

infs 692 m3

2022-12-16

---

## Data entry

```
library(readr)
df<- read.csv("/Users/yangyufan/Desktop/infs 692 final project/radiomics_completedata.csv")
```

## Packages

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
```

```
library(ggplot2)
library(stringr)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'

## The following object is masked from 'package:dplyr':
##
##   combine
```

```
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.2 --
```

```
## v tibble 3.1.8      v purrr 0.3.4
## v tidyr 1.2.1      v forcats 0.5.2
## -- Conflicts ----- tidyverse_conflicts() --
## x gridExtra::combine() masks dplyr::combine()
## x dplyr::filter()      masks stats::filter()
## x dplyr::lag()         masks stats::lag()

library(cluster)
library(factoextra)

## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa

library(mclust)

## Package 'mclust' version 6.0.0
## Type 'citation("mclust")' for citing this R package in publications.
##
## Attaching package: 'mclust'
##
## The following object is masked from 'package:purrr':
##
##     map
```

## Data prepreation

```
summary(df)
```

## Institution	Failure.binary	Failure	Entropy_cooc.W.ADC
## Length:197	Min. :0.0000	Min. : 4.767	Min. : 9.533
## Class :character	1st Qu.:0.0000	1st Qu.:11.267	1st Qu.:11.559
## Mode :character	Median :0.0000	Median :20.500	Median :12.279
##	Mean :0.3401	Mean :26.367	Mean :12.279
##	3rd Qu.:1.0000	3rd Qu.:37.900	3rd Qu.:12.977
##	Max. :1.0000	Max. :97.633	Max. :14.510
## GLNU_align.H.PET	Min_hist.PET	Max_hist.PET	Mean_hist.PET
## Min. : 9.445	Min. : 1.485	Min. : 4.164	Min. : 2.425
## 1st Qu.: 37.518	1st Qu.: 5.152	1st Qu.:13.072	1st Qu.: 7.498
## Median : 80.035	Median : 7.389	Median :21.014	Median :11.449
## Mean : 95.382	Mean : 8.513	Mean :24.271	Mean :13.008
## 3rd Qu.:112.145	3rd Qu.:11.005	3rd Qu.:33.761	3rd Qu.:17.387
## Max. :559.352	Max. :28.404	Max. :79.986	Max. :44.043
## Variance_hist.PET	Standard_Deviation_hist.PET	Skewness_hist.PET	
## Min. : 0.1787	Min. :0.4194	Min. : -0.001136	
## 1st Qu.: 2.2583	1st Qu.:1.6391	1st Qu.: 0.444828	
## Median : 6.4504	Median :2.7341	Median : 0.734796	
## Mean : 9.2575	Mean :3.0492	Mean : 0.911980	
## 3rd Qu.:12.6824	3rd Qu.:4.2095	3rd Qu.: 1.199956	
## Max. :49.0121	Max. :9.9293	Max. : 4.901172	
## Kurtosis_hist.PET	Energy_hist.PET	Entropy_hist.PET	AUC_hist.PET
## Min. : -2.2661	Min. : -0.063283	Min. : 5.296	Min. :0.4403

```

## 1st Qu.: -0.5259 1st Qu.: -0.012100 1st Qu.: 8.281 1st Qu.: 0.5039
## Median : -0.1672 Median : 0.007731 Median : 9.922 Median : 0.5170
## Mean : 0.4909 Mean : 0.003647 Mean : 11.241 Mean : 0.6397
## 3rd Qu.: 0.5017 3rd Qu.: 0.020205 3rd Qu.: 12.528 3rd Qu.: 0.9764
## Max. : 33.7421 Max. : 0.089760 Max. : 25.055 Max. : 1.1242
## H_suv.PET Volume.PET X3D_surface.PET ratio_3ds_vol.PET
## Min. : 0.1557 Min. : 3584 Min. : 926.2 Min. : 0.1171
## 1st Qu.: 0.6073 1st Qu.: 16846 1st Qu.: 7680.0 1st Qu.: 2.3726
## Median : 1.0579 Median : 34286 Median : 13705.0 Median : 3.5661
## Mean : 1.2148 Mean : 48419 Mean : 21597.6 Mean : 3.7876
## 3rd Qu.: 1.5739 3rd Qu.: 69138 3rd Qu.: 22901.7 3rd Qu.: 4.9584
## Max. : 4.1235 Max. : 283502 Max. : 290926.3 Max. : 11.4815
## ratio_3ds_vol_norm.PET irregularity.PET tumor_length.PET Compactness_v1.PET
## Min. : 1.487 Min. : 1.730 Min. : 13.84 Min. : -0.061021
## 1st Qu.: 14.899 1st Qu.: 1.963 1st Qu.: 39.34 1st Qu.: 0.003078
## Median : 18.320 Median : 2.123 Median : 51.36 Median : 0.005560
## Mean : 21.078 Mean : 2.593 Mean : 62.59 Mean : 0.005022
## 3rd Qu.: 27.985 3rd Qu.: 3.553 3rd Qu.: 75.90 3rd Qu.: 0.016708
## Max. : 75.896 Max. : 5.105 Max. : 306.76 Max. : 0.040820
## Compactness_v2.PET Spherical_disproportion.PET Sphericity.PET
## Min. : -0.061536 Min. : 1.487 Min. : -0.008712
## 1st Qu.: 0.002703 1st Qu.: 14.899 1st Qu.: 0.053418
## Median : 0.015918 Median : 18.320 Median : 0.070447
## Mean : 0.038685 Mean : 21.078 Mean : 0.175106
## 3rd Qu.: 0.032250 3rd Qu.: 27.985 3rd Qu.: 0.141500
## Max. : 0.509032 Max. : 75.896 Max. : 1.261968
## Asphericity.PET Center_of_mass.PET Max_3D_diam.PET Major_axis_length.PET
## Min. : 0.4868 Min. : 0.02145 Min. : 13.84 Min. : 14.11
## 1st Qu.: 13.8993 1st Qu.: 0.39969 1st Qu.: 41.92 1st Qu.: 37.32
## Median : 17.3200 Median : 0.62581 Median : 62.74 Median : 54.19
## Mean : 19.8243 Mean : 0.83411 Mean : 79.02 Mean : 66.81
## 3rd Qu.: 26.9567 3rd Qu.: 1.04679 3rd Qu.: 98.06 3rd Qu.: 83.98
## Max. : 73.8960 Max. : 5.95651 Max. : 306.76 Max. : 288.01
## Minor_axis_length.PET Least_axis_length.PET Elongation.PET Flatness.PET
## Min. : 10.98 Min. : 6.961 Min. : 0.2847 Min. : 0.2061
## 1st Qu.: 27.29 1st Qu.: 22.247 1st Qu.: 0.6649 1st Qu.: 0.5117
## Median : 41.35 Median : 31.747 Median : 0.7906 Median : 0.6508
## Mean : 44.56 Mean : 36.355 Mean : 0.8943 Mean : 0.7124
## 3rd Qu.: 53.41 3rd Qu.: 42.708 3rd Qu.: 0.9866 3rd Qu.: 0.7964
## Max. : 148.69 Max. : 137.273 Max. : 1.9731 Max. : 1.6248
## Max_cooc.L.PET Average_cooc.L.PET Variance_cooc.L.PET Entropy_cooc.L.PET
## Min. : -0.061012 Min. : 7.286 Min. : 24.0 Min. : 8.077
## 1st Qu.: -0.010176 1st Qu.: 20.927 1st Qu.: 137.9 1st Qu.: 10.376
## Median : 0.007806 Median : 23.525 Median : 201.1 Median : 10.630
## Mean : 0.004478 Mean : 27.099 Mean : 217.0 Mean : 12.948
## 3rd Qu.: 0.020696 3rd Qu.: 28.993 3rd Qu.: 255.3 3rd Qu.: 16.154
## Max. : 0.057722 Max. : 64.058 Max. : 575.6 Max. : 22.440
## DAVE_cooc.L.PET DVAR_cooc.L.PET DENT_cooc.L.PET SAVE_cooc.L.PET
## Min. : 4.325 Min. : 21.97 Min. : 3.635 Min. : 14.56
## 1st Qu.: 8.901 1st Qu.: 64.46 1st Qu.: 4.657 1st Qu.: 41.85
## Median : 12.670 Median : 99.01 Median : 5.062 Median : 47.04
## Mean : 13.886 Mean : 111.59 Mean : 6.056 Mean : 54.20
## 3rd Qu.: 15.530 3rd Qu.: 130.75 3rd Qu.: 7.270 3rd Qu.: 57.95
## Max. : 38.939 Max. : 395.31 Max. : 10.965 Max. : 128.08

```

```

## SVAR_cooc.L.PET SENT_cooc.L.PET ASM_cooc.L.PET Contrast_cooc.L.PET
## Min. : 63.6 Min. : 4.832 Min. : -0.0627950 Min. : 32.37
## 1st Qu.: 399.7 1st Qu.: 6.211 1st Qu.: -0.0121930 1st Qu.: 137.93
## Median : 558.2 Median : 6.469 Median : 0.0040010 Median : 239.14
## Mean : 595.2 Mean : 7.722 Mean : 0.0009685 Mean : 272.95
## 3rd Qu.: 696.7 3rd Qu.: 9.759 3rd Qu.: 0.0169560 3rd Qu.: 326.69
## Max. : 1671.9 Max. : 13.423 Max. : 0.0442660 Max. : 1151.93
## Dissimilarity_cooc.L.PET Inv_diff_cooc.L.PET Inv_diff_norm_cooc.L.PET
## Min. : 4.325 Min. : 0.07774 Min. : 0.7734
## 1st Qu.: 8.901 1st Qu.: 0.15401 1st Qu.: 0.8409
## Median : 12.670 Median : 0.18711 Median : 0.8752
## Mean : 13.886 Mean : 0.22728 Mean : 1.0843
## 3rd Qu.: 15.530 3rd Qu.: 0.28121 3rd Qu.: 1.6137
## Max. : 38.939 Max. : 0.65958 Max. : 1.9108
## IDM_cooc.L.PET IDM_norm_cooc.L.PET Inv_var_cooc.L.PET
## Min. : 0.006727 Min. : 0.8766 Min. : 0.01145
## 1st Qu.: 0.080322 1st Qu.: 0.9419 1st Qu.: 0.08407
## Median : 0.105318 Median : 0.9625 Median : 0.10969
## Mean : 0.129528 Mean : 1.1972 Mean : 0.13310
## 3rd Qu.: 0.166520 3rd Qu.: 1.8260 3rd Qu.: 0.17249
## Max. : 0.478270 Max. : 2.0165 Max. : 0.47857
## Correlation_cooc.L.PET Autocorrelation_cooc.L.PET Tendency_cooc.L.PET
## Min. : -0.01336 Min. : 60.68 Min. : 63.6
## 1st Qu.: 0.34436 1st Qu.: 492.39 1st Qu.: 399.7
## Median : 0.42414 Median : 614.95 Median : 558.2
## Mean : 0.49058 Mean : 693.99 Mean : 595.2
## 3rd Qu.: 0.62925 3rd Qu.: 811.25 3rd Qu.: 696.7
## Max. : 1.28668 Max. : 2225.86 Max. : 1671.9
## Shade_cooc.L.PET Prominence_cooc.L.PET IC1_.L.PET IC2_.L.PET
## Min. : -7233 Min. : 28425 Min. : -0.360734 Min. : 0.4430
## 1st Qu.: 2180 1st Qu.: 456518 1st Qu.: -0.126535 1st Qu.: 0.6654
## Median : 4857 Median : 768547 Median : -0.089284 Median : 0.7938
## Mean : 5987 Mean : 853930 Mean : -0.100955 Mean : 0.9102
## 3rd Qu.: 8315 3rd Qu.: 1091790 3rd Qu.: -0.056803 3rd Qu.: 0.9552
## Max. : 24034 Max. : 3269996 Max. : -0.008777 Max. : 1.9104
## Coarseness_vdif_.L.PET Contrast_vdif_.L.PET Busyness_vdif_.L.PET
## Min. : -0.061468 Min. : 0.1886 Min. : -0.03228
## 1st Qu.: -0.006006 1st Qu.: 0.5195 1st Qu.: 0.06736
## Median : 0.017239 Median : 0.9731 Median : 0.15893
## Mean : 0.014100 Mean : 1.4150 Mean : 0.26365
## 3rd Qu.: 0.033488 3rd Qu.: 1.4553 3rd Qu.: 0.32494
## Max. : 0.141802 Max. : 18.6449 Max. : 2.44794
## Complexity_vdif_.L.PET Strength_vdif_.L.PET SRE_align.L.PET LRE_align.L.PET
## Min. : 7268 Min. : 2.002 Min. : 0.8629 Min. : 0.9847
## 1st Qu.: 12641 1st Qu.: 8.460 1st Qu.: 0.9715 1st Qu.: 1.0571
## Median : 17160 Median : 23.324 Median : 0.9893 Median : 1.0890
## Mean : 19663 Mean : 39.906 Mean : 1.2275 Mean : 1.3639
## 3rd Qu.: 21957 3rd Qu.: 55.792 3rd Qu.: 1.9080 3rd Qu.: 2.0723
## Max. : 69560 Max. : 295.545 Max. : 2.0211 Max. : 2.4167
## GLNU_align.L.PET RLNU_align.L.PET RP_align.L.PET LGRE_align.L.PET
## Min. : 1.647 Min. : 39.43 Min. : 0.8740 Min. : -0.03560
## 1st Qu.: 8.230 1st Qu.: 300.12 1st Qu.: 0.9627 1st Qu.: 0.03366
## Median : 21.227 Median : 713.34 Median : 0.9843 Median : 0.06100
## Mean : 43.923 Mean : 1406.28 Mean : 1.2196 Mean : 0.07204

```

## 3rd Qu.: 62.183	3rd Qu.: 1803.07	3rd Qu.:1.8882	3rd Qu.: 0.10134
## Max. :441.820	Max. :15312.68	Max. :2.0161	Max. : 0.36303
## HGRE_align.L.PET	LGSRE_align.L.PET	HGSRE_align.L.PET	LGHRE_align.L.PET
## Min. : 67.61	Min. :-0.03590	Min. : 65.67	Min. :-0.03429
## 1st Qu.: 499.26	1st Qu.: 0.03241	1st Qu.: 487.32	1st Qu.: 0.03791
## Median : 602.00	Median : 0.06090	Median : 584.44	Median : 0.06539
## Mean : 692.34	Mean : 0.07031	Mean : 680.33	Mean : 0.07954
## 3rd Qu.: 820.69	3rd Qu.: 0.10037	3rd Qu.: 801.22	3rd Qu.: 0.11015
## Max. :2080.05	Max. : 0.34822	Max. :2047.60	Max. : 0.43073
## HGLRE_align.L.PET	GLNU_norm_align.L.PET	RLNU_norm_align.L.PET	
## Min. : 76.1	Min. :-0.03837	Min. :0.8611	
## 1st Qu.: 535.8	1st Qu.: 0.02299	1st Qu.:0.9333	
## Median : 665.0	Median : 0.03344	Median :0.9634	
## Mean : 742.8	Mean : 0.03685	Mean :1.1894	
## 3rd Qu.: 884.2	3rd Qu.: 0.05188	3rd Qu.:1.7947	
## Max. :2209.9	Max. : 0.18495	Max. :1.9936	
## GLVAR_align.L.PET	RLVAR_align.L.PET	Entropy_align.L.PET	SZSE.L.PET
## Min. : 25.37	Min. :-0.04672	Min. : 4.280	Min. :0.1768
## 1st Qu.:140.87	1st Qu.: 0.01945	1st Qu.: 5.450	1st Qu.:0.9142
## Median :196.49	Median : 0.03054	Median : 5.577	Median :0.9499
## Mean :211.94	Mean : 0.03593	Mean : 6.828	Mean :1.1618
## 3rd Qu.:248.98	3rd Qu.: 0.05440	3rd Qu.: 8.560	3rd Qu.:1.7686
## Max. :542.91	Max. : 0.16722	Max. :11.667	Max. :1.9617
## LZSE.L.PET	LGLZE.L.PET	HGLZE.L.PET	SZLGE.L.PET
## Min. :1.003	Min. :-0.03560	Min. : 71.77	Min. :-0.04675
## 1st Qu.:1.248	1st Qu.: 0.03474	1st Qu.: 502.88	1st Qu.: 0.03069
## Median :1.354	Median : 0.06054	Median : 603.02	Median : 0.05654
## Mean :1.758	Mean : 0.07159	Mean : 695.76	Mean : 0.06579
## 3rd Qu.:2.358	3rd Qu.: 0.10166	3rd Qu.: 819.19	3rd Qu.: 0.09873
## Max. :5.785	Max. : 0.35820	Max. :1988.06	Max. : 0.30999
## SZHGE.L.PET	LZLGE.L.PET	LZHGE.L.PET	GLNU_area.L.PET
## Min. : 65.32	Min. :-0.02915	Min. : 115.8	Min. : 1.551
## 1st Qu.: 467.58	1st Qu.: 0.04621	1st Qu.: 623.2	1st Qu.: 7.695
## Median : 561.06	Median : 0.08144	Median : 783.7	Median : 19.019
## Mean : 652.04	Mean : 0.10463	Mean : 926.5	Mean : 39.542
## 3rd Qu.: 772.90	3rd Qu.: 0.13560	3rd Qu.:1075.6	3rd Qu.: 57.064
## Max. :1911.50	Max. : 0.71824	Max. :3030.5	Max. :408.095
## ZSNU.L.PET	ZSP.L.PET	GLNU_norm.L.PET	ZSNU_norm.L.PET
## Min. : 35.19	Min. :0.3864	Min. :-0.03836	Min. :0.7155
## 1st Qu.: 254.69	1st Qu.:0.8886	1st Qu.: 0.02259	1st Qu.:0.8153
## Median : 594.33	Median :0.9286	Median : 0.03365	Median :0.8713
## Mean : 1125.99	Mean :1.1336	Mean : 0.03628	Mean :1.0601
## 3rd Qu.: 1322.79	3rd Qu.:1.6321	3rd Qu.: 0.05133	3rd Qu.:1.4555
## Max. :12249.90	Max. :1.9410	Max. : 0.18003	Max. :1.8450
## GLVAR_area.L.PET	ZSVAR.L.PET	Entropy_area.L.PET	Max_cooc.H.PET
## Min. : 27.01	Min. :0.00253	Min. : 4.512	Min. :-0.04902
## 1st Qu.:144.01	1st Qu.:0.08041	1st Qu.: 5.689	1st Qu.: 0.02770
## Median :196.99	Median :0.12536	Median : 5.858	Median : 0.06533
## Mean :213.84	Mean :0.17957	Mean : 7.134	Mean : 0.10212
## 3rd Qu.:250.79	3rd Qu.:0.20093	3rd Qu.: 9.648	3rd Qu.: 0.14406
## Max. :534.49	Max. :1.05837	Max. :12.150	Max. : 0.81117
## Average_cooc.H.PET	Variance_cooc.H.PET	Entropy_cooc.H.PET	DAVE_cooc.H.PET
## Min. :36.47	Min. : 1.866	Min. : 2.473	Min. : 0.6999
## 1st Qu.:38.49	1st Qu.:226.943	1st Qu.: 5.687	1st Qu.:11.9980

```

## Median :42.01      Median :276.466      Median : 7.103      Median :14.1391
## Mean :51.10       Mean :305.171      Mean : 7.840       Mean :16.3158
## 3rd Qu.:72.93     3rd Qu.:297.145   3rd Qu.: 7.871     3rd Qu.:18.1939
## Max. :93.09       Max. :611.179     Max. :16.101      Max. :36.3879
## DVAR_cooc.H.PET  DENT_cooc.H.PET  SAVE_cooc.H.PET  SVAR_cooc.H.PET
## Min. : 2.353     Min. : 0.8283     Min. : 72.92     Min. : 4.611
## 1st Qu.:121.528  1st Qu.: 3.0993   1st Qu.: 76.41   1st Qu.: 656.858
## Median :151.762  Median : 4.1300   Median : 79.88   Median : 753.357
## Mean :169.383    Mean : 4.3811     Mean : 99.66     Mean : 840.679
## 3rd Qu.:191.314  3rd Qu.: 4.9869   3rd Qu.:145.84   3rd Qu.: 886.786
## Max. :394.861    Max. :10.0676     Max. :186.16     Max. :1776.231
## SENT_cooc.H.PET  ASM_cooc.H.PET  Contrast_cooc.H.PET
## Min. : 0.302     Min. : -0.05834   Min. : 2.821
## 1st Qu.: 2.981    1st Qu.: 0.01188   1st Qu.: 266.667
## Median : 4.955    Median : 0.03473   Median : 349.442
## Mean : 5.092     Mean : 0.05256     Mean : 389.651
## 3rd Qu.: 5.976    3rd Qu.: 0.07810   3rd Qu.: 457.092
## Max. :12.565     Max. : 0.65981     Max. :1055.743
## Dissimilarity_cooc.H.PET  Inv_diff_cooc.H.PET  Inv_diff_norm_cooc.H.PET
## Min. : 0.6999      Min. :0.1124      Min. :0.7478
## 1st Qu.:11.9980     1st Qu.:0.2252     1st Qu.:0.8304
## Median :14.1391     Median :0.3182     Median :0.8601
## Mean :16.3158       Mean :0.3705       Mean :1.0644
## 3rd Qu.:18.1939     3rd Qu.:0.4680     3rd Qu.:1.5894
## Max. :36.3879      Max. :1.2243      Max. :1.8274
## IDM_cooc.H.PET  IDM_norm_cooc.H.PET  Inv_var_cooc_.H.PET
## Min. :0.05396    Min. :0.8484      Min. : -0.055882
## 1st Qu.:0.16043   1st Qu.:0.9278     1st Qu.: 0.009132
## Median :0.25827    Median :0.9475     Median : 0.027178
## Mean :0.30526     Mean :1.1756       Mean : 0.026354
## 3rd Qu.:0.38620    3rd Qu.:1.7906     3rd Qu.: 0.044357
## Max. :1.17324     Max. :1.9649       Max. : 0.123834
## Correlation_cooc.H.PET  Autocorrelation_cooc.H.PET  Tendency_cooc.H.PET
## Min. : -0.000138     Min. :1474        Min. : 4.611
## 1st Qu.: 0.315680     1st Qu.:1599      1st Qu.: 629.846
## Median : 0.392730     Median :1849      Median : 753.311
## Mean : 0.450630       Mean :2206        Mean : 831.034
## 3rd Qu.: 0.558411     3rd Qu.:2950      3rd Qu.: 888.115
## Max. : 1.225154      Max. :4427        Max. :1776.231
## Shade_cooc.H.PET  Prominence_cooc.H.PET  IC1_d.H.PET  IC2_d.H.PET
## Min. : -15874      Min. : 134        Min. : -0.26739   Min. :0.2221
## 1st Qu.: -5732     1st Qu.: 729696    1st Qu.: -0.09830   1st Qu.:0.4330
## Median : -3931     Median :1173937    Median : -0.05559   Median :0.5250
## Mean : -4088       Mean :1214525     Mean : -0.06806     Mean :0.6034
## 3rd Qu.: -2025     3rd Qu.:1469772    3rd Qu.: -0.03012   3rd Qu.:0.7239
## Max. : 3449       Max. :3219875     Max. : 0.01637     Max. :1.4532
## Coarseness_vdif.H.PET  Contrast_vdif.H.PET  Busyness_vdif.H.PET
## Min. : -0.063165     Min. : 0.2156     Min. : -0.02149
## 1st Qu.: -0.012344    1st Qu.: 38.2720   1st Qu.: 0.12606
## Median : 0.005432     Median : 62.4850   Median : 0.31395
## Mean : 0.001635       Mean :112.8780     Mean : 2.29160
## 3rd Qu.: 0.018121     3rd Qu.:134.1018   3rd Qu.: 0.83327
## Max. : 0.052168       Max. :1099.8953     Max. :40.35804
## Complexity_vdif.H.PET  Strength_vdif.H.PET  SRE_align.H.PET  LRE_align.H.PET

```

## Min. : 1806	Min. : 0.2884	Min. : 0.4984	Min. : 1.163
## 1st Qu.: 17897	1st Qu.: 4.5072	1st Qu.: 0.8453	1st Qu.: 1.393
## Median : 25517	Median : 13.9361	Median : 0.9161	Median : 1.828
## Mean : 27323	Mean : 39.8013	Mean : 1.0944	Mean : 2.249
## 3rd Qu.: 33113	3rd Qu.: 39.7754	3rd Qu.: 1.4601	3rd Qu.: 2.706
## Max. : 77554	Max. : 2126.3694	Max. : 1.9425	Max. : 6.679
## RLNU_align.H.PET	RP_align.H.PET	LGRE_align.H.PET	HGRE_align.H.PET
## Min. : 29.06	Min. : 0.4429	Min. : -0.061932	Min. : 1443
## 1st Qu.: 166.08	1st Qu.: 0.8112	1st Qu.: -0.010726	1st Qu.: 1551
## Median : 493.35	Median : 0.8881	Median : 0.005428	Median : 1765
## Mean : 1003.64	Mean : 1.0512	Mean : 0.002599	Mean : 2118
## 3rd Qu.: 1232.19	3rd Qu.: 1.3806	3rd Qu.: 0.018529	3rd Qu.: 2920
## Max. : 12515.43	Max. : 1.9135	Max. : 0.058436	Max. : 4928
## LGSRE_align.H.PET	HGSRE_align.H.PET	LGHRE_align.H.PET	HGLRE_align.H.PET
## Min. : -0.062119	Min. : 1105	Min. : -0.060688	Min. : 1739
## 1st Qu.: -0.010919	1st Qu.: 1389	1st Qu.: -0.009758	1st Qu.: 2166
## Median : 0.005302	Median : 1475	Median : 0.006693	Median : 3318
## Mean : 0.002353	Mean : 1826	Mean : 0.004084	Mean : 3978
## 3rd Qu.: 0.018418	3rd Qu.: 2615	3rd Qu.: 0.020079	3rd Qu.: 4836
## Max. : 0.057712	Max. : 3746	Max. : 0.061592	Max. : 15092
## GLNU_norm_align.H.PET	RLNU_norm_align.H.PET	GLVAR_align.H.PET	
## Min. : 0.000795	Min. : 0.2702	Min. : 1.666	
## 1st Qu.: 0.107847	1st Qu.: 0.6952	1st Qu.: 232.056	
## Median : 0.174514	Median : 0.8057	Median : 295.015	
## Mean : 0.222793	Mean : 0.9222	Mean : 324.108	
## 3rd Qu.: 0.295122	3rd Qu.: 1.0280	3rd Qu.: 329.111	
## Max. : 0.883282	Max. : 1.8171	Max. : 695.249	
## RLVAR_align.H.PET	Entropy_align.H.PET	SZSE.H.PET	LZSE.H.PET
## Min. : 0.02306	Min. : 2.128	Min. : 0.1136	Min. : 1.946
## 1st Qu.: 0.13992	1st Qu.: 3.381	1st Qu.: 0.6298	1st Qu.: 3.659
## Median : 0.25736	Median : 3.839	Median : 0.7709	Median : 7.177
## Mean : 0.37168	Mean : 4.472	Mean : 0.8590	Mean : 78.744
## 3rd Qu.: 0.49132	3rd Qu.: 4.953	3rd Qu.: 0.8672	3rd Qu.: 21.995
## Max. : 2.02894	Max. : 9.332	Max. : 1.7258	Max. : 3263.559
## LGLZE.H.PET	HGLZE.H.PET	SZLGE.H.PET	SZHGE.H.PET
## Min. : -0.062002	Min. : 1213	Min. : -0.062397	Min. : 244.1
## 1st Qu.: -0.010533	1st Qu.: 1534	1st Qu.: -0.011847	1st Qu.: 1084.3
## Median : 0.005468	Median : 1870	Median : 0.005118	Median : 1212.6
## Mean : 0.002728	Mean : 2183	Mean : 0.002011	Mean : 1427.6
## 3rd Qu.: 0.018478	3rd Qu.: 2748	3rd Qu.: 0.017706	3rd Qu.: 1618.4
## Max. : 0.063216	Max. : 4732	Max. : 0.062112	Max. : 3237.0
## LZLGE.H.PET	LZHGE.H.PET	GLNU_area.H.PET	ZSNU.H.PET
## Min. : -0.054985	Min. : 2645	Min. : 3.737	Min. : 2.096
## 1st Qu.: 0.008822	1st Qu.: 5590	1st Qu.: 23.451	1st Qu.: 52.451
## Median : 0.027093	Median : 15647	Median : 51.916	Median : 174.378
## Mean : 0.075976	Mean : 161924	Mean : 94.734	Mean : 458.281
## 3rd Qu.: 0.064368	3rd Qu.: 44703	3rd Qu.: 132.613	3rd Qu.: 511.028
## Max. : 2.074899	Max. : 5859252	Max. : 872.124	Max. : 6851.599
## ZSP.H.PET	GLNU_norm.H.PET	ZSNU_norm.H.PET	GLVAR_area.H.PET
## Min. : 0.00288	Min. : 0.000309	Min. : 0.1394	Min. : 4.462
## 1st Qu.: 0.40544	1st Qu.: 0.106671	1st Qu.: 0.3770	1st Qu.: 229.704
## Median : 0.62856	Median : 0.172544	Median : 0.5521	Median : 297.243
## Mean : 0.64546	Mean : 0.215413	Mean : 0.5858	Mean : 324.218
## 3rd Qu.: 0.76959	3rd Qu.: 0.287310	3rd Qu.: 0.6712	3rd Qu.: 340.901

