MixAll (PMS (log) + additional variables)

PMS

20 May, 2023

Assumptions of the Alogrithm

The clusterDiagGaussian() model assumes that the data is generated from a mixture of Gaussian distributions. It assumes independence and diagonal covariance thus meaning no correlation between variables. Each component follows a Gaussian distribution with estimated mean and standard deviation parameters. The model represents a mixture of K components, allowing for equal or different standard deviations within each component.

How it works

The MixAll model is basically a mixture model. Mixture models assume data is generated from a combination of probability distributions. Parameter estimation is achieved by maximizing the observed log-likelihood or integrated log-likelihood for data with missing values. Estimation algorithms like EM, SEM, and CEM are used and the default is EM which is highlighted below, involving steps such as imputation, conditional probability calculation, and parameter updates. The EM algorithm iteratively performs these steps until convergence.

1. **I step:** Impute the missing values x_i^m using the current MAP value provided by the current parameter θ^{m-1}.
2. **E step:** Compute the current conditional probabilities t_{ik}^m for $i = 1, \ldots, n$ and $k = 1, \ldots, K$ using the current parameter θ^{m-1}.
3. **M step:** Update the maximum likelihood estimate θ^m of θ using the conditional probabilities t_{ik}^m as conditional mixing weights, aiming to maximize the log-likelihood function, where $t^m = (t_{ik}^m, i = 1, \ldots, n, k = 1, \ldots, K)$.
4. **Parameter update:** The updated expression of mixture proportions p_k^m for $k = 1, \ldots, K$ are computed. Detailed formulas for updating the parameters λ_k and α depend on the component parameterization.

Note that there are one of two strategies that can be used as a function call: clusterFastStrategy() and clusterSemiSEMStrategy(). When using the clusterFastStrategy(), result is not guaranteed if the model is quite difficult to estimate (overlapping class for examples). If there are lots of missing values its suggested that the fff is used as it uses a MonteCarlo estimator to estimate unbiased estimators. In our case the fast strategy was used as the other would take way too long and we dont have the computing power especially for all 10 measures and trying numerous different number of clusters. . .
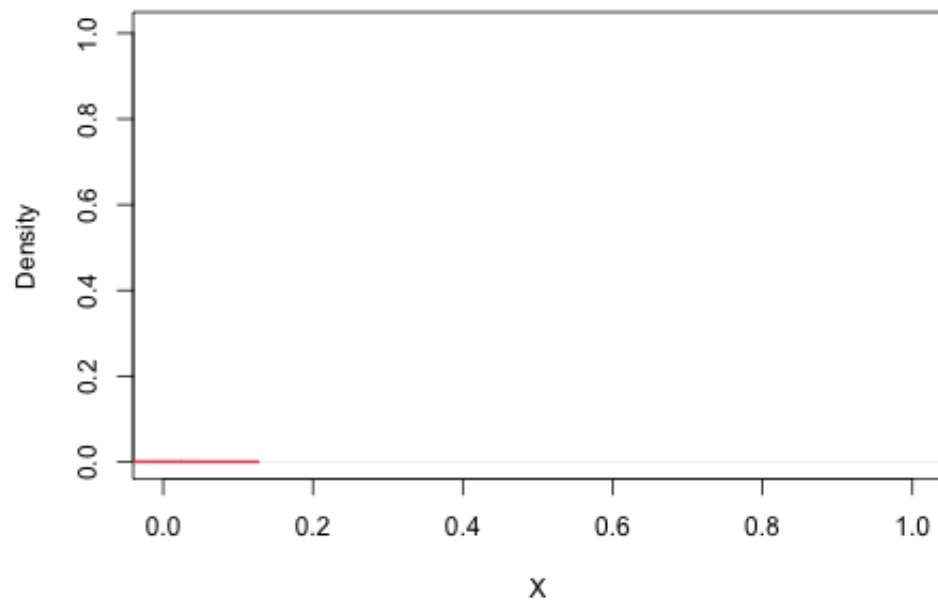
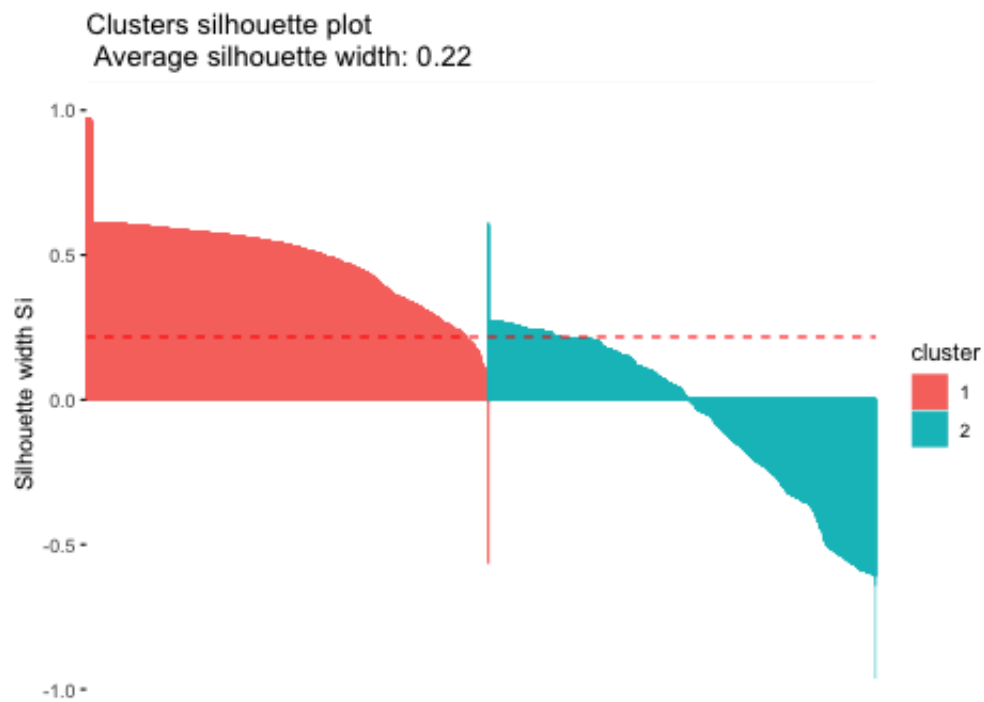More information can be found here

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Amenities

Employment
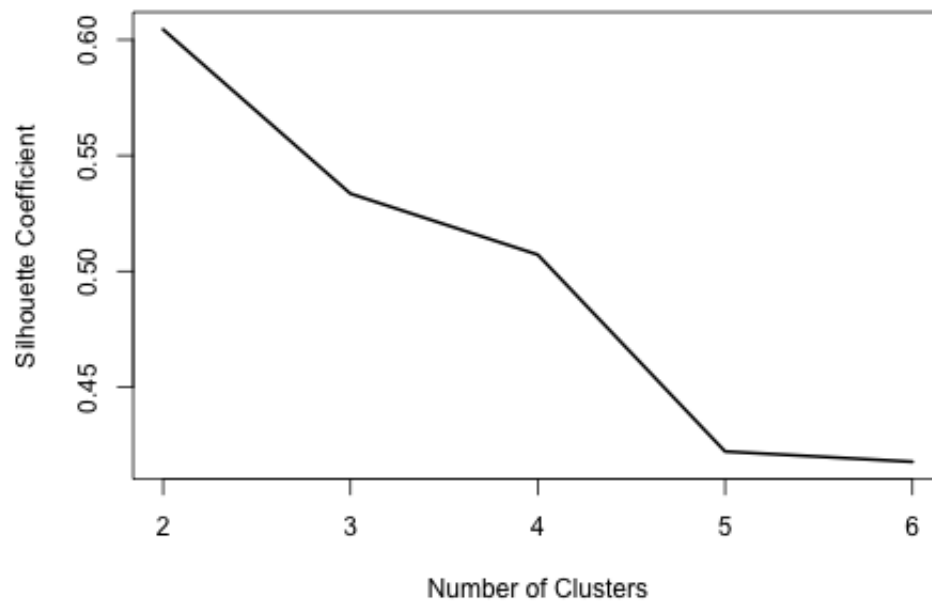

```
## [1] "Maximum silhouete coefficient: 0.604469251678442 For 2 clusters."
```

```
## [1] "Segment cutoff values:"
## [1] NA
##   cluster size ave.sil.width
## 1       1 6440          0.48
## 2       2 6213         -0.06
```


