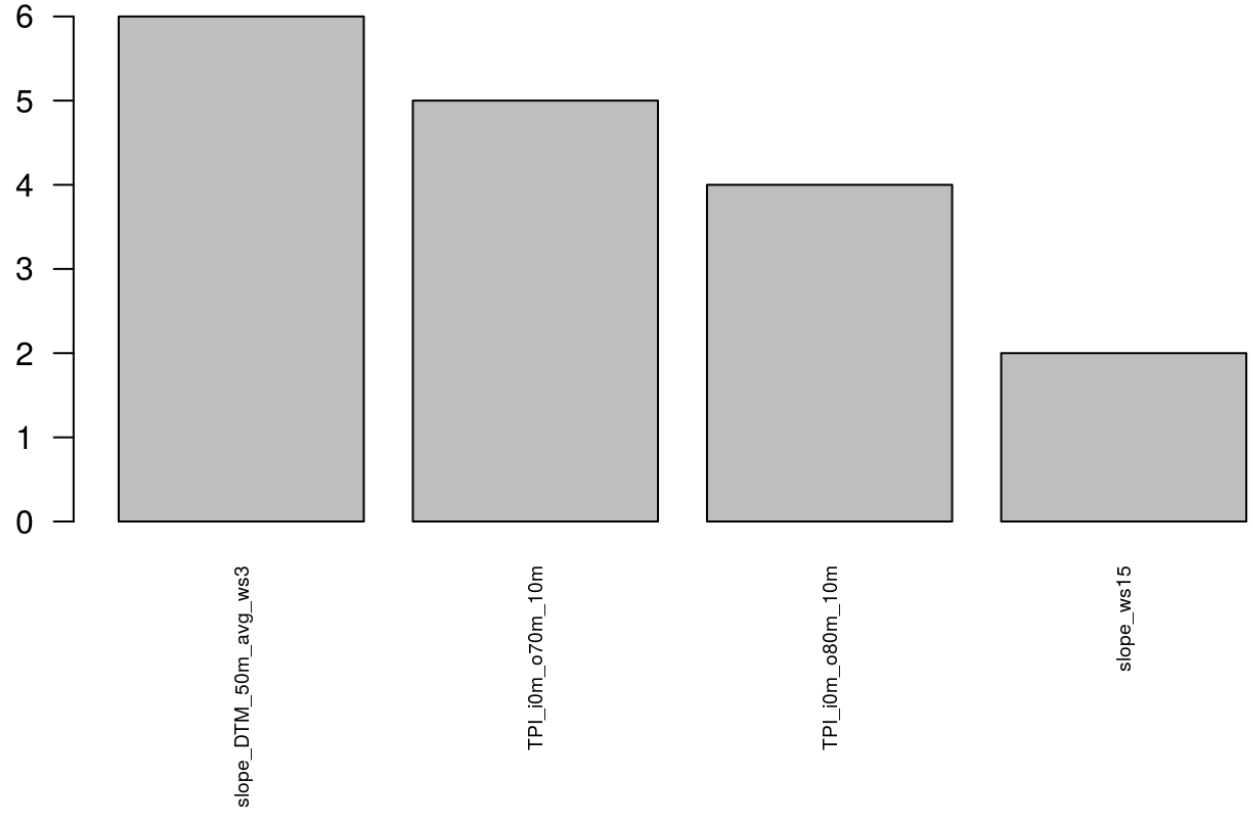

```
##                k 1                           k 2
## 1 TPI_i0m_o80m_10m             TPI_i0m_o80m_10m
## 2            Slope        slope_DTM_50m_avg_ws3
## 3  TPI_i150m_o400m hillheight_vr500_hr1500_t125
##                            k 3                   k 4
## 1            TPI_i0m_o70m_10m      TPI_i0m_o70m_10m
## 2       slope_DTM_50m_avg_ws3                 Slope
## 3 hillheight_vr750_hr250_t500 longc_DTM_50m_avg_ws5
##                              k 5                   k 6
## 1              TPI_i0m_o70m_10m      TPI_i0m_o80m_10m
## 2         slope_DTM_50m_avg_ws3                 Slope
## 3 valleydepth_vr1000_hr250_t100 profc_DTM_50m_avg_ws7
##                            k 7                   k 8
## 1            TPI_i0m_o80m_10m        TPI_i0m_o60m_10m
## 2       slope_DTM_50m_avg_ws3   slope_DTM_50m_avg_ws3
## 3 valleydepth_vr250_hr500_t50 sindex_vr750_hr750_t500
##                            k 9                                 k 10
## 1            TPI_i0m_o80m_10m                TPI_i0m_o80m_10m
## 2       slope_DTM_50m_avg_ws3 Terrain_Ruggedness_Index_TRI_r1
## 3 valleydepth_vr250_hr500_t25     hillheight_vr250_hr1000_t75
```




```
##                allchosen Freq
## 8  slope_DTM_50m_avg_ws3    6
## 12      TPI_i0m_o80m_10m    6
## 7                   Slope    3
## 11      TPI_i0m_o70m_10m    3
```




```
##                 k 1               k 2               k 3                     k 4
## 1 TPI_i0m_o70m_10m TPI_i0m_o70m_10m TPI_i0m_o70m_10m      TPI_i0m_o80m_10m
## 2       slope_ws15        slope_ws15         slope_ws5 slope_DTM_50m_avg_ws3
##                   k 5                   k 6                   k 7
## 1      TPI_i0m_o80m_10m      TPI_i0m_o70m_10m      TPI_i0m_o80m_10m
## 2 slope_DTM_50m_avg_ws3 slope_DTM_50m_avg_ws3 slope_DTM_50m_avg_ws3
##                   k 8                   k 9                  k 10
## 1     TPI_i0m_o100m_10m      TPI_i0m_o80m_10m      TPI_i0m_o70m_10m
## 2 slope_DTM_50m_avg_ws3 profc_DTM_50m_avg_ws5 slope_DTM_50m_avg_ws3
```




```
##               allchosen Freq
## 2 slope_DTM_50m_avg_ws3    6
## 6      TPI_i0m_o70m_10m    5
## 7      TPI_i0m_o80m_10m    4
## 3            slope_ws15    2
```

- UA: without tpi!!:“crosc_ws5”,
- KAPPA: seems 4 are appropriate: NR1:
- TAU:
- QUALITY:

```
## [1] "10fold cv-error:  0.487359550561798  for predictors crosc_ws5 AND slope
_DTM_50m_avg_ws3 AND General_Curvature AND maxic_ws5"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   8   4   2   0   1   1   0   1   2