```

## Max. :1.59616 Max. :0.855168 Max. :1.3792 Max. :719.046
## ZSVAR_H.PET Entropy_area.H.PET Max_cooc.W.PET Average_cooc.W.PET
## Min. : 0.3741 Min. : 2.980 Min. : -0.059812 Min. : 1.598
## 1st Qu.: 1.3509 1st Qu.: 4.319 1st Qu.: 0.006934 1st Qu.: 5.456
## Median : 5.0446 Median : 4.662 Median : 0.025257 Median : 9.169
## Mean : 71.8617 Mean : 5.548 Mean : 0.033306 Mean :10.771
## 3rd Qu.: 16.7681 3rd Qu.: 6.824 3rd Qu.: 0.051286 3rd Qu.:14.611
## Max. :2860.0216 Max. :10.652 Max. : 0.449036 Max. :36.018
## Variance_cooc.W.PET Entropy_cooc.W.PET DAVE_cooc.W.PET DVAR_cooc.W.PET
## Min. : 0.8107 Min. : 2.897 Min. : 0.6561 Min. : 0.5749
## 1st Qu.: 9.3123 1st Qu.: 6.861 1st Qu.: 2.6785 1st Qu.: 4.7001
## Median : 27.0179 Median : 8.627 Median : 4.6500 Median :12.8543
## Mean : 37.3629 Mean : 9.635 Mean : 5.1596 Mean :18.6218
## 3rd Qu.: 53.1635 3rd Qu.:10.508 3rd Qu.: 7.0237 3rd Qu.:28.4017
## Max. :201.4968 Max. :20.210 Max. :15.3052 Max. :86.3098
## DENT_cooc.W.PET SAVE_cooc.W.PET SVAR_cooc.W.PET SENT_cooc.W.PET
## Min. :1.532 Min. : 3.179 Min. : 2.122 Min. : 2.149
## 1st Qu.:2.966 1st Qu.:10.896 1st Qu.: 25.538 1st Qu.: 4.207
## Median :3.812 Median :18.391 Median : 72.682 Median : 5.079
## Mean :4.220 Mean :21.542 Mean :104.483 Mean : 5.817
## 3rd Qu.:4.501 3rd Qu.:29.255 3rd Qu.:139.053 3rd Qu.: 6.449
## Max. :8.815 Max. :72.004 Max. :665.393 Max. :12.170
## ASM_cooc.W.PET Contrast_cooc.W.PET Dissimilarity_cooc.W.PET
## Min. : -0.062353 Min. : 1.089 Min. : 0.6561
## 1st Qu.: -0.004474 1st Qu.: 11.192 1st Qu.: 2.6785
## Median : 0.016520 Median : 30.108 Median : 4.6500
## Mean : 0.014274 Mean : 44.970 Mean : 5.1596
## 3rd Qu.: 0.034118 3rd Qu.: 73.855 3rd Qu.: 7.0237
## Max. : 0.253551 Max. :202.948 Max. :15.3052
## Inv_diff_cooc.W.PET Inv_diff_norm_cooc.W.PET IDM_cooc.W.PET
## Min. :0.1633 Min. :0.7791 Min. :0.07432
## 1st Qu.:0.2752 1st Qu.:0.8451 1st Qu.:0.18502
## Median :0.3964 Median :0.8758 Median :0.30145
## Mean :0.4418 Mean :1.0870 Mean :0.33895
## 3rd Qu.:0.5466 3rd Qu.:1.6416 3rd Qu.:0.43576
## Max. :1.2799 Max. :1.9114 Max. :1.21935
## IDM_norm_cooc.W.PET Inv_var_cooc.W.PET Correlation_cooc.W.PET
## Min. :0.8769 Min. :0.07723 Min. : -0.0277
## 1st Qu.:0.9430 1st Qu.:0.19117 1st Qu.: 0.3427
## Median :0.9636 Median :0.28977 Median : 0.4127
## Mean :1.1979 Mean :0.32696 Mean : 0.4866
## 3rd Qu.:1.8477 3rd Qu.:0.41129 3rd Qu.: 0.6186
## Max. :2.0164 Max. :1.04619 Max. : 1.2818
## Autocorrelation_cooc.W.PET Tendency_cooc.W.PET Shade_cooc.W.PET
## Min. : 2.776 Min. : 2.122 Min. : -472.31
## 1st Qu.: 32.984 1st Qu.: 25.538 1st Qu.: 24.62
## Median : 86.175 Median : 72.682 Median : 218.44
## Mean :130.362 Mean :104.483 Mean : 692.68
## 3rd Qu.:178.427 3rd Qu.:139.053 3rd Qu.: 707.21
## Max. :749.138 Max. :665.393 Max. :16137.66
## Prominence_cooc.W.PET IC1_d.W.PET IC2_d.W.PET
## Min. : 21.1 Min. : -0.21907 Min. :0.3013
## 1st Qu.: 1874.4 1st Qu.: -0.08709 1st Qu.:0.4948
## Median : 13676.0 Median : -0.05299 Median :0.5904

```



```

## Mean      : 55611.2      Mean      :-0.06354      Mean      :0.6821
## 3rd Qu.: 45767.4      3rd Qu.: -0.03315      3rd Qu.: 0.8056
## Max.      :1509311.3     Max.      : 0.00861      Max.      :1.5168
## Coarseness_vdif.W.PET Contrast_vdif.W.PET Busyness_vdif.W.PET
## Min.      : -0.06146     Min.      :0.000965     Min.      : 0.03516
## 1st Qu.: -0.00453     1st Qu.: 0.150611     1st Qu.: 0.56267
## Median : 0.01781     Median :0.280164     Median : 1.43660
## Mean      : 0.01721     Mean      :0.342734     Mean      : 2.16432
## 3rd Qu.: 0.03610     3rd Qu.:0.452249     3rd Qu.: 3.15534
## Max.      : 0.20872     Max.      :1.444736     Max.      :11.12206
## Complexity_vdif.W.PET Strength_vdif.W.PET SRE_align.W.PET LRE_align.W.PET
## Min.      : 5.614      Min.      : 0.1781      Min.      :0.7395      Min.      :1.046
## 1st Qu.: 194.871     1st Qu.: 1.1065      1st Qu.:0.9134      1st Qu.:1.170
## Median : 984.268     Median : 2.2893      Median :0.9574      Median :1.370
## Mean      : 2062.542     Mean      : 5.0491      Mean      :1.1734      Mean      :1.662
## 3rd Qu.: 2569.228     3rd Qu.: 5.8991      3rd Qu.:1.7269      3rd Qu.:2.255
## Max.      :20059.404     Max.      :61.7200      Max.      :1.9861      Max.      :3.585
## GLNU_align.W.PET RLNU_align.W.PET RP_align.W.PET LGRE_align.W.PET
## Min.      : 5.344      Min.      : 34.44      Min.      :0.6657      Min.      : -0.01941
## 1st Qu.: 27.625     1st Qu.: 243.12      1st Qu.:0.8961      1st Qu.: 0.09795
## Median : 60.907     Median : 588.96      Median :0.9437      Median : 0.17543
## Mean      : 93.014     Mean      :1247.59      Mean      :1.1491      Mean      : 0.21609
## 3rd Qu.:112.549     3rd Qu.:1477.14      3rd Qu.:1.6687      3rd Qu.: 0.28936
## Max.      :585.246     Max.      :14756.99      Max.      :1.9718      Max.      : 0.80922
## HGRE_align.W.PET LGSRE_align.W.PET HGSRE_align.W.PET LGHRE_align.W.PET
## Min.      : 2.83      Min.      : -0.02025     Min.      : 2.439      Min.      : -0.01581
## 1st Qu.: 31.63      1st Qu.: 0.09226     1st Qu.: 29.165     1st Qu.: 0.11778
## Median : 85.35      Median : 0.15830     Median : 82.365     Median : 0.22250
## Mean      :130.67     Mean      : 0.19832     Mean      :125.584     Mean      : 0.31693
## 3rd Qu.:181.54      3rd Qu.: 0.27032     3rd Qu.:176.987     3rd Qu.: 0.43051
## Max.      :749.93     Max.      : 0.70224     Max.      :721.820     Max.      : 2.01331
## HGLRE_align.W.PET GLNU_norm_align.W.PET RLNU_norm_align.W.PET
## Min.      : 5.043      Min.      : -0.03140     Min.      :0.5313
## 1st Qu.: 41.894     1st Qu.: 0.05388     1st Qu.:0.8197
## Median :102.892     Median : 0.09042     Median :0.8985
## Mean      :153.740     Mean      : 0.11510     Mean      :1.0688
## 3rd Qu.:207.370     3rd Qu.: 0.15921     3rd Qu.:1.3888
## Max.      :872.887     Max.      : 0.53440     Max.      :1.9165
## GLVAR_align.W.PET RLVAR_align.W.PET Entropy_align.W.PET SZSE.W.PET
## Min.      : 0.6799     Min.      : -0.02491     Min.      : 2.364      Min.      :0.1446
## 1st Qu.: 8.9257     1st Qu.: 0.05873     1st Qu.: 3.940      1st Qu.:0.7905
## Median : 26.1549     Median : 0.11017     Median : 4.641      Median :0.8713
## Mean      : 37.3810     Mean      : 0.14379     Mean      : 5.332      Mean      :1.0228
## 3rd Qu.: 51.2124     3rd Qu.: 0.19111     3rd Qu.: 5.889      3rd Qu.:1.2783
## Max.      :197.9114     Max.      : 0.74587     Max.      :10.991      Max.      :1.8620
## LZSE.W.PET LGLZE.W.PET HGLZE.W.PET SZLGE.W.PET
## Min.      : 1.319     Min.      : -0.01897     Min.      : 4.719      Min.      : -0.02662
## 1st Qu.: 1.828     1st Qu.: 0.09971     1st Qu.: 32.919     1st Qu.: 0.08003
## Median : 3.062     Median : 0.16869     Median : 88.919     Median : 0.13095
## Mean      : 5.582     Mean      : 0.20838     Mean      :132.558     Mean      : 0.15976
## 3rd Qu.: 5.821     3rd Qu.: 0.29480     3rd Qu.:187.907     3rd Qu.: 0.22850
## Max.      :52.606     Max.      : 0.74683     Max.      :739.930     Max.      : 0.59463
## SZHGE.W.PET LZLGE.W.PET LZHGE.W.PET GLNU_area.W.PET
## Min.      : 3.586     Min.      : -0.00334     Min.      : 29.12      Min.      : 3.955

```

##	1st Qu.: 24.620	1st Qu.: 0.17882	1st Qu.: 117.24	1st Qu.: 19.251
##	Median : 77.473	Median : 0.39627	Median : 219.86	Median : 43.031
##	Mean : 116.907	Mean : 1.68893	Mean : 279.58	Mean : 70.400
##	3rd Qu.: 164.783	3rd Qu.: 1.22155	3rd Qu.: 390.53	3rd Qu.: 80.177
##	Max. : 648.206	Max. : 38.43046	Max. : 1468.92	Max. : 523.768
##	ZSNU.W.PET	ZSP.W.PET	GLNU_norm.W.PET	ZSNU_norm.W.PET
##	Min. : 13.29	Min. : 0.2638	Min. : -0.03171	Min. : 0.3028
##	1st Qu.: 126.68	1st Qu.: 0.6851	1st Qu.: 0.05384	1st Qu.: 0.5907
##	Median : 369.19	Median : 0.8149	Median : 0.08874	Median : 0.7271
##	Mean : 807.76	Mean : 0.9093	Mean : 0.11167	Mean : 0.8091
##	3rd Qu.: 976.44	3rd Qu.: 0.9165	3rd Qu.: 0.15491	3rd Qu.: 0.8512
##	Max. : 10982.07	Max. : 1.8140	Max. : 0.53949	Max. : 1.6323
##	GLVAR_area.W.PET	ZSVAR.W.PET	Entropy_area.W.PET	Min_hist.ADC
##	Min. : 1.139	Min. : 0.08773	Min. : 3.231	Min. : -0.0629
##	1st Qu.: 9.309	1st Qu.: 0.31288	1st Qu.: 4.692	1st Qu.: 0.0159
##	Median : 26.776	Median : 0.82646	Median : 5.089	Median : 202.0159
##	Mean : 38.267	Mean : 2.67281	Mean : 6.053	Mean : 372.1823
##	3rd Qu.: 52.241	3rd Qu.: 2.10797	3rd Qu.: 6.989	3rd Qu.: 657.0025
##	Max. : 205.064	Max. : 42.32352	Max. : 11.929	Max. : 1834.0386
##	Max_hist.ADC	Mean_hist.ADC	Variance_hist.ADC	Standard_Deviation_hist.ADC
##	Min. : 1584	Min. : 770.5	Min. : 24185	Min. : 155.5
##	1st Qu.: 2157	1st Qu.: 1105.7	1st Qu.: 54876	1st Qu.: 237.2
##	Median : 2491	Median : 1246.8	Median : 97348	Median : 324.6
##	Mean : 2881	Mean : 1471.6	Mean : 110699	Mean : 358.0
##	3rd Qu.: 3206	3rd Qu.: 1698.2	3rd Qu.: 128881	3rd Qu.: 420.9
##	Max. : 6566	Max. : 3979.1	Max. : 433425	Max. : 931.1
##	Skewness_hist.ADC	Kurtosis_hist.ADC	Energy_hist.ADC	Entropy_hist.ADC
##	Min. : -2.86142	Min. : -1.03080	Min. : -0.061697	Min. : 6.367
##	1st Qu.: 0.08714	1st Qu.: 0.07697	1st Qu.: -0.010850	1st Qu.: 8.912
##	Median : 0.47482	Median : 0.56705	Median : 0.005925	Median : 9.427
##	Mean : 0.48975	Mean : 0.91228	Mean : 0.002762	Mean : 11.377
##	3rd Qu.: 0.86498	3rd Qu.: 1.22031	3rd Qu.: 0.018290	3rd Qu.: 12.734
##	Max. : 2.90688	Max. : 7.95446	Max. : 0.056900	Max. : 21.409
##	AUC_hist.ADC	Volume.ADC	X3D_surface.ADC	ratio_3ds_vol.ADC
##	Min. : 0.4209	Min. : 3309	Min. : 836.3	Min. : 0.06764
##	1st Qu.: 0.5013	1st Qu.: 17331	1st Qu.: 4274.9	1st Qu.: 0.19507
##	Median : 0.5321	Median : 34939	Median : 7760.7	Median : 0.26240
##	Mean : 0.6578	Mean : 49327	Mean : 11891.5	Mean : 0.31648
##	3rd Qu.: 0.8417	3rd Qu.: 69781	3rd Qu.: 15321.4	3rd Qu.: 0.35928
##	Max. : 1.2567	Max. : 283036	Max. : 60866.2	Max. : 1.12860
##	ratio_3ds_vol_norm.ADC	irregularity.ADC	Compactness_v1.ADC	Compactness_v2.ADC
##	Min. : 1.152	Min. : 1.420	Min. : -0.04630	Min. : 0.03537
##	1st Qu.: 1.419	1st Qu.: 1.660	1st Qu.: 0.01935	1st Qu.: 0.27212
##	Median : 1.530	Median : 1.775	Median : 0.03492	Median : 0.34432
##	Mean : 1.892	Mean : 2.192	Mean : 0.03625	Mean : 0.39037
##	3rd Qu.: 2.633	3rd Qu.: 2.840	3rd Qu.: 0.04998	3rd Qu.: 0.45219
##	Max. : 4.304	Max. : 4.526	Max. : 0.10334	Max. : 0.94104
##	Spherical_disproportion.ADC	Sphericity.ADC	Asphericity.ADC	
##	Min. : 1.152	Min. : 0.3986	Min. : 0.1525	
##	1st Qu.: 1.419	1st Qu.: 0.6457	1st Qu.: 0.4186	
##	Median : 1.530	Median : 0.7019	Median : 0.5299	
##	Mean : 1.892	Mean : 0.8408	Mean : 0.6381	
##	3rd Qu.: 2.633	3rd Qu.: 0.8910	3rd Qu.: 0.7901	
##	Max. : 4.304	Max. : 1.5696	Max. : 2.3040	

```

## Center_of_mass.ADC Max_3D_diam.ADC Major_axis_length.ADC
## Min. :0.03906 Min. : 19.46 Min. : 18.66
## 1st Qu.:0.44876 1st Qu.: 59.94 1st Qu.: 44.70
## Median :0.74819 Median : 84.20 Median : 58.07
## Mean :1.14812 Mean :101.26 Mean : 67.84
## 3rd Qu.:1.44506 3rd Qu.:124.32 3rd Qu.: 80.89
## Max. :6.61714 Max. :319.24 Max. :205.34
## Minor_axis_length.ADC Least_axis_length.ADC Elongation.ADC Flatness.ADC
## Min. : 11.84 Min. : 9.012 Min. :0.3876 Min. :0.2899
## 1st Qu.: 29.77 1st Qu.: 21.457 1st Qu.:0.6664 1st Qu.:0.4574
## Median : 43.04 Median : 31.121 Median :0.8188 Median :0.5959
## Mean : 49.96 Mean : 36.797 Mean :0.9163 Mean :0.6695
## 3rd Qu.: 60.53 3rd Qu.: 45.643 3rd Qu.:0.9657 3rd Qu.:0.7832
## Max. :146.27 Max. :126.071 Max. :1.9194 Max. :1.6007
## Max_cooc.L.ADC Average_cooc.L.ADC Variance_cooc.L.ADC Entropy_cooc.L.ADC
## Min. : -0.060698 Min. :11.94 Min. : 26.79 Min. : 7.953
## 1st Qu.: -0.005478 1st Qu.:24.84 1st Qu.: 57.78 1st Qu.: 9.459
## Median : 0.009990 Median :29.80 Median : 91.69 Median : 9.990
## Mean : 0.008675 Mean :34.80 Mean :102.87 Mean :12.091
## 3rd Qu.: 0.024420 3rd Qu.:41.31 3rd Qu.:125.60 3rd Qu.:16.775
## Max. : 0.070194 Max. :87.69 Max. :364.52 Max. :21.438
## DAVE_cooc.L.ADC DVAR_cooc.L.ADC DENT_cooc.L.ADC SAVE_cooc.L.ADC
## Min. : 3.797 Min. : 15.20 Min. : 3.477 Min. : 23.88
## 1st Qu.: 6.137 1st Qu.: 31.59 1st Qu.: 4.117 1st Qu.: 49.69
## Median : 7.790 Median : 45.96 Median : 4.445 Median : 59.59
## Mean : 8.909 Mean : 52.47 Mean : 5.329 Mean : 69.60
## 3rd Qu.: 9.895 3rd Qu.: 63.89 3rd Qu.: 7.051 3rd Qu.: 82.59
## Max. :24.018 Max. :192.64 Max. :10.000 Max. :175.38
## SVAR_cooc.L.ADC SENT_cooc.L.ADC ASM_cooc.L.ADC Contrast_cooc.L.ADC
## Min. : 76.88 Min. : 0.4244 Min. : -0.06258 Min. : 30.25
## 1st Qu.:168.78 1st Qu.: 3.5924 1st Qu.: -0.01124 1st Qu.: 68.18
## Median :238.12 Median : 4.6982 Median : 0.00535 Median :101.13
## Mean :290.97 Mean : 4.9922 Mean : 0.00231 Mean :120.50
## 3rd Qu.:361.56 3rd Qu.: 5.2351 3rd Qu.: 0.01817 3rd Qu.:146.32
## Max. :977.73 Max. :10.7853 Max. : 0.04834 Max. :480.30
## Dissimilarity_cooc.L.ADC Inv_diff_cooc.L.ADC Inv_diff_norm_cooc.L.ADC
## Min. : 3.797 Min. :0.1211 Min. :0.8159
## 1st Qu.: 6.137 1st Qu.:0.2120 1st Qu.:0.8884
## Median : 7.790 Median :0.2541 Median :0.9164
## Mean : 8.909 Mean :0.3072 Mean :1.1370
## 3rd Qu.: 9.895 3rd Qu.:0.3664 3rd Qu.:1.7296
## Max. :24.018 Max. :0.7329 Max. :1.9233
## IDM_cooc.L.ADC IDM_norm_cooc.L.ADC Inv_var_cooc.L.ADC
## Min. :0.03829 Min. :0.9046 Min. :0.04011
## 1st Qu.:0.12604 1st Qu.:0.9695 1st Qu.:0.13166
## Median :0.16496 Median :0.9873 Median :0.17144
## Mean :0.19917 Mean :1.2268 Mean :0.20488
## 3rd Qu.:0.24259 3rd Qu.:1.9071 3rd Qu.:0.24624
## Max. :0.56514 Max. :2.0233 Max. :0.57456
## Correlation_cooc.L.ADC Autocorrelation_.L.ADC Tendency_cooc.L.ADC
## Min. :0.1004 Min. : 159.6 Min. : 76.88
## 1st Qu.:0.3627 1st Qu.: 660.4 1st Qu.:168.78
## Median :0.4566 Median : 901.9 Median :238.12
## Mean :0.5177 Mean :1049.5 Mean :290.97

```

## 3rd Qu.:0.5883	3rd Qu.:1255.8	3rd Qu.:361.56	
## Max. :1.3433	Max. :3868.3	Max. :977.73	
## Shade_.L.ADC	Prominence_cooc.L.ADC	IC1_.L.ADC	IC2_.L.ADC
## Min. : -9355.5	Min. : 31891	Min. : -0.355780	Min. : 0.3575
## 1st Qu.: 339.3	1st Qu.: 104430	1st Qu.: -0.105700	1st Qu.: 0.6076
## Median : 1241.6	Median : 193878	Median : -0.069750	Median : 0.6945
## Mean : 1925.1	Mean : 271202	Mean : -0.082097	Mean : 0.8307
## 3rd Qu.: 2696.2	3rd Qu.: 358073	3rd Qu.: -0.049570	3rd Qu.: 0.9135
## Max. :17923.8	Max. :1477800	Max. : -0.000042	Max. :1.8831
## Coarseness_vdif_.L.ADC	Contrast_vdif_.L.ADC	Busyness_vdif_.L.ADC	
## Min. : -0.061827	Min. : 0.03438	Min. : -0.00377	
## 1st Qu.: -0.006482	1st Qu.: 0.18037	1st Qu.: 0.07402	
## Median : 0.011012	Median : 0.30336	Median : 0.15940	
## Mean : 0.010556	Mean : 0.43449	Mean : 0.28774	
## 3rd Qu.: 0.024980	3rd Qu.: 0.50912	3rd Qu.: 0.38552	
## Max. : 0.159060	Max. : 2.88890	Max. : 2.83448	
## Complexity_vdif_.L.ADC	Strength_vdif_.L.ADC	SRE_align.L.ADC	LRE_align.L.ADC
## Min. : 3160	Min. : 0.6215	Min. : 0.8781	Min. : 1.013
## 1st Qu.: 5699	1st Qu.: 3.5323	1st Qu.: 0.9595	1st Qu.: 1.099
## Median : 7329	Median : 6.7704	Median : 0.9763	Median : 1.158
## Mean : 7989	Mean : 11.7712	Mean : 1.2112	Mean : 1.444
## 3rd Qu.: 8949	3rd Qu.: 10.9074	3rd Qu.: 1.8500	3rd Qu.: 2.124
## Max. :19146	Max. :124.5108	Max. : 2.0115	Max. : 2.695
## GLNU_align.L.ADC	RLNU_align.L.ADC	RP_align.L.ADC	LGRE_align.L.ADC
## Min. : 2.928	Min. : 83.32	Min. : 0.8566	Min. : -0.060495
## 1st Qu.: 23.171	1st Qu.: 735.51	1st Qu.: 0.9450	1st Qu.: -0.009555
## Median : 58.656	Median : 1490.24	Median : 0.9671	Median : 0.011670
## Mean : 139.308	Mean : 3196.96	Mean : 1.1970	Mean : 0.007212
## 3rd Qu.: 184.212	3rd Qu.: 3845.10	3rd Qu.: 1.8070	3rd Qu.: 0.023320
## Max. :1551.693	Max. :32004.16	Max. : 2.0027	Max. : 0.104120
## HGRE_align.L.ADC	LGSRE_align.L.ADC	HGSRE_align.L.ADC	LGHRE_align.L.ADC
## Min. : 222.5	Min. : -0.060661	Min. : 213.9	Min. : -0.060251
## 1st Qu.: 760.1	1st Qu.: -0.009606	1st Qu.: 730.4	1st Qu.: -0.009340
## Median : 990.4	Median : 0.011614	Median : 953.5	Median : 0.012690
## Mean :1151.2	Mean : 0.006945	Mean :1118.1	Mean : 0.008564
## 3rd Qu.:1363.1	3rd Qu.: 0.022950	3rd Qu.:1335.9	3rd Qu.: 0.024449
## Max. :3836.6	Max. : 0.099580	Max. :3606.7	Max. : 0.129340
## HGLRE_align.L.ADC	GLNU_norm_align.L.ADC	RLNU_norm_align.L.ADC	
## Min. : 263.5	Min. : -0.03396	Min. : 0.7932	
## 1st Qu.: 811.0	1st Qu.: 0.02674	1st Qu.: 0.9002	
## Median :1161.0	Median : 0.04254	Median : 0.9359	
## Mean :1299.7	Mean : 0.04488	Mean : 1.1483	
## 3rd Qu.:1507.8	3rd Qu.: 0.05889	3rd Qu.:1.6802	
## Max. :4967.3	Max. : 0.15004	Max. :1.9751	
## GLVAR_align.L.ADC	RLVAR_align.L.ADC	Entropy_align.L.ADC	SZSE.L.ADC
## Min. : 34.75	Min. : -0.03777	Min. : 4.855	Min. : 0.7951
## 1st Qu.: 66.38	1st Qu.: 0.03397	1st Qu.: 5.201	1st Qu.: 0.8893
## Median : 99.51	Median : 0.05501	Median : 5.413	Median : 0.9265
## Mean :113.33	Mean : 0.06600	Mean : 6.663	Mean : 1.1414
## 3rd Qu.:137.79	3rd Qu.: 0.09048	3rd Qu.: 9.883	3rd Qu.: 1.6840
## Max. :414.54	Max. : 0.27810	Max. :11.550	Max. :1.9782
## LZSE.L.ADC	LGLZE.L.ADC	HGLZE.L.ADC	SZLGE.L.ADC
## Min. :1.095	Min. : -0.060558	Min. : 247.2	Min. : -0.060905
## 1st Qu.:1.378	1st Qu.: -0.009506	1st Qu.: 765.0	1st Qu.: -0.009813

## Median :1.602	Median : 0.011602	Median :1004.7	Median : 0.009820
## Mean :2.053	Mean : 0.007065	Mean :1162.8	Mean : 0.006419
## 3rd Qu.:2.632	3rd Qu.: 0.023204	3rd Qu.:1385.0	3rd Qu.: 0.022040
## Max. :5.694	Max. : 0.094520	Max. :3778.6	Max. : 0.083520
## SZHGE.L.ADC	LZLGE.L.ADC	LZHGE.L.ADC	GLNU_area.L.ADC
## Min. : 221.9	Min. :-0.05978	Min. : 572.3	Min. : 2.825
## 1st Qu.: 716.6	1st Qu.: -0.00818	1st Qu.:1056.8	1st Qu.: 21.085
## Median : 924.7	Median : 0.01568	Median :1444.9	Median : 51.834
## Mean :1070.6	Mean : 0.01295	Mean :1770.0	Mean : 117.810
## 3rd Qu.:1273.6	3rd Qu.: 0.02897	3rd Qu.:2113.7	3rd Qu.: 141.882
## Max. :3188.0	Max. : 0.19624	Max. :8508.1	Max. :1158.523
## ZSNU.L.ADC	ZSP.L.ADC	GLNU_norm.L.ADC	ZSNU_norm.L.ADC
## Min. : 78.23	Min. :0.7039	Min. :-0.03427	Min. :0.6298
## 1st Qu.: 593.23	1st Qu.:0.8479	1st Qu.: 0.02621	1st Qu.:0.7773
## Median : 1285.11	Median :0.8961	Median : 0.04183	Median :0.8263
## Mean : 2429.57	Mean :1.0881	Mean : 0.04322	Mean :0.9974
## 3rd Qu.: 2959.09	3rd Qu.:1.5089	3rd Qu.: 0.05692	3rd Qu.:1.3535
## Max. :25131.32	Max. :1.9628	Max. : 0.13852	Max. :1.8940
## GLVAR_area.L.ADC	ZSVAR.L.ADC	Entropy_area.L.ADC	Max_cooc.H.ADC
## Min. : 37.86	Min. :0.03177	Min. : 5.194	Min. :-0.061367
## 1st Qu.: 68.97	1st Qu.:0.14187	1st Qu.: 5.561	1st Qu.: -0.011254
## Median :101.65	Median :0.21926	Median : 5.754	Median : 0.005600
## Mean :116.09	Mean :0.36882	Mean : 7.090	Mean : 0.002366
## 3rd Qu.:139.58	3rd Qu.:0.42200	3rd Qu.:10.476	3rd Qu.: 0.018330
## Max. :425.25	Max. :2.14718	Max. :12.226	Max. : 0.049158
## Average_cooc.H.ADC	Variance_cooc.H.ADC	Entropy_cooc.H.ADC	DAVE_cooc.H.ADC
## Min. :28.16	Min. :297.5	Min. : 9.89	Min. :10.34
## 1st Qu.:30.69	1st Qu.:314.3	1st Qu.:11.38	1st Qu.:13.82
## Median :31.71	Median :321.4	Median :11.58	Median :15.39
## Mean :39.11	Mean :397.5	Mean :14.26	Mean :18.54
## 3rd Qu.:56.32	3rd Qu.:601.2	3rd Qu.:19.78	3rd Qu.:20.68
## Max. :68.81	Max. :663.0	Max. :23.56	Max. :37.03
## DVAR_cooc.H.ADC	DENT_cooc.H.ADC	SAVE_cooc.H.ADC	SVAR_cooc.H.ADC
## Min. : 97.48	Min. : 4.857	Min. : 56.32	Min. : 724.4
## 1st Qu.:139.62	1st Qu.: 5.226	1st Qu.: 61.38	1st Qu.: 857.9
## Median :160.65	Median : 5.370	Median : 63.42	Median : 955.4
## Mean :189.30	Mean : 6.636	Mean : 78.21	Mean :1121.2
## 3rd Qu.:197.36	3rd Qu.: 9.714	3rd Qu.:112.64	3rd Qu.:1448.9
## Max. :400.90	Max. :11.187	Max. :137.58	Max. :2106.8
## SENT_cooc.H.ADC	ASM_cooc.H.ADC	Contrast_cooc.H.ADC	
## Min. :3.088	Min. :-6.334e-02	Min. : 210.8	
## 1st Qu.:3.594	1st Qu.: -1.234e-02	1st Qu.: 338.6	
## Median :3.768	Median : 3.080e-03	Median : 402.3	
## Mean :4.602	Mean : 6.846e-05	Mean : 468.8	
## 3rd Qu.:6.240	3rd Qu.: 1.633e-02	3rd Qu.: 518.7	
## Max. :8.211	Max. : 3.973e-02	Max. :1062.3	
## Dissimilarity_cooc.H.ADC	Inv_diff_cooc.H.ADC	Inv_diff_norm_cooc.H.ADC	
## Min. :10.34	Min. :0.06013	Min. :0.7359	
## 1st Qu.:13.82	1st Qu.:0.13807	1st Qu.:0.8182	
## Median :15.39	Median :0.16200	Median :0.8424	
## Mean :18.54	Mean :0.18794	Mean :1.0408	
## 3rd Qu.:20.68	3rd Qu.:0.21904	3rd Qu.:1.5697	
## Max. :37.03	Max. :0.43808	Max. :1.7813	
## IDM_cooc.H.ADC	IDM_norm_cooc.H.ADC	Inv_var_cooc.H.ADC	