Clusters silhouette plot
Average silhouette width: 0.22

```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##      7497      7193
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##      71.2      73.9
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   238011.8  230455.2
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##        3287      3151
## B      3088      3027
## D       858       760
## K       264       255
##
##
##
##  Index of Remoteness:
##  Cluster 1 Cluster 2
##      0.228     0.229
##
##
##
##  Provinces:
##                       Cluster 1 Cluster 2
## Alberta                    232       226
## BritishColumbia            372       351
## NewBrunswick                62        60
## NorthwestTerritories         4         3
## NovaScotia                 239       211
## Ontario                   1146      1094
## Quebec                     436       422
## Saskatchewan                43        28
## NA's                      4963      4798
##
##
##
##  Amenity dense:
##    Cluster 1 Cluster 2
## 0      6778      6516
## 1       553       531
## 2        80        67
## F        86        79
```

```
## 
## 
## 
##  PMS_prox_idx_emp :
##  Cluster 1 Cluster 2
##   -4.82647  -4.81975
## 
## 
## 
##  PMS_prox_idx_pharma :
##  Cluster 1 Cluster 2
##    -3.5442  -3.56135
## 
## 
## 
##  PMS_prox_idx_childcare :
##  Cluster 1 Cluster 2
##    -3.1067  -3.10146
## 
## 
## 
##  PMS_prox_idx_health :
##  Cluster 1 Cluster 2
##   -5.05424  -5.06827
## 
## 
## 
##  PMS_prox_idx_grocery :
##  Cluster 1 Cluster 2
##   -3.05616  -3.03782
## 
## 
## 
##  PMS_prox_idx_educpri :
##  Cluster 1 Cluster 2
##   -2.39754  -2.41575
## 
## 
## 
##  PMS_prox_idx_educsec :
##  Cluster 1 Cluster 2
##   -2.50118  -2.51429
## 
## 
## 
##  PMS_prox_idx_lib :
##  Cluster 1 Cluster 2
##   -2.35151  -2.36833
## 
## 
## 
##  PMS_prox_idx_parks :
##  Cluster 1 Cluster 2
##   -3.03349  -3.05406
```
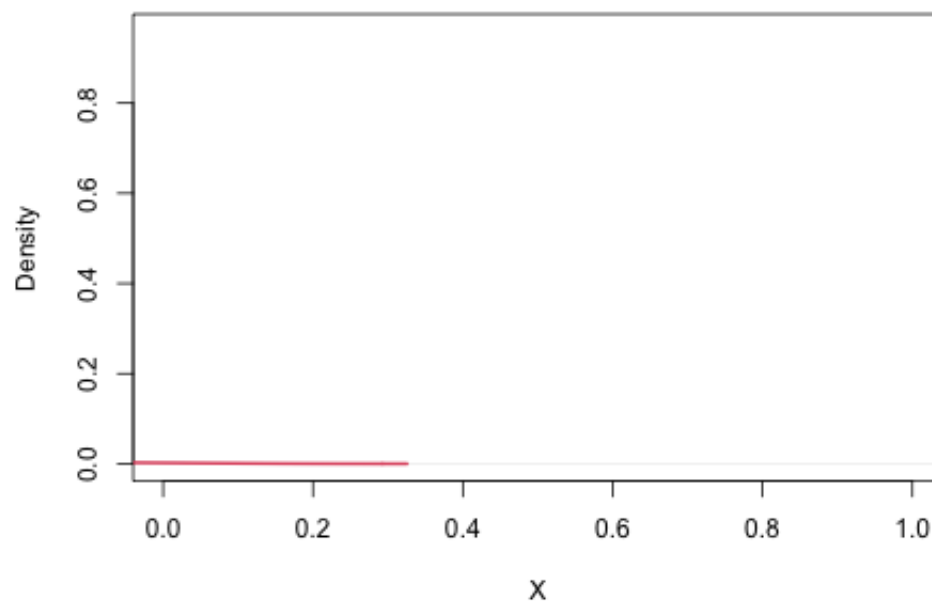
```
## 
## 
## 
## PMS_prox_idx_transit :
## Cluster 1 Cluster 2
##   -4.59395  -4.55615
```
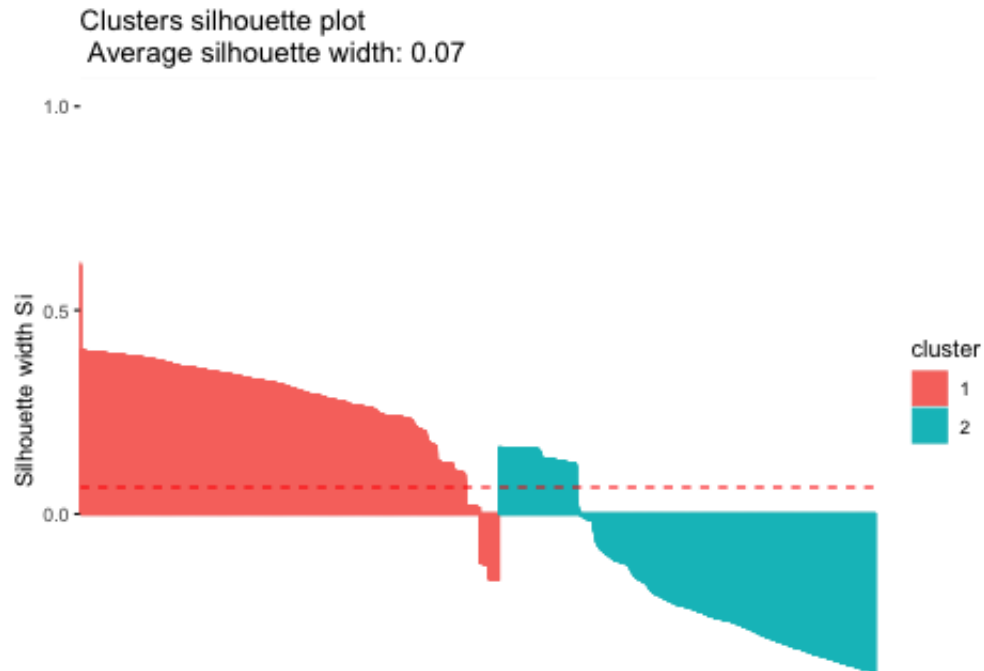
Pharmacy
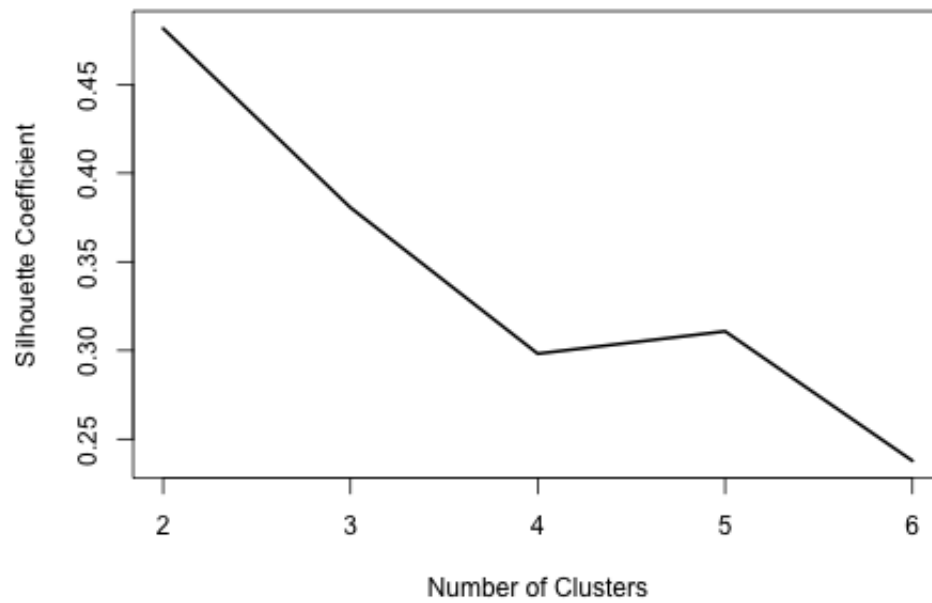

```
## [1] "Maximum silhouete coefficient: 0.481613505260609 For 2 clusters."
```



```
## [1] "Segment cutoff values:"
```