##    LO   0  28   0   6   0   1   2   1   0
##    DA   3   5  14   3   3   0   0   2   1
##    FS   1   4   1  14   0   3   0   0   1
##    SF   0   0   0   0   0   0   0   0   0
##    BS   9  60  43  71  66 590  54  68 155
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   0   0   7   0
##    RI   0   4   1   7   2  35   6  26 108
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.54 , 0.0132 , 2.4
## [1] 95 % confidence limits for accuracy: 0.5138 ... 0.5663
## [1] User's accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4211 0.7368 0.4516 0.5833    NaN 0.5287    NaN 1.0000 0.5714
## [1] Producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.3810 0.2667 0.2295 0.1386 0.0000 0.9365 0.0000 0.0667 0.4045
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.2626 , 0.0168 , 6.4
## [1] 95 % confidence limits for kappa: 0.2294 ... 0.2957
## [1] Per-class kappa, stdev, & CV%, for user's accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4124 0.7159 0.4271 0.5515    NaN 0.1547    NaN 1.0000 0.4725
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1141 0.0766 0.0923 0.1075    NaN 0.0128    NaN 0.0000 0.0416
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 27.7 10.7 21.6 19.5  NaN  8.3  NaN  0.0  8.8
## [1] Per-class kappa, stdev, & CV%, for producer's reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.3726 0.2466 0.2124 0.1238 0.0000 0.7065 0.0000 0.0621 0.3134
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1064 0.0419 0.0532 0.0329 0.0000 0.0414 0.0000 0.0228 0.0307
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 28.6 17.0 25.1 26.5  NaN  5.9  NaN 36.7  9.8
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0133 0.0267 0.0218 0.0169 0.0000 0.7837 0.0000 0.0049 0.1327
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
## [1] Tau, stdev, & CV%: 0.4825 , 0.0118 , 2.5
## [1] 95% confidence limits for tau:0.459...0.5061
## [1] "mean quality =  0.187387075952568"
```

```
## [1] "The quality of the modeled TP is  0.187387075952568"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
## [1] "10fold cv-error:  0.488061797752809  for predictors TPI_i0m_o70m_10m AN
D slope_DTM_50m_avg_ws3"