```

## Min.      :-0.00194    Min.      :0.8397    Min.      :-0.000839
## 1st Qu.: 0.07046    1st Qu.:0.9197    1st Qu.: 0.076110
## Median : 0.09089    Median :0.9388    Median : 0.094310
## Mean   : 0.10088    Mean   :1.1632    Mean   : 0.104632
## 3rd Qu.: 0.13118    3rd Qu.:1.7772    3rd Qu.: 0.128963
## Max.    : 0.28066    Max.    :1.9478    Max.    : 0.284360
## Correlation_cooc.H.ADC Autocorrelation_cooc.H.ADC Tendency_cooc.H.ADC
## Min.      :0.1050    Min.      : 876.6    Min.      : 724.4
## 1st Qu.:0.3585    1st Qu.:1080.2    1st Qu.: 857.9
## Median :0.4504    Median :1116.9    Median : 955.4
## Mean   :0.5131    Mean   :1385.0    Mean   :1121.2
## 3rd Qu.:0.5837    3rd Qu.:1753.3    3rd Qu.:1448.9
## Max.    :1.3649    Max.    :2505.6    Max.    :2106.8
## Shade_cooc.H.ADC Prominence_cooc.H.ADC IC1_d.H.ADC IC2_d.H.ADC
## Min.      :-8499.7    Min.      :1213171    Min.      :-0.570580    Min.      :0.4320
## 1st Qu.: 748.5    1st Qu.:1618184    1st Qu.: -0.112350    1st Qu.:0.6404
## Median : 3042.8    Median :1824374    Median : -0.068910    Median :0.7285
## Mean   : 2950.7    Mean   :2126432    Mean   : -0.090971    Mean   :0.8845
## 3rd Qu.: 5104.4    3rd Qu.:2426342    3rd Qu.: -0.044849    3rd Qu.:1.0007
## Max.    :18630.6    Max.    :4294925    Max.    : -0.003503    Max.    :2.0014
## Coarseness_vdif.H.ADC Contrast_vdif.H.ADC Busyness_vdif.H.ADC
## Min.      :-0.061933    Min.      :1.145    Min.      :0.01268
## 1st Qu.: -0.007910    1st Qu.:1.612    1st Qu.:0.09567
## Median : 0.009940    Median :1.840    Median :0.22381
## Mean   : 0.009101    Mean   :2.202    Mean   :0.43392
## 3rd Qu.: 0.024210    3rd Qu.:2.314    3rd Qu.:0.50409
## Max.    : 0.153460    Max.    :4.627    Max.    :4.36709
## Complexity_vdif.H.ADC Strength_vdif.H.ADC SRE_align.H.ADC LRE_align.H.ADC
## Min.      : 9957    Min.      : 0.4551    Min.      :0.9156    Min.      :0.9794
## 1st Qu.:14427    1st Qu.: 2.6916    1st Qu.:0.9784    1st Qu.:1.0466
## Median :16384    Median : 6.1903    Median :0.9908    Median :1.0801
## Mean   :19867    Mean   :13.4790    Mean   :1.2334    Mean   :1.3406
## 3rd Qu.:21148    3rd Qu.:10.5148    3rd Qu.:1.9250    3rd Qu.:2.0588
## Max.    :42297    Max.    :181.9847    Max.    :2.0252    Max.    :2.3153
## GLNU_align.H.ADC RLNU_align.H.ADC RP_align.H.ADC LGRE_align.H.ADC
## Min.      : 1.584    Min.      : 85.87    Min.      :0.9078    Min.      :-0.03979
## 1st Qu.:12.706    1st Qu.: 764.05    1st Qu.:0.9724    1st Qu.: 0.01467
## Median :25.814    Median :1550.12    Median :0.9859    Median : 0.02747
## Mean   :58.815    Mean   :3496.20    Mean   :1.2264    Mean   : 0.02925
## 3rd Qu.:70.386    3rd Qu.:4241.95    3rd Qu.:1.9094    3rd Qu.: 0.04298
## Max.   :588.394    Max.   :34324.60    Max.   :2.0230    Max.   : 0.09034
## HGRE_align.H.ADC LGSRE_align.H.ADC HGSRE_align.H.ADC LGHRE_align.H.ADC
## Min.      :1339    Min.      :-0.04251    Min.      :1291    Min.      :-0.03747
## 1st Qu.:1357    1st Qu.: 0.01308    1st Qu.:1332    1st Qu.: 0.02119
## Median :1361    Median : 0.02689    Median :1343    Median : 0.03304
## Mean   :1704    Mean   : 0.02799    Mean   :1677    Mean   : 0.03599
## 3rd Qu.:2678    3rd Qu.: 0.04101    3rd Qu.:2582    3rd Qu.: 0.04858
## Max.    :2770    Max.    : 0.09016    Max.    :2766    Max.    : 0.11562
## HGLRE_align.H.ADC GLNU_norm_align.H.ADC RLNU_norm_align.H.ADC
## Min.      :1393    Min.      :-0.047696    Min.      :0.8817
## 1st Qu.:1440    1st Qu.: 0.003221    1st Qu.:0.9506
## Median :1472    Median : 0.018760    Median :0.9658
## Mean   :1826    Mean   : 0.019683    Mean   :1.2020
## 3rd Qu.:2787    3rd Qu.: 0.035140    3rd Qu.:1.8572

```

```

## Max. :3188 Max. : 0.071516 Max. :2.0141
## GLVAR_align.H.ADC RLVAR_align.H.ADC Entropy_align.H.ADC SZSE.H.ADC
## Min. :322.1 Min. :-0.04738 Min. : 5.897 Min. :0.8714
## 1st Qu.:327.3 1st Qu.: 0.01435 1st Qu.: 6.059 1st Qu.:0.9437
## Median :329.0 Median : 0.03147 Median : 6.110 Median :0.9633
## Mean :411.1 Mean : 0.03018 Mean : 7.628 Mean :1.1969
## 3rd Qu.:644.2 3rd Qu.: 0.04710 3rd Qu.:11.797 3rd Qu.:1.8366
## Max. :666.8 Max. : 0.14354 Max. :12.434 Max. :2.0318
## LZSE.H.ADC LGLZE.H.ADC HGLZE.H.ADC SZLGE.H.ADC
## Min. :1.002 Min. :-0.04387 Min. :1294 Min. :-0.04717
## 1st Qu.:1.170 1st Qu.: 0.01170 1st Qu.:1345 1st Qu.: 0.01008
## Median :1.273 Median : 0.02622 Median :1358 Median : 0.02373
## Mean :1.565 Mean : 0.02660 Mean :1693 Mean : 0.02353
## 3rd Qu.:2.032 3rd Qu.: 0.04063 3rd Qu.:2602 3rd Qu.: 0.03775
## Max. :3.168 Max. : 0.09077 Max. :2782 Max. : 0.09001
## SZHGE.H.ADC LZLGE.H.ADC LZHGE.H.ADC GLNU_area.H.ADC
## Min. :1194 Min. :-0.03357 Min. :1380 Min. : 1.591
## 1st Qu.:1276 1st Qu.: 0.03276 1st Qu.:1637 1st Qu.: 12.263
## Median :1297 Median : 0.04771 Median :1730 Median : 24.973
## Mean :1610 Mean : 0.05474 Mean :2186 Mean : 55.897
## 3rd Qu.:2389 3rd Qu.: 0.07758 3rd Qu.:2821 3rd Qu.: 67.941
## Max. :2771 Max. : 0.25488 Max. :5458 Max. :558.830
## ZSNU.H.ADC ZSP.H.ADC GLNU_norm.H.ADC ZSNU_norm.H.ADC
## Min. : 87.02 Min. :0.8333 Min. :-0.047639 Min. :0.7801
## 1st Qu.: 678.59 1st Qu.:0.9189 1st Qu.: 0.003343 1st Qu.:0.8701
## Median : 1396.50 Median :0.9466 Median : 0.018810 Median :0.8990
## Mean : 3030.35 Mean :1.1728 Mean : 0.019767 Mean :1.1151
## 3rd Qu.: 3667.15 3rd Qu.:1.7747 3rd Qu.: 0.035190 3rd Qu.:1.6280
## Max. :29629.65 Max. :2.0318 Max. : 0.071972 Max. :2.0318
## GLVAR_area.H.ADC ZSVAR.H.ADC Entropy_area.H.ADC Max_cooc.W.ADC
## Min. :304.7 Min. :-0.02688 Min. : 5.896 Min. :-0.062539
## 1st Qu.:319.8 1st Qu.: 0.05756 1st Qu.: 6.205 1st Qu.: -0.011760
## Median :324.5 Median : 0.10225 Median : 6.310 Median : 0.005340
## Mean :403.0 Mean : 0.12984 Mean : 7.838 Mean : 0.001454
## 3rd Qu.:612.4 3rd Qu.: 0.16953 3rd Qu.:11.797 3rd Qu.: 0.017830
## Max. :667.6 Max. : 0.67137 Max. :13.040 Max. : 0.044078
## Average_cooc.W.ADC Variance_cooc.W.ADC DAVE_cooc.W.ADC DVAR_cooc.W.ADC
## Min. : 29.56 Min. : 202.5 Min. :11.03 Min. : 111.7
## 1st Qu.: 76.40 1st Qu.: 515.9 1st Qu.:19.68 1st Qu.: 270.4
## Median :101.18 Median : 875.9 Median :23.47 Median : 406.2
## Mean :112.13 Mean :1021.3 Mean :26.92 Mean : 500.7
## 3rd Qu.:127.59 3rd Qu.:1215.9 3rd Qu.:31.46 3rd Qu.: 632.5
## Max. :287.27 Max. :4153.9 Max. :67.92 Max. :1928.6
## DENT_cooc.W.ADC SAVE_cooc.W.ADC SVAR_cooc.W.ADC SENT_cooc.W.ADC
## Min. : 4.951 Min. : 59.1 Min. : 576.1 Min. : 0.4612
## 1st Qu.: 5.724 1st Qu.:152.8 1st Qu.: 1358.0 1st Qu.: 4.4419
## Median : 6.029 Median :201.6 Median : 2445.7 Median : 5.6292
## Mean : 7.295 Mean :222.1 Mean : 2969.2 Mean : 6.2348
## 3rd Qu.: 9.905 3rd Qu.:258.6 3rd Qu.: 3452.3 3rd Qu.: 6.9115
## Max. :13.086 Max. :574.5 Max. :13038.4 Max. :14.5664
## ASM_cooc.W.ADC Contrast_cooc.W.ADC Dissimilarity_cooc.W.ADC
## Min. :-0.0633940 Min. : 234.1 Min. :11.03
## 1st Qu.: -0.0125000 1st Qu.: 658.3 1st Qu.:19.68
## Median : 0.0031100 Median : 912.7 Median :23.47

```

```

## Mean      :-0.0000207      Mean      :1116.0      Mean      :26.92
## 3rd Qu.: 0.0161900      3rd Qu.:1396.9      3rd Qu.:31.46
## Max.      : 0.0400080      Max.      :4232.8      Max.      :67.92
## Inv_diff_cooc.W.ADC Inv_diff_norm_cooc.W.ADC IDM_cooc.W.ADC
## Min.      :-0.05393      Min.      :0.8150      Min.      :-0.02253
## 1st Qu.: 0.09815      1st Qu.:0.8872      1st Qu.: 0.04441
## Median : 0.11970      Median :0.9153      Median : 0.06268
## Mean      : 0.14050      Mean      :1.1357      Mean      : 0.07154
## 3rd Qu.: 0.17216      3rd Qu.:1.7277      3rd Qu.: 0.09256
## Max.      : 0.40997      Max.      :1.9223      Max.      : 0.25187
## IDM_norm_cooc.W.ADC Inv_var_cooc.W.ADC Correlation_cooc.W.ADC
## Min.      :0.9041      Min.      :-0.02408      Min.      :0.1014
## 1st Qu.:0.9687      1st Qu.: 0.04662      1st Qu.:0.3624
## Median :0.9868      Median : 0.06495      Median :0.4571
## Mean      :1.2262      Mean      : 0.07465      Mean      :0.5182
## 3rd Qu.:1.9060      3rd Qu.: 0.09746      3rd Qu.:0.5887
## Max.      :2.0230      Max.      : 0.26587      Max.      :1.3440
## Autocorrelation_cooc.W.ADC Tendency_cooc.W.ADC Shade_cooc.W.ADC
## Min.      : 928.8      Min.      : 576.1      Min.      :-231517
## 1st Qu.: 5977.2      1st Qu.: 1358.0      1st Qu.: 7524
## Median : 9096.7      Median : 2445.7      Median : 31458
## Mean      :11144.9      Mean      : 2969.2      Mean      : 58766
## 3rd Qu.:14469.5      3rd Qu.: 3452.3      3rd Qu.: 85528
## Max.      :43202.8      Max.      :13038.4      Max.      : 755230
## Prominence_cooc.W.ADC IC1_d.W.ADC IC2_d.W.ADC
## Min.      : 1433500      Min.      :-0.50566      Min.      :0.5665
## 1st Qu.: 5716560      1st Qu.: -0.16643      1st Qu.:0.7903
## Median : 19224987      Median : -0.11797      Median :0.8772
## Mean      : 33910637      Mean      :-0.13225      Mean      :1.0345
## 3rd Qu.: 34839926      3rd Qu.: -0.07287      3rd Qu.:1.2267
## Max.      :307755358      Max.      :-0.02415      Max.      :1.9966
## Coarseness_vdif.W.ADC Contrast_vdif.W.ADC Busyness_vdif.W.ADC
## Min.      :-0.061838      Min.      : 0.2571      Min.      :-0.05337
## 1st Qu.: -0.006689      1st Qu.: 0.8881      1st Qu.: 0.01175
## Median : 0.010730      Median : 1.2594      Median : 0.02935
## Mean      : 0.009025      Mean      : 1.7176      Mean      : 0.03315
## 3rd Qu.: 0.024410      3rd Qu.: 1.8783      3rd Qu.: 0.05108
## Max.      : 0.136240      Max.      :11.8652      Max.      : 0.20823
## Complexity_vdif.W.ADC Strength_vdif.W.ADC SRE_align.W.ADC LRE_align.W.ADC
## Min.      : 13124      Min.      : 5.875      Min.      :0.9168      Min.      :0.971
## 1st Qu.: 80886      1st Qu.: 26.207      1st Qu.:0.9827      1st Qu.:1.033
## Median : 171030      Median : 39.950      Median :0.9948      Median :1.050
## Mean      : 230384      Mean      : 55.180      Mean      :1.2398      Mean      :1.309
## 3rd Qu.: 319660      3rd Qu.: 69.655      3rd Qu.:1.9273      3rd Qu.:2.036
## Max.      :1592687      Max.      :275.938      Max.      :2.0293      Max.      :2.231
## GLNU_align.W.ADC RLNU_align.W.ADC RP_align.W.ADC LGRE_align.W.ADC
## Min.      : 2.009      Min.      : 84.52      Min.      :0.9094      Min.      :-0.062656
## 1st Qu.: 9.596      1st Qu.: 782.23      1st Qu.:0.9791      1st Qu.: -0.011249
## Median : 21.609      Median : 1579.33      Median :0.9919      Median : 0.006620
## Mean      : 41.983      Mean      : 3616.56      Mean      :1.2353      Mean      : 0.003831
## 3rd Qu.: 49.552      3rd Qu.: 4373.92      3rd Qu.:1.9126      3rd Qu.: 0.019870
## Max.      :399.403      Max.      :37073.37      Max.      :2.0264      Max.      : 0.083100
## HGRE_align.W.ADC LGSRE_align.W.ADC HGSRE_align.W.ADC LGHRE_align.W.ADC
## Min.      : 1203      Min.      :-0.062658      Min.      : 1197      Min.      :-0.062644

```



```

## 1st Qu.: 6277      1st Qu.: -0.011255      1st Qu.: 6229      1st Qu.: -0.011226
## Median :10535      Median : 0.006610      Median :10430      Median : 0.006850
## Mean :11874      Mean : 0.003696      Mean :11767      Mean : 0.004544
## 3rd Qu.:15160      3rd Qu.: 0.019860      3rd Qu.:15039      3rd Qu.: 0.020246
## Max. :44980      Max. : 0.079860      Max. :44616      Max. : 0.100080
## HGLRE_align.W.ADC GLNU_norm_align.W.ADC RLNU_norm_align.W.ADC
## Min. : 1228      Min. : -0.054220      Min. : 0.8830
## 1st Qu.: 6510      1st Qu.: 0.001565      1st Qu.: 0.9630
## Median :10971      Median : 0.016165      Median : 0.9811
## Mean :12314      Mean : 0.015675      Mean :1.2181
## 3rd Qu.:15680      3rd Qu.: 0.032238      3rd Qu.:1.8599
## Max. :46468      Max. : 0.087040      Max. :2.0143
## GLVAR_align.W.ADC RLVAR_align.W.ADC Entropy_align.W.ADC SZSE.W.ADC
## Min. : 245.7      Min. : -0.051522      Min. : 5.391      Min. : 0.8776
## 1st Qu.: 552.4      1st Qu.: 0.004423      1st Qu.: 6.386      1st Qu.: 0.9617
## Median : 976.3      Median : 0.019194      Median : 6.872      Median : 0.9785
## Mean :1109.8      Mean : 0.018487      Mean : 8.232      Mean :1.2124
## 3rd Qu.:1292.1      3rd Qu.: 0.033640      3rd Qu.:10.782      3rd Qu.:1.8489
## Max. :4324.2      Max. : 0.104882      Max. :15.143      Max. :1.9947
## LZSE.W.ADC LGLZE.W.ADC HGLZE.W.ADC SZLGE.W.ADC
## Min. :1.029      Min. : -0.062651      Min. : 1226      Min. : -0.062658
## 1st Qu.:1.103      1st Qu.: -0.011240      1st Qu.: 6306      1st Qu.: -0.011250
## Median :1.144      Median : 0.006480      Median :10639      Median : 0.006184
## Mean :1.433      Mean : 0.003563      Mean :11908      Mean : 0.003268
## 3rd Qu.:2.069      3rd Qu.: 0.019763      3rd Qu.:15245      3rd Qu.: 0.019752
## Max. :2.761      Max. : 0.073640      Max. :45137      Max. : 0.065320
## SZHGE.W.ADC LZLGE.W.ADC LZHGE.W.ADC GLNU_area.W.ADC
## Min. : 1191      Min. : -0.062616      Min. : 1369      Min. : 2.016
## 1st Qu.: 6169      1st Qu.: -0.011160      1st Qu.: 6882      1st Qu.: 9.340
## Median :10324      Median : 0.009070      Median :11686      Median : 20.363
## Mean :11600      Mean : 0.006405      Mean :13334      Mean : 40.154
## 3rd Qu.:14845      3rd Qu.: 0.021579      3rd Qu.:17173      3rd Qu.: 48.480
## Max. :44249      Max. : 0.136980      Max. :51885      Max. :387.349
## ZSNU.W.ADC ZSP.W.ADC GLNU_norm.W.ADC ZSNU_norm.W.ADC
## Min. : 84.04      Min. : 0.8518      Min. : -0.054262      Min. : 0.7920
## 1st Qu.: 741.28      1st Qu.: 0.9458      1st Qu.: 0.001476      1st Qu.: 0.9085
## Median :1479.04      Median : 0.9661      Median : 0.018532      Median : 0.9380
## Mean :3334.08      Mean :1.1938      Mean : 0.016572      Mean :1.1576
## 3rd Qu.:3976.61      3rd Qu.:1.7974      3rd Qu.: 0.033476      3rd Qu.:1.6779
## Max. :35037.70      Max. :1.9805      Max. : 0.086040      Max. :2.0071
## GLVAR_area.W.ADC ZSVAR.W.ADC Entropy_area.W.ADC
## Min. : 253.6      Min. : -0.02982      Min. : 5.585
## 1st Qu.: 564.9      1st Qu.: 0.03180      1st Qu.: 6.626
## Median : 983.1      Median : 0.05597      Median : 7.026
## Mean :1114.7      Mean : 0.06550      Mean : 8.507
## 3rd Qu.:1295.2      3rd Qu.: 0.09194      3rd Qu.:11.170
## Max. :4306.8      Max. : 0.31875      Max. :15.381

```