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 2752         0.27
## 2       2 2479        -0.16
```

Clusters silhouette plot
Average silhouette width: 0.07


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       7737      6953
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       72.5      72.6
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   231344.5  237611.6
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3385      3053
## B       3240      2875
## D        841       777
```
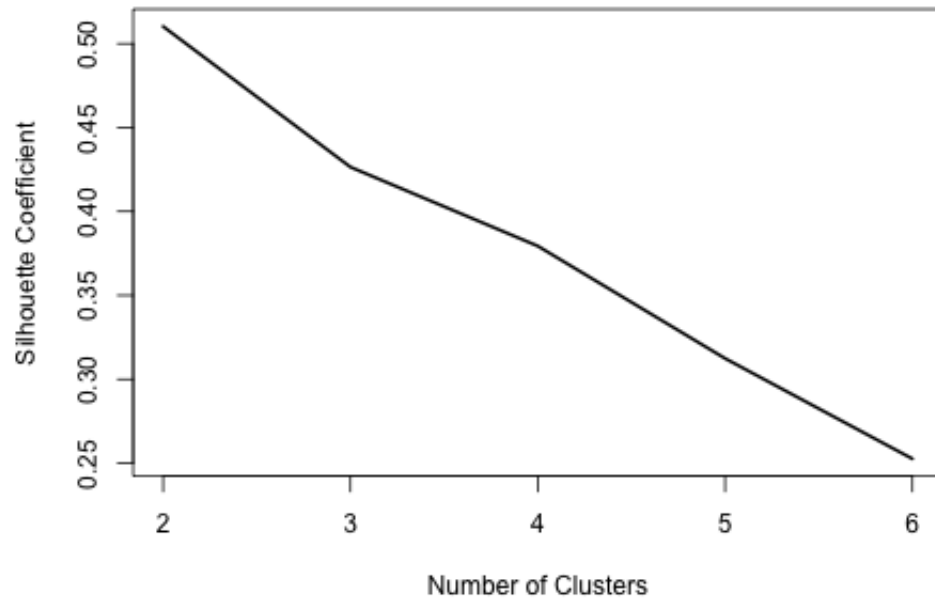
```
## K           271         248
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##        0.23      0.227
##
##
##
##   Provinces:
##                          Cluster 1 Cluster 2
## Alberta                        247       211
## BritishColumbia                395       328
## NewBrunswick                    64        58
## NorthwestTerritories             5         2
## NovaScotia                     230       220
## Ontario                       1139      1101
## Quebec                         457       401
## Saskatchewan                    34        37
## NA's                          5166      4595
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0       6993      6301
## 1        586       498
## 2         75        72
## F         83        82
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##    -4.82928  -4.81635
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##    -3.53553  -3.57154
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##    -3.10941  -3.09819
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##    -5.06934  -5.05199
```
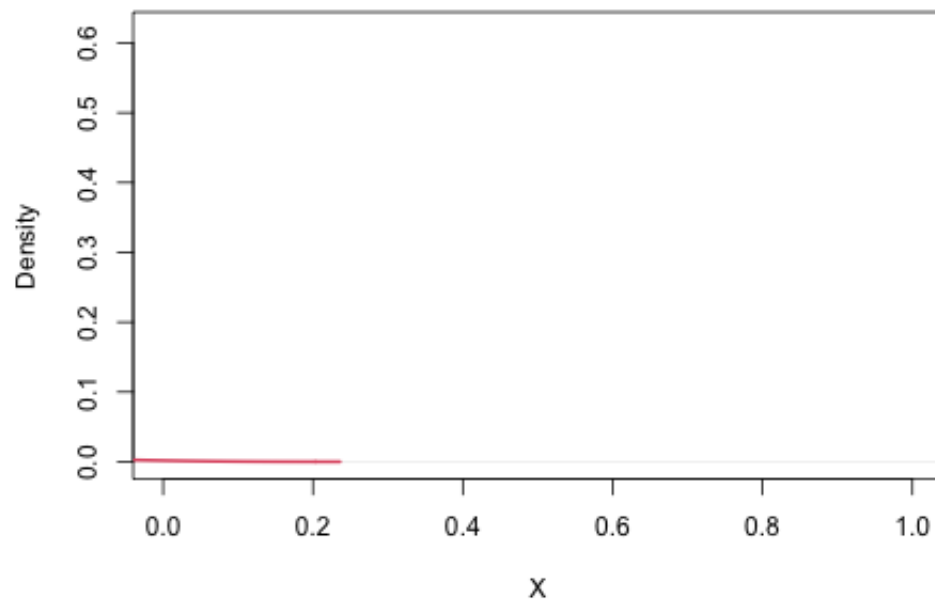
```
## 
## 
## 
##  PMS_prox_idx_grocery :
##  Cluster 1 Cluster 2
##   -3.03806  -3.05691
## 
## 
## 
##  PMS_prox_idx_educpri :
##  Cluster 1 Cluster 2
##    -2.3925  -2.42219
## 
## 
## 
##  PMS_prox_idx_educsec :
##  Cluster 1 Cluster 2
##   -2.50421  -2.51131
## 
## 
## 
##  PMS_prox_idx_lib :
##  Cluster 1 Cluster 2
##   -2.37526  -2.34226
## 
## 
## 
##  PMS_prox_idx_parks :
##  Cluster 1 Cluster 2
##   -3.05836  -3.02718
## 
## 
## 
##  PMS_prox_idx_transit :
##  Cluster 1 Cluster 2
##   -4.57967  -4.57104
```
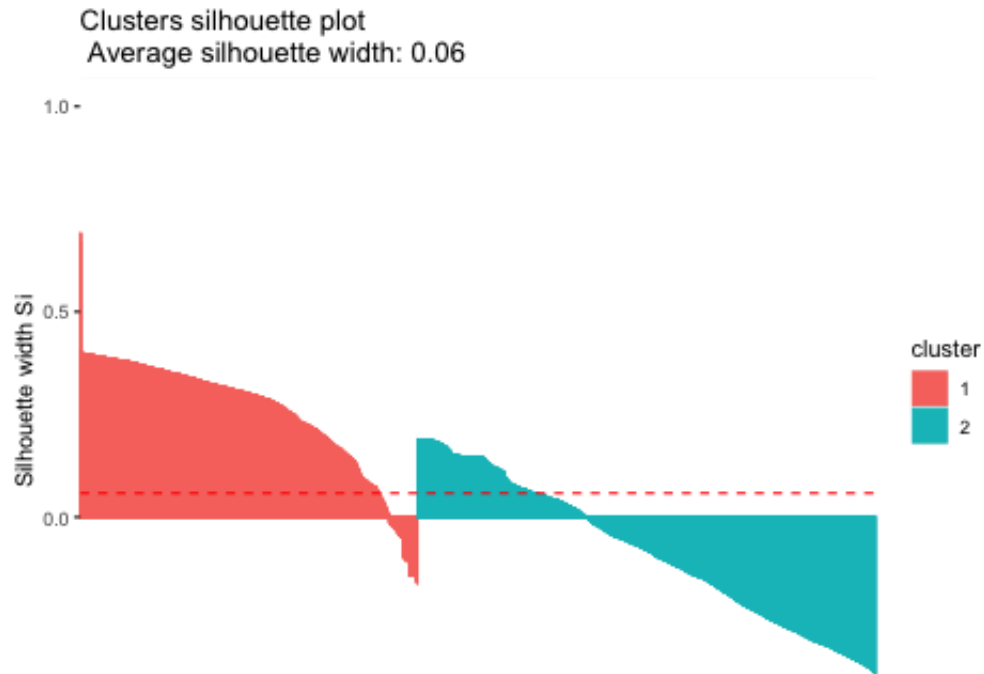
Childcare


```
## [1] "Maximum silhouete coefficient: 0.51025270145027 For 2 clusters."
```



```
## [1] "Segment cutoff values:"
```

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 3065          0.25
## 2       2 4166         -0.08
```

Clusters silhouette plot
Average silhouette width: 0.06


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       6229      8461
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       75.5      70.3
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   237257.5  232140.9
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         2677      3761
## B       2652      3463
## D        687       931
```

```
## K           213          306
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##       0.224      0.231
##
##
##
##   Provinces:
##                        Cluster 1 Cluster 2
## Alberta                     203        255
## BritishColumbia             327        396
## NewBrunswick                 52         70
## NorthwestTerritories          3          4
## NovaScotia                  198        252
## Ontario                     995       1245
## Quebec                      369        489
## Saskatchewan                 30         41
## NA's                       4052       5709
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0      5626       7668
## 1       459        625
## 2        62         85
## F        82         83
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##    -4.82007   -4.8255
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##    -3.54223  -3.56059
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##    -3.12129  -3.09123
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##    -5.04898  -5.07011
```
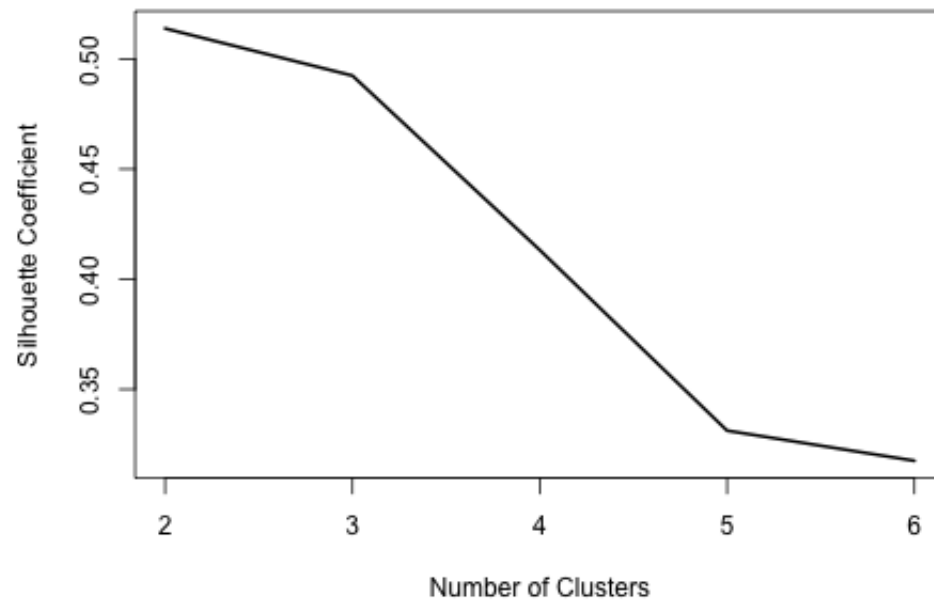
```
## 
## 
## 
## PMS_prox_idx_grocery :
## Cluster 1 Cluster 2
##   -3.03497  -3.05598
## 
## 
## 
## PMS_prox_idx_educpri :
## Cluster 1 Cluster 2
##   -2.41389  -2.40106
## 
## 
## 
## PMS_prox_idx_educsec :
## Cluster 1 Cluster 2
##   -2.51505   -2.5021
## 
## 
## 
## PMS_prox_idx_lib :
## Cluster 1 Cluster 2
##   -2.34956  -2.36727
## 
## 
## 
## PMS_prox_idx_parks :
## Cluster 1 Cluster 2
##   -3.06516  -3.02769
## 
## 
## 
## PMS_prox_idx_transit :
## Cluster 1 Cluster 2
##   -4.56868  -4.58085
```
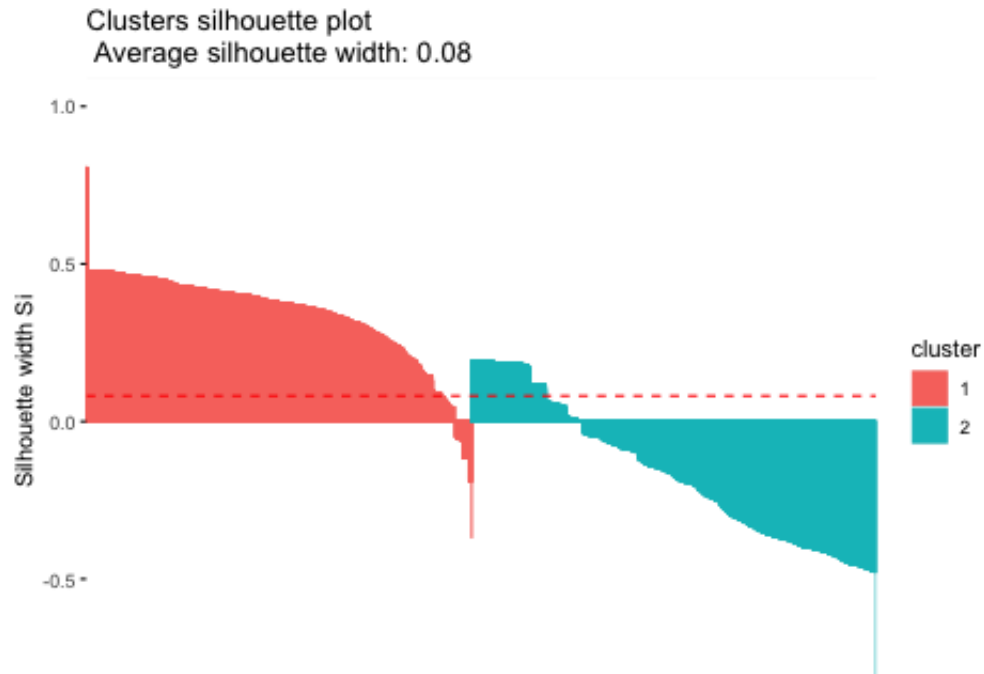