##
## preds  FL  LO  DA  FS  SF  BS  SS  SH  RI
##    FL   9   3   2   0   1   1   0   1   3
##    LO   1  34   1  14   1   2   2   0   3
##    DA   4   7  15   4   3   1   0   1   3
##    FS   0   0   0   8   0   3   0   1   0
##    SF   0   0   0   0   0   0   0   0   0
##    BS   7  58  41  71  65 589  53  68 165
##    SS   0   0   0   0   0   0   0   0   0
##    SH   0   0   0   0   0   1   0   5   0
##    RI   0   3   2   4   2  33   7  29  93
## [1] Number of observations: 1424
## [1] Summary of naive statistics
## [1] Overall accuracy, stdev, CV%: 0.5288 , 0.0132 , 2.5
## [1] 95 % confidence limits for accuracy: 0.5025 ... 0.5551
## [1] User’s accuracy
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4500 0.5862 0.3947 0.6667    NaN 0.5273    NaN 0.8333 0.5376
## [1] Producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4286 0.3238 0.2459 0.0792 0.0000 0.9349 0.0000 0.0476 0.3483
## [1] Summary of kappa statistics
## [1] Overall kappa, stdev, & CV%: 0.246 , 0.0164 , 6.7
## [1] 95 % confidence limits for kappa: 0.2135 ... 0.2785
## [1] Per-class kappa, stdev, & CV%, for user’s accuracy:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4418 0.5533 0.3676 0.6412    NaN 0.1522    NaN 0.8201 0.4309
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1120 0.0686 0.0815 0.1461    NaN 0.0128    NaN 0.1641 0.0439
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.4 12.4 22.2 22.8  NaN  8.4  NaN 20.0 10.2
## [1] Per-class kappa, stdev, & CV%, for producer’s reliability:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.4204 0.2951 0.2252 0.0714 0.0000 0.6981 0.0000 0.0436 0.2582
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.1086 0.0452 0.0548 0.0254 0.0000 0.0419 0.0000 0.0194 0.0291
##   FL   LO   DA   FS   SF   BS   SS   SH   RI
## 25.8 15.3 24.3 35.5  NaN  6.0  NaN 44.5 11.3
## [1] Number of observations: 1424
## [1] Prior class probabilities:
## [1] 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111 0.1111111
## [8] 0.1111111 0.1111111
## [1] Observed class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0140 0.0407 0.0267 0.0084 0.0000 0.7844 0.0000 0.0042 0.1215
## [1] Reference class proportions:
##     FL     LO     DA     FS     SF     BS     SS     SH     RI
## 0.0147 0.0737 0.0428 0.0709 0.0506 0.4424 0.0435 0.0737 0.1875
```

```
## [1] Tau, stdev, & CV%: 0.4699 , 0.0119 , 2.5
## [1] 95% confidence limits for tau:0.4463...0.4935
## [1] "mean quality =  0.180377190390757"
## [1] "The quality of the modeled TP is  0.180377190390757"
```

```
## Warning in chisq.test(CM): Chi-squared approximation may be incorrect
```

```
## [1] "#########  Cramer's V =  NaN"
## [1] "##############################################################################
############################"
```