```
df <- na.omit(df)
```

```
head(df)
```

```
## Institution Failure.binary Failure Entropy_cooc.W.ADC GLNU_align.H.PET
```

## 1	A	0	49.30000	12.85352	46.25635
## 2	A	1	12.56667	12.21115	27.45454
## 3	A	0	79.80000	12.75682	90.19570
## 4	A	1	17.86667	13.46730	325.64333
## 5	A	0	39.56667	12.63733	89.57904
## 6	A	1	4.76667	13.16159	101.71345
##	Min_hist.PET	Max_hist.PET	Mean_hist.PET	Variance_hist.PET	
## 1	6.249117	17.825541	9.783773	6.814365	
## 2	11.005214	26.469077	15.426640	12.932074	
## 3	2.777718	6.877486	4.295330	0.923425	
## 4	6.296588	22.029843	10.334779	6.649795	
## 5	3.583846	7.922501	4.454175	0.572094	
## 6	2.597947	6.206142	3.769041	0.615282	
##	Standard_Deviation_hist.PET	Skewness_hist.PET	Kurtosis_hist.PET		
## 1		2.612479	0.688533	-0.339727	
## 2		3.598298	0.789526	-0.319613	
## 3		0.962163	0.248637	-0.944246	
## 4		2.580759	0.832011	0.855861	
## 5		0.757225	1.574845	3.250288	
## 6		0.785315	0.610611	-0.090239	
##	Energy_hist.PET	Entropy_hist.PET	AUC_hist.PET	H_suv.PET	Volume.PET
## 1	0.005095	9.629587	0.506553	1.123930	13751.970
## 2	0.006297	8.072951	0.507519	1.927281	9327.705
## 3	0.005015	9.669316	0.503300	0.410573	26624.003
## 4	0.003289	10.574730	0.544274	0.919612	51058.073
## 5	0.008066	7.621834	0.543922	0.306344	29414.553
## 6	0.005237	10.589120	0.507322	0.388752	14240.032
##	X3D_surface.PET	ratio_3ds_vol.PET	ratio_3ds_vol_norm.PET	irregularity.PET	
## 1	5622.519	3.214263	15.91400	2.212137	
## 2	8356.832	4.848032	21.09429	2.348324	
## 3	16832.003	3.163721	19.52154	2.121251	
## 4	29100.294	2.027384	20.12864	1.859572	
## 5	7769.379	4.815431	21.01721	2.219725	
## 6	9563.905	3.699578	18.53249	2.136984	
##	tumor_length.PET	Compactness_v1.PET	Compactness_v2.PET		
## 1	44.04796	0.003366	0.002778		
## 2	39.39796	0.003078	0.002637		
## 3	50.91422	0.003145	0.002664		
## 4	76.23900	0.003118	0.002653		
## 5	36.93490	0.003081	0.002638		
## 6	46.00253	0.003195	0.002687		
##	Spherical_disproportion.PET	Sphericity.PET	Asphericity.PET	Center_of_mass.PET	
## 1		15.91400	0.065378	14.91400	0.811086
## 2		21.09429	0.049942	20.09429	0.587732
## 3		19.52154	0.053762	18.52154	0.393189
## 4		20.12864	0.052217	19.12864	0.866799
## 5		21.01721	0.050116	20.01721	0.525997
## 6		18.53249	0.056497	17.53249	0.308017
##	Max_3D_diam.PET	Major_axis_length.PET	Minor_axis_length.PET		
## 1	44.04796	34.60475	25.88546		
## 2	39.39796	35.13100	27.30539		
## 3	50.91422	48.12896	30.37293		
## 4	76.23900	64.12797	54.46594		
## 5	36.93490	35.99413	23.84296		

## 6	46.00253	42.95117	31.60120	
##	Least_axis_length.PET	Elongation.PET	Flatness.PET	Max_cooc.L.PET
## 1	24.98484	0.750543	0.724516	0.005020
## 2	21.15130	0.779759	0.604571	0.008190
## 3	27.52209	0.633585	0.574348	0.005033
## 4	51.56490	0.851856	0.806616	0.005971
## 5	21.38912	0.664919	0.596741	0.007553
## 6	15.99647	0.738262	0.374927	0.005396
##	Average_cooc.L.PET	Variance_cooc.L.PET	Entropy_cooc.L.PET	DAVE_cooc.L.PET
## 1	22.87750	205.6627	10.688721	11.857838
## 2	21.90654	226.6299	10.291026	13.993568
## 3	27.25065	208.9461	10.878250	12.281559
## 4	17.81061	102.6657	10.238635	7.473982
## 5	15.35938	142.2193	9.829042	10.237690
## 6	23.34637	181.6257	10.702694	11.660805
##	DVAR_cooc.L.PET	DENT_cooc.L.PET	SAVE_cooc.L.PET	SVAR_cooc.L.PET
## 1	84.21646	4.997454	45.75246	587.8808
## 2	129.35103	5.205762	43.81055	581.4143
## 3	85.30680	5.004455	54.49878	599.6980
## 4	43.94774	4.379716	35.61869	310.8875
## 5	79.40248	4.799453	30.71623	384.7110
## 6	87.31571	4.964671	46.69022	503.2667
##	SENT_cooc.L.PET	ASM_cooc.L.PET	Contrast_cooc.L.PET	Dissimilarity_cooc.L.PET
## 1	6.530649	0.003302	234.76478	11.857838
## 2	6.489125	0.003596	325.10017	13.993568
## 3	6.587702	0.003198	236.08136	12.281559
## 4	6.108770	0.003680	99.77033	7.473982
## 5	6.049095	0.004001	184.16098	10.237690
## 6	6.460137	0.003268	223.23109	11.660805
##	Inv_diff_cooc.L.PET	Inv_diff_norm_cooc.L.PET	IDM_cooc.L.PET	
## 1	0.165784		0.858670	0.088949
## 2	0.156018		0.839093	0.085385
## 3	0.154252		0.852986	0.079027
## 4	0.228938		0.904866	0.141631
## 5	0.188717		0.875632	0.108336
## 6	0.166582		0.860102	0.090157
##	IDM_norm_cooc.L.PET	Inv_var_cooc.L.PET	Correlation_cooc.L.PET	
## 1	0.953919	0.091308		0.431777
## 2	0.937653	0.087501		0.285278
## 3	0.952616	0.084629		0.437596
## 4	0.980381	0.149832		0.516631
## 5	0.963872	0.114365		0.355073
## 6	0.955880	0.093295		0.387992
##	Autocorrelation_cooc.L.PET	Tendency_cooc.L.PET	Shade_cooc.L.PET	
## 1	611.5456	587.8808		6860.4448
## 2	543.8667	581.4143		4691.7137
## 3	833.3669	599.6980		403.0883
## 4	369.9095	310.8875		3805.6356
## 5	285.9728	384.7110		9785.4495
## 6	614.9464	503.2667		4106.7640
##	Prominence_cooc.L.PET	IC1_.L.PET	IC2_.L.PET	Coarseness_vdif_.L.PET
## 1	869822.0	-0.083966	0.789572	0.014320
## 2	803734.5	-0.096731	0.814047	0.014196
## 3	800129.8	-0.072366	0.758160	0.016269

## 4	345452.5	-0.050269	0.655209	0.004936		
## 5	743501.3	-0.070677	0.727840	0.017239		
## 6	708597.7	-0.073872	0.759220	0.016045		
##	Contrast_vdif_.L.PET	Busyness_vdif_.L.PET	Complexity_vdif_.L.PET			
## 1	1.021460		0.087378	17053.35		
## 2	1.510199		0.080209	21289.19		
## 3	1.014169		0.057518	15199.89		
## 4	0.306364		0.392674	10762.05		
## 5	0.854170		0.081956	16796.63		
## 6	0.895212		0.069338	15170.83		
##	Strength_vdif_.L.PET	SRE_align.L.PET	LRE_align.L.PET	GLNU_align.L.PET		
## 1	27.40494	0.986583	1.070671	10.162131		
## 2	35.76496	0.989835	1.057129	8.416510		
## 3	24.45341	0.989308	1.057095	9.117958		
## 4	5.55092	0.973462	1.129413	94.565775		
## 5	57.03783	0.986186	1.069172	10.574675		
## 6	26.08534	0.985853	1.070890	10.057347		
##	RLNU_align.L.PET	RP_align.L.PET	LGRE_align.L.PET	HGRE_align.L.PET		
## 1	383.8912	0.981089	0.063695	590.1484		
## 2	263.3486	0.985313	0.065825	560.1103		
## 3	394.6779	0.984963	0.039224	781.3663		
## 4	2941.3190	0.963661	0.048051	386.6793		
## 5	262.4745	0.981101	0.091713	295.6003		
## 6	397.9059	0.980630	0.048144	627.3399		
##	LGSRE_align.L.PET	HGSRE_align.L.PET	LGHRE_align.L.PET	HGLRE_align.L.PET		
## 1	0.062491	580.5855	0.068738	631.5734		
## 2	0.064212	554.5346	0.072438	583.5148		
## 3	0.038778	768.0350	0.041011	836.1597		
## 4	0.046564	376.9558	0.054360	428.3121		
## 5	0.090222	292.3243	0.097821	308.7154		
## 6	0.047408	618.2607	0.051089	665.2563		
##	GLNU_norm_align.L.PET	RLNU_norm_align.L.PET	GLVAR_align.L.PET			
## 1	0.027914	0.961445	201.5094			
## 2	0.033437	0.969710	214.6379			
## 3	0.024834	0.968128	216.6109			
## 4	0.032318	0.928789	107.6866			
## 5	0.041113	0.960224	121.3562			
## 6	0.026718	0.959459	187.2442			
##	RLVAR_align.L.PET	Entropy_align.L.PET	SZSE.L.PET	LZSE.L.PET	LGLZE.L.PET	
## 1	0.025908	5.586143	0.926936	1.384001	0.062262	
## 2	0.021453	5.385714	0.961338	1.244838	0.064793	
## 3	0.020843	5.702830	0.974475	1.114749	0.040452	
## 4	0.046375	5.480351	0.905696	1.617562	0.047964	
## 5	0.024509	5.053054	0.966013	1.148597	0.093268	
## 6	0.025153	5.622598	0.936782	1.322943	0.046110	
##	HGLZE.L.PET	SZLGE.L.PET	SZHGE.L.PET	LZLGE.L.PET	LZHGE.L.PET	GLNU_area.L.PET
## 1	592.5775	0.056127	553.5787	0.089951	831.7709	9.166018
## 2	566.7718	0.060570	546.1829	0.086532	650.3679	7.817915
## 3	769.6933	0.040391	735.9377	0.040694	904.7157	8.877842
## 4	393.5484	0.043346	360.6300	0.076789	591.1260	83.352565
## 5	300.9426	0.091138	295.8022	0.101787	321.5044	10.245976
## 6	617.0878	0.041385	567.5274	0.065899	836.6098	9.390127
##	ZSNU.L.PET	ZSP.L.PET	GLNU_norm.L.PET	ZSNU_norm.L.PET	GLVAR_area.L.PET	
## 1	301.1987	0.899841	0.027499	0.823228	201.7881	

## 2	233.4102	0.941158	0.032589	0.900252	213.9100
## 3	372.1247	0.966472	0.024663	0.930516	216.4466
## 4	2206.3053	0.860538	0.031941	0.781042	109.9100
## 5	242.2684	0.956101	0.040895	0.909893	123.6639
## 6	325.9069	0.913118	0.026787	0.844660	184.6198
##	ZSVAR.L.PET	Entropy_area.L.PET	Max_cooc.H.PET	Average_cooc.H.PET	
## 1	0.142022	5.886187	0.031232	39.87474	
## 2	0.109793	5.546278	0.043568	39.22729	
## 3	0.038537	5.775912	0.169447	44.90994	
## 4	0.259194	5.901957	0.040212	38.15816	
## 5	0.048849	5.156114	0.423535	49.45276	
## 6	0.116919	5.851581	0.217884	46.26425	
##	Variance_cooc.H.PET	Entropy_cooc.H.PET	DAVE_cooc.H.PET	DVAR_cooc.H.PET	
## 1	255.25108	6.344137	13.397288	131.6433	
## 2	259.22064	7.168339	14.938851	146.5065	
## 3	226.94291	3.662030	11.817845	143.8888	
## 4	276.46636	6.205163	12.489582	129.5153	
## 5	65.47745	2.835302	6.261891	56.9727	
## 6	174.57711	3.122212	10.059360	134.1508	
##	DENT_cooc.H.PET	SAVE_cooc.H.PET	SVAR_cooc.H.PET	SENT_cooc.H.PET	
## 1	4.528843	79.74696	769.9364	5.285948	
## 2	2.880112	75.45206	667.2773	5.693972	
## 3	4.354173	89.81735	824.2760	3.057425	
## 4	4.257568	76.31379	820.4186	5.186241	
## 5	3.891832	98.90299	765.7524	2.360339	
## 6	1.916625	92.52596	463.0127	2.599031	
##	ASM_cooc.H.PET	Contrast_cooc.H.PET	Dissemblability_cooc.H.PET		
## 1	0.017558	311.0628	13.397288		
## 2	0.012079	369.6002	14.938851		
## 3	0.096088	283.4905	11.817845		
## 4	0.020168	285.4418	12.489582		
## 5	0.233933	96.1523	6.261891		
## 6	0.146959	235.2907	10.059360		
##	Inv_diff_cooc.H.PET	Inv_diff_norm_cooc.H.PET	IDM_cooc.H.PET		
## 1	0.240428	0.846191	0.181276		
## 2	0.198536	0.831014	0.137656		
## 3	0.439712	0.866805	0.405377		
## 4	0.279879	0.856139	0.224079		
## 5	0.576561	0.923498	0.543300		
## 6	0.516123	0.886644	0.485744		
##	IDM_norm_cooc.H.PET	Inv_var_cooc.H.PET	Correlation_cooc.H.PET		
## 1	0.940222	0.030684	0.393202		
## 2	0.929828	0.032006	0.289621		
## 3	0.944553	0.011773	0.377943		
## 4	0.945253	0.032706	0.486297		
## 5	0.980482	0.021087	0.268281		
## 6	0.953100	0.009811	0.328640		
##	Autocorrelation_cooc.H.PET	Tendency_cooc.H.PET	Shade_cooc.H.PET		
## 1	1689.514	709.9364	-2209.927		
## 2	1613.004	667.2773	-4195.799		
## 3	2101.874	624.2760	-4303.802		
## 4	1589.599	820.4186	-5395.462		
## 5	2462.728	165.7524	1099.232		
## 6	2197.079	463.0127	-2285.992		

##	Prominence_cooc.H.PET	IC1_d.H.PET	IC2_d.H.PET	Coarseness_vdif.H.PET		
## 1	1028531.31	-0.043805	0.512217	0.004319		
## 2	957339.84	-0.023569	0.418010	0.005180		
## 3	729696.02	-0.063791	0.473698	0.003375		
## 4	1434052.83	-0.069422	0.611279	0.002825		
## 5	55971.88	-0.044636	0.360145	0.003902		
## 6	381561.77	-0.056410	0.417972	0.003199		
##	Contrast_vdif.H.PET	Busyness_vdif.H.PET	Complexity_vdif.H.PET			
## 1	49.10863	0.141647	25517.13			
## 2	28.26579	0.103194	28339.01			
## 3	220.66779	0.236919	24028.42			
## 4	40.72831	0.833266	23437.94			
## 5	32.04753	0.124684	15279.35			
## 6	271.03091	0.279836	22773.21			
##	Strength_vdif.H.PET	SRE_align.H.PET	LRE_align.H.PET	RLNU_align.H.PET		
## 1	19.64713	0.917833	1.449477	291.82356		
## 2	25.47241	0.953059	1.241419	227.49063		
## 3	22.15293	0.774121	2.674531	165.69391		
## 4	2.79079	0.880393	1.732322	2033.70698		
## 5	53.29819	0.741090	2.918639	99.23077		
## 6	21.85351	0.720078	3.392842	140.39293		
##	RP_align.H.PET	LGRE_align.H.PET	HGRE_align.H.PET	LGSRE_align.H.PET		
## 1	0.888556	0.004341	1569.763	0.004198		
## 2	0.935326	0.004349	1536.186	0.004223		
## 3	0.710370	0.003527	1821.062	0.003336		
## 4	0.839415	0.005339	1588.246	0.005019		
## 5	0.684948	0.002975	2476.679	0.002849		
## 6	0.656286	0.003229	2111.778	0.003040		
##	HGSRE_align.H.PET	LGHRE_align.H.PET	HGLRE_align.H.PET	GLNU_norm_align.H.PET		
## 1	1433.081	0.005120	2278.993	0.130158		
## 2	1472.727	0.004991	1836.812	0.108781		
## 3	1318.500	0.004849	5694.966	0.309012		
## 4	1388.818	0.007300	2734.362	0.120339		
## 5	1889.628	0.003929	6544.325	0.470904		
## 6	1501.696	0.004877	7061.132	0.374988		
##	RLNU_norm_align.H.PET	GLVAR_align.H.PET	RLVAR_align.H.PET	Entropy_align.H.PET		
## 1	0.805658	271.94120	0.166759	3.665844		
## 2	0.881876	263.05257	0.089416	3.807145		
## 3	0.559747	231.23849	0.633026	2.962910		
## 4	0.733600	302.00409	0.279758	3.963763		
## 5	0.516961	63.36076	0.708711	2.615080		
## 6	0.492823	187.63061	0.894173	2.953297		
##	SZSE.H.PET	LZSE.H.PET	LGLZE.H.PET	HGLZE.H.PET	SZLGE.H.PET	SZHGE.H.PET
## 1	0.729896	6.346008	0.004206	1945.242	0.003751	1205.4141
## 2	0.889774	1.945761	0.004294	1541.326	0.004071	1371.5287
## 3	0.543152	38.343615	0.003595	1869.824	0.003145	833.9286
## 4	0.686000	28.192087	0.005281	2614.722	0.004412	1088.6316
## 5	0.494282	85.120177	0.002930	2778.032	0.002719	1427.6154
## 6	0.494144	151.989372	0.003258	2079.108	0.002893	988.7421
##	LZLGE.H.PET	LZHGE.H.PET	GLNU_area.H.PET	ZSNU.H.PET	ZSP.H.PET	GLNU_norm.H.PET
## 1	0.014967	9278.763	28.21123	112.61992	0.564877	0.125177
## 2	0.007054	2730.177	23.91083	171.00253	0.829245	0.106933
## 3	0.027806	99597.669	42.33586	36.25834	0.312626	0.330695
## 4	0.066848	39940.885	160.59767	604.01684	0.425782	0.117405

## 5	0.047180	166256.576	23.73782	17.00253	0.245387	0.351578
## 6	0.115459	288928.476	28.02885	17.76569	0.181354	0.371297
##	ZSNU_norm.H.PET	GLVAR_area.H.PET	ZSVAR_H.PET	Entropy_area.H.PET		
## 1	0.492171	263.01858	3.183797	4.580974		
## 2	0.749255	257.55868	0.482612	4.158935		
## 3	0.283583	218.15517	27.944240	4.080320		
## 4	0.434586	309.53854	22.609920	5.086907		
## 5	0.252530	70.97225	68.165160	3.954518		
## 6	0.236256	205.12926	120.717731	4.002762		
##	Max_cooc.W.PET	Average_cooc.W.PET	Variance_cooc.W.PET	Entropy_cooc.W.PET		
## 1	0.013277	8.741717	27.724284	8.310617		
## 2	0.015738	10.946398	54.254568	8.954940		
## 3	0.046074	4.019422	3.648015	5.580950		
## 4	0.013915	9.152454	25.597213	8.286935		
## 5	0.116685	2.577872	2.729045	4.706665		
## 6	0.063098	3.127779	2.391005	5.013592		
##	DAVE_cooc.W.PET	DVAR_cooc.W.PET	DENT_cooc.W.PET	SAVE_cooc.W.PET		
## 1	4.361115	12.870015	3.611785	17.480905		
## 2	6.845926	31.128005	4.224171	21.890266		
## 3	1.595373	1.629296	2.279633	8.036314		
## 4	3.728549	11.060383	3.431589	18.302378		
## 5	1.376959	1.728999	2.205393	5.153215		
## 6	1.306368	1.277859	2.076037	6.253029		
##	SVAR_cooc.W.PET	SENT_cooc.W.PET	ASM_cooc.W.PET	Contrast_cooc.W.PET		
## 1	79.024802	5.099087	0.006555	31.867274		
## 2	139.053134	5.483416	0.005298	77.960077		
## 3	10.420558	3.676978	0.027061	4.166444		
## 4	77.440194	5.106053	0.007012	24.943599		
## 5	7.293066	3.190894	0.061557	3.618055		
## 6	6.581107	3.336839	0.041094	2.977854		
##	Dissimilarity_cooc.W.PET	Inv_diff_cooc.W.PET	Inv_diff_norm_cooc.W.PET			
## 1	4.361115	0.306285	0.861048			
## 2	6.845926	0.244001	0.837985			
## 3	1.595373	0.503481	0.863798			
## 4	3.728549	0.343449	0.905179			
## 5	1.376959	0.558453	0.882471			
## 6	1.306368	0.553594	0.874095			
##	IDM_cooc.W.PET	IDM_norm_cooc.W.PET	Inv_var_cooc.W.PET	Correlation_cooc.W.PET		
## 1	0.213874	0.955388	0.224294	0.427805		
## 2	0.158456	0.936467	0.164222	0.284054		
## 3	0.439777	0.957440	0.421156	0.431424		
## 4	0.254836	0.980367	0.261941	0.515299		
## 5	0.509374	0.964322	0.439330	0.339500		
## 6	0.504966	0.961979	0.468899	0.379680		
##	Autocorrelation_cooc.W.PET	Tendency_cooc.W.PET	Shade_cooc.W.PET			
## 1	88.165309	79.024802	341.143402			
## 2	135.044039	139.053134	552.913441			
## 3	17.701479	10.420558	2.361775			
## 4	96.847788	77.440194	471.374078			
## 5	7.553672	7.293066	26.823935			
## 6	10.670526	6.581107	7.170907			
##	Prominence_cooc.W.PET	IC1_d.W.PET	IC2_d.W.PET	Coarseness_vdif.W.PET		
## 1	15813.1737	-0.042283	0.565302	0.015034		
## 2	45767.4163	-0.044029	0.591913	0.015811		

## 3	242.8423	-0.052987	0.524822	0.017811		
## 4	21312.7505	-0.056187	0.630354	0.004934		
## 5	276.1447	-0.033151	0.398878	0.018221		
## 6	124.4042	-0.044775	0.466821	0.017235		
##	Contrast_vdif.W.PET	Busyness_vdif.W.PET	Complexity_vdif.W.PET			
## 1	0.294464	0.717283	869.48613			
## 2	0.599158	0.420854	2313.88985			
## 3	0.112568	2.860859	40.08855			
## 4	0.133588	1.549091	1346.28621			
## 5	0.078944	3.650188	44.97271			
## 6	0.079545	4.181398	27.61148			
##	Strength_vdif.W.PET	SRE_align.W.PET	LRE_align.W.PET	GLNU_align.W.PET		
## 1	3.919855	0.961787	1.191350	24.97624		
## 2	8.341981	0.977438	1.116168	14.88136		
## 3	0.511453	0.889821	1.618702	53.72505		
## 4	1.384522	0.943354	1.291573	179.17215		
## 5	1.109636	0.876250	1.674603	59.72108		
## 6	0.444774	0.863194	1.800706	67.44333		
##	RLNU_align.W.PET	RP_align.W.PET	LGRE_align.W.PET	HGRE_align.W.PET		
## 1	347.5995	0.947236	0.150278	85.345885		
## 2	250.6373	0.968373	0.127690	139.175484		
## 3	265.0196	0.853307	0.272808	15.983362		
## 4	2609.2747	0.922696	0.092857	101.288786		
## 5	170.2453	0.840992	0.466475	7.937118		
## 6	245.9412	0.822440	0.339659	10.636341		
##	LGSRE_align.W.PET	HGSRE_align.W.PET	LGHRE_align.W.PET	HGLRE_align.W.PET		
## 1	0.144360	82.365395	0.178628	98.96776		
## 2	0.122525	136.722689	0.150485	150.71592		
## 3	0.245883	13.790048	0.414898	28.12741		
## 4	0.087782	95.978334	0.117784	126.22675		
## 5	0.401364	7.231352	0.833918	11.22377		
## 6	0.297964	9.120687	0.601806	18.69612		
##	GLNU_norm_align.W.PET	RLNU_norm_align.W.PET	GLVAR_align.W.PET			
## 1	0.067162	0.901536	27.361255			
## 2	0.058138	0.938874	51.482886			
## 3	0.154351	0.749487	3.691659			
## 4	0.061479	0.859819	27.190856			
## 5	0.256845	0.724823	2.405984			
## 6	0.196000	0.702794	2.523334			
##	RLVAR_align.W.PET	Entropy_align.W.PET	SZSE.W.PET	LZSE.W.PET	LGLZE.W.PET	
## 1	0.069370	4.413771	0.862196	2.111226	0.136626	
## 2	0.043126	4.601911	0.939019	1.436265	0.126898	
## 3	0.229632	3.470022	0.737823	5.821460	0.309701	
## 4	0.107059	4.683410	0.816094	3.396694	0.091699	
## 5	0.239812	2.974484	0.688181	6.186741	0.438075	
## 6	0.289495	3.306066	0.662526	12.143891	0.342286	
##	HGLZE.W.PET	SZLGE.W.PET	SZHGE.W.PET	LZLGE.W.PET	LZHGE.W.PET	GLNU_area.W.PET
## 1	88.918679	0.112325	79.094274	0.392257	161.03980	20.13918
## 2	138.464377	0.116457	128.987889	0.195656	189.79771	13.47643
## 3	14.973723	0.247502	10.310508	1.043890	117.40582	38.33586
## 4	106.496868	0.073436	88.831921	0.286957	297.89713	131.17762
## 5	9.015688	0.284427	6.692377	3.360406	31.91043	35.02885
## 6	10.745985	0.252353	6.482655	5.046844	107.42661	36.93970
##	ZSNU.W.PET	ZSP.W.PET	GLNU_norm.W.PET	ZSNU_norm.W.PET	GLVAR_area.W.PET	



## 1	224.38141	0.789816	0.065066	0.699359	27.622423
## 2	211.55675	0.901447	0.056642	0.852145	50.978030
## 3	121.85027	0.586665	0.160280	0.503961	3.807675
## 4	1419.26821	0.697656	0.059662	0.620677	29.116647
## 5	66.31832	0.545387	0.232966	0.438818	2.699725
## 6	77.07583	0.451942	0.195918	0.406055	2.633927
##	ZSVAR.W.PET	Entropy_area.W.PET	Min_hist.ADC	Max_hist.ADC	Mean_hist.ADC
## 1	0.497852	4.937916	549.00253	2268.003	1238.232
## 2	0.198720	4.834988	0.00253	2211.003	1158.946
## 3	2.890741	4.143192	634.00253	2860.003	1252.476
## 4	1.327156	5.449999	0.00253	2869.003	1195.303
## 5	2.793389	3.991207	0.00253	2389.003	1022.390
## 6	7.192684	4.330361	0.00253	2498.003	1344.979
##	Variance_hist.ADC	Standard_Deviation_hist.ADC	Skewness_hist.ADC		
## 1	113473.17		336.8603	1.05752	
## 2	83953.26		289.7494	-0.49105	
## 3	193194.07		439.5410	1.53649	
## 4	132561.08		364.0919	0.24067	
## 5	110268.35		332.0693	0.31916	
## 6	276984.10		526.2953	-0.19996	
##	Kurtosis_hist.ADC	Energy_hist.ADC	Entropy_hist.ADC	AUC_hist.ADC	Volume.ADC
## 1	0.39978	0.00757	7.72697	0.52307	14702.81
## 2	1.41215	0.00503	8.82392	0.49147	11850.17
## 3	2.15473	0.00426	9.42564	0.56722	26067.89
## 4	0.23359	0.00365	10.02927	0.52148	51577.90
## 5	0.50069	0.00454	9.12787	0.50458	27419.14
## 6	-1.03080	0.00413	9.41989	0.49047	16131.31
##	X3D_surface.ADC	ratio_3ds_vol.ADC	ratio_3ds_vol_norm.ADC	irregularity.ADC	
## 1	2621.908	0.39370	1.52762	1.93975	
## 2	3814.097	0.27791	1.37006	1.76130	
## 3	5638.645	0.21884	1.32876	1.57930	
## 4	11033.100	0.21644	1.64907	1.63673	
## 5	5670.769	0.22562	1.35892	1.61457	
## 6	6099.528	0.30552	1.70690	1.72859	
##	Compactness_v1.ADC	Compactness_v2.ADC	Spherical_disproportion.ADC		
## 1	0.03070	0.28444	1.52762		
## 2	0.03570	0.39354	1.37006		
## 3	0.03727	0.43122	1.32876		
## 4	0.02764	0.22655	1.64907		
## 5	0.03611	0.40326	1.35892		
## 6	0.02637	0.20451	1.70690		
##	Sphericity.ADC	Asphericity.ADC	Center_of_mass.ADC	Max_3D_diam.ADC	
## 1	0.65823	0.52762	0.97407	46.80855	
## 2	0.73378	0.37006	1.00173	57.64178	
## 3	0.75655	0.32876	1.48789	64.07496	
## 4	0.60987	0.64907	1.32794	85.02235	
## 5	0.73978	0.35892	0.57983	59.88998	
## 6	0.58926	0.70690	1.60559	66.42410	
##	Major_axis_length.ADC	Minor_axis_length.ADC	Least_axis_length.ADC		
## 1	45.53640	20.24517	13.58989		
## 2	35.07877	28.70241	23.63536		
## 3	42.14714	36.72698	25.93458		
## 4	58.00549	42.98623	35.06326		
## 5	39.28351	35.40209	31.13508		

## 6	52.01087	34.53146	21.82211
##	Elongation.ADC	Flatness.ADC	Max_cooc.L.ADC
## 1	0.44709	0.30093	0.01362
## 2	0.82074	0.67629	0.00769
## 3	0.87392	0.61784	0.00984
## 4	0.74359	0.60699	0.00893
## 5	0.90372	0.79509	0.00863
## 6	0.66644	0.42207	0.00548
##	Variance_cooc.L.ADC	Entropy_cooc.L.ADC	DAVE_cooc.L.ADC
## 1	135.95808	9.35172	9.33833
## 2	60.59539	9.52569	6.58341
## 3	159.14565	9.93157	8.05607
## 4	57.02199	9.50974	5.46198
## 5	65.76514	9.76494	6.96837
## 6	176.68232	10.64861	9.13371
##	DENT_cooc.L.ADC	SAVE_cooc.L.ADC	SVAR_cooc.L.ADC
## 1	4.68745	48.53685	361.5607
## 2	4.18551	68.30632	167.0920
## 3	4.48343	34.80936	490.1310
## 4	3.95039	52.39829	174.5978
## 5	4.26293	54.05993	180.9453
## 6	4.65758	66.62846	552.9789
##	ASM_cooc.L.ADC	Contrast_cooc.L.ADC	Dissimilarity_cooc.L.ADC
## 1	0.00535	182.26652	9.33833
## 2	0.00448	75.28447	6.58341
## 3	0.00458	146.44656	8.05607
## 4	0.00454	53.48506	5.46198
## 5	0.00414	82.11021	6.96837
## 6	0.00338	153.74529	9.13371
##	Inv_diff_cooc.L.ADC	Inv_diff_norm_cooc.L.ADC	IDM_cooc.L.ADC
## 1	0.23569	0.88844	0.15619
## 2	0.24103	0.91456	0.15044
## 3	0.24921	0.90225	0.16496
## 4	0.27847	0.92805	0.18834
## 5	0.23450	0.90993	0.14567
## 6	0.20980	0.88787	0.12604
##	IDM_norm_cooc.L.ADC	Inv_var_cooc.L.ADC	Correlation_cooc.L.ADC
## 1	0.96528	0.15633	0.33222
## 2	0.98542	0.15887	0.38132
## 3	0.97276	0.17144	0.54243
## 4	0.99019	0.19368	0.53355
## 5	0.98376	0.15283	0.37826
## 6	0.96963	0.13018	0.56744
##	Autocorrelation_.L.ADC	Tendency_cooc.L.ADC	Shade_.L.ADC
## 1	633.7211	361.5607	7639.8939
## 2	1189.3065	167.0920	-1156.8109
## 3	388.8025	490.1310	17093.4493
## 4	716.6097	174.5978	616.3283
## 5	755.2618	180.9453	592.0947
## 6	1209.5645	552.9789	-1837.1897
##	IC1_.L.ADC	IC2_.L.ADC	Coarseness_vdif_.L.ADC
## 1	-0.11842	0.83912	0.02135
## 2	-0.05061	0.63924	0.01258
## 3	-0.07274	0.73740	0.00784

## 4	-0.06200	0.68774	0.00556	0.15512		
## 5	-0.04812	0.63329	0.01085	0.27967		
## 6	-0.09225	0.81078	0.01042	0.60161		
##	Busyness_vdif_.L.ADC Complexity_vdif_.L.ADC Strength_vdif_.L.ADC					
## 1	0.04811		8748.919	30.44366		
## 2	0.05243		5213.433	10.85376		
## 3	0.21602		9811.189	12.83805		
## 4	0.20181		4912.319	3.52728		
## 5	0.08515		5705.778	8.31391		
## 6	0.06946		8974.106	10.09240		
##	SRE_align.L.ADC LRE_align.L.ADC GLNU_align.L.ADC RLNU_align.L.ADC					
## 1	0.97677	1.11587	9.40856	232.7602		
## 2	0.97564	1.11803	26.43616	645.9593		
## 3	0.96919	1.14834	43.70925	1177.5699		
## 4	0.96126	1.18592	102.31243	2562.1046		
## 5	0.97703	1.11715	28.40221	788.2562		
## 6	0.98211	1.08986	21.25471	890.8892		
##	RP_align.L.ADC LGRE_align.L.ADC HGRE_align.L.ADC LGSRE_align.L.ADC					
## 1	0.96871	0.00908	831.5410	0.00900		
## 2	0.96669	0.00605	1191.1595	0.00602		
## 3	0.95823	0.01361	487.9258	0.01321		
## 4	0.94795	0.00810	786.0107	0.00784		
## 5	0.96795	0.00721	833.8975	0.00716		
## 6	0.97551	0.00591	1362.5846	0.00587		
##	HGSRE_align.L.ADC LGHRE_align.L.ADC HGLRE_align.L.ADC GLNU_norm_align.L.ADC					
## 1	820.9252	0.00946	876.2823	0.04038		
## 2	1157.5280	0.00615	1335.5219	0.04066		
## 3	478.4817	0.01531	528.1310	0.03656		
## 4	757.7992	0.00954	909.4492	0.03841		
## 5	815.1979	0.00741	917.7657	0.03626		
## 6	1335.9421	0.00607	1478.8704	0.02516		
##	RLNU_norm_align.L.ADC GLVAR_align.L.ADC RLVAR_align.L.ADC Entropy_align.L.ADC					
## 1	0.93826	154.93296	0.04141	5.29371		
## 2	0.93411	69.45486	0.04188	5.17751		
## 3	0.91877	156.30297	0.05240	5.47452		
## 4	0.90022	64.98946	0.06534	5.31012		
## 5	0.93819	78.05347	0.04295	5.30441		
## 6	0.95061	175.82591	0.03219	5.74239		
##	SZSE.L.ADC LZSE.L.ADC LGLZE.L.ADC HGLZE.L.ADC SZLGE.L.ADC SZHGE.L.ADC					
## 1	0.93703	1.33159	0.00927	858.5837	0.00905	831.8537
## 2	0.92448	1.39444	0.00624	1184.8610	0.00617	1086.4222
## 3	0.87706	1.82170	0.01338	514.4899	0.01189	468.7768
## 4	0.90217	1.59820	0.00767	792.5723	0.00686	720.2240
## 5	0.91279	1.55603	0.00757	833.3315	0.00743	760.6074
## 6	0.93634	1.29245	0.00606	1348.0807	0.00598	1247.0381
##	LZLGE.L.ADC LZHGE.L.ADC GLNU_area.L.ADC ZSNU.L.ADC ZSP.L.ADC GLNU_norm.L.ADC					
## 1	0.01042	981.8102	8.25894	197.1051	0.91304	0.03781
## 2	0.00662	1681.2171	24.10984	524.4053	0.89683	0.04002
## 3	0.02376	734.9103	34.98083	798.7819	0.82545	0.03416
## 4	0.01300	1204.1618	90.93063	1994.0215	0.86029	0.03768
## 5	0.00840	1283.7978	24.73040	600.5032	0.87065	0.03520
## 6	0.00644	1779.7534	19.65712	741.6164	0.91756	0.02479
##	ZSNU_norm.L.ADC GLVAR_area.L.ADC ZSVAR.L.ADC Entropy_area.L.ADC					
## 1	0.84485	158.37071	0.12535		5.53926	

## 2	0.81809	71.19097	0.14408	5.46224
## 3	0.72475	157.77185	0.34501	6.00431
## 4	0.77331	66.76247	0.23904	5.67242
## 5	0.79579	82.41219	0.22912	5.69671
## 6	0.84241	176.08461	0.09810	6.01150
##	Max_cooc.H.ADC	Average_cooc.H.ADC	Variance_cooc.H.ADC	Entropy_cooc.H.ADC
## 1	0.00464	29.95976	310.9790	11.72265
## 2	0.00420	33.61846	312.8265	11.35537
## 3	0.00622	30.58315	335.7248	11.53210
## 4	0.00461	30.75681	310.6464	11.60919
## 5	0.00393	31.26939	305.7453	11.56749
## 6	0.00496	30.52540	330.9954	11.34674
##	DAVE_cooc.H.ADC	DVAR_cooc.H.ADC	DENT_cooc.H.ADC	SAVE_cooc.H.ADC
## 1	15.71847	162.7022	5.37436	59.91700
## 2	15.39980	148.1637	5.34697	67.23440
## 3	13.82367	148.1751	5.24052	61.16377
## 4	12.67796	118.4962	5.12061	61.51110
## 5	15.22805	152.9835	5.34969	62.53624
## 6	12.68957	134.2114	5.12373	61.04826
##	SVAR_cooc.H.ADC	SENT_cooc.H.ADC	ASM_cooc.H.ADC	Contrast_cooc.H.ADC
## 1	834.2180	3.87272	0.00312	409.6931
## 2	866.0614	3.21841	0.00292	385.2396
## 3	1003.6953	3.81762	0.00296	339.1990
## 4	963.4178	3.73436	0.00290	279.1628
## 5	838.1762	3.61892	0.00291	384.8001
## 6	1028.8043	3.58842	0.00300	295.1723
##	Dissimilarity_cooc.H.ADC	Inv_diff_cooc.H.ADC	Inv_diff_norm_cooc.H.ADC	
## 1	15.71847	0.14449	0.82408	
## 2	15.39980	0.13871	0.82594	
## 3	13.82367	0.16711	0.84276	
## 4	12.67796	0.16941	0.85215	
## 5	15.22805	0.14798	0.82834	
## 6	12.68957	0.17461	0.85365	
##	IDM_cooc.H.ADC	IDM_norm_cooc.H.ADC	Inv_var_cooc.H.ADC	Correlation_cooc.H.ADC
## 1	0.07807	0.92422	0.08536	0.34381
## 2	0.06993	0.92757	0.07472	0.38679
## 3	0.09608	0.93697	0.09823	0.49736
## 4	0.09588	0.94673	0.09742	0.55321
## 5	0.07991	0.92793	0.08208	0.37325
## 6	0.09995	0.94500	0.10213	0.55665
##	Autocorrelation_cooc.H.ADC	Tendency_cooc.H.ADC	Shade_cooc.H.ADC	
## 1	1003.570	834.2180	4888.58538	
## 2	1250.239	866.0614	-4080.74039	
## 3	1101.301	1003.6953	7361.25628	
## 4	1116.892	963.4178	2723.56893	
## 5	1090.963	838.1762	-98.86912	
## 6	1115.056	1028.8043	509.16337	
##	Prominence_cooc.H.ADC	IC1_d.H.ADC	IC2_d.H.ADC	Coarseness_vdif.H.ADC
## 1	1518300	-0.15943	0.92667	0.02421
## 2	1589114	-0.05988	0.72703	0.01048
## 3	2077405	-0.06514	0.74687	0.00767
## 4	1824192	-0.05338	0.70043	0.00496
## 5	1538643	-0.05818	0.72034	0.00898
## 6	1971550	-0.09605	0.83415	0.00994

##	Contrast_vdif.H.ADC	Busyness_vdif.H.ADC	Complexity_vdif.H.ADC			
## 1	1.85757	0.03586	16806.66			
## 2	1.80534	0.09301	16186.56			
## 3	1.49359	0.14284	13464.93			
## 4	1.41213	0.29907	12641.54			
## 5	1.83534	0.11398	16384.39			
## 6	1.45238	0.09984	12914.39			
##	Strength_vdif.H.ADC	SRE_align.H.ADC	LRE_align.H.ADC	GLNU_align.H.ADC		
## 1	29.66079	0.99220	1.04664	4.07230		
## 2	10.90410	0.99123	1.04949	11.31108		
## 3	7.03589	0.98442	1.08787	20.88959		
## 4	3.31909	0.98263	1.08821	46.68109		
## 5	8.83863	0.98826	1.06328	13.66324		
## 6	10.10115	0.98601	1.07180	15.03108		
##	RLNU_align.H.ADC	RP_align.H.ADC	LGRE_align.H.ADC	HGRE_align.H.ADC		
## 1	246.9236	0.98876	0.02752	1363.457		
## 2	687.6470	0.98755	0.02717	1357.005		
## 3	1249.7235	0.97718	0.02776	1343.165		
## 4	2786.7832	0.97588	0.02638	1359.587		
## 5	824.1350	0.98339	0.02668	1358.525		
## 6	904.6320	0.98077	0.02665	1361.936		
##	LGSRE_align.H.ADC	HGSRE_align.H.ADC	LGHRE_align.H.ADC	HGLRE_align.H.ADC		
## 1	0.02695	1349.190	0.02979	1430.871		
## 2	0.02648	1340.025	0.02994	1430.336		
## 3	0.02707	1310.372	0.03080	1516.790		
## 4	0.02500	1334.267	0.03403	1466.691		
## 5	0.02577	1338.937	0.03083	1444.863		
## 6	0.02539	1342.295	0.03304	1444.991		
##	GLNU_norm_align.H.ADC	RLNU_norm_align.H.ADC	GLVAR_align.H.ADC			
## 1	0.01859	0.97614	329.5023			
## 2	0.01850	0.97320	329.3505			
## 3	0.01848	0.95625	325.6524			
## 4	0.01843	0.95150	327.9251			
## 5	0.01850	0.96576	329.3047			
## 6	0.01845	0.96023	327.5799			
##	RLVAR_align.H.ADC	Entropy_align.H.ADC	SZSE.H.ADC	LZSE.H.ADC	LGLZE.H.ADC	
## 1	0.01753	6.01510	0.96829	1.15763	0.02871	
## 2	0.01839	6.04615	0.96505	1.15896	0.02661	
## 3	0.03446	6.10308	0.93628	1.65499	0.02502	
## 4	0.03209	6.13418	0.95168	1.26414	0.02388	
## 5	0.02330	6.06848	0.95866	1.24670	0.02517	
## 6	0.02577	6.08534	0.94459	1.30242	0.02141	
##	HGLZE.H.ADC	SZLGE.H.ADC	SZHGE.H.ADC	LZLGE.H.ADC	LZHGE.H.ADC	GLNU_area.H.ADC
## 1	1353.052	0.02838	1303.023	0.03004	1618.472	3.99028
## 2	1355.552	0.02483	1302.738	0.03376	1584.380	10.95282
## 3	1293.549	0.02152	1196.086	0.04888	2953.476	19.42358
## 4	1353.634	0.02049	1283.290	0.04521	1725.853	44.63370
## 5	1328.345	0.02373	1252.666	0.04477	1783.557	13.08842
## 6	1363.271	0.01864	1280.446	0.06832	1716.544	14.22012
##	ZSNU.H.ADC	ZSP.H.ADC	GLNU_norm.H.ADC	ZSNU_norm.H.ADC	GLVAR_area.H.ADC	
## 1	223.9086	0.95584	0.01881	0.91643	324.0822	
## 2	619.2862	0.95385	0.01854	0.90792	327.6186	
## 3	1007.9399	0.89316	0.01876	0.84458	305.6363	
## 4	2450.9039	0.93025	0.01848	0.87848	321.4979	

## 5	727.4123	0.93716	0.01859	0.89506	324.1160
## 6	762.1457	0.92170	0.01856	0.86177	315.8327
##	ZSVAR.H.ADC	Entropy_area.H.ADC	Max_cooc.W.ADC	Average_cooc.W.ADC	
## 1	0.05727	6.06723	0.00675	65.37977	
## 2	0.05401	6.18594	0.00382	118.60405	
## 3	0.39430	6.37088	0.00376	60.27417	
## 4	0.10225	6.32299	0.00302	117.52784	
## 5	0.10193	6.21756	0.00355	101.18139	
## 6	0.11881	6.31556	0.00343	130.61014	
##	Variance_cooc.W.ADC	DAVE_cooc.W.ADC	DVAR_cooc.W.ADC	DENT_cooc.W.ADC	
## 1	1010.0875	25.43812	706.5272	6.06338	
## 2	746.1691	23.15154	390.8192	5.94785	
## 3	1991.6618	28.49457	1018.7085	6.25261	
## 4	1181.5174	24.91785	487.4797	6.07963	
## 5	945.7911	26.38488	481.6157	6.14012	
## 6	2779.9243	36.21365	1103.2759	6.60187	
##	SAVE_cooc.W.ADC	SVAR_cooc.W.ADC	SENT_cooc.W.ADC	ASM_cooc.W.ADC	
## 1	130.7570	2686.849	5.54316	0.00323	
## 2	237.2056	2057.975	2.77584	0.00280	
## 3	120.5458	6136.137	6.76239	0.00275	
## 4	235.0531	3617.812	6.13864	0.00265	
## 5	202.3602	2605.515	5.80987	0.00273	
## 6	261.2178	8705.171	3.87339	0.00266	
##	Contrast_cooc.W.ADC	Dis similarity_cooc.W.ADC	Inv_diff_cooc.W.ADC		
## 1	1353.496	25.43812	0.12826		
## 2	926.696	23.15154	0.10420		
## 3	1830.505	28.49457	0.10990		
## 4	1108.253	24.91785	0.10456		
## 5	1177.644	26.38488	0.09861		
## 6	2414.521	36.21365	0.08344		
##	Inv_diff_norm_cooc.W.ADC	IDM_cooc.W.ADC	IDM_norm_cooc.W.ADC		
## 1	0.88720	0.06987	0.96438		
## 2	0.91342	0.04700	0.98505		
## 3	0.90097	0.05282	0.97202		
## 4	0.92684	0.04905	0.98983		
## 5	0.90880	0.04557	0.98327		
## 6	0.88642	0.03696	0.96879		
##	Inv_var_cooc.W.ADC	Correlation_cooc.W.ADC	Autocorrelation_cooc.W.ADC		
## 1	0.07218	0.33254	4607.525		
## 2	0.04790	0.38156	14349.142		
## 3	0.05640	0.54299	4709.081		
## 4	0.04962	0.53354	14439.590		
## 5	0.04452	0.37996	10594.131		
## 6	0.03757	0.56825	18631.013		
##	Tendency_cooc.W.ADC	Shade_cooc.W.ADC	Prominence_cooc.W.ADC	IC1_d.W.ADC	
## 1	2686.849	154504.57	28492973	-0.20561	
## 2	2057.975	-49857.50	17100002	-0.13210	
## 3	6136.137	755229.72	202604689	-0.13981	
## 4	3617.812	57995.75	38091821	-0.08828	
## 5	2605.515	31890.26	23457384	-0.13836	
## 6	8705.171	-113889.96	146542333	-0.23037	
##	IC2_d.W.ADC	Coarseness_vdif.W.ADC	Contrast_vdif.W.ADC	Busyness_vdif.W.ADC	
## 1	0.96152	0.01818	4.78265	0.01774	
## 2	0.91270	0.01162	1.49489	0.00979	

## 3	0.92904	0.00742	1.99390	0.02744		
## 4	0.85241	0.00544	1.11708	0.01846		
## 5	0.92596	0.01002	1.72379	0.01257		
## 6	0.98684	0.00959	3.20701	0.00873		
##	Complexity_vdif.W.ADC	Strength_vdif.W.ADC	SRE_align.W.ADC	LRE_align.W.ADC		
## 1	94483.95	120.21874	0.99193	1.04495		
## 2	123984.35	70.45906	0.99469	1.03484		
## 3	322896.60	118.12334	0.99389	1.03917		
## 4	270786.27	41.10745	0.99307	1.04143		
## 5	183481.75	68.98942	0.99446	1.03681		
## 6	408132.18	116.30778	0.99699	1.02540		
##	GLNU_align.W.ADC	RLNU_align.W.ADC	RP_align.W.ADC	LGRE_align.W.ADC		
## 1	4.26622	246.5777	0.98876	0.00683		
## 2	8.60033	696.8829	0.99205	0.00418		
## 3	13.91071	1298.3291	0.99080	0.00430		
## 4	24.38419	2904.1988	0.98991	0.00579		
## 5	8.43212	844.4260	0.99159	0.00400		
## 6	6.05624	944.0342	0.99512	0.00374		
##	HGRE_align.W.ADC	LGSRE_align.W.ADC	HGSRE_align.W.ADC	LGHRE_align.W.ADC		
## 1	5992.756	0.00683	5952.927	0.00685		
## 2	14395.425	0.00418	14281.115	0.00418		
## 3	5853.808	0.00429	5824.143	0.00434		
## 4	15776.936	0.00562	15649.652	0.00681		
## 5	11683.555	0.00400	11599.962	0.00400		
## 6	21008.240	0.00373	20894.393	0.00374		
##	HGLRE_align.W.ADC	GLNU_norm_align.W.ADC	RLNU_norm_align.W.ADC			
## 1	6152.074	0.01935	0.97502			
## 2	14868.922	0.01462	0.98198			
## 3	5983.117	0.01300	0.97996			
## 4	16293.667	0.01072	0.97773			
## 5	12044.998	0.01230	0.98150			
## 6	21478.153	0.00885	0.98802			
##	GLVAR_align.W.ADC	RLVAR_align.W.ADC	Entropy_align.W.ADC	SZSE.W.ADC	LZSE.W.ADC	
## 1	1139.4041	0.01629	6.94511	0.98460	1.07424	
## 2	842.8456	0.01345	6.67452	0.96527	1.11797	
## 3	1938.7178	0.01519	6.79621	0.98765	1.17872	
## 4	1327.6869	0.01562	7.20649	0.98060	1.10239	
## 5	1109.3728	0.01437	6.95074	0.97667	1.13245	
## 6	2767.6284	0.01027	7.49193	0.98323	1.08445	
##	LGLZE.W.ADC	HGLZE.W.ADC	SZLGE.W.ADC	SZHGE.W.ADC	LZLGE.W.ADC	LZHGE.W.ADC
## 1	0.00686	6055.150	0.00686	6018.454	0.00690	6201.935
## 2	0.00422	14407.506	0.00422	14026.413	0.00423	16054.013
## 3	0.00433	5883.686	0.00430	5711.245	0.00453	6674.638
## 4	0.00511	15809.845	0.00455	15506.485	0.00888	17172.910
## 5	0.00403	11663.603	0.00403	11366.888	0.00405	13231.943
## 6	0.00376	20996.110	0.00375	20573.429	0.00377	22707.428
##	GLNU_area.W.ADC	ZSNU.W.ADC	ZSP.W.ADC	GLNU_norm.W.ADC	ZSNU_norm.W.ADC	
## 1	4.13400	239.2894	0.97918	0.01899	0.95586	
## 2	8.37627	644.7370	0.95637	0.01461	0.93288	
## 3	13.11686	1165.7026	0.97268	0.02501	0.91537	
## 4	23.84726	2760.4129	0.97203	0.01069	0.94658	
## 5	8.14437	784.5973	0.96469	0.02526	0.93769	
## 6	5.93657	893.1791	0.97662	0.00884	0.95272	
##	GLVAR_area.W.ADC	ZSVAR.W.ADC	Entropy_area.W.ADC			