Health

[1] "Maximum silhouete coefficient: 0.5138566981864 For 2 clusters."
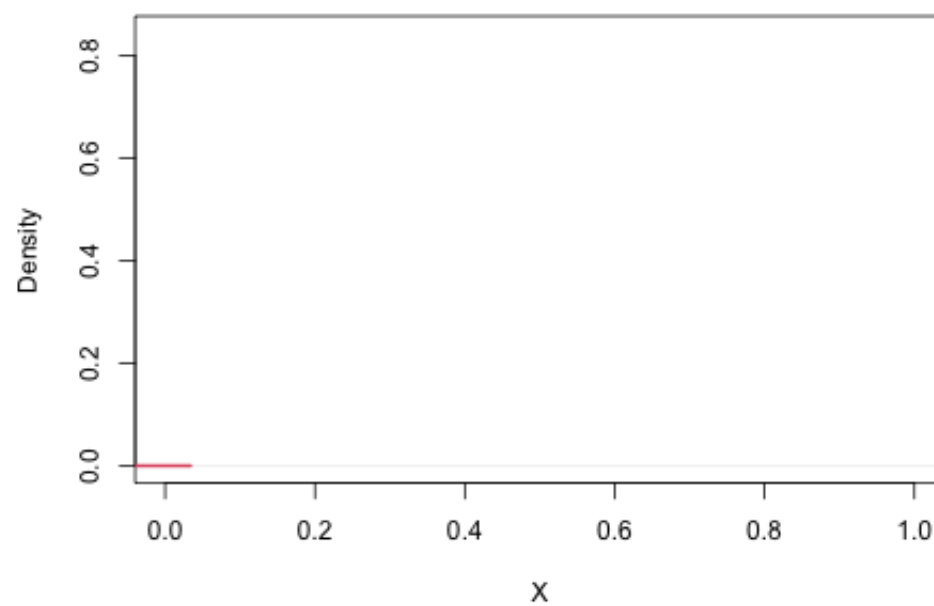
[1] "Segment cutoff values:"

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 4349         0.34
## 2       2 4564        -0.16
```

Clusters silhouette plot
Average silhouette width: 0.08


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       7159      7531
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       72.6      72.5
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   237234.1  231530.2
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3157      3281
## B       2992      3123
## D        769       849
```
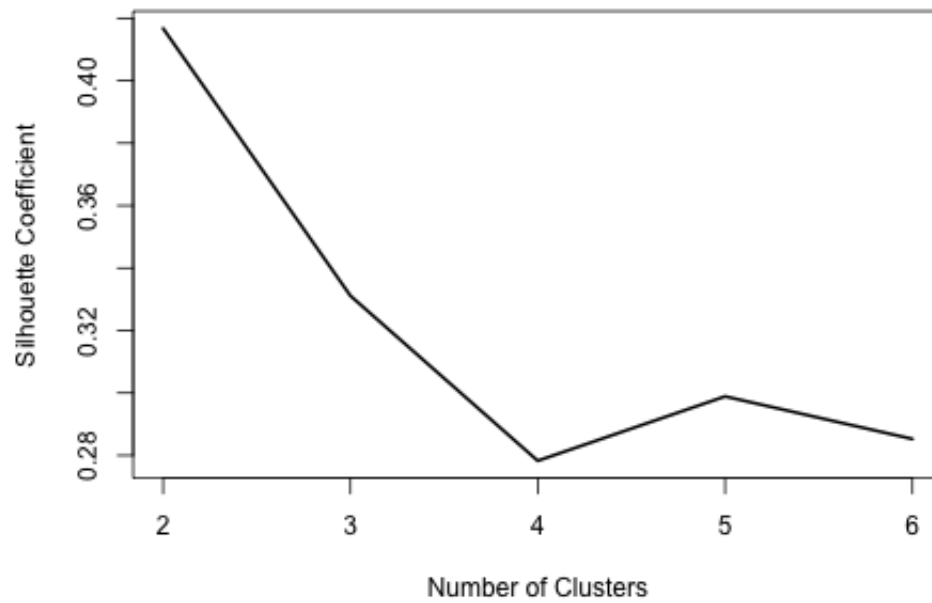
```
## K          241          278
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##       0.227     0.229
##
##
##
##   Provinces:
##                         Cluster 1 Cluster 2
## Alberta                       228       230
## BritishColumbia               346       377
## NewBrunswick                   63        59
## NorthwestTerritories           4         3
## NovaScotia                    232       218
## Ontario                      1120      1120
## Quebec                        419       439
## Saskatchewan                   29        42
## NA's                         4718      5043
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0      6479      6815
## 1       526       558
## 2        68        79
## F        86        79
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##   -4.81976  -4.82644
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##   -3.57715   -3.5296
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##   -3.10546  -3.10281
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##   -5.08229  -5.04092
```
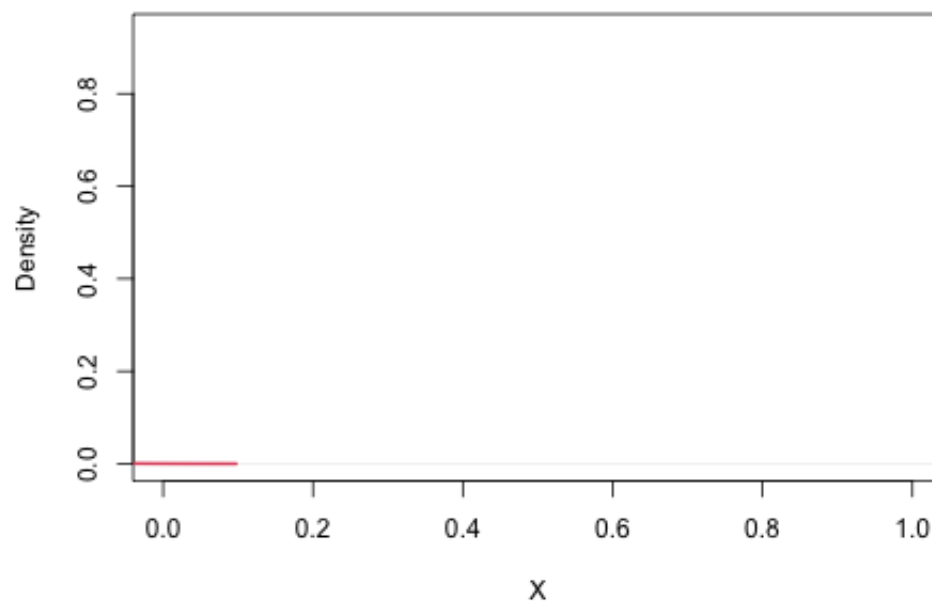
```
##
##
##
## PMS_prox_idx_grocery :
## Cluster 1 Cluster 2
##   -3.04499  -3.04913
##
##
##
## PMS_prox_idx_educpri :
## Cluster 1 Cluster 2
##   -2.40693  -2.40617
##
##
##
## PMS_prox_idx_educsec :
## Cluster 1 Cluster 2
##   -2.49655  -2.51787
##
##
##
## PMS_prox_idx_lib :
## Cluster 1 Cluster 2
##    -2.3566  -2.36278
##
##
##
## PMS_prox_idx_parks :
## Cluster 1 Cluster 2
##   -3.04351  -3.04369
##
##
##
## PMS_prox_idx_transit :
## Cluster 1 Cluster 2
##   -4.58123  -4.57023
```
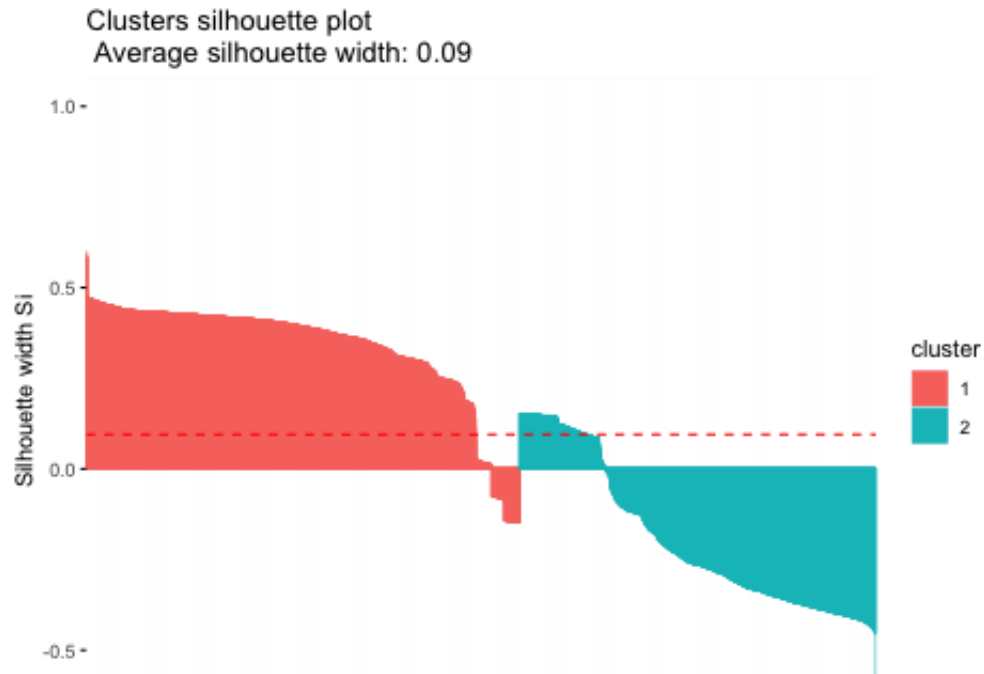

Grocery


```
## [1] "Maximum silhouete coefficient: 0.416726256014498 For 2 clusters."
```



```
## [1] "Segment cutoff values:"
```