```
## 1      1145.1050      0.02586      6.28632
## 2      847.5254      0.04153      6.77853
## 3     1923.8571      0.07104      7.15685
## 4     1329.9529      0.03848      7.29521
## 5     1116.3867      0.05223      7.05149
## 6     2743.2376      0.03055      7.54787
```

## K MEANS

separate training data and labels

```
x_train <- data.matrix(df[,-2])
label <- df[2]
```

## Standardization

```
x_train <- scale(x_train)
summary(x_train)
```

```
##      Institution      Failure      Entropy_cooc.W.ADC      GLNU_align.H.PET
## Min.      :-0.7095 Min.      :-1.1289 Min.      :-2.6407173 Min.      :-0.9982
## 1st Qu.: -0.7095 1st Qu.: -0.7892 1st Qu.: -0.6921994 1st Qu.: -0.6721
## Median : -0.7095 Median : -0.3066 Median : 0.0001827 Median : -0.1783
## Mean   : 0.0000 Mean   : 0.0000 Mean   : 0.0000000 Mean   : 0.0000
## 3rd Qu.: 1.0940 3rd Qu.: 0.6028 3rd Qu.: 0.6719746 3rd Qu.: 0.1947
## Max.    : 1.9957 Max.    : 3.7247 Max.    : 2.1464095 Max.    : 5.3894
## Min_hist.PET      Max_hist.PET      Mean_hist.PET      Variance_hist.PET
## Min.      :-1.4098 Min.      :-1.3604 Min.      :-1.3802 Min.      :-0.9758
## 1st Qu.: -0.6742 1st Qu.: -0.7578 1st Qu.: -0.7186 1st Qu.: -0.7523
## Median : -0.2256 Median : -0.2204 Median : -0.2033 Median : -0.3017
## Mean   : 0.0000 Mean   : 0.0000 Mean   : 0.0000 Mean   : 0.0000
## 3rd Qu.: 0.4998 3rd Qu.: 0.6421 3rd Qu.: 0.5710 3rd Qu.: 0.3681
## Max.    : 3.9898 Max.    : 3.7697 Max.    : 4.0472 Max.    : 4.2731
## Standard_Deviation_hist.PET Skewness_hist.PET Kurtosis_hist.PET
## Min.      :-1.4225 Min.      :-1.3197 Min.      :-0.906441
## 1st Qu.: -0.7628 1st Qu.: -0.6752 1st Qu.: -0.334292
## Median : -0.1704 Median : -0.2561 Median : -0.216370
## Mean   : 0.0000 Mean   : 0.0000 Mean   : 0.000000
## 3rd Qu.: 0.6276 3rd Qu.: 0.4162 3rd Qu.: 0.003553
## Max.    : 3.7217 Max.    : 5.7654 Max.    : 10.932045
## Energy_hist.PET      Entropy_hist.PET      AUC_hist.PET      H_suv.PET
## Min.      :-2.3215 Min.      :-1.4015 Min.      :-0.8502 Min.      :-1.4116
## 1st Qu.: -0.5462 1st Qu.: -0.6977 1st Qu.: -0.5790 1st Qu.: -0.8097
## Median : 0.1416 Median : -0.3109 Median : -0.5232 Median : -0.2091
## Mean   : 0.0000 Mean   : 0.0000 Mean   : 0.0000 Mean   : 0.0000
## 3rd Qu.: 0.5743 3rd Qu.: 0.3033 3rd Qu.: 1.4352 3rd Qu.: 0.4785
## Max.    : 2.9868 Max.    : 3.2567 Max.    : 2.0653 Max.    : 3.8765
## Volume.PET      X3D_surface.PET      ratio_3ds_vol.PET      ratio_3ds_vol_norm.PET
## Min.      :-0.9976 Min.      :-0.67301 Min.      :-1.46122 Min.      :-1.4293
## 1st Qu.: -0.7025 1st Qu.: -0.45312 1st Qu.: -0.56332 1st Qu.: -0.4508
## Median : -0.3145 Median : -0.25696 Median : -0.08817 Median : -0.2012
```