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 2301          0.33
## 2       2 1894         -0.19
```

Clusters silhouette plot
Average silhouette width: 0.09


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       8058      6632
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       72.5      72.6
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   231359.2  237897.1
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3542      2896
## B       3353      2762
## D        897       721
```

```
## K         266        253
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##       0.227     0.229
##
##
##
##   Provinces:
##                       Cluster 1 Cluster 2
## Alberta                     253       205
## BritishColumbia             381       342
## NewBrunswick                 72        50
## NorthwestTerritories          4         3
## NovaScotia                  249       201
## Ontario                    1252       988
## Quebec                      462       396
## Saskatchewan                 37        34
## NA's                       5348      4413
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0      7299      5995
## 1       585       499
## 2        77        70
## F        97        68
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##   -4.84207  -4.80014
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##   -3.55591  -3.54913
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##   -3.11013  -3.09688
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##    -5.0761  -5.04311
```
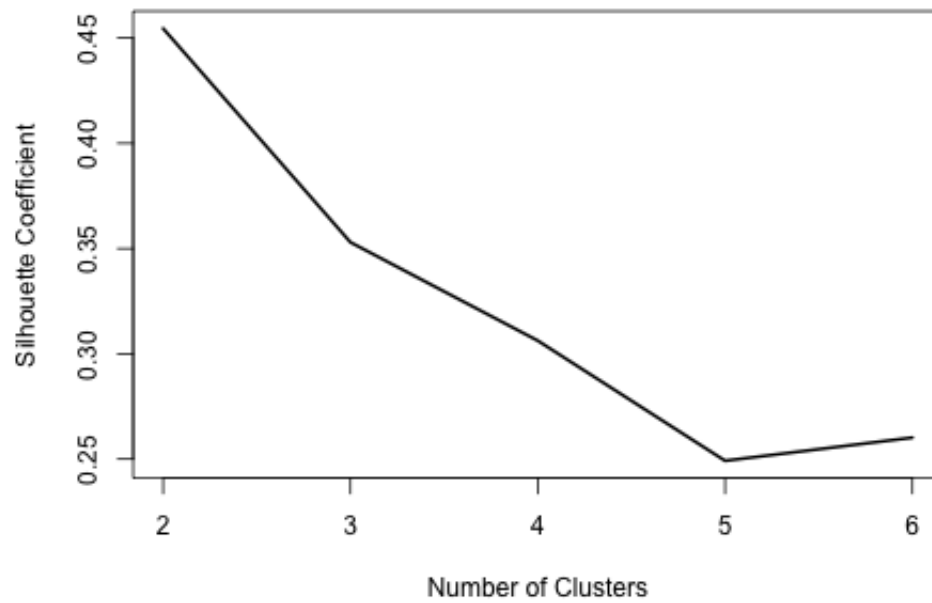
```
##
##
##
##  PMS_prox_idx_grocery :
##  Cluster 1 Cluster 2
##   -3.04368  -3.05117
##
##
##
##  PMS_prox_idx_educpri :
##  Cluster 1 Cluster 2
##   -2.40356  -2.41018
##
##
##
##  PMS_prox_idx_educsec :
##  Cluster 1 Cluster 2
##   -2.50884  -2.50587
##
##
##
##  PMS_prox_idx_lib :
##  Cluster 1 Cluster 2
##   -2.35602  -2.36423
##
##
##
##  PMS_prox_idx_parks :
##  Cluster 1 Cluster 2
##   -3.04919   -3.0369
##
##
##
##  PMS_prox_idx_transit :
##  Cluster 1 Cluster 2
##   -4.57647  -4.57459
```
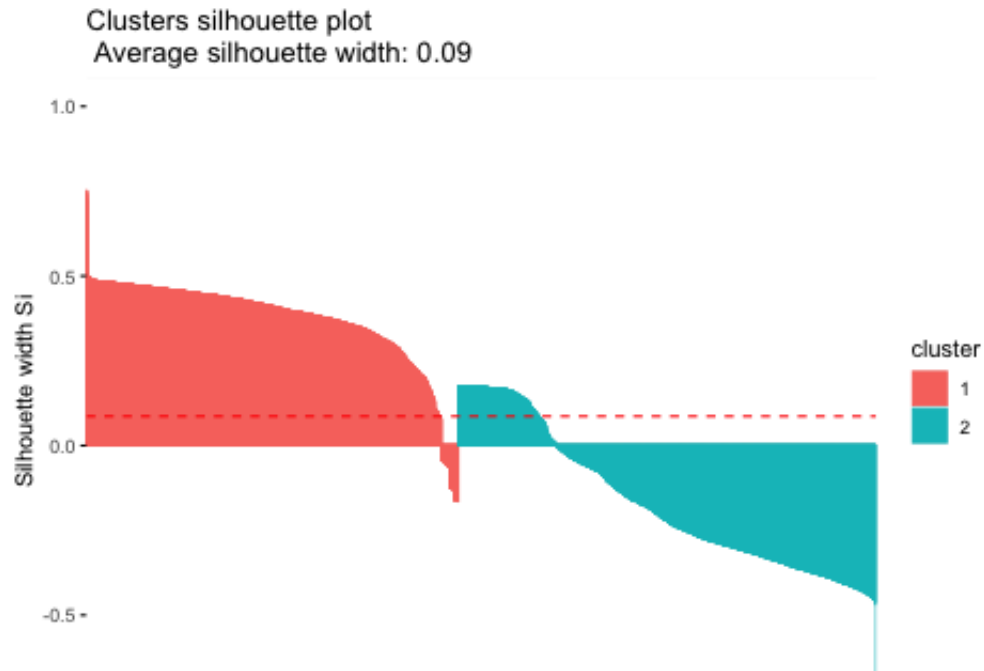
Primary Education

[1] "Maximum silhouete coefficient: 0.454558774575833 For 2 clusters."
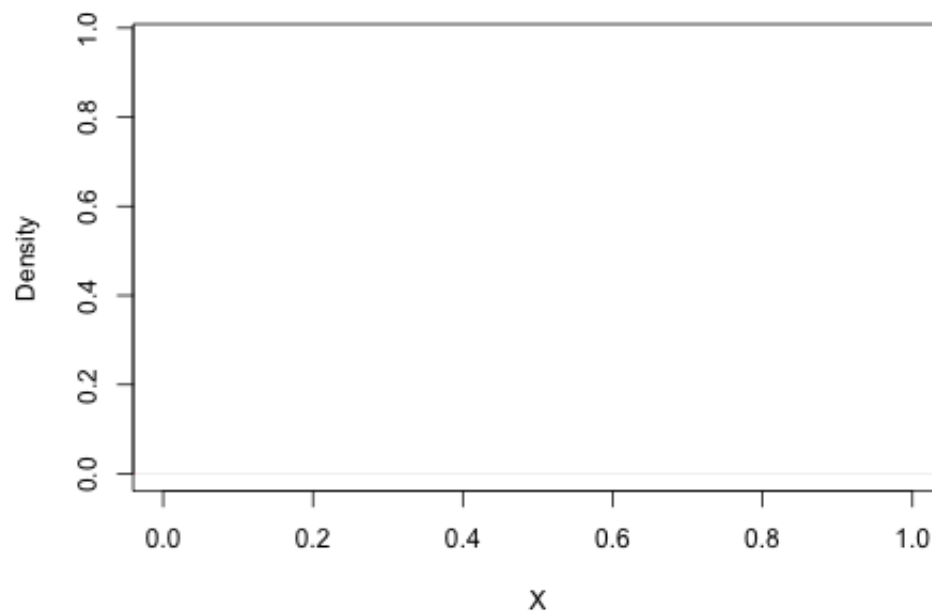
[1] "Segment cutoff values:"

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 3150          0.37
## 2       2 3541         -0.17
```

Clusters silhouette plot
Average silhouette width: 0.09


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       6930      7760
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       71.6      73.4
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##     230412  237790.4
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3049      3389
## B      2861      3254
## D       765       853
```

```
## K        255        264
##
##
##
##  Index of Remoteness:
##  Cluster 1 Cluster 2
##     0.229     0.228
##
##
##
##  Provinces:
##                      Cluster 1 Cluster 2
## Alberta                   219       239
## BritishColumbia           357       366
## NewBrunswick               61        61
## NorthwestTerritories        3         4
## NovaScotia                211       239
## Ontario                  1019      1221
## Quebec                    402       456
## Saskatchewan               38        33
## NA's                     4620      5141
##
##
##
##  Amenity dense:
##   Cluster 1 Cluster 2
## 0      6265      7029
## 1       514       570
## 2        76        71
## F        75        90
##
##
##
##  PMS_prox_idx_emp :
##  Cluster 1 Cluster 2
##   -4.82049  -4.82558
##
##
##
##  PMS_prox_idx_pharma :
##  Cluster 1 Cluster 2
##   -3.56695  -3.53997
##
##
##
##  PMS_prox_idx_childcare :
##  Cluster 1 Cluster 2
##   -3.09847  -3.10925
##
##
##
##  PMS_prox_idx_health :
##  Cluster 1 Cluster 2
##   -5.06449  -5.05813
```

```
## 
## 
## 
## PMS_prox_idx_grocery : 
## Cluster 1 Cluster 2 
##  -3.03399  -3.05898 
## 
## 
## 
## PMS_prox_idx_educpri : 
## Cluster 1 Cluster 2 
##  -2.39807  -2.41425 
## 
## 
## 
## PMS_prox_idx_educsec : 
## Cluster 1 Cluster 2 
##  -2.48481  -2.52903 
## 
## 
## 
## PMS_prox_idx_lib : 
## Cluster 1 Cluster 2 
##  -2.35952  -2.36003 
## 
## 
## 
## PMS_prox_idx_parks : 
## Cluster 1 Cluster 2 
##   -3.0519  -3.03607 
## 
## 
## 
## PMS_prox_idx_transit : 
## Cluster 1 Cluster 2 
##  -4.56468  -4.58513 
```
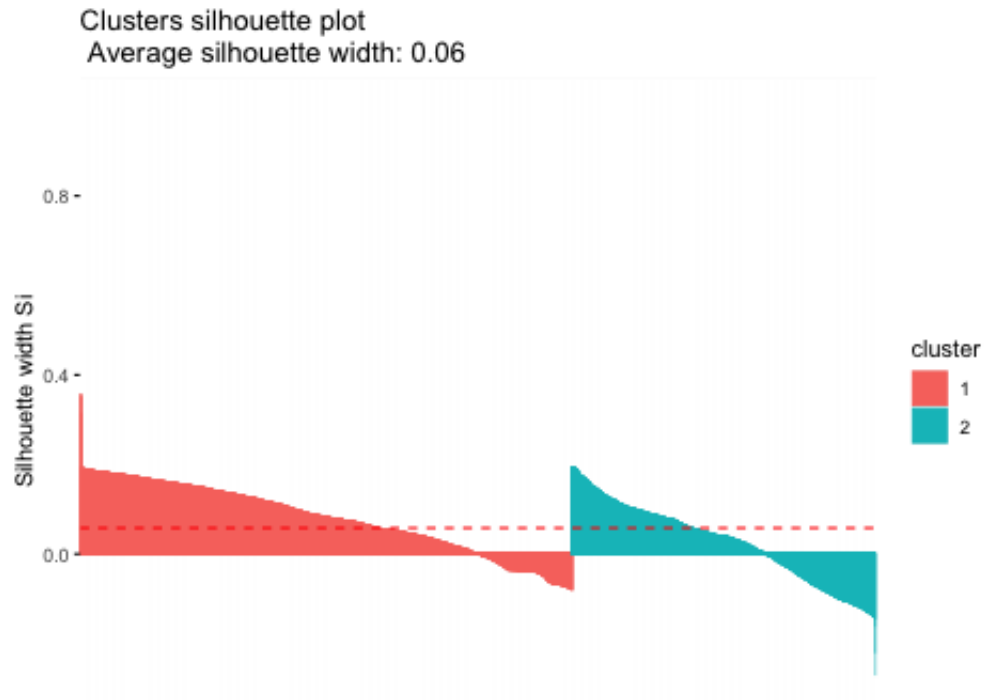