```

## Mean      : 0.0000      Mean      : 0.00000      Mean      : 0.00000      Mean      : 0.0000
## 3rd Qu.: 0.4610      3rd Qu.: 0.04246      3rd Qu.: 0.46611      3rd Qu.: 0.5039
## Max.      : 5.2306      Max.      : 8.76871      Max.      : 3.06294      Max.      : 3.9993
## irregularity.PET tumor_length.PET Compactness_v1.PET Compactness_v2.PET
## Min.      : -0.9167      Min.      : -1.3131      Min.      : -2.8712      Min.      : -1.18599
## 1st Qu.: -0.6689      1st Qu.: -0.6263      1st Qu.: -0.0845      1st Qu.: -0.42580
## Median : -0.4986      Median : -0.3025      Median : 0.0234      Median : -0.26942
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.00000
## 3rd Qu.: 1.0201      3rd Qu.: 0.3586      3rd Qu.: 0.5081      3rd Qu.: -0.07615
## Max.      : 2.6689      Max.      : 6.5779      Max.      : 1.5563      Max.      : 5.56600
## Spherical_disproportion.PET Sphericity.PET Asphericity.PET
## Min.      : -1.4293      Min.      : -0.7419      Min.      : -1.4360
## 1st Qu.: -0.4508      1st Qu.: -0.4912      1st Qu.: -0.4400
## Median : -0.2012      Median : -0.4224      Median : -0.1860
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.5039      3rd Qu.: -0.1356      3rd Qu.: 0.5296
## Max.      : 3.9993      Max.      : 4.3869      Max.      : 4.0153
## Center_of_mass.PET Max_3D_diam.PET Major_axis_length.PET
## Min.      : -1.0766      Min.      : -1.2376      Min.      : -1.2762
## 1st Qu.: -0.5755      1st Qu.: -0.7045      1st Qu.: -0.7141
## Median : -0.2760      Median : -0.3091      Median : -0.3055
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.2817      3rd Qu.: 0.3615      3rd Qu.: 0.4158
## Max.      : 6.7859      Max.      : 4.3245      Max.      : 5.3569
## Minor_axis_length.PET Least_axis_length.PET Elongation.PET
## Min.      : -1.4576      Min.      : -1.4299      Min.      : -1.5978
## 1st Qu.: -0.7494      1st Qu.: -0.6863      1st Qu.: -0.6012
## Median : -0.1394      Median : -0.2241      Median : -0.2718
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.3841      3rd Qu.: 0.3090      3rd Qu.: 0.2418
## Max.      : 4.5198      Max.      : 4.9092      Max.      : 2.8276
## Flatness.PET Max_cooc.L.PET Average_cooc.L.PET Variance_cooc.L.PET
## Min.      : -1.6295      Min.      : -2.3063      Min.      : -1.8155      Min.      : -1.8240
## 1st Qu.: -0.6460      1st Qu.: -0.5161      1st Qu.: -0.5656      1st Qu.: -0.7476
## Median : -0.1984      Median : 0.1172      Median : -0.3274      Median : -0.1502
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.2702      3rd Qu.: 0.5711      3rd Qu.: 0.1736      3rd Qu.: 0.3612
## Max.      : 2.9366      Max.      : 1.8750      Max.      : 3.3868      Max.      : 3.3880
## Entropy_cooc.L.PET DAVE_cooc.L.PET DVAR_cooc.L.PET DENT_cooc.L.PET
## Min.      : -1.0745      Min.      : -1.5187      Min.      : -1.4327      Min.      : -1.1172
## 1st Qu.: -0.5674      1st Qu.: -0.7917      1st Qu.: -0.7535      1st Qu.: -0.6459
## Median : -0.5112      Median : -0.1931      Median : -0.2010      Median : -0.4587
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.7073      3rd Qu.: 0.2613      3rd Qu.: 0.3063      3rd Qu.: 0.5602
## Max.      : 2.0941      Max.      : 3.9795      Max.      : 4.5360      Max.      : 2.2650
## SAVE_cooc.L.PET SVAR_cooc.L.PET SENT_cooc.L.PET ASM_cooc.L.PET
## Min.      : -1.8170      Min.      : -1.9401      Min.      : -1.0602      Min.      : -2.3413
## 1st Qu.: -0.5659      1st Qu.: -0.7133      1st Qu.: -0.5543      1st Qu.: -0.4833
## Median : -0.3280      Median : -0.1350      Median : -0.4595      Median : 0.1113
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.1719      3rd Qu.: 0.3703      3rd Qu.: 0.7475      3rd Qu.: 0.5870
## Max.      : 3.3867      Max.      : 3.9295      Max.      : 2.0924      Max.      : 1.5898
## Contrast_cooc.L.PET Dissimilarity_cooc.L.PET Inv_diff_cooc.L.PET
## Min.      : -1.3944      Min.      : -1.5187      Min.      : -1.3782

```

## 1st Qu.:-0.7826	1st Qu.:-0.7917	1st Qu.:-0.6753	
## Median :-0.1960	Median :-0.1931	Median :-0.3702	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.3115	3rd Qu.: 0.2613	3rd Qu.: 0.4971	
## Max. : 5.0946	Max. : 3.9795	Max. : 3.9843	
## Inv_diff_norm_cooc.L.PET	IDM_cooc.L.PET	IDM_norm_cooc.L.PET	
## Min. :-0.7941	Min. :-1.6038	Min. :-0.7477	
## 1st Qu.:-0.6216	1st Qu.:-0.6426	1st Qu.:-0.5955	
## Median :-0.5340	Median :-0.3162	Median :-0.5474	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 1.3523	3rd Qu.: 0.4831	3rd Qu.: 1.4669	
## Max. : 2.1111	Max. : 4.5547	Max. : 1.9113	
## Inv_var_cooc.L.PET	Correlation_cooc.L.PET	Autocorrelation_cooc.L.PET	
## Min. :-1.5503	Min. :-2.0530	Min. :-1.7897	
## 1st Qu.:-0.6248	1st Qu.:-0.5957	1st Qu.:-0.5697	
## Median :-0.2984	Median :-0.2707	Median :-0.2234	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.5020	3rd Qu.: 0.5649	3rd Qu.: 0.3314	
## Max. : 4.4029	Max. : 3.2432	Max. : 4.3290	
## Tendency_cooc.L.PET	Shade_cooc.L.PET	Prominence_cooc.L.PET	IC1_.L.PET
## Min. :-1.9401	Min. :-2.5311	Min. :-1.6096	Min. :-4.3900
## 1st Qu.:-0.7133	1st Qu.:-0.7290	1st Qu.:-0.7749	1st Qu.:-0.4323
## Median :-0.1350	Median :-0.2164	Median :-0.1665	Median : 0.1972
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3703	3rd Qu.: 0.4457	3rd Qu.: 0.4638	3rd Qu.: 0.7461
## Max. : 3.9295	Max. : 3.4552	Max. : 4.7110	Max. : 1.5577
## IC2_.L.PET	Coarseness_vdif_.L.PET	Contrast_vdif_.L.PET	
## Min. :-1.3125	Min. :-2.19089	Min. :-0.62417	
## 1st Qu.:-0.6877	1st Qu.:-0.58292	1st Qu.:-0.45572	
## Median :-0.3269	Median : 0.09101	Median :-0.22491	
## Mean : 0.0000	Mean : 0.00000	Mean : 0.00000	
## 3rd Qu.: 0.1265	3rd Qu.: 0.56210	3rd Qu.: 0.02051	
## Max. : 2.8100	Max. : 3.70237	Max. : 8.76892	
## Busyness_vdif_.L.PET	Complexity_vdif_.L.PET	Strength_vdif_.L.PET	
## Min. :-0.9015	Min. :-1.2644	Min. :-0.8182	
## 1st Qu.:-0.5980	1st Qu.:-0.7164	1st Qu.:-0.6788	
## Median :-0.3190	Median :-0.2554	Median :-0.3579	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.1867	3rd Qu.: 0.2340	3rd Qu.: 0.3429	
## Max. : 6.6543	Max. : 5.0903	Max. : 5.5183	
## SRE_align.L.PET	LRE_align.L.PET	GLNU_align.L.PET	RLNU_align.L.PET
## Min. :-0.8310	Min. :-0.7771	Min. :-0.6911	Min. :-0.7305
## 1st Qu.:-0.5835	1st Qu.:-0.6287	1st Qu.:-0.5835	1st Qu.:-0.5912
## Median :-0.5429	Median :-0.5633	Median :-0.3710	Median :-0.3704
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.5509	3rd Qu.: 1.4519	3rd Qu.: 0.2985	3rd Qu.: 0.2121
## Max. : 1.8088	Max. : 2.1577	Max. : 6.5043	Max. : 7.4324
## RP_align.L.PET	LGRE_align.L.PET	HGRE_align.L.PET	LGSRE_align.L.PET
## Min. :-0.7933	Min. :-1.7593	Min. :-1.7899	Min. :-1.7791
## 1st Qu.:-0.5897	1st Qu.:-0.6273	1st Qu.:-0.5532	1st Qu.:-0.6347
## Median :-0.5401	Median :-0.1805	Median :-0.2588	Median :-0.1576
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.5347	3rd Qu.: 0.4789	3rd Qu.: 0.3678	3rd Qu.: 0.5035
## Max. : 1.8283	Max. : 4.7561	Max. : 3.9761	Max. : 4.6553

## HGSRE_align.L.PET	LGHRE_align.L.PET	HGLRE_align.L.PET	GLNU_norm_align.L.PET
## Min. : -1.7826	Min. : -1.6709	Min. : -1.8146	Min. : -2.01031
## 1st Qu.: -0.5598	1st Qu.: -0.6111	1st Qu.: -0.5634	1st Qu.: -0.37038
## Median : -0.2781	Median : -0.2078	Median : -0.2117	Median : -0.09112
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.00000
## 3rd Qu.: 0.3506	3rd Qu.: 0.4492	3rd Qu.: 0.3849	3rd Qu.: 0.40169
## Max. : 3.9653	Max. : 5.1552	Max. : 3.9930	Max. : 3.95815
## RLNU_norm_align.L.PET	GLVAR_align.L.PET	RLVAR_align.L.PET	Entropy_align.L.PET
## Min. : -0.7729	Min. : -1.8808	Min. : -2.1546	Min. : -1.0695
## 1st Qu.: -0.6031	1st Qu.: -0.7164	1st Qu.: -0.4296	1st Qu.: -0.5786
## Median : -0.5322	Median : -0.1558	Median : -0.1405	Median : -0.5251
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.4250	3rd Qu.: 0.3734	3rd Qu.: 0.4813	3rd Qu.: 0.7270
## Max. : 1.8933	Max. : 3.3364	Max. : 3.4224	Max. : 2.0307
## SZSE.L.PET	LZSE.L.PET	LGLZE.L.PET	HGLZE.L.PET
## Min. : -2.2713	Min. : -0.9047	Min. : -1.7850	Min. : -1.8049
## 1st Qu.: -0.5709	1st Qu.: -0.6106	1st Qu.: -0.6137	1st Qu.: -0.5579
## Median : -0.4887	Median : -0.4838	Median : -0.1840	Median : -0.2683
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.3993	3rd Qu.: 0.7175	3rd Qu.: 0.5007	3rd Qu.: 0.3570
## Max. : 1.8445	Max. : 4.8194	Max. : 4.7727	Max. : 3.7380
## SZLGE.L.PET	SZHGE.L.PET	LZLGE.L.PET	LZHGE.L.PET
## Min. : -1.9920	Min. : -1.7536	Min. : -1.4035	Min. : -1.5923
## 1st Qu.: -0.6213	1st Qu.: -0.5513	1st Qu.: -0.6129	1st Qu.: -0.5958
## Median : -0.1637	Median : -0.2719	Median : -0.2433	Median : -0.2804
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.5831	3rd Qu.: 0.3612	3rd Qu.: 0.3249	3rd Qu.: 0.2929
## Max. : 4.3225	Max. : 3.7642	Max. : 6.4375	Max. : 4.1325
## GLNU_area.L.PET	ZSNU.L.PET	ZSP.L.PET	GLNU_norm.L.PET
## Min. : -0.6914	Min. : -0.7314	Min. : -1.7968	Min. : -2.01371
## 1st Qu.: -0.5796	1st Qu.: -0.5842	1st Qu.: -0.5892	1st Qu.: -0.36931
## Median : -0.3735	Median : -0.3565	Median : -0.4930	Median : -0.07108
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.00000
## 3rd Qu.: 0.3189	3rd Qu.: 0.1320	3rd Qu.: 1.1986	3rd Qu.: 0.40606
## Max. : 6.7070	Max. : 7.4588	Max. : 1.9416	Max. : 3.87814
## ZSNU_norm.L.PET	GLVAR_area.L.PET	ZSVAR.L.PET	Entropy_area.L.PET
## Min. : -0.9004	Min. : -1.8796	Min. : -1.0498	Min. : -1.0506
## 1st Qu.: -0.6398	1st Qu.: -0.7025	1st Qu.: -0.5880	1st Qu.: -0.5791
## Median : -0.4933	Median : -0.1695	Median : -0.3215	Median : -0.5115
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.0332	3rd Qu.: 0.3718	3rd Qu.: 0.1266	3rd Qu.: 1.0068
## Max. : 2.0513	Max. : 3.2261	Max. : 5.2109	Max. : 2.0092
## Max_cooc.H.PET	Average_cooc.H.PET	Variance_cooc.H.PET	Entropy_cooc.H.PET
## Min. : -1.1988	Min. : -0.8105	Min. : -2.38574	Min. : -1.580753
## 1st Qu.: -0.5903	1st Qu.: -0.6985	1st Qu.: -0.61533	1st Qu.: -0.634054
## Median : -0.2918	Median : -0.5036	Median : -0.22579	Median : -0.217121
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	Mean : 0.000000
## 3rd Qu.: 0.3327	3rd Qu.: 1.2098	3rd Qu.: -0.06314	3rd Qu.: 0.009014
## Max. : 5.6239	Max. : 2.3267	Max. : 2.40699	Max. : 2.432758
## DAVE_cooc.H.PET	DVAR_cooc.H.PET	DENT_cooc.H.PET	SAVE_cooc.H.PET
## Min. : -2.2715	Min. : -2.2424	Min. : -1.9708	Min. : -0.7658
## 1st Qu.: -0.6281	1st Qu.: -0.6424	1st Qu.: -0.7111	1st Qu.: -0.6657
## Median : -0.3166	Median : -0.2366	Median : -0.1393	Median : -0.5665
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000

## 3rd Qu.: 0.2732	3rd Qu.: 0.2944	3rd Qu.: 0.3360	3rd Qu.: 1.3226
## Max. : 2.9198	Max. : 3.0270	Max. : 3.1543	Max. : 2.4774
## SVAR_cooc.H.PET	SENT_cooc.H.PET	ASM_cooc.H.PET	Contrast_cooc.H.PET
## Min. : -2.4962	Min. : -1.7399	Min. : -1.3487	Min. : -2.0431
## 1st Qu.: -0.5488	1st Qu.: -0.7667	1st Qu.: -0.4947	1st Qu.: -0.6495
## Median : -0.2607	Median : -0.0498	Median : -0.2169	Median : -0.2124
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1377	3rd Qu.: 0.3208	3rd Qu.: 0.3106	3rd Qu.: 0.3562
## Max. : 2.7932	Max. : 2.7141	Max. : 7.3847	Max. : 3.5180
## Dissimilarity_cooc.H.PET	Inv_diff_cooc.H.PET	Inv_diff_norm_cooc.H.PET	
## Min. : -2.2715	Min. : -1.3295	Min. : -0.8346	
## 1st Qu.: -0.6281	1st Qu.: -0.7485	1st Qu.: -0.6168	
## Median : -0.3166	Median : -0.2692	Median : -0.5386	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.2732	3rd Qu.: 0.5024	3rd Qu.: 1.3838	
## Max. : 2.9198	Max. : 4.3984	Max. : 2.0111	
## IDM_cooc.H.PET	IDM_norm_cooc.H.PET	Inv_var_cooc_.H.PET	
## Min. : -1.3223	Min. : -0.7823	Min. : -2.36605	
## 1st Qu.: -0.7621	1st Qu.: -0.5924	1st Qu.: -0.49549	
## Median : -0.2472	Median : -0.5455	Median : 0.02372	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	
## 3rd Qu.: 0.4259	3rd Qu.: 1.4702	3rd Qu.: 0.51799	
## Max. : 4.5673	Max. : 1.8868	Max. : 2.80467	
## Correlation_cooc.H.PET	Autocorrelation_cooc.H.PET	Tendency_cooc.H.PET	
## Min. : -1.9872	Min. : -0.9010	Min. : -2.3578	
## 1st Qu.: -0.5949	1st Qu.: -0.7473	1st Qu.: -0.5740	
## Median : -0.2552	Median : -0.4396	Median : -0.2217	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.4751	3rd Qu.: 0.9161	3rd Qu.: 0.1629	
## Max. : 3.4144	Max. : 2.7356	Max. : 2.6966	
## Shade_cooc.H.PET	Prominence_cooc.H.PET	IC1_d.H.PET	IC2_d.H.PET
## Min. : -3.52117	Min. : -1.80967	Min. : -3.7681	Min. : -1.4586
## 1st Qu.: -0.49100	1st Qu.: -0.72248	1st Qu.: -0.5716	1st Qu.: -0.6520
## Median : 0.04694	Median : -0.06048	Median : 0.2356	Median : -0.3001
## Mean : 0.00000	Mean : 0.00000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.61650	3rd Qu.: 0.38037	3rd Qu.: 0.7171	3rd Qu.: 0.4610
## Max. : 2.25176	Max. : 2.98834	Max. : 1.5960	Max. : 3.2512
## Coarseness_vdif.H.PET	Contrast_vdif.H.PET	Busyness_vdif.H.PET	
## Min. : -2.3467	Min. : -0.7552	Min. : -0.3915	
## 1st Qu.: -0.5062	1st Qu.: -0.5001	1st Qu.: -0.3665	
## Median : 0.1375	Median : -0.3378	Median : -0.3347	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.5970	3rd Qu.: 0.1423	3rd Qu.: -0.2468	
## Max. : 1.8301	Max. : 6.6160	Max. : 6.4429	
## Complexity_vdif.H.PET	Strength_vdif.H.PET	SRE_align.H.PET	LRE_align.H.PET
## Min. : -1.5450	Min. : -0.255369	Min. : -1.4539	Min. : -0.9776
## 1st Qu.: -0.5707	1st Qu.: -0.228103	1st Qu.: -0.6077	1st Qu.: -0.7704
## Median : -0.1093	Median : -0.167165	Median : -0.4349	Median : -0.3787
## Mean : 0.0000	Mean : 0.000000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3507	3rd Qu.: -0.000167	3rd Qu.: 0.8920	3rd Qu.: 0.4111
## Max. : 3.0416	Max. : 13.485338	Max. : 2.0686	Max. : 3.9848
## RLNU_align.H.PET	RP_align.H.PET	LGRE_align.H.PET	HGRE_align.H.PET
## Min. : -0.6807	Min. : -1.5208	Min. : -2.3681	Min. : -0.8599
## 1st Qu.: -0.5850	1st Qu.: -0.5999	1st Qu.: -0.4890	1st Qu.: -0.7219

## Median :-0.3564	Median :-0.4076	Median : 0.1038	Median :-0.4500
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1596	3rd Qu.: 0.8237	3rd Qu.: 0.5846	3rd Qu.: 1.0208
## Max. : 8.0403	Max. : 2.1558	Max. : 2.0491	Max. : 3.5783
## LGSRE_align.H.PET	HGSRE_align.H.PET	LGHRE_align.H.PET	HGLRE_align.H.PET
## Min. :-2.3686	Min. :-1.0830	Min. :-2.36459	Min. :-0.8964
## 1st Qu.: -0.4876	1st Qu.: -0.6569	1st Qu.: -0.50531	1st Qu.: -0.7256
## Median : 0.1083	Median :-0.5275	Median : 0.09526	Median :-0.2641
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	Mean : 0.0000
## 3rd Qu.: 0.5902	3rd Qu.: 1.1850	3rd Qu.: 0.58394	3rd Qu.: 0.3434
## Max. : 2.0338	Max. : 2.8829	Max. : 2.09944	Max. : 4.4495
## GLNU_norm_align.H.PET	RLNU_norm_align.H.PET	GLVAR_align.H.PET	
## Min. :-1.3690	Min. :-1.7457	Min. :-2.30021	
## 1st Qu.: -0.7088	1st Qu.: -0.6077	1st Qu.: -0.65667	
## Median :-0.2977	Median :-0.3120	Median :-0.20754	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	
## 3rd Qu.: 0.4460	3rd Qu.: 0.2832	3rd Qu.: 0.03569	
## Max. : 4.0729	Max. : 2.3962	Max. : 2.64762	
## RLVAR_align.H.PET	Entropy_align.H.PET	SZSE.H.PET	LZSE.H.PET
## Min. :-0.9927	Min. :-1.3773	Min. :-2.01033	Min. :-0.2197
## 1st Qu.: -0.6599	1st Qu.: -0.6408	1st Qu.: -0.61818	1st Qu.: -0.2148
## Median :-0.3255	Median :-0.3720	Median :-0.23766	Median :-0.2048
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	Mean : 0.0000
## 3rd Qu.: 0.3407	3rd Qu.: 0.2830	3rd Qu.: 0.02202	3rd Qu.: -0.1624
## Max. : 4.7189	Max. : 2.8563	Max. : 2.33769	Max. : 9.1121
## LGLZE.H.PET	HGLZE.H.PET	SZLGE.H.PET	SZHGE.H.PET
## Min. :-2.3646	Min. :-1.1843	Min. :-2.3595	Min. :-1.9479
## 1st Qu.: -0.4844	1st Qu.: -0.7924	1st Qu.: -0.5077	1st Qu.: -0.5651
## Median : 0.1001	Median :-0.3822	Median : 0.1138	Median :-0.3540
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.5754	3rd Qu.: 0.6900	3rd Qu.: 0.5750	3rd Qu.: 0.3140
## Max. : 2.2097	Max. : 3.1106	Max. : 2.2017	Max. : 2.9780
## LZLGE.H.PET	LZHGE.H.PET	GLNU_area.H.PET	ZSNU.H.PET
## Min. :-0.54529	Min. :-0.2440	Min. :-0.7448	Min. :-0.60734
## 1st Qu.: -0.27961	1st Qu.: -0.2395	1st Qu.: -0.5834	1st Qu.: -0.54030
## Median :-0.20354	Median :-0.2241	Median :-0.3505	Median :-0.37798
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	Mean : 0.00000
## 3rd Qu.: -0.04833	3rd Qu.: -0.1796	3rd Qu.: 0.3100	3rd Qu.: 0.07023
## Max. : 8.32302	Max. : 8.7283	Max. : 6.3626	Max. : 8.51176
## ZSP.H.PET	GLNU_norm.H.PET	ZSNU_norm.H.PET	GLVAR_area.H.PET
## Min. :-1.79277	Min. :-1.3840	Min. :-1.5075	Min. :-2.2073
## 1st Qu.: -0.66964	1st Qu.: -0.6997	1st Qu.: -0.7051	1st Qu.: -0.6524
## Median :-0.04715	Median :-0.2758	Median :-0.1138	Median :-0.1862
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.34632	3rd Qu.: 0.4626	3rd Qu.: 0.2882	3rd Qu.: 0.1152
## Max. : 2.65243	Max. : 4.1164	Max. : 2.6790	Max. : 2.7256
## ZSVAR_H.PET	Entropy_area.H.PET	Max_cooc.W.PET	Average_cooc.W.PET
## Min. :-0.2318	Min. :-1.2574	Min. :-1.6095	Min. :-1.4019
## 1st Qu.: -0.2286	1st Qu.: -0.6018	1st Qu.: -0.4558	1st Qu.: -0.8122
## Median :-0.2166	Median :-0.4339	Median :-0.1391	Median :-0.2448
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: -0.1786	3rd Qu.: 0.6244	3rd Qu.: 0.3108	3rd Qu.: 0.5870
## Max. : 9.0394	Max. : 2.4985	Max. : 7.1859	Max. : 3.8583
## Variance_cooc.W.PET	Entropy_cooc.W.PET	DAVE_cooc.W.PET	DVAR_cooc.W.PET

## Min. : -0.9724	Min. : -1.7194	Min. : -1.4328	Min. : -1.0019
## 1st Qu.: -0.7462	1st Qu.: -0.7078	1st Qu.: -0.7893	1st Qu.: -0.7729
## Median : -0.2752	Median : -0.2573	Median : -0.1621	Median : -0.3202
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.4203	3rd Qu.: 0.2226	3rd Qu.: 0.5930	3rd Qu.: 0.5429
## Max. : 4.3665	Max. : 2.6984	Max. : 3.2278	Max. : 3.7577
## DENT_cooc.W.PET	SAVE_cooc.W.PET	SVAR_cooc.W.PET	SENT_cooc.W.PET
## Min. : -1.5151	Min. : -1.4034	Min. : -0.9176	Min. : -1.6147
## 1st Qu.: -0.7070	1st Qu.: -0.8136	1st Qu.: -0.7077	1st Qu.: -0.7088
## Median : -0.2302	Median : -0.2408	Median : -0.2851	Median : -0.3249
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1586	3rd Qu.: 0.5895	3rd Qu.: 0.3099	3rd Qu.: 0.2781
## Max. : 2.5901	Max. : 3.8567	Max. : 5.0280	Max. : 2.7969
## ASM_cooc.W.PET	Contrast_cooc.W.PET	Dissemblability_cooc.W.PET	
## Min. : -1.99234	Min. : -1.0299	Min. : -1.4328	
## 1st Qu.: -0.48745	1st Qu.: -0.7928	1st Qu.: -0.7893	
## Median : 0.05841	Median : -0.3488	Median : -0.1621	
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.51597	3rd Qu.: 0.6780	3rd Qu.: 0.5930	
## Max. : 6.22137	Max. : 3.7078	Max. : 3.2278	
## Inv_diff_cooc.W.PET	Inv_diff_norm_cooc.W.PET	IDM_cooc.W.PET	
## Min. : -1.3099	Min. : -0.7856	Min. : -1.3363	
## 1st Qu.: -0.7837	1st Qu.: -0.6173	1st Qu.: -0.7773	
## Median : -0.2135	Median : -0.5389	Median : -0.1893	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.4930	3rd Qu.: 1.4149	3rd Qu.: 0.4888	
## Max. : 3.9426	Max. : 2.1031	Max. : 4.4456	
## IDM_norm_cooc.W.PET	Inv_var_cooc.W.PET	Correlation_cooc.W.PET	
## Min. : -0.7484	Min. : -1.4005	Min. : -2.0998	
## 1st Qu.: -0.5943	1st Qu.: -0.7615	1st Qu.: -0.5874	
## Median : -0.5463	Median : -0.2085	Median : -0.3015	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 1.5152	3rd Qu.: 0.4729	3rd Qu.: 0.5390	
## Max. : 1.9086	Max. : 4.0334	Max. : 3.2472	
## Autocorrelation_cooc.W.PET	Tendency_cooc.W.PET	Shade_cooc.W.PET	
## Min. : -0.9699	Min. : -0.9176	Min. : -0.642572	
## 1st Qu.: -0.7403	1st Qu.: -0.7077	1st Qu.: -0.368478	
## Median : -0.3359	Median : -0.2851	Median : -0.261575	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.000000	
## 3rd Qu.: 0.3654	3rd Qu.: 0.3099	3rd Qu.: 0.008015	
## Max. : 4.7041	Max. : 5.0280	Max. : 8.518947	
## Prominence_cooc.W.PET	IC1_d.W.PET	IC2_d.W.PET	
## Min. : -0.34028	Min. : -3.6791	Min. : -1.3917	
## 1st Qu.: -0.32894	1st Qu.: -0.5572	1st Qu.: -0.6843	
## Median : -0.25670	Median : 0.2495	Median : -0.3351	
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: -0.06026	3rd Qu.: 0.7187	3rd Qu.: 0.4516	
## Max. : 8.89848	Max. : 1.7065	Max. : 3.0508	
## Coarseness_vdif.W.PET	Contrast_vdif.W.PET	Busyness_vdif.W.PET	
## Min. : -1.99411	Min. : -1.3073	Min. : -1.0270	
## 1st Qu.: -0.55094	1st Qu.: -0.7349	1st Qu.: -0.7725	
## Median : 0.01536	Median : -0.2393	Median : -0.3510	
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.47908	3rd Qu.: 0.4189	3rd Qu.: 0.4780	

## Max. : 4.85464	Max. : 4.2154	Max. : 4.3207	
## Complexity_vdif.W.PET	Strength_vdif.W.PET	SRE_align.W.PET	LRE_align.W.PET
## Min. :-0.6810	Min. :-0.6419	Min. :-1.0181	Min. :-0.9674
## 1st Qu.:-0.6183	1st Qu.:-0.5195	1st Qu.:-0.6101	1st Qu.:-0.7727
## Median :-0.3570	Median :-0.3637	Median :-0.5069	Median :-0.4586
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1677	3rd Qu.: 0.1120	3rd Qu.: 1.2989	3rd Qu.: 0.9322
## Max. : 5.9579	Max. : 7.4677	Max. : 1.9071	Max. : 3.0236
## GLNU_align.W.PET	RLNU_align.W.PET	RP_align.W.PET	LGRE_align.W.PET
## Min. :-0.8453	Min. :-0.6972	Min. :-1.1501	Min. :-1.4375
## 1st Qu.:-0.6305	1st Qu.:-0.5773	1st Qu.:-0.6020	1st Qu.:-0.7212
## Median :-0.3096	Median :-0.3785	Median :-0.4886	Median :-0.2482
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1883	3rd Qu.: 0.1319	3rd Qu.: 1.2365	3rd Qu.: 0.4473
## Max. : 4.7459	Max. : 7.7636	Max. : 1.9575	Max. : 3.6206
## HGRE_align.W.PET	LGSRE_align.W.PET	HGSRE_align.W.PET	LGHRE_align.W.PET
## Min. :-0.9727	Min. :-1.5082	Min. :-0.9636	Min. :-1.1145
## 1st Qu.:-0.7535	1st Qu.:-0.7319	1st Qu.:-0.7545	1st Qu.:-0.6670
## Median :-0.3449	Median :-0.2761	Median :-0.3382	Median :-0.3163
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3870	3rd Qu.: 0.4968	3rd Qu.: 0.4022	3rd Qu.: 0.3804
## Max. : 4.7116	Max. : 3.4773	Max. : 4.6655	Max. : 5.6818
## HGLRE_align.W.PET	GLNU_norm_align.W.PET	RLNU_norm_align.W.PET	
## Min. :-1.0113	Min. :-1.5704	Min. :-1.3413	
## 1st Qu.:-0.7607	1st Qu.:-0.6563	1st Qu.:-0.6216	
## Median :-0.3458	Median :-0.2646	Median :-0.4249	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.3648	3rd Qu.: 0.4728	3rd Qu.: 0.7986	
## Max. : 4.8912	Max. : 4.4945	Max. : 2.1157	
## GLVAR_align.W.PET	RLVAR_align.W.PET	Entropy_align.W.PET	SZSE.W.PET
## Min. :-0.9778	Min. :-1.2760	Min. :-1.4547	Min. :-2.1793
## 1st Qu.:-0.7581	1st Qu.:-0.6434	1st Qu.:-0.6822	1st Qu.:-0.5764
## Median :-0.2991	Median :-0.2543	Median :-0.3384	Median :-0.3760
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3685	3rd Qu.: 0.3579	3rd Qu.: 0.2730	3rd Qu.: 0.6341
## Max. : 4.2771	Max. : 4.5541	Max. : 2.7738	Max. : 2.0828
## LZSE.W.PET	LGLZE.W.PET	HGLZE.W.PET	SZLGE.W.PET
## Min. :-0.56525	Min. :-1.4829	Min. :-0.9676	Min. :-1.6516
## 1st Qu.:-0.49773	1st Qu.:-0.7088	1st Qu.:-0.7541	1st Qu.:-0.7065
## Median :-0.33414	Median :-0.2589	Median :-0.3303	Median :-0.2553
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.03172	3rd Qu.: 0.5637	3rd Qu.: 0.4189	3rd Qu.: 0.6091
## Max. : 6.23487	Max. : 3.5121	Max. : 4.5971	Max. : 3.8533
## SZHGE.W.PET	LZLGE.W.PET	LZHGE.W.PET	GLNU_area.W.PET
## Min. :-0.9315	Min. :-0.3661	Min. :-1.1058	Min. :-0.7987
## 1st Qu.:-0.7586	1st Qu.:-0.3267	1st Qu.:-0.7168	1st Qu.:-0.6149
## Median :-0.3241	Median :-0.2797	Median :-0.2637	Median :-0.3290
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3935	3rd Qu.:-0.1011	3rd Qu.: 0.4898	3rd Qu.: 0.1175
## Max. : 4.3673	Max. : 7.9493	Max. : 5.2512	Max. : 5.4500
## ZSNU.W.PET	ZSP.W.PET	GLNU_norm.W.PET	ZSNU_norm.W.PET
## Min. :-0.6430	Min. :-1.66591	Min. :-1.6056	Min. :-1.4766
## 1st Qu.:-0.5512	1st Qu.:-0.57871	1st Qu.:-0.6475	1st Qu.:-0.6368
## Median :-0.3550	Median :-0.24376	Median :-0.2568	Median :-0.2391

## Mean : 0.0000	Mean : 0.00000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1365	3rd Qu.: 0.01851	3rd Qu.: 0.4843	3rd Qu.: 0.1228
## Max. : 8.2345	Max. : 2.33471	Max. : 4.7909	Max. : 2.4009
## GLVAR_area.W.PET	ZSVAR.W.PET	Entropy_area.W.PET	Min_hist.ADC
## Min. : -0.9650	Min. : -0.45407	Min. : -1.2694	Min. : -0.8659
## 1st Qu.: -0.7526	1st Qu.: -0.41452	1st Qu.: -0.6122	1st Qu.: -0.8657
## Median : -0.2987	Median : -0.32431	Median : -0.4336	Median : -0.3958
## Mean : 0.0000	Mean : 0.00000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3632	3rd Qu.: -0.09921	3rd Qu.: 0.4213	3rd Qu.: 0.6625
## Max. : 4.3352	Max. : 6.96463	Max. : 2.6434	Max. : 3.4005
## Max_hist.ADC	Mean_hist.ADC	Variance_hist.ADC	
## Min. : -1.1458	Min. : -1.1633	Min. : -1.1378	
## 1st Qu.: -0.6395	1st Qu.: -0.6070	1st Qu.: -0.7342	
## Median : -0.3444	Median : -0.3730	Median : -0.1756	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.2875	3rd Qu.: 0.3761	3rd Qu.: 0.2391	
## Max. : 3.2565	Max. : 4.1608	Max. : 4.2445	
## Standard_Deviation_hist.ADC	Skewness_hist.ADC	Kurtosis_hist.ADC	
## Min. : -1.2692	Min. : -4.4869	Min. : -1.3821	
## 1st Qu.: -0.7569	1st Qu.: -0.5391	1st Qu.: -0.5941	
## Median : -0.2092	Median : -0.0200	Median : -0.2456	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.3944	3rd Qu.: 0.5024	3rd Qu.: 0.2191	
## Max. : 3.5929	Max. : 3.2363	Max. : 5.0090	
## Energy_hist.ADC	Entropy_hist.ADC	AUC_hist.ADC	Volume.ADC
## Min. : -2.2980	Min. : -1.2091	Min. : -0.9703	Min. : -1.0257
## 1st Qu.: -0.4853	1st Qu.: -0.5949	1st Qu.: -0.6408	1st Qu.: -0.7131
## Median : 0.1128	Median : -0.4706	Median : -0.5148	Median : -0.3207
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.5536	3rd Qu.: 0.3276	3rd Qu.: 0.7533	3rd Qu.: 0.4559
## Max. : 1.9300	Max. : 2.4215	Max. : 2.4529	Max. : 5.2090
## X3D_surface.ADC	ratio_3ds_vol.ADC	ratio_3ds_vol_norm.ADC	irregularity.ADC
## Min. : -0.9942	Min. : -1.3129	Min. : -1.0356	Min. : -0.9512
## 1st Qu.: -0.6849	1st Qu.: -0.6406	1st Qu.: -0.6629	1st Qu.: -0.6557
## Median : -0.3715	Median : -0.2853	Median : -0.5071	Median : -0.5135
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3084	3rd Qu.: 0.2258	3rd Qu.: 1.0377	3rd Qu.: 0.7975
## Max. : 4.4041	Max. : 4.2847	Max. : 3.3783	Max. : 2.8739
## Compactness_v1.ADC	Compactness_v2.ADC	Spherical_disproportion.ADC	
## Min. : -2.36966	Min. : -1.8949	Min. : -1.0356	
## 1st Qu.: -0.48498	1st Qu.: -0.6312	1st Qu.: -0.6629	
## Median : -0.03812	Median : -0.2458	Median : -0.5071	
## Mean : 0.00000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.39424	3rd Qu.: 0.3300	3rd Qu.: 1.0377	
## Max. : 1.92604	Max. : 2.9393	Max. : 3.3783	
## Sphericity.ADC	Asphericity.ADC	Center_of_mass.ADC	Max_3D_diam.ADC
## Min. : -1.3956	Min. : -1.4420	Min. : -1.0193	Min. : -1.3856
## 1st Qu.: -0.6158	1st Qu.: -0.6518	1st Qu.: -0.6428	1st Qu.: -0.7000
## Median : -0.4383	Median : -0.3215	Median : -0.3676	Median : -0.2890
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.1583	3rd Qu.: 0.4512	3rd Qu.: 0.2729	3rd Qu.: 0.3907
## Max. : 2.3002	Max. : 4.9466	Max. : 5.0265	Max. : 3.6923
## Major_axis_length.ADC	Minor_axis_length.ADC	Least_axis_length.ADC	
## Min. : -1.4031	Min. : -1.3722	Min. : -1.2557	



## 1st Qu.:-0.6601	1st Qu.:-0.7267	1st Qu.:-0.6933	
## Median :-0.2786	Median :-0.2491	Median :-0.2565	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.3723	3rd Qu.: 0.3804	3rd Qu.: 0.3998	
## Max. : 3.9229	Max. : 3.4663	Max. : 4.0347	
## Elongation.ADC	Flatness.ADC	Max_cooc.L.ADC	Average_cooc.L.ADC
## Min. :-1.4264	Min. :-1.3266	Min. :-2.40536	Min. :-1.5647
## 1st Qu.:-0.6741	1st Qu.:-0.7412	1st Qu.:-0.49072	1st Qu.:-0.6815
## Median :-0.2632	Median :-0.2571	Median : 0.04561	Median :-0.3424
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	Mean : 0.0000
## 3rd Qu.: 0.1331	3rd Qu.: 0.3973	3rd Qu.: 0.54594	3rd Qu.: 0.4455
## Max. : 2.7058	Max. : 3.2541	Max. : 2.13306	Max. : 3.6204
## Variance_cooc.L.ADC	Entropy_cooc.L.ADC	DAVE_cooc.L.ADC	DVAR_cooc.L.ADC
## Min. :-1.2859	Min. :-0.9824	Min. :-1.2864	Min. :-1.1717
## 1st Qu.:-0.7621	1st Qu.:-0.6248	1st Qu.:-0.6974	1st Qu.:-0.6565
## Median :-0.1890	Median :-0.4987	Median :-0.2815	Median :-0.2047
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3842	3rd Qu.: 1.1123	3rd Qu.: 0.2482	3rd Qu.: 0.3589
## Max. : 4.4226	Max. : 2.2194	Max. : 3.8017	Max. : 4.4068
## DENT_cooc.L.ADC	SAVE_cooc.L.ADC	SVAR_cooc.L.ADC	SENT_cooc.L.ADC
## Min. :-0.9759	Min. :-1.5653	Min. :-1.2644	Min. :-1.9727
## 1st Qu.:-0.6384	1st Qu.:-0.6818	1st Qu.:-0.7216	1st Qu.:-0.6045
## Median :-0.4655	Median :-0.3427	Median :-0.3121	Median :-0.1270
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.9078	3rd Qu.: 0.4446	3rd Qu.: 0.4169	3rd Qu.: 0.1049
## Max. : 2.4613	Max. : 3.6211	Max. : 4.0559	Max. : 2.5018
## ASM_cooc.L.ADC	Contrast_cooc.L.ADC	Dissemblarity_cooc.L.ADC	
## Min. :-2.3863	Min. :-1.1727	Min. :-1.2864	
## 1st Qu.:-0.4982	1st Qu.:-0.6799	1st Qu.:-0.6974	
## Median : 0.1118	Median :-0.2518	Median :-0.2815	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.5833	3rd Qu.: 0.3354	3rd Qu.: 0.2482	
## Max. : 1.6927	Max. : 4.6750	Max. : 3.8017	
## Inv_diff_cooc.L.ADC	Inv_diff_norm_cooc.L.ADC	IDM_cooc.L.ADC	
## Min. :-1.3386	Min. :-0.7848	Min. :-1.5068	
## 1st Qu.:-0.6851	1st Qu.:-0.6074	1st Qu.:-0.6849	
## Median :-0.3821	Median :-0.5390	Median :-0.3204	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.4258	3rd Qu.: 1.4482	3rd Qu.: 0.4067	
## Max. : 3.0608	Max. : 1.9217	Max. : 3.4277	
## IDM_norm_cooc.L.ADC	Inv_var_cooc.L.ADC	Correlation_cooc.L.ADC	
## Min. :-0.7347	Min. :-1.5182	Min. :-1.5857	
## 1st Qu.:-0.5868	1st Qu.:-0.6747	1st Qu.:-0.5887	
## Median :-0.5461	Median :-0.3082	Median :-0.2321	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 1.5511	3rd Qu.: 0.3811	3rd Qu.: 0.2686	
## Max. : 1.8161	Max. : 3.4062	Max. : 3.1376	
## Autocorrelation_.L.ADC	Tendency_cooc.L.ADC	Shade_.L.ADC	
## Min. :-1.4980	Min. :-1.2644	Min. :-3.0880	
## 1st Qu.:-0.6548	1st Qu.:-0.7216	1st Qu.:-0.4341	
## Median :-0.2485	Median :-0.3121	Median :-0.1871	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.3473	3rd Qu.: 0.4169	3rd Qu.: 0.2111	
## Max. : 4.7450	Max. : 4.0559	Max. : 4.3795	

```

## Prominence_cooc.L.ADC      IC1_.L.ADC      IC2_.L.ADC
## Min.      :-0.9301      Min.      :-5.1869      Min.      :-1.3787
## 1st Qu.: -0.6482      1st Qu.: -0.4473      1st Qu.: -0.6500
## Median : -0.3005      Median :  0.2340      Median : -0.3969
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.:  0.3376      3rd Qu.:  0.6165      3rd Qu.:  0.2411
## Max.      : 4.6896      Max.      : 1.5551      Max.      : 3.0658
## Coarseness_vdif_.L.ADC Contrast_vdif_.L.ADC Busyness_vdif_.L.ADC
## Min.      :-2.02453      Min.      :-0.9205      Min.      :-0.7744
## 1st Qu.: -0.47654      1st Qu.: -0.5846      1st Qu.: -0.5677
## Median :  0.01276      Median : -0.3017      Median : -0.3409
## Mean      : 0.00000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.:  0.40344      3rd Qu.:  0.1717      3rd Qu.:  0.2597
## Max.      : 4.15362      Max.      : 5.6466      Max.      : 6.7651
## Complexity_vdif_.L.ADC Strength_vdif_.L.ADC SRE_align.L.ADC
## Min.      :-1.4237      Min.      :-0.65013      Min.      :-0.7719
## 1st Qu.: -0.6752      1st Qu.: -0.48041      1st Qu.: -0.5832
## Median : -0.1945      Median : -0.29159      Median : -0.5443
## Mean      : 0.0000      Mean      : 0.00000      Mean      : 0.0000
## 3rd Qu.:  0.2832      3rd Qu.: -0.05036      3rd Qu.:  1.4803
## Max.      : 3.2894      Max.      : 6.57379      Max.      : 1.8545
## LRE_align.L.ADC      GLNU_align.L.ADC      RLNU_align.L.ADC      RP_align.L.ADC
## Min.      :-0.8114      Min.      :-0.6574      Min.      :-0.7015      Min.      :-0.7982
## 1st Qu.: -0.6500      1st Qu.: -0.5599      1st Qu.: -0.5546      1st Qu.: -0.5910
## Median : -0.5388      Median : -0.3888      Median : -0.3845      Median : -0.5391
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.:  1.2822      3rd Qu.:  0.2165      3rd Qu.:  0.1460      3rd Qu.:  1.4307
## Max.      : 2.3579      Max.      : 6.8086      Max.      : 6.4904      Max.      : 1.8896
## LGRE_align.L.ADC      HGRE_align.L.ADC      LGSRE_align.L.ADC      HGSRE_align.L.ADC
## Min.      :-2.2148      Min.      :-1.5774      Min.      :-2.2243      Min.      :-1.5947
## 1st Qu.: -0.5485      1st Qu.: -0.6643      1st Qu.: -0.5445      1st Qu.: -0.6838
## Median :  0.1458      Median : -0.2731      Median :  0.1536      Median : -0.2903
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.:  0.5269      3rd Qu.:  0.3600      3rd Qu.:  0.5266      3rd Qu.:  0.3842
## Max.      : 3.1699      Max.      : 4.5613      Max.      : 3.0478      Max.      : 4.3891
## LGHRE_align.L.ADC      HGLRE_align.L.ADC      GLNU_norm_align.L.ADC
## Min.      :-2.1734      Min.      :-1.4860      Min.      :-2.11008
## 1st Qu.: -0.5655      1st Qu.: -0.7008      1st Qu.: -0.48538
## Median :  0.1303      Median : -0.1989      Median : -0.06251
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.00000
## 3rd Qu.:  0.5017      3rd Qu.:  0.2984      3rd Qu.:  0.37502
## Max.      : 3.8145      Max.      : 5.2592      Max.      : 2.81475
## RLNU_norm_align.L.ADC      GLVAR_align.L.ADC      RLVAR_align.L.ADC      Entropy_align.L.ADC
## Min.      :-0.8664      Min.      :-1.2324      Min.      :-1.8814      Min.      :-0.7768
## 1st Qu.: -0.6053      1st Qu.: -0.7363      1st Qu.: -0.5808      1st Qu.: -0.6281
## Median : -0.5184      Median : -0.2167      Median : -0.1993      Median : -0.5369
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.:  1.2976      3rd Qu.:  0.3836      3rd Qu.:  0.4437      3rd Qu.:  1.3840
## Max.      : 2.0169      Max.      : 4.7240      Max.      : 3.8452      Max.      : 2.1004
## SZSE.L.ADC      LZSE.L.ADC      LGLZE.L.ADC      HGLZE.L.ADC
## Min.      :-0.8496      Min.      :-0.9893      Min.      :-2.2245      Min.      :-1.5684
## 1st Qu.: -0.6186      1st Qu.: -0.6976      1st Qu.: -0.5451      1st Qu.: -0.6815
## Median : -0.5273      Median : -0.4658      Median :  0.1492      Median : -0.2709
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000

```

## 3rd Qu.: 1.3310	3rd Qu.: 0.5987	3rd Qu.: 0.5309	3rd Qu.: 0.3807
## Max. : 2.0528	Max. : 3.7629	Max. : 2.8769	Max. : 4.4810
## SZLGE.L.ADC	SZHGE.L.ADC	LZLGE.L.ADC	LZHGE.L.ADC
## Min. : -2.2426	Min. : -1.6111	Min. : -1.99415	Min. : -1.0980
## 1st Qu.: -0.5407	1st Qu.: -0.6719	1st Qu.: -0.57935	1st Qu.: -0.6538
## Median : 0.1133	Median : -0.2769	Median : 0.07479	Median : -0.2980
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	Mean : 0.0000
## 3rd Qu.: 0.5203	3rd Qu.: 0.3855	3rd Qu.: 0.43939	3rd Qu.: 0.3151
## Max. : 2.5683	Max. : 4.0198	Max. : 5.02589	Max. : 6.1772
## GLNU_area.L.ADC	ZSNU.L.ADC	ZSP.L.ADC	GLNU_norm.L.ADC
## Min. : -0.6701	Min. : -0.7023	Min. : -0.9792	Min. : -2.11873
## 1st Qu.: -0.5637	1st Qu.: -0.5485	1st Qu.: -0.6124	1st Qu.: -0.46511
## Median : -0.3845	Median : -0.3419	Median : -0.4893	Median : -0.03802
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.00000
## 3rd Qu.: 0.1403	3rd Qu.: 0.1582	3rd Qu.: 1.0724	3rd Qu.: 0.37453
## Max. : 6.0648	Max. : 6.7810	Max. : 2.2292	Max. : 2.60581
## ZSNU_norm.L.ADC	GLVAR_area.L.ADC	ZSVAR.L.ADC	Entropy_area.L.ADC
## Min. : -1.0136	Min. : -1.2168	Min. : -0.8481	Min. : -0.7653
## 1st Qu.: -0.6068	1st Qu.: -0.7329	1st Qu.: -0.5710	1st Qu.: -0.6170
## Median : -0.4718	Median : -0.2247	Median : -0.3763	Median : -0.5393
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.9821	3rd Qu.: 0.3653	3rd Qu.: 0.1338	3rd Qu.: 1.3657
## Max. : 2.4730	Max. : 4.8084	Max. : 4.4745	Max. : 2.0718
## Max_cooc.H.ADC	Average_cooc.H.ADC	Variance_cooc.H.ADC	Entropy_cooc.H.ADC
## Min. : -2.3371	Min. : -0.7948	Min. : -0.7235	Min. : -0.8847
## 1st Qu.: -0.4994	1st Qu.: -0.6111	1st Qu.: -0.6025	1st Qu.: -0.5826
## Median : 0.1186	Median : -0.5369	Median : -0.5508	Median : -0.5426
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.5854	3rd Qu.: 1.2501	3rd Qu.: 1.4743	3rd Qu.: 1.1187
## Max. : 1.7159	Max. : 2.1569	Max. : 1.9213	Max. : 1.8848
## DAVE_cooc.H.ADC	DVAR_cooc.H.ADC	DENT_cooc.H.ADC	SAVE_cooc.H.ADC
## Min. : -1.1715	Min. : -1.1938	Min. : -0.7651	Min. : -0.7953
## 1st Qu.: -0.6742	1st Qu.: -0.6459	1st Qu.: -0.6067	1st Qu.: -0.6114
## Median : -0.4508	Median : -0.3725	Median : -0.5447	Median : -0.5374
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.3058	3rd Qu.: 0.1048	3rd Qu.: 1.3235	3rd Qu.: 1.2503
## Max. : 2.6408	Max. : 2.7511	Max. : 1.9569	Max. : 2.1563
## SVAR_cooc.H.ADC	SENT_cooc.H.ADC	ASM_cooc.H.ADC	Contrast_cooc.H.ADC
## Min. : -0.9707	Min. : -0.9294	Min. : -2.3505	Min. : -1.2775
## 1st Qu.: -0.6441	1st Qu.: -0.6185	1st Qu.: -0.4601	1st Qu.: -0.6448
## Median : -0.4055	Median : -0.5117	Median : 0.1116	Median : -0.3296
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.8015	3rd Qu.: 1.0046	3rd Qu.: 0.6028	3rd Qu.: 0.2470
## Max. : 2.4109	Max. : 2.2145	Max. : 1.4704	Max. : 2.9382
## Dissimilarity_cooc.H.ADC	Inv_diff_cooc.H.ADC	Inv_diff_norm_cooc.H.ADC	
## Min. : -1.1715	Min. : -1.5080	Min. : -0.8136	
## 1st Qu.: -0.6742	1st Qu.: -0.5884	1st Qu.: -0.5940	
## Median : -0.4508	Median : -0.3060	Median : -0.5295	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.3058	3rd Qu.: 0.3670	3rd Qu.: 1.4111	
## Max. : 2.6408	Max. : 2.9514	Max. : 1.9758	
## IDM_cooc.H.ADC	IDM_norm_cooc.H.ADC	Inv_var_cooc.H.ADC	
## Min. : -1.8238	Min. : -0.7770	Min. : -1.8455	
## 1st Qu.: -0.5396	1st Qu.: -0.5848	1st Qu.: -0.4991	

```

## Median :-0.1772 Median :-0.5391 Median :-0.1806
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.5376 3rd Qu.: 1.4745 3rd Qu.: 0.4257
## Max. : 3.1890 Max. : 1.8842 Max. : 3.1448
## Correlation_cooc.H.ADC Autocorrelation_cooc.H.ADC Tendency_cooc.H.ADC
## Min. :-1.5337 Min. :-1.0271 Min. :-0.9707
## 1st Qu.: -0.5809 1st Qu.: -0.6158 1st Qu.: -0.6441
## Median :-0.2354 Median :-0.5417 Median :-0.4055
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.2656 3rd Qu.: 0.7441 3rd Qu.: 0.8015
## Max. : 3.2010 Max. : 2.2641 Max. : 2.4109
## Shade_cooc.H.ADC Prominence_cooc.H.ADC IC1_d.H.ADC IC2_d.H.ADC
## Min. :-2.77052 Min. :-1.1193 Min. :-6.0367 Min. :-1.2413
## 1st Qu.: -0.53284 1st Qu.: -0.6229 1st Qu.: -0.2691 1st Qu.: -0.6695
## Median : 0.02229 Median :-0.3702 Median : 0.2777 Median :-0.4280
## Mean : 0.00000 Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.52112 3rd Qu.: 0.3676 3rd Qu.: 0.5805 3rd Qu.: 0.3188
## Max. : 3.79390 Max. : 2.6578 Max. : 1.1009 Max. : 3.0638
## Coarseness_vdif.H.ADC Contrast_vdif.H.ADC Busyness_vdif.H.ADC
## Min. :-2.03513 Min. :-1.2124 Min. :-0.6917
## 1st Qu.: -0.48736 1st Qu.: -0.6760 1st Qu.: -0.5554
## Median : 0.02405 Median :-0.4152 Median :-0.3450
## Mean : 0.00000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.43289 3rd Qu.: 0.1278 3rd Qu.: 0.1152
## Max. : 4.13594 Max. : 2.7803 Max. : 6.4584
## Complexity_vdif.H.ADC Strength_vdif.H.ADC SRE_align.H.ADC LRE_align.H.ADC
## Min. :-1.2507 Min. :-0.5432 Min. :-0.7222 Min. :-0.7514
## 1st Qu.: -0.6866 1st Qu.: -0.4499 1st Qu.: -0.5795 1st Qu.: -0.6115
## Median :-0.4396 Median :-0.3040 Median :-0.5513 Median :-0.5418
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.1617 3rd Qu.: -0.1236 3rd Qu.: 1.5719 3rd Qu.: 1.4942
## Max. : 2.8308 Max. : 7.0284 Max. : 1.7996 Max. : 2.0278
## GLNU_align.H.ADC RLNU_align.H.ADC RP_align.H.ADC LGRE_align.H.ADC
## Min. :-0.6935 Min. :-0.7005 Min. :-0.7282 Min. :-2.15229
## 1st Qu.: -0.5587 1st Qu.: -0.5612 1st Qu.: -0.5806 1st Qu.: -0.45456
## Median :-0.3999 Median :-0.3997 Median :-0.5496 Median :-0.05554
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000 Mean : 0.00000
## 3rd Qu.: 0.1402 3rd Qu.: 0.1532 3rd Qu.: 1.5612 3rd Qu.: 0.42792
## Max. : 6.4171 Max. : 6.3321 Max. : 1.8209 Max. : 1.90419
## HGRE_align.H.ADC LGSRE_align.H.ADC HGSRE_align.H.ADC LGHRE_align.H.ADC
## Min. :-0.6158 Min. :-2.21358 Min. :-0.6616 Min. :-2.16369
## 1st Qu.: -0.5856 1st Qu.: -0.46834 1st Qu.: -0.5905 1st Qu.: -0.43595
## Median :-0.5793 Median :-0.03469 Median :-0.5732 Median :-0.08695
## Mean : 0.0000 Mean : 0.00000 Mean : 0.0000 Mean : 0.00000
## 3rd Qu.: 1.6403 3rd Qu.: 0.40877 3rd Qu.: 1.5502 3rd Qu.: 0.37072
## Max. : 1.7953 Max. : 1.95168 Max. : 1.8648 Max. : 2.34515
## HGLRE_align.H.ADC GLNU_norm_align.H.ADC RLNU_norm_align.H.ADC
## Min. :-0.6756 Min. :-2.22103 Min. :-0.7467
## 1st Qu.: -0.6034 1st Qu.: -0.54265 1st Qu.: -0.5861
## Median :-0.5529 Median :-0.03044 Median :-0.5508
## Mean : 0.0000 Mean : 0.00000 Mean : 0.0000
## 3rd Qu.: 1.4993 3rd Qu.: 0.50950 3rd Qu.: 1.5274
## Max. : 2.1245 Max. : 1.70856 Max. : 1.8932
## GLVAR_align.H.ADC RLVAR_align.H.ADC Entropy_align.H.ADC SZSE.H.ADC

```

## Min. : -0.6228	Min. : -2.23664	Min. : -0.6485	Min. : -0.7613
## 1st Qu.: -0.5864	1st Qu.: -0.45655	1st Qu.: -0.5877	1st Qu.: -0.5921
## Median : -0.5747	Median : 0.03709	Median : -0.5689	Median : -0.5464
## Mean : 0.0000	Mean : 0.00000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.6294	3rd Qu.: 0.48787	3rd Qu.: 1.5623	3rd Qu.: 1.4964
## Max. : 1.7875	Max. : 3.26888	Max. : 1.8011	Max. : 1.9530
## LZSE.H.ADC	LGLZE.H.ADC	HGLZE.H.ADC	SZLGE.H.ADC
## Min. : -0.9658	Min. : -2.22947	Min. : -0.6777	Min. : -2.274047
## 1st Qu.: -0.6763	1st Qu.: -0.47148	1st Qu.: -0.5910	1st Qu.: -0.432630
## Median : -0.4997	Median : -0.01215	Median : -0.5690	Median : 0.006384
## Mean : 0.0000	Mean : 0.00000	Mean : 0.0000	Mean : 0.000000
## 3rd Qu.: 0.8006	3rd Qu.: 0.44354	3rd Qu.: 1.5427	3rd Qu.: 0.457299
## Max. : 2.7486	Max. : 2.02997	Max. : 1.8487	Max. : 2.138033
## SZHGE.H.ADC	LZLGE.H.ADC	LZHGE.H.ADC	GLNU_area.H.ADC
## Min. : -0.7407	Min. : -1.9143	Min. : -0.9615	Min. : -0.6950
## 1st Qu.: -0.5947	1st Qu.: -0.4764	1st Qu.: -0.6552	1st Qu.: -0.5584
## Median : -0.5574	Median : -0.1523	Median : -0.5438	Median : -0.3958
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.3859	3rd Qu.: 0.4952	3rd Qu.: 0.7570	3rd Qu.: 0.1541
## Max. : 2.0669	Max. : 4.3386	Max. : 3.9017	Max. : 6.4362
## ZSNU.H.ADC	ZSP.H.ADC	GLNU_norm.H.ADC	ZSNU_norm.H.ADC
## Min. : -0.7054	Min. : -0.8087	Min. : -2.22083	Min. : -0.8353
## 1st Qu.: -0.5636	1st Qu.: -0.6050	1st Qu.: -0.54112	1st Qu.: -0.6110
## Median : -0.3916	Median : -0.5389	Median : -0.03152	Median : -0.5388
## Mean : 0.0000	Mean : 0.0000	Mean : 0.00000	Mean : 0.0000
## 3rd Qu.: 0.1526	3rd Qu.: 1.4343	3rd Qu.: 0.50815	3rd Qu.: 1.2790
## Max. : 6.3748	Max. : 2.0467	Max. : 1.72002	Max. : 2.2862
## GLVAR_area.H.ADC	ZSVAR.H.ADC	Entropy_area.H.ADC	Max_cooc.W.ADC
## Min. : -0.7003	Min. : -1.3982	Min. : -0.7062	Min. : -2.3379
## 1st Qu.: -0.5925	1st Qu.: -0.6448	1st Qu.: -0.5938	1st Qu.: -0.4827
## Median : -0.5589	Median : -0.2461	Median : -0.5557	Median : 0.1420
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.4922	3rd Qu.: 0.3541	3rd Qu.: 1.4400	3rd Qu.: 0.5983
## Max. : 1.8856	Max. : 4.8315	Max. : 1.8920	Max. : 1.5572
## Average_cooc.W.ADC	Variance_cooc.W.ADC	DAVE_cooc.W.ADC	DVAR_cooc.W.ADC
## Min. : -1.4890	Min. : -1.1255	Min. : -1.4215	Min. : -1.1708
## 1st Qu.: -0.6443	1st Qu.: -0.6947	1st Qu.: -0.6477	1st Qu.: -0.6932
## Median : -0.1974	Median : -0.1999	Median : -0.3082	Median : -0.2843
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 0.2788	3rd Qu.: 0.2675	3rd Qu.: 0.4060	3rd Qu.: 0.3968
## Max. : 3.1582	Max. : 4.3063	Max. : 3.6687	Max. : 4.2974
## DENT_cooc.W.ADC	SAVE_cooc.W.ADC	SVAR_cooc.W.ADC	SENT_cooc.W.ADC
## Min. : -0.9201	Min. : -1.5115	Min. : -1.0500	Min. : -1.9175
## 1st Qu.: -0.6168	1st Qu.: -0.6428	1st Qu.: -0.7069	1st Qu.: -0.5955
## Median : -0.4971	Median : -0.1899	Median : -0.2297	Median : -0.2012
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	Mean : 0.0000
## 3rd Qu.: 1.0249	3rd Qu.: 0.3385	3rd Qu.: 0.2119	3rd Qu.: 0.2247
## Max. : 2.2735	Max. : 3.2681	Max. : 4.4179	Max. : 2.7670
## ASM_cooc.W.ADC	Contrast_cooc.W.ADC	Dissemblarity_cooc.W.ADC	
## Min. : -2.3485	Min. : -1.2599	Min. : -1.4215	
## 1st Qu.: -0.4625	1st Qu.: -0.6538	1st Qu.: -0.6477	
## Median : 0.1160	Median : -0.2904	Median : -0.3082	
## Mean : 0.0000	Mean : 0.0000	Mean : 0.0000	
## 3rd Qu.: 0.6007	3rd Qu.: 0.4014	3rd Qu.: 0.4060	

```

## Max. : 1.4834 Max. : 4.4526 Max. : 3.6687
## Inv_diff_cooc.W.ADC Inv_diff_norm_cooc.W.ADC IDM_cooc.W.ADC
## Min. : -2.4673 Min. : -0.7847 Min. : -1.8818
## 1st Qu.: -0.5374 1st Qu.: -0.6079 1st Qu.: -0.5428
## Median : -0.2640 Median : -0.5392 Median : -0.1774
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.4018 3rd Qu.: 1.4483 3rd Qu.: 0.4203
## Max. : 3.4195 Max. : 1.9241 Max. : 3.6069
## IDM_norm_cooc.W.ADC Inv_var_cooc.W.ADC Correlation_cooc.W.ADC
## Min. : -0.7349 Min. : -1.8864 Min. : -1.5829
## 1st Qu.: -0.5875 1st Qu.: -0.5355 1st Qu.: -0.5917
## Median : -0.5463 Median : -0.1854 Median : -0.2323
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 1.5506 3rd Qu.: 0.4358 3rd Qu.: 0.2677
## Max. : 1.8175 Max. : 3.6532 Max. : 3.1362
## Autocorrelation_cooc.W.ADC Tendency_cooc.W.ADC Shade_cooc.W.ADC
## Min. : -1.2943 Min. : -1.0500 Min. : -2.2695
## 1st Qu.: -0.6547 1st Qu.: -0.7069 1st Qu.: -0.4006
## Median : -0.2595 Median : -0.2297 Median : -0.2135
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.4212 3rd Qu.: 0.2119 3rd Qu.: 0.2092
## Max. : 4.0616 Max. : 4.4179 Max. : 5.4450
## Prominence_cooc.W.ADC IC1_d.W.ADC IC2_d.W.ADC
## Min. : -0.6919 Min. : -4.5975 Min. : -1.2237
## 1st Qu.: -0.6007 1st Qu.: -0.4209 1st Qu.: -0.6385
## Median : -0.3129 Median : 0.1758 Median : -0.4111
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.0198 3rd Qu.: 0.7310 3rd Qu.: 0.5026
## Max. : 5.8345 Max. : 1.3308 Max. : 2.5156
## Coarseness_vdif.W.ADC Contrast_vdif.W.ADC Busyness_vdif.W.ADC
## Min. : -2.1195 Min. : -0.9791 Min. : -2.11863
## 1st Qu.: -0.4700 1st Qu.: -0.5561 1st Qu.: -0.52395
## Median : 0.0510 Median : -0.3072 Median : -0.09297
## Mean : 0.0000 Mean : 0.0000 Mean : 0.00000
## 3rd Qu.: 0.4602 3rd Qu.: 0.1078 3rd Qu.: 0.43915
## Max. : 3.8050 Max. : 6.8033 Max. : 4.28742
## Complexity_vdif.W.ADC Strength_vdif.W.ADC SRE_align.W.ADC LRE_align.W.ADC
## Min. : -0.9709 Min. : -1.1121 Min. : -0.7308 Min. : -0.7211
## 1st Qu.: -0.6681 1st Qu.: -0.6535 1st Qu.: -0.5816 1st Qu.: -0.5887
## Median : -0.2653 Median : -0.3435 Median : -0.5543 Median : -0.5529
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000 Mean : 0.0000
## 3rd Qu.: 0.3990 3rd Qu.: 0.3265 3rd Qu.: 1.5552 3rd Qu.: 1.5492
## Max. : 6.0882 Max. : 4.9793 Max. : 1.7860 Max. : 1.9636
## GLNU_align.W.ADC RLNU_align.W.ADC RP_align.W.ADC LGRE_align.W.ADC
## Min. : -0.7333 Min. : -0.6902 Min. : -0.7401 Min. : -2.27237
## 1st Qu.: -0.5941 1st Qu.: -0.5539 1st Qu.: -0.5818 1st Qu.: -0.51539
## Median : -0.3737 Median : -0.3981 Median : -0.5526 Median : 0.09534
## Mean : 0.0000 Mean : 0.0000 Mean : 0.0000 Mean : 0.00000
## 3rd Qu.: 0.1388 3rd Qu.: 0.1480 3rd Qu.: 1.5379 3rd Qu.: 0.54819
## Max. : 6.5566 Max. : 6.5382 Max. : 1.7965 Max. : 2.70926
## HGRE_align.W.ADC LGSRE_align.W.ADC HGSRE_align.W.ADC LGHRE_align.W.ADC
## Min. : -1.3135 Min. : -2.27566 Min. : -1.3136 Min. : -2.24791
## 1st Qu.: -0.6889 1st Qu.: -0.51275 1st Qu.: -0.6882 1st Qu.: -0.52760
## Median : -0.1647 Median : 0.09994 Median : -0.1662 Median : 0.07717

```

```

## Mean      : 0.0000      Mean      : 0.00000      Mean      : 0.0000      Mean      : 0.00000
## 3rd Qu.: 0.4045      3rd Qu.: 0.55436      3rd Qu.: 0.4067      3rd Qu.: 0.52536
## Max.      : 4.0753      Max.      : 2.61211      Max.      : 4.0823      Max.      : 3.19638
## HGLRE_align.W.ADC  GLNU_norm_align.W.ADC  RLNU_norm_align.W.ADC
## Min.      : -1.3123      Min.      : -2.28055      Min.      : -0.7720
## 1st Qu.: -0.6870      1st Qu.: -0.46039      1st Qu.: -0.5878
## Median    : -0.1590      Median    : 0.01598      Median    : -0.5460
## Mean      : 0.0000      Mean      : 0.00000      Mean      : 0.0000
## 3rd Qu.: 0.3984      3rd Qu.: 0.54042      3rd Qu.: 1.4790
## Max.      : 4.0428      Max.      : 2.32851      Max.      : 1.8347
## GLVAR_align.W.ADC  RLVAR_align.W.ADC  Entropy_align.W.ADC  SZSE.W.ADC
## Min.      : -1.1389      Min.      : -2.29100      Min.      : -0.9913      Min.      : -0.7773
## 1st Qu.: -0.7347      1st Qu.: -0.46023      1st Qu.: -0.6439      1st Qu.: -0.5819
## Median    : -0.1759      Median    : 0.02314      Median    : -0.4745      Median    : -0.5430
## Mean      : 0.0000      Mean      : 0.00000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.2403      3rd Qu.: 0.49588      3rd Qu.: 0.8898      3rd Qu.: 1.4776
## Max.      : 4.2367      Max.      : 2.82723      Max.      : 2.4115      Max.      : 1.8160
## LZSE.W.ADC      LGLZE.W.ADC      HGLZE.W.ADC      SZLGE.W.ADC
## Min.      : -0.7715      Min.      : -2.2768      Min.      : -1.3138      Min.      : -2.2818
## 1st Qu.: -0.6308      1st Qu.: -0.5090      1st Qu.: -0.6890      1st Qu.: -0.5025
## Median    : -0.5511      Median    : 0.1003      Median    : -0.1561      Median    : 0.1009
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 1.2120      3rd Qu.: 0.5570      3rd Qu.: 0.4104      3rd Qu.: 0.5705
## Max.      : 2.5306      Max.      : 2.4096      Max.      : 4.0870      Max.      : 2.1477
## SZHGE.W.ADC      LZLGE.W.ADC      LZHGE.W.ADC      GLNU_area.W.ADC
## Min.      : -1.3133      Min.      : -2.13651      Min.      : -1.3090      Min.      : -0.7321
## 1st Qu.: -0.6852      1st Qu.: -0.54372      1st Qu.: -0.7059      1st Qu.: -0.5915
## Median    : -0.1610      Median    : 0.08248      Median    : -0.1803      Median    : -0.3799
## Mean      : 0.0000      Mean      : 0.00000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.4095      3rd Qu.: 0.46969      3rd Qu.: 0.4200      3rd Qu.: 0.1598
## Max.      : 4.1196      Max.      : 4.04184      Max.      : 4.2178      Max.      : 6.6650
## ZSNU.W.ADC      ZSP.W.ADC      GLNU_norm.W.ADC      ZSNU_norm.W.ADC
## Min.      : -0.6841      Min.      : -0.8076      Min.      : -2.2549      Min.      : -0.8857
## 1st Qu.: -0.5457      1st Qu.: -0.5855      1st Qu.: -0.4805      1st Qu.: -0.6034
## Median    : -0.3904      Median    : -0.5378      Median    : 0.0624      Median    : -0.5320
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.1352      3rd Qu.: 1.4251      3rd Qu.: 0.5381      3rd Qu.: 1.2603
## Max.      : 6.6729      Max.      : 1.8574      Max.      : 2.2114      Max.      : 2.0579
## GLVAR_area.W.ADC  ZSVAR.W.ADC      Entropy_area.W.ADC
## Min.      : -1.1391      Min.      : -1.6945      Min.      : -0.9756
## 1st Qu.: -0.7273      1st Qu.: -0.5990      1st Qu.: -0.6280
## Median    : -0.1741      Median    : -0.1693      Median    : -0.4946
## Mean      : 0.0000      Mean      : 0.0000      Mean      : 0.0000
## 3rd Qu.: 0.2387      3rd Qu.: 0.4701      3rd Qu.: 0.8891
## Max.      : 4.2228      Max.      : 4.5022      Max.      : 2.2949

```

start at 2 clusters

```

k2 <- kmeans(x_train, centers = 2, nstart = 25)
str(k2)

```

```
## List of 9
```

```
## $ cluster      : Named int [1:197] 2 2 2 2 2 2 2 2 2 2 ...
##   ..- attr(*, "names")= chr [1:197] "1" "2" "3" "4" ...
## $ centers       : num [1:2, 1:430] 1.580918 -0.537727 -0.001473 0.000501 0.048455 ...
##   ..- attr(*, "dimnames")=List of 2
##     ..$ : chr [1:2] "1" "2"
##     ..$ : chr [1:430] "Institution" "Failure" "Entropy_cooc.W.ADC" "GLNU_align.H.PET" ...
## $ totss        : num 84280
## $ withinss     : num [1:2] 21069 23827
## $ tot.withinss : num 44895
## $ betweenss    : num 39385
## $ size         : int [1:2] 50 147
## $ iter         : int 1
## $ ifault       : int 0
## - attr(*, "class")= chr "kmeans"
```