Secondary Education
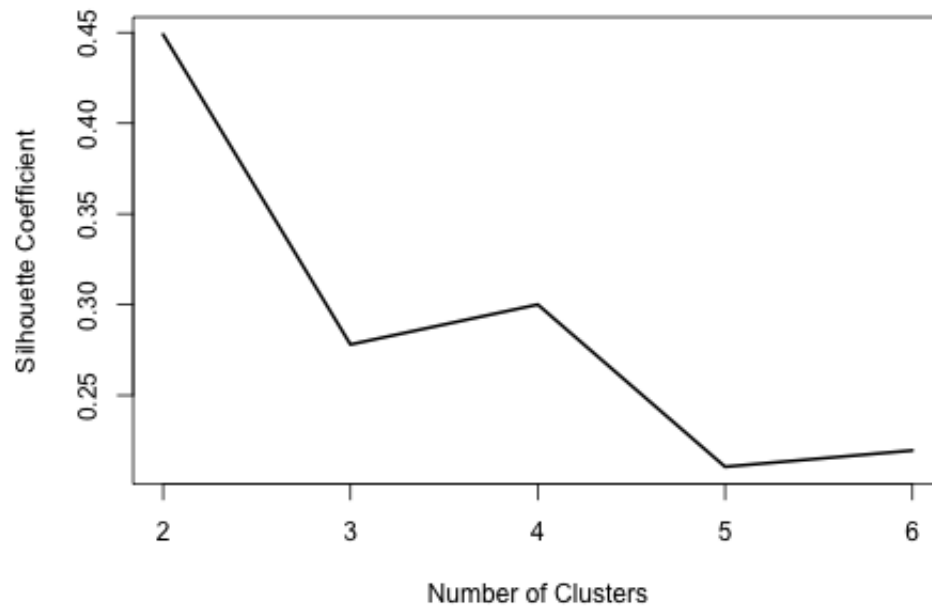
[1] "Maximum silhouete coefficient: 0.44897433850965 For 2 clusters."
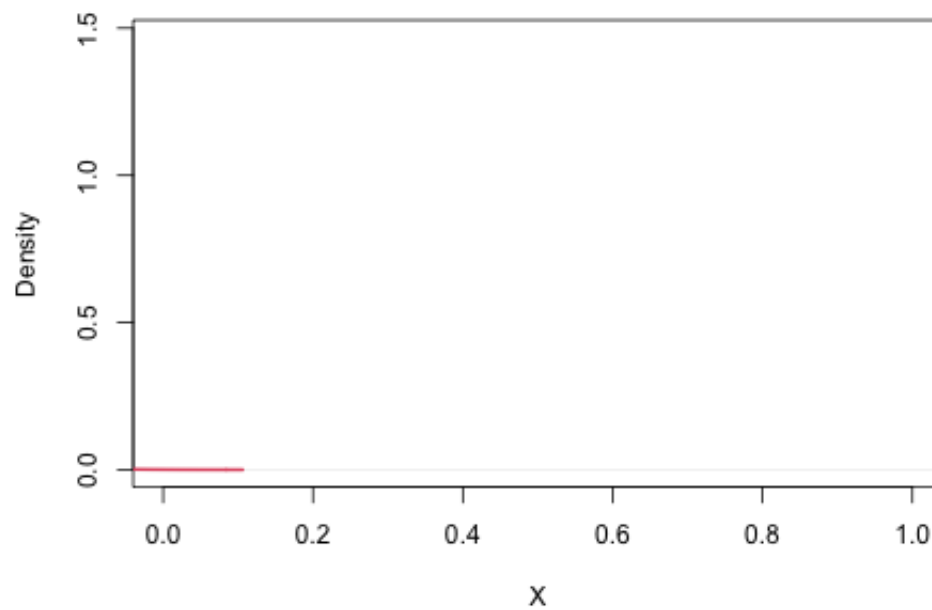
[1] "Segment cutoff values:"

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 2589          0.08
## 2       2 1600          0.03
```

Clusters silhouette plot
Average silhouette width: 0.06


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       9069      5621
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       71.7      73.8
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   236492.6  230790.7
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3910      2528
## B       3796      2319
## D       1016       602
```

```
## K        347        172
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##       0.229      0.228
##
##
##
##   Provinces:
##                        Cluster 1 Cluster 2
## Alberta                     292        166
## BritishColumbia             460        263
## NewBrunswick                 74         48
## NorthwestTerritories          4          3
## NovaScotia                  260        190
## Ontario                    1363        877
## Quebec                      544        314
## Saskatchewan                 47         24
## NA's                       6025       3736
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0       8171       5123
## 1        692        392
## 2         91         56
## F        115         50
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##    -4.79739  -4.86475
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##    -3.53305  -3.58602
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##    -3.10436   -3.1037
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##    -5.04274  -5.09131
```

```
## 
## 
## 
## PMS_prox_idx_grocery :
## Cluster 1 Cluster 2
##  -3.04267  -3.05471
## 
## 
## 
## PMS_prox_idx_educpri :
## Cluster 1 Cluster 2
##  -2.40971  -2.40135
## 
## 
## 
## PMS_prox_idx_educsec :
## Cluster 1 Cluster 2
##  -2.50489  -2.51192
## 
## 
## 
## PMS_prox_idx_lib :
## Cluster 1 Cluster 2
##  -2.37099  -2.34111
## 
## 
## 
## PMS_prox_idx_parks :
## Cluster 1 Cluster 2
##  -3.03603  -3.05629
## 
## 
## 
## PMS_prox_idx_transit :
## Cluster 1 Cluster 2
##  -4.56828  -4.58805
```

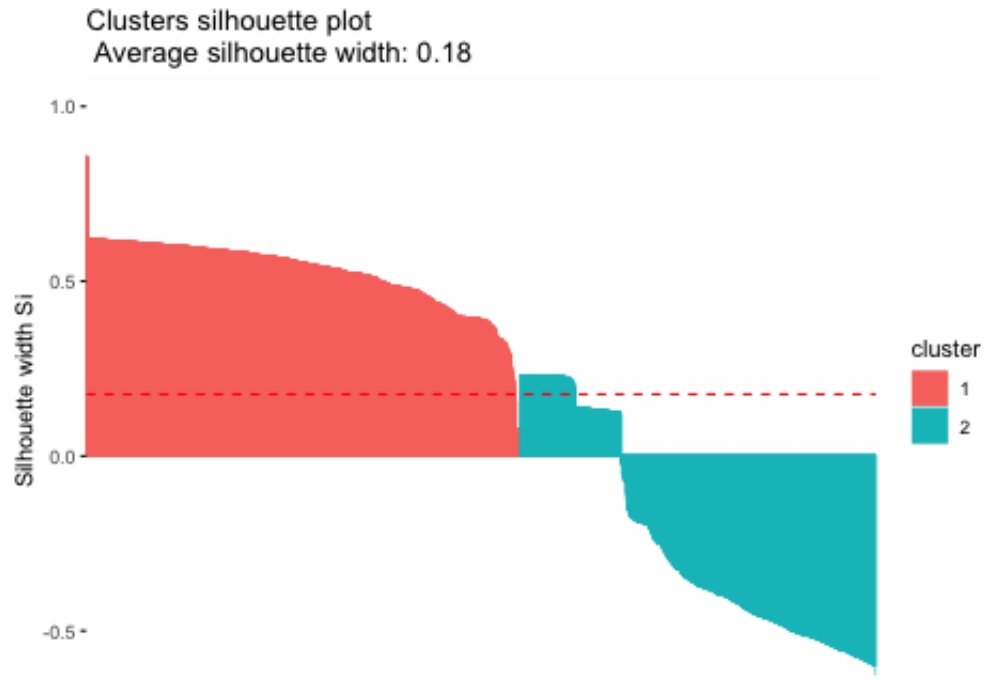
Libraries
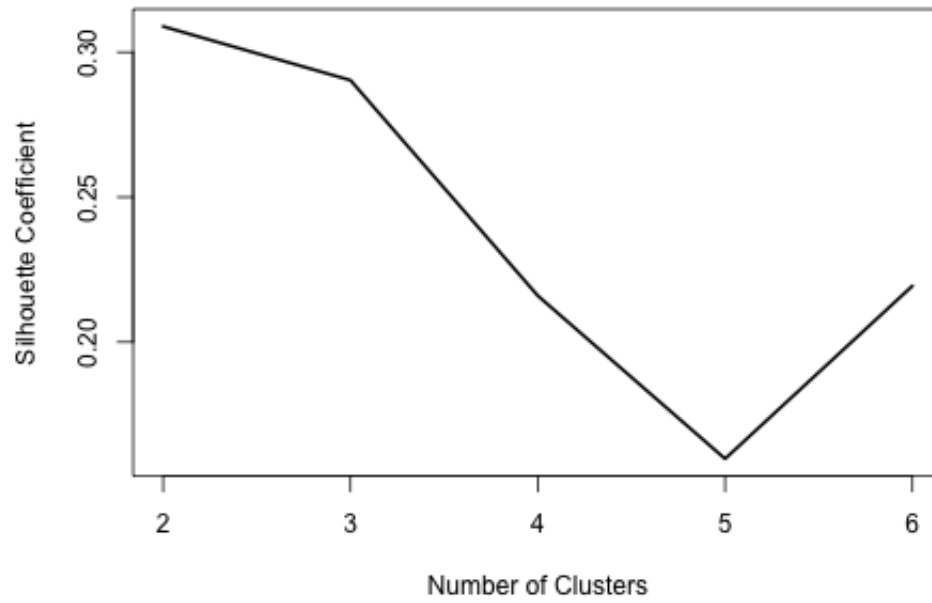
[1] "Maximum silhouete coefficient: 0.308886604883922 For 2 clusters."
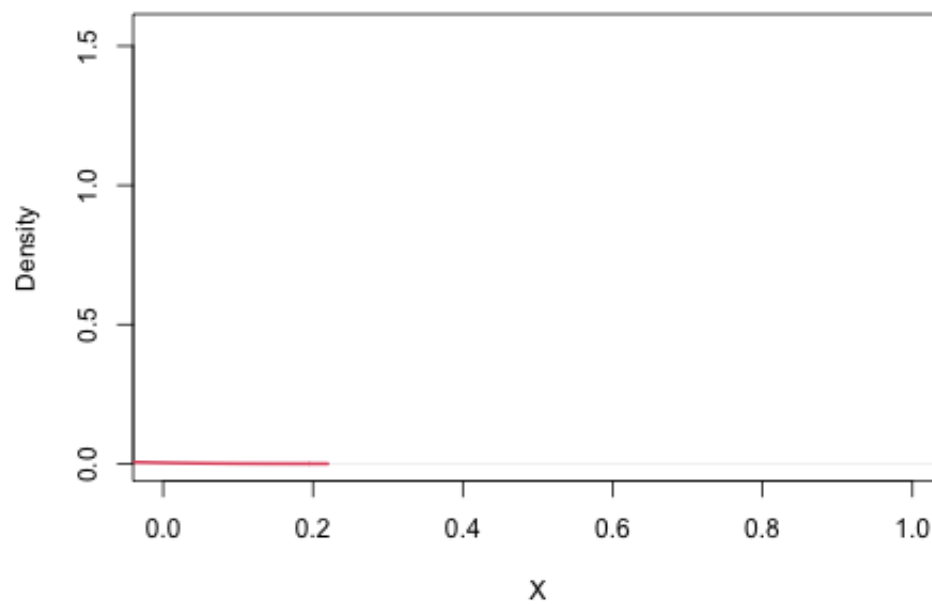
[1] "Segment cutoff values:"

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 1810          0.52
## 2       2 1480         -0.25
```

Clusters silhouette plot
Average silhouette width: 0.18


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       8067      6623
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       73.5      71.3
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##    236745.9  231343.5
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3479      2959
## B       3399      2716
## D        898       720
```

```
## K        291        228
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##       0.226     0.231
##
##
##
##   Provinces:
##                        Cluster 1 Cluster 2
## Alberta                      263       195
## BritishColumbia              396       327
## NewBrunswick                  67        55
## NorthwestTerritories          3         4
## NovaScotia                   239       211
## Ontario                     1263       977
## Quebec                       464       394
## Saskatchewan                  40        31
## NA's                        5332      4429
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0      7304      5990
## 1       592       492
## 2        78        69
## F        93        72
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##   -4.79948  -4.85205
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##   -3.55091  -3.55511
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##   -3.12245  -3.08112
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##   -5.05535  -5.06838
```
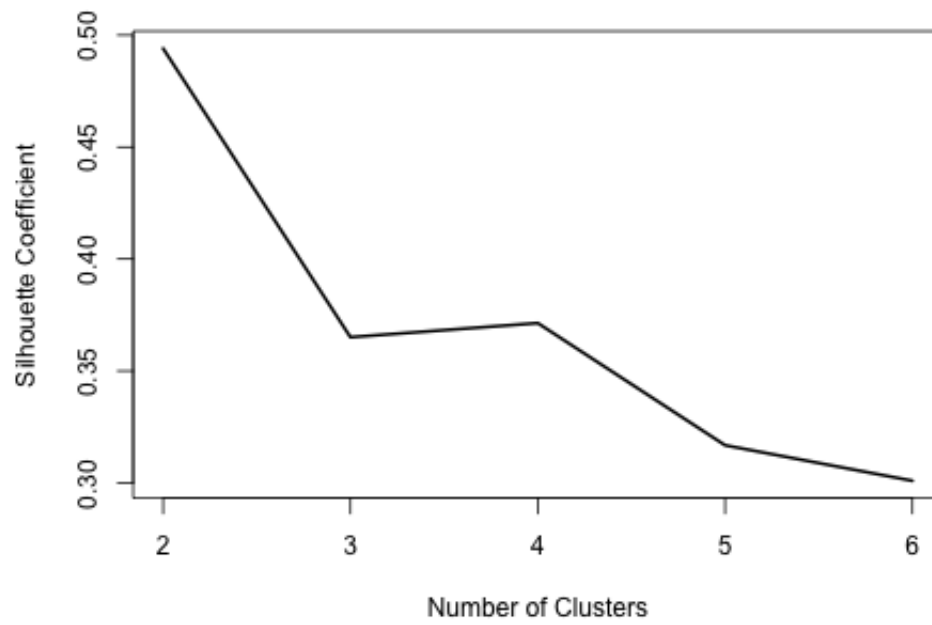
```
##
##
##
## PMS_prox_idx_grocery :
## Cluster 1 Cluster 2
##  -3.05146   -3.0416
##
##
##
## PMS_prox_idx_educpri :
## Cluster 1 Cluster 2
##  -2.40642  -2.40669
##
##
##
## PMS_prox_idx_educsec :
## Cluster 1 Cluster 2
##  -2.50172  -2.51452
##
##
##
## PMS_prox_idx_lib :
## Cluster 1 Cluster 2
##  -2.36041  -2.35904
##
##
##
## PMS_prox_idx_parks :
## Cluster 1 Cluster 2
##   -3.0371  -3.05171
##
##
##
## PMS_prox_idx_transit :
## Cluster 1 Cluster 2
##  -4.60834  -4.53379
```

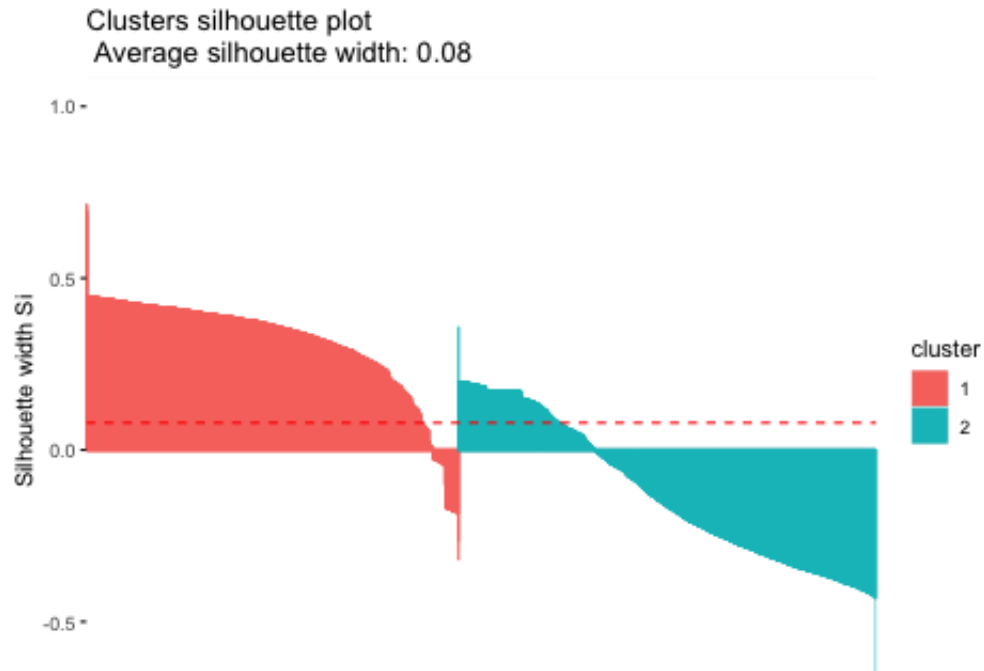---

Parks

[1] "Maximum silhouete coefficient: 0.494045285082614 For 2 clusters."
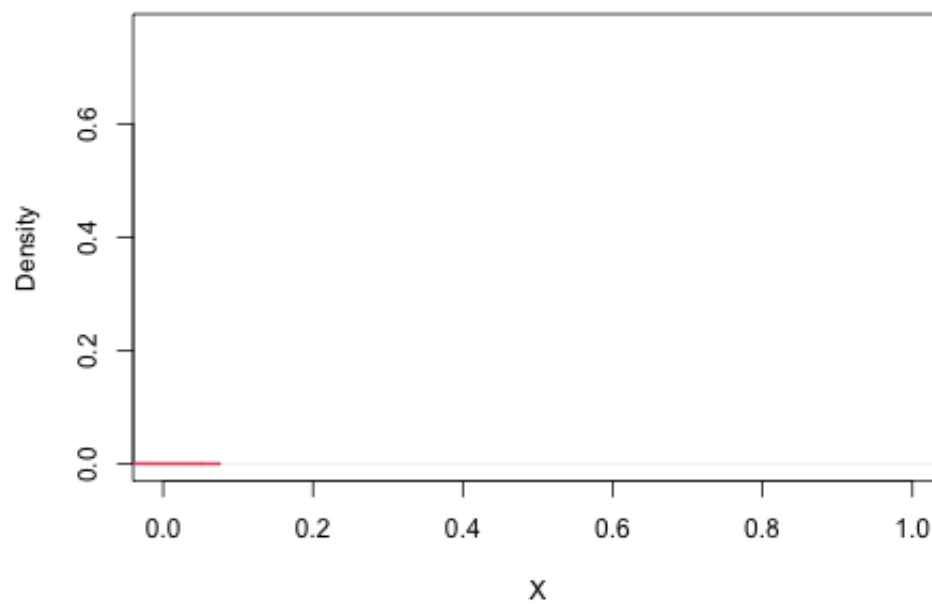
[1] "Segment cutoff values:"

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 3285          0.31
## 2       2 3684         -0.13
```

Clusters silhouette plot
Average silhouette width: 0.08


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       6902      7788
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       72.7      72.4
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   240363.7  228946.6
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3009      3429
## B       2885      3230
## D        751       867
```
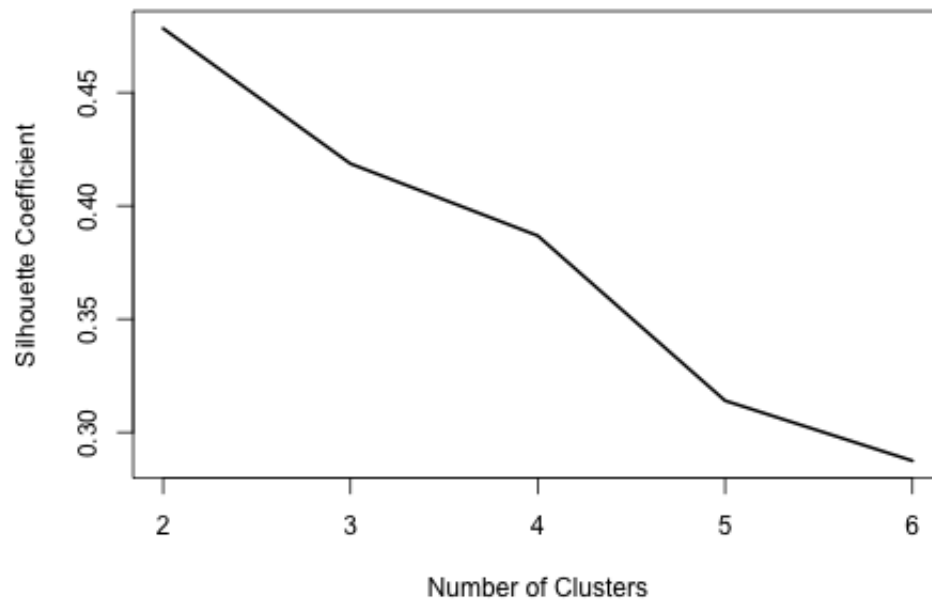
```
## K          257          262
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##       0.227      0.229
##
##
##
##   Provinces:
##                            Cluster 1 Cluster 2
## Alberta                          230       228
## BritishColumbia                  331       392
## NewBrunswick                      64        58
## NorthwestTerritories               5         2
## NovaScotia                       207       243
## Ontario                         1066      1174
## Quebec                           396       462
## Saskatchewan                      32        39
## NA's                            4571      5190
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0      6242      7052
## 1       509       575
## 2        72        75
## F        79        86
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##    -4.80215  -4.84177
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##    -3.56134  -3.54502
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##    -3.10227  -3.10577
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##    -5.05912  -5.06299
```

```
## 
## 
## 
##  PMS_prox_idx_grocery :
##  Cluster 1 Cluster 2
##   -3.04612  -3.04799
## 
## 
## 
##  PMS_prox_idx_educpri :
##  Cluster 1 Cluster 2
##   -2.40052   -2.4119
## 
## 
## 
##  PMS_prox_idx_educsec :
##  Cluster 1 Cluster 2
##   -2.49521  -2.51833
## 
## 
## 
##  PMS_prox_idx_lib :
##  Cluster 1 Cluster 2
##   -2.35735  -2.36195
## 
## 
## 
##  PMS_prox_idx_parks :
##  Cluster 1 Cluster 2
##   -3.02301  -3.06214
## 
## 
## 
##  PMS_prox_idx_transit :
##  Cluster 1 Cluster 2
##   -4.55191  -4.59671
```
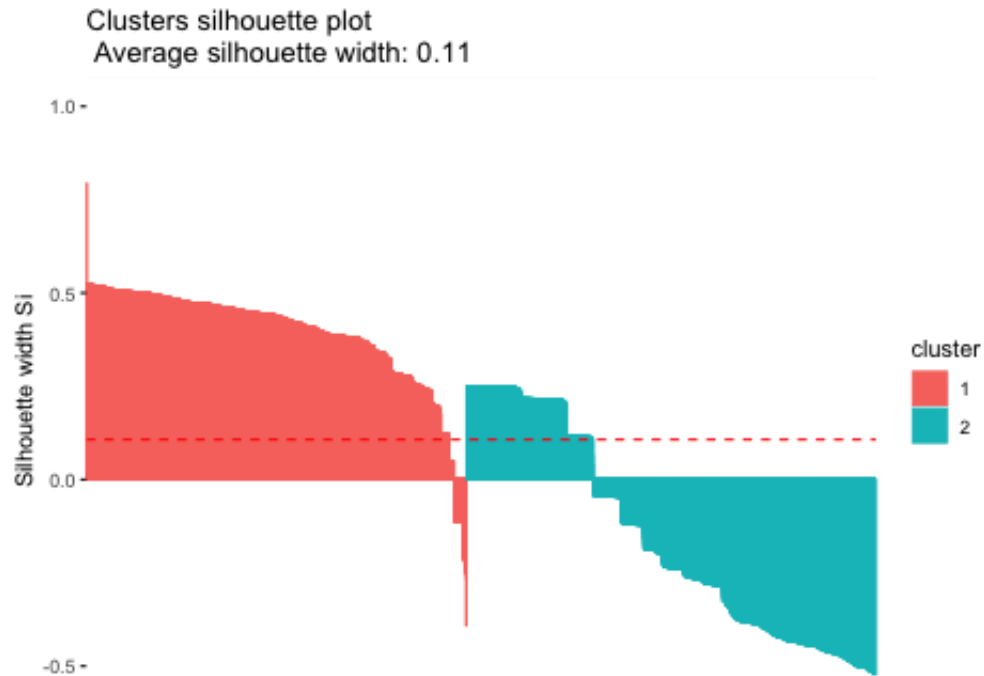
Transit

[1] "Maximum silhouete coefficient: 0.478316107924928 For 2 clusters."
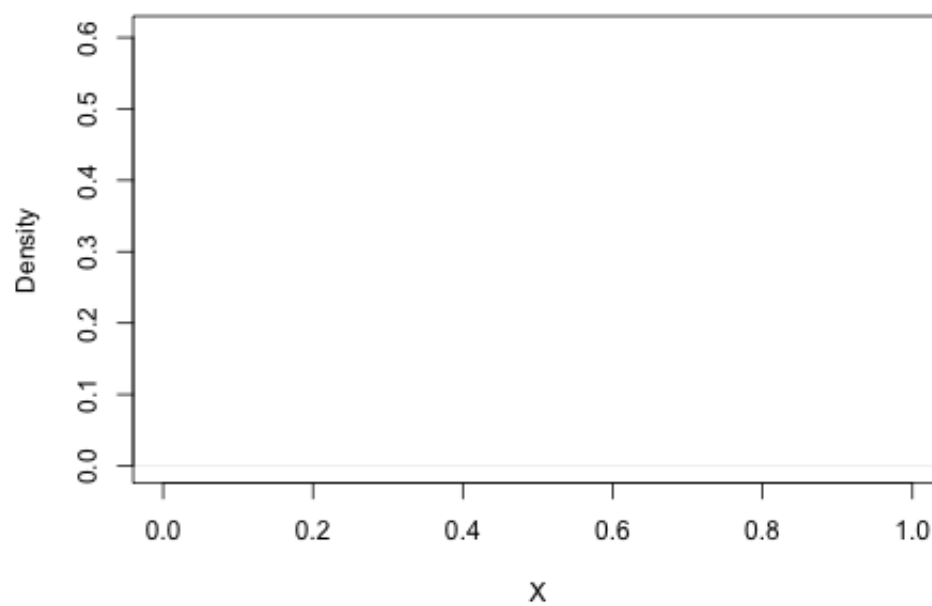
[1] "Segment cutoff values:"

```
## [1] NA
##   cluster size ave.sil.width
## 1       1 2576          0.39
## 2       2 2776         -0.16
```

Clusters silhouette plot
Average silhouette width: 0.11


```
## [1] "Cluster profiles:"
## [1] "Num of DBs:"
##  Cluster 1 Cluster 2
##       7066      7624
##
##
##
##  DB Population:
##  Cluster 1 Cluster 2
##       74.5      70.7
##
##
##
##  CSD Population:
##  Cluster 1 Cluster 2
##   233419.1  235137.3
##
##
##
##  CMA Type:
##    Cluster 1 Cluster 2
##         3097      3341
## B       2923      3192
## D        786       832
```

```
## K           260       259
##
##
##
##   Index of Remoteness:
##   Cluster 1 Cluster 2
##      0.229     0.228
##
##
##
##   Provinces:
##                       Cluster 1 Cluster 2
## Alberta                     240       218
## BritishColumbia             362       361
## NewBrunswick                 53        69
## NorthwestTerritories          5         2
## NovaScotia                  213       237
## Ontario                    1073      1167
## Quebec                      423       435
## Saskatchewan                 29        42
## NA's                       4668      5093
##
##
##
##   Amenity dense:
##    Cluster 1 Cluster 2
## 0      6345      6949
## 1       560       524
## 2        71        76
## F        90        75
##
##
##
##   PMS_prox_idx_emp :
##   Cluster 1 Cluster 2
##    -4.81376  -4.83186
##
##
##
##   PMS_prox_idx_pharma :
##   Cluster 1 Cluster 2
##    -3.51653  -3.58702
##
##
##
##   PMS_prox_idx_childcare :
##   Cluster 1 Cluster 2
##    -3.08069   -3.1256
##
##
##
##   PMS_prox_idx_health :
##   Cluster 1 Cluster 2
##    -5.04632   -5.0747
```

```
##
##
##
## PMS_prox_idx_grocery :
## Cluster 1 Cluster 2
##  -3.03121  -3.06213
##
##
##
## PMS_prox_idx_educpri :
## Cluster 1 Cluster 2
##  -2.40087  -2.41177
##
##
##
## PMS_prox_idx_educsec :
## Cluster 1 Cluster 2
##  -2.48847  -2.52491
##
##
##
## PMS_prox_idx_lib :
## Cluster 1 Cluster 2
##  -2.37088  -2.34919
##
##
##
## PMS_prox_idx_parks :
## Cluster 1 Cluster 2
##  -3.03795  -3.04874
##
##
##
## PMS_prox_idx_transit :
## Cluster 1 Cluster 2
##  -4.54398  -4.60454
```

Conclusion

text