```
##plot the 2 clusters
```

```
fviz_cluster(k2, data = x_train)
```



```
## get the each cluster's data
```

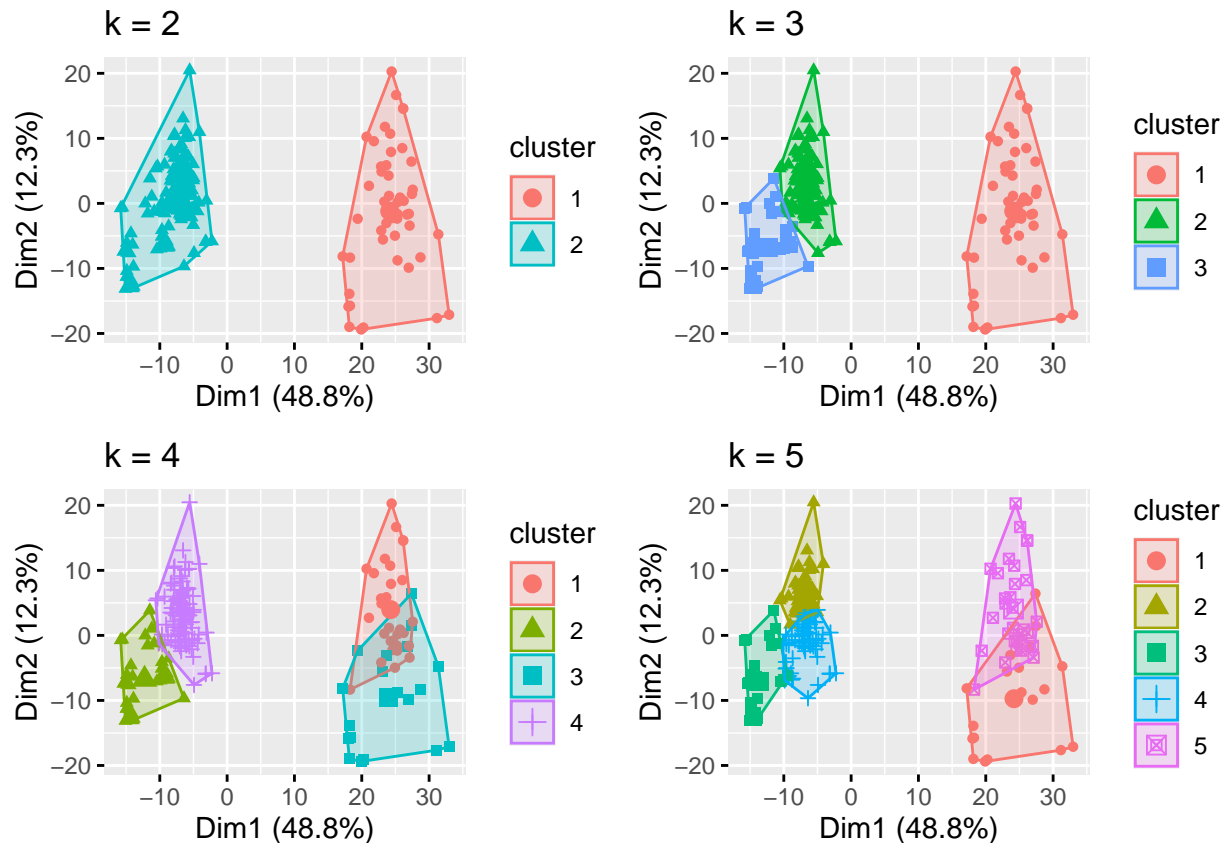
```
k3 <- kmeans(x_train, centers = 3, nstart = 25)
k4 <- kmeans(x_train, centers = 4, nstart = 25)
k5 <- kmeans(x_train, centers = 5, nstart = 25)
```



## plots to compare

```
p1 <- fviz_cluster(k2, geom = "point", data = x_train) + ggtitle("k = 2")
p2 <- fviz_cluster(k3, geom = "point", data = x_train) + ggtitle("k = 3")
p3 <- fviz_cluster(k4, geom = "point", data = x_train) + ggtitle("k = 4")
p4 <- fviz_cluster(k5, geom = "point", data = x_train) + ggtitle("k = 5")

grid.arrange(p1, p2, p3, p4, nrow = 2)
```



##Determining Optimal Number of Clusters

```
set.seed(123)
```

#function to compute total within-cluster sum of square

```
wss <- function(k) {
  kmeans(x_train, k, nstart = 10)$tot.withinss
}
```

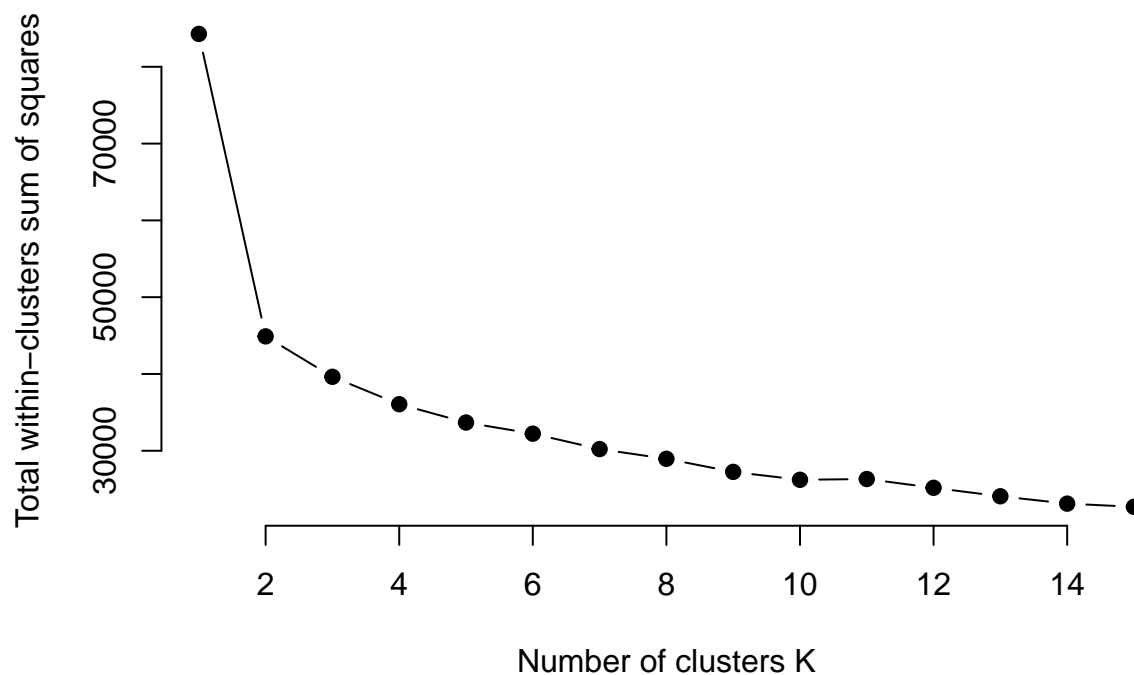
Compute and plot wss for k = 1 to k = 15

```
k.values <- 1:15
```

extract wss for 2-15 clusters

```
wss_values <- map_dbl(k.values, wss)

plot(k.values, wss_values,
     type="b", pch = 19, frame = FALSE,
     xlab="Number of clusters K",
     ylab="Total within-clusters sum of squares")
```



compute gap statistic

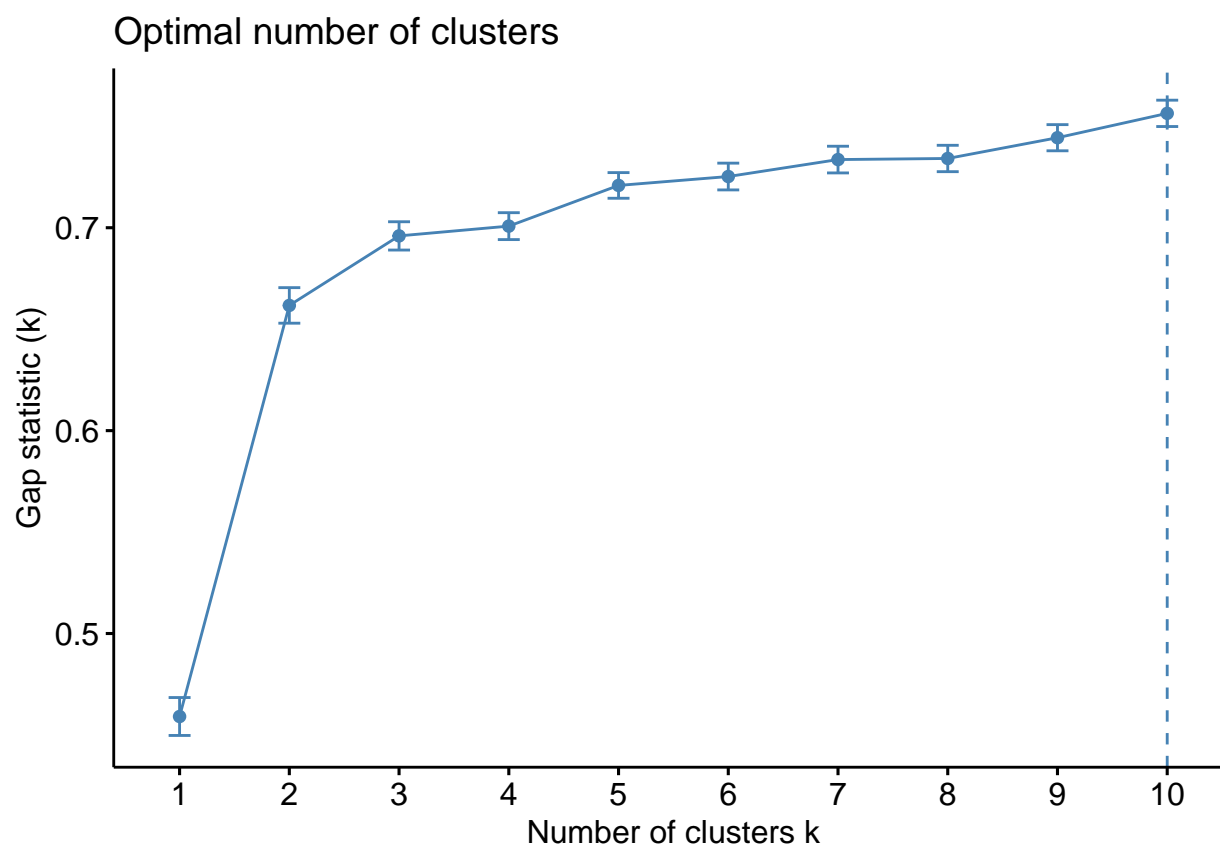
```
set.seed(123)
gap_stat <- clusGap(x_train, FUN = kmeans, nstart = 25,
                   K.max = 10, B = 50)
```

## Print the result

```
print(gap_stat, method = "firstmax")
```

```
## Clustering Gap statistic ["clusGap"] from call:  
## clusGap(x = x_train, FUNcluster = kmeans, K.max = 10, B = 50,      nstart = 25)  
## B=50 simulated reference sets, k = 1..10; spaceH0="scaledPCA"  
## --> Number of clusters (method 'firstmax'): 10  
##      logW      E.logW      gap      SE.sim  
## [1,] 7.172238 7.631343 0.4591050 0.009344722  
## [2,] 6.879860 7.541570 0.6617097 0.008762466  
## [3,] 6.799071 7.495045 0.6959738 0.006975238  
## [4,] 6.760250 7.461038 0.7007876 0.006630901  
## [5,] 6.715751 7.436595 0.7208444 0.006319998  
## [6,] 6.689678 7.414915 0.7252363 0.006598069  
## [7,] 6.661851 7.395440 0.7335893 0.006576344  
## [8,] 6.643375 7.377503 0.7341279 0.006496770  
## [9,] 6.616695 7.361058 0.7443634 0.006441963  
## [10,] 6.589169 7.345537 0.7563681 0.006495757
```

```
fviz_gap_stat(gap_stat)
```



```
## Compute k-means clustering with k = 2
```

```
set.seed(123)
final <- kmeans(x_train, 2, nstart = 25)
print(final)
```

```
## K-means clustering with 2 clusters of sizes 50, 147
##
## Cluster means:
##      Institution      Failure Entropy_cooc.W.ADC GLNU_align.H.PET Min_hist.PET
## 1    1.5809179 -0.0014733768      0.04845450      -0.07901100      0.9204612
## 2   -0.5377272  0.0005011486      -0.01648112      0.02687449     -0.3130820
##      Max_hist.PET Mean_hist.PET Variance_hist.PET Standard_Deviation_hist.PET
## 1      0.9468341      0.9216792      0.4594337      0.9319222
## 2     -0.3220524     -0.3134963     -0.1562700     -0.3169804
##      Skewness_hist.PET Kurtosis_hist.PET Energy_hist.PET Entropy_hist.PET
## 1      0.9115602      0.25274217      0.6864958      1.5003007
## 2     -0.3100545     -0.08596673     -0.2335020     -0.5103064
##      AUC_hist.PET H_suv.PET Volume.PET X3D_surface.PET ratio_3ds_vol.PET
## 1      1.6957546      0.9652219      0.5900077      0.3802612      0.9436984
## 2     -0.5767873     -0.3283068     -0.2006829     -0.1293406     -0.3209858
##      ratio_3ds_vol_norm.PET irregularity.PET tumor_length.PET Compactness_v1.PET
## 1      0.9622506      1.6522842      1.0256292      0.8807232
## 2     -0.3272961     -0.5620014     -0.3488535     -0.2995657
##      Compactness_v2.PET Spherical_disproportion.PET Sphericity.PET Asphericity.PET
## 1      0.4324058      0.9622506      0.4460709      0.9240341
## 2     -0.1470768     -0.3272961     -0.1517248     -0.3142973
##      Center_of_mass.PET Max_3D_diam.PET Major_axis_length.PET
## 1      0.6358358      0.8259982      0.8904297
## 2     -0.2162707     -0.2809518     -0.3028672
##      Minor_axis_length.PET Least_axis_length.PET Elongation.PET Flatness.PET
## 1      1.1433164      0.9772289      1.4563692      1.3553445
## 2     -0.3888831     -0.3323908     -0.4953637     -0.4610015
##      Max_cooc.L.PET Average_cooc.L.PET Variance_cooc.L.PET Entropy_cooc.L.PET
## 1      0.7290795      1.389215      1.1041050      1.6813985
## 2     -0.2479862     -0.472522     -0.3755459     -0.5719043
##      DAVE_cooc.L.PET DVAR_cooc.L.PET DENT_cooc.L.PET SAVE_cooc.L.PET
## 1      1.2936781      1.1366603      1.6603800      1.3889879
## 2     -0.4400266     -0.3866192     -0.5647551     -0.4724449
##      SVAR_cooc.L.PET SENT_cooc.L.PET ASM_cooc.L.PET Contrast_cooc.L.PET
## 1      1.1209781      1.6614758      0.6775498      0.9285775
## 2     -0.3812851     -0.5651278     -0.2304591     -0.3158427
##      Dissimilarity_cooc.L.PET Inv_diff_cooc.L.PET Inv_diff_norm_cooc.L.PET
## 1      1.2936781      1.443028      1.6979660
## 2     -0.4400266     -0.490826     -0.5775395
##      IDM_cooc.L.PET IDM_norm_cooc.L.PET Inv_var_cooc.L.PET Correlation_cooc.L.PET
## 1      1.2814891      1.7046571      1.2896785      1.123648
## 2     -0.4358807     -0.5798153     -0.4386661     -0.382193
##      Autocorrelation_cooc.L.PET Tendency_cooc.L.PET Shade_cooc.L.PET
## 1      1.0338012      1.1209781      0.5578271
## 2     -0.3516331     -0.3812851     -0.1897371
##      Prominence_cooc.L.PET IC1_.L.PET IC2_.L.PET Coarseness_vdif_.L.PET
## 1      0.7889007 -0.6341334  1.5273752      0.7537450
## 2     -0.2683336  0.2156916 -0.5195154     -0.2563758
##      Contrast_vdif_.L.PET Busyness_vdif_.L.PET Complexity_vdif_.L.PET
```

```

## 1          0.3878173          0.5565230          1.2153015
## 2          -0.1319107          -0.1892936          -0.4133678
## Strength_vdif_.L.PET SRE_align.L.PET LRE_align.L.PET GLNU_align.L.PET
## 1          0.4934069          1.706523          1.6948229          0.4587983
## 2          -0.1678255          -0.580450          -0.5764704          -0.1560539
## RLNU_align.L.PET RP_align.L.PET LGRE_align.L.PET HGRE_align.L.PET
## 1          0.4189336          1.7061400          1.0408063          1.0700373
## 2          -0.1424944          -0.5803197          -0.3540158          -0.3639583
## LGSRE_align.L.PET HGSRE_align.L.PET LGHRE_align.L.PET HGLRE_align.L.PET
## 1          1.048281          1.0672364          1.0052958          1.078233
## 2          -0.356558          -0.3630056          -0.3419373          -0.366746
## GLNU_norm_align.L.PET RLNU_norm_align.L.PET GLVAR_align.L.PET
## 1          1.1041018          1.7034139          1.1510468
## 2          -0.3755448          -0.5793925          -0.3915125
## RLVAR_align.L.PET Entropy_align.L.PET SZSE.L.PET LZSE.L.PET LGLZE.L.PET
## 1          1.0474522          1.6880661          1.6676802          1.1852630          1.0601400
## 2          -0.3562762          -0.5741722          -0.5672382          -0.4031507          -0.3605919
## HGLZE.L.PET SZLGE.L.PET SZHGE.L.PET LZLGE.L.PET LZHGE.L.PET GLNU_area.L.PET
## 1          1.0866745          1.0735299          1.0776043          0.8457163          0.8914749          0.4621309
## 2          -0.3696172          -0.3651462          -0.3665321          -0.2876586          -0.3032228          -0.1571874
## ZSNU.L.PET ZSP.L.PET GLNU_norm.L.PET ZSNU_norm.L.PET GLVAR_area.L.PET
## 1          0.4218710          1.679008          1.1042309          1.681848          1.1694826
## 2          -0.1434935          -0.571091          -0.3755887          -0.572057          -0.3977832
## ZSVAR.L.PET Entropy_area.L.PET Max_cooc.H.PET Average_cooc.H.PET
## 1          0.7548095          1.6893793          0.5052232          1.6652563
## 2          -0.2567379          -0.5746188          -0.1718446          -0.5664137
## Variance_cooc.H.PET Entropy_cooc.H.PET DAVE_cooc.H.PET DVAR_cooc.H.PET
## 1          1.4721984          1.4404122          1.5079528          1.4645709
## 2          -0.5007478          -0.4899361          -0.5129091          -0.4981534
## DENT_cooc.H.PET SAVE_cooc.H.PET SVAR_cooc.H.PET SENT_cooc.H.PET
## 1          1.3368883          1.6782221          1.4484331          1.1582831
## 2          -0.4547239          -0.5708239          -0.4926643          -0.3939739
## ASM_cooc.H.PET Contrast_cooc.H.PET Dissimilarity_cooc.H.PET
## 1          0.4701159          1.344935          1.5079528
## 2          -0.1599034          -0.457461          -0.5129091
## Inv_diff_cooc.H.PET Inv_diff_norm_cooc.H.PET IDM_cooc.H.PET
## 1          1.1377441          1.6996628          0.9576980
## 2          -0.3869878          -0.5781166          -0.3257476
## IDM_norm_cooc.H.PET Inv_var_cooc_.H.PET Correlation_cooc.H.PET
## 1          1.7052806          0.9554037          1.1365587
## 2          -0.5800274          -0.3249672          -0.3865846
## Autocorrelation_cooc.H.PET Tendency_cooc.H.PET Shade_cooc.H.PET
## 1          1.5649714          1.4092944          -0.7124616
## 2          -0.5323032          -0.4793518          0.2423339
## Prominence_cooc.H.PET IC1_d.H.PET IC2_d.H.PET Coarseness_vdif.H.PET
## 1          1.0427158          -0.23095606          1.3345708          0.6663547
## 2          -0.3546653          0.07855648          -0.4539356          -0.2266512
## Contrast_vdif.H.PET Busyness_vdif.H.PET Complexity_vdif.H.PET
## 1          0.4860224          0.25301766          1.0958360
## 2          -0.1653138          -0.08606043          -0.3727333
## Strength_vdif.H.PET SRE_align.H.PET LRE_align.H.PET RLNU_align.H.PET
## 1          0.03112072          1.6638495          1.0890098          0.4166644
## 2          -0.01058528          -0.5659352          -0.3704115          -0.1417226
## RP_align.H.PET LGRE_align.H.PET HGRE_align.H.PET LGSRE_align.H.PET

```

```

## 1      1.6436641      0.7082866      1.5743684      0.7040204
## 2     -0.5590694     -0.2409138     -0.5354994     -0.2394627
## HGSRE_align.H.PET LGHRE_align.H.PET HGLRE_align.H.PET GLNU_norm_align.H.PET
## 1      1.6533952      0.7311054      0.7453460      0.8572435
## 2     -0.5623793     -0.2486753     -0.2535191     -0.2915794
## RLNU_norm_align.H.PET GLVAR_align.H.PET RLVAR_align.H.PET Entropy_align.H.PET
## 1      1.5584253      1.4161797      0.4776867      1.550297
## 2     -0.5300766     -0.4816938     -0.1624785     -0.527312
## SZSE.H.PET LZSE.H.PET LGLZE.H.PET HGLZE.H.PET SZLGE.H.PET SZHGE.H.PET
## 1  1.4671263 -0.09759617  0.7096710  1.4890573  0.6984264  1.4294579
## 2 -0.4990226  0.03319598 -0.2413847 -0.5064821 -0.2375600 -0.4862102
## LZLGE.H.PET LZHGE.H.PET GLNU_area.H.PET ZSNU.H.PET ZSP.H.PET
## 1  0.001044652 -0.08592571  0.4835029  0.3648643  1.1565208
## 2 -0.000355324  0.02922643 -0.1644568 -0.1241035 -0.3933744
## GLNU_norm.H.PET ZSNU_norm.H.PET GLVAR_area.H.PET ZSVAR.H.PET
## 1  0.8791603  1.2441418  1.3802703 -0.09449223
## 2 -0.2990341 -0.4231775 -0.4694797  0.03214021
## Entropy_area.H.PET Max_cooc.W.PET Average_cooc.W.PET Variance_cooc.W.PET
## 1  1.6279234  0.5502762  0.9151412  0.4579807
## 2 -0.5537154 -0.1871688 -0.3112725 -0.1557757
## Entropy_cooc.W.PET DAVE_cooc.W.PET DVAR_cooc.W.PET DENT_cooc.W.PET
## 1  1.4784780  0.9564701  0.5165571  1.450023
## 2 -0.5028837 -0.3253300 -0.1756997 -0.493205
## SAVE_cooc.W.PET SVAR_cooc.W.PET SENT_cooc.W.PET ASM_cooc.W.PET
## 1  0.9140050  0.4135667  1.5336398  0.5955603
## 2 -0.3108861 -0.1406689 -0.5216462 -0.2025715
## Contrast_cooc.W.PET Dissimilarity_cooc.W.PET Inv_diff_cooc.W.PET
## 1  0.5325478  0.9564701  1.2750883
## 2 -0.1811387 -0.3253300 -0.4337035
## Inv_diff_norm_cooc.W.PET IDM_cooc.W.PET IDM_norm_cooc.W.PET
## 1  1.6983343  1.044167  1.7048157
## 2 -0.5776647 -0.355159 -0.5798693
## Inv_var_cooc.W.PET Correlation_cooc.W.PET Autocorrelation_cooc.W.PET
## 1  1.1637708  1.1228422  0.4576739
## 2 -0.3958404 -0.3819191 -0.1556714
## Tendency_cooc.W.PET Shade_cooc.W.PET Prominence_cooc.W.PET IC1_d.W.PET
## 1  0.4135667  0.07642004  0.022900737 -0.26887955
## 2 -0.1406689 -0.02599321 -0.007789366  0.09145563
## IC2_d.W.PET Coarseness_vdif.W.PET Contrast_vdif.W.PET Busyness_vdif.W.PET
## 1  1.4455561  0.7071892  0.8252351  0.4153574
## 2 -0.4916858 -0.2405405 -0.2806922 -0.1412780
## Complexity_vdif.W.PET Strength_vdif.W.PET SRE_align.W.PET LRE_align.W.PET
## 1  0.2991726  0.4249851  1.697315  1.4801473
## 2 -0.1017594 -0.1445527 -0.577318 -0.5034515
## GLNU_align.W.PET RLNU_align.W.PET RP_align.W.PET LGRE_align.W.PET
## 1  0.4738278  0.4182280  1.6901986  0.8300003
## 2 -0.1611659 -0.1422544 -0.5748975 -0.2823130
## HGRE_align.W.PET LGSRE_align.W.PET HGSRE_align.W.PET LGHRE_align.W.PET
## 1  0.4630749  0.8904857  0.4557129  0.5563026
## 2 -0.1575085 -0.3028863 -0.1550044 -0.1892186
## HGLRE_align.W.PET GLNU_norm_align.W.PET RLNU_norm_align.W.PET
## 1  0.4921754  0.8494549  1.658483
## 2 -0.1674066 -0.2889302 -0.564110
## GLVAR_align.W.PET RLVAR_align.W.PET Entropy_align.W.PET SZSE.W.PET

```

```

## 1      0.4593218      0.5957178      1.5543465  1.6121174
## 2      -0.1562319      -0.2026251      -0.5286893 -0.5483392
##      LZSE.W.PET LGLZE.W.PET HGLZE.W.PET SZLGE.W.PET SZHGE.W.PET  LZLGE.W.PET
## 1      0.21517025    0.8709408    0.4690713    0.9938480    0.4481637 -0.004326372
## 2     -0.07318716   -0.2962384   -0.1595481   -0.3380435   -0.1524366  0.001471555
##      LZHGE.W.PET GLNU_area.W.PET ZSNU.W.PET  ZSP.W.PET GLNU_norm.W.PET
## 1      0.5263985      0.4910918  0.3971868  1.4948131      0.8826796
## 2     -0.1790471     -0.1670380 -0.1350976 -0.5084398     -0.3002311
##      ZSNU_norm.W.PET GLVAR_area.W.PET ZSVAR.W.PET Entropy_area.W.PET Min_hist.ADC
## 1      1.4869647      0.4655759  0.06408427    1.6167770    0.5724098
## 2     -0.5057703     -0.1583592 -0.02179737    -0.5499242   -0.1946972
##      Max_hist.ADC Mean_hist.ADC Variance_hist.ADC Standard_Deviation_hist.ADC
## 1      1.5075750      1.4864908      0.7599395      1.2359485
## 2     -0.5127806     -0.5056091     -0.2584828     -0.4203906
##      Skewness_hist.ADC Kurtosis_hist.ADC Energy_hist.ADC Entropy_hist.ADC
## 1      0.3899909      0.4662845      0.7015053      1.6284344
## 2     -0.1326500     -0.1586002     -0.2386073     -0.5538893
##      AUC_hist.ADC Volume.ADC X3D_surface.ADC ratio_3ds_vol.ADC
## 1      1.6655300    0.5687484      0.7349831      1.1042095
## 2     -0.5665068   -0.1934518     -0.2499942     -0.3755815
##      ratio_3ds_vol_norm.ADC irregularity.ADC Compactness_v1.ADC Compactness_v2.ADC
## 1      1.6106322      1.6397737      1.1221987      1.3007130
## 2     -0.5478341     -0.5577462     -0.3817002     -0.4424194
##      Spherical_disproportion.ADC Sphericity.ADC Asphericity.ADC Center_of_mass.ADC
## 1      1.6106322      1.6242350      1.1989866      0.5373920
## 2     -0.5478341     -0.5524609     -0.4078186     -0.1827864
##      Max_3D_diam.ADC Major_axis_length.ADC Minor_axis_length.ADC
## 1      1.0866100      1.2316275      1.1312333
## 2     -0.3695952     -0.4189209     -0.3847732
##      Least_axis_length.ADC Elongation.ADC Flatness.ADC Max_cooc.L.ADC
## 1      1.0417403      1.4824827      1.4052040      0.8250964
## 2     -0.3543334     -0.5042458     -0.4779606     -0.2806450
##      Average_cooc.L.ADC Variance_cooc.L.ADC Entropy_cooc.L.ADC DAVE_cooc.L.ADC
## 1      1.456079      0.9533869      1.6827114      1.2819538
## 2     -0.495265      -0.3242813     -0.5723508     -0.4360387
##      DVAR_cooc.L.ADC DENT_cooc.L.ADC SAVE_cooc.L.ADC SVAR_cooc.L.ADC
## 1      0.9295089      1.6521421      1.4558899      0.9317704
## 2     -0.3161595     -0.5619531     -0.4952006     -0.3169287
##      SENT_cooc.L.ADC ASM_cooc.L.ADC Contrast_cooc.L.ADC Dissimilarity_cooc.L.ADC
## 1      1.2584756      0.7127202      0.8811662      1.2819538
## 2     -0.4280529     -0.2424218     -0.2997164     -0.4360387
##      Inv_diff_cooc.L.ADC Inv_diff_norm_cooc.L.ADC IDM_cooc.L.ADC
## 1      1.5058302      1.7039344      1.3642322
## 2     -0.5121871     -0.5795695     -0.4640245
##      IDM_norm_cooc.L.ADC Inv_var_cooc.L.ADC Correlation_cooc.L.ADC
## 1      1.7073272      1.379898      1.2216811
## 2     -0.5807235     -0.469353      -0.4155378
##      Autocorrelation_.L.ADC Tendency_cooc.L.ADC Shade_.L.ADC Prominence_cooc.L.ADC
## 1      1.1050198      0.9317704    0.29259000      0.5515288
## 2     -0.3758571     -0.3169287   -0.09952041     -0.1875948
##      IC1_.L.ADC IC2_.L.ADC Coarseness_vdif_.L.ADC Contrast_vdif_.L.ADC
## 1     -0.6732168    1.5121032      0.6939723      0.6587722
## 2     0.2289853   -0.5143208     -0.2360450     -0.2240722
##      Busyness_vdif_.L.ADC Complexity_vdif_.L.ADC Strength_vdif_.L.ADC

```

```

## 1          0.6475886          1.2753146          0.4214397
## 2          -0.2202682          -0.4337805          -0.1433468
## SRE_align.L.ADC LRE_align.L.ADC GLNU_align.L.ADC RLNU_align.L.ADC
## 1          1.7052408          1.6811893          0.5682374          0.5910147
## 2          -0.5800139          -0.5718331          -0.1932780          -0.2010254
## RP_align.L.ADC LGRE_align.L.ADC HGRE_align.L.ADC LGSRE_align.L.ADC
## 1          1.7034645          0.7243458          1.2086645          0.7235521
## 2          -0.5794097          -0.2463761          -0.4111104          -0.2461061
## HGSRE_align.L.ADC LGHRE_align.L.ADC HGLRE_align.L.ADC GLNU_norm_align.L.ADC
## 1          1.2124123          0.7234431          1.1801466          1.2291014
## 2          -0.4123852          -0.2460691          -0.4014104          -0.4180617
## RLNU_norm_align.L.ADC GLVAR_align.L.ADC RLVAR_align.L.ADC Entropy_align.L.ADC
## 1          1.6955541          0.9930121          1.1385331          1.6982212
## 2          -0.5767191          -0.3377592          -0.3872562          -0.5776262
## SZSE.L.ADC LZSE.L.ADC LGLZE.L.ADC HGLZE.L.ADC SZLGE.L.ADC SZHGE.L.ADC
## 1  1.6968578  1.3430968  0.7262967  1.2295659  0.7219542  1.2399482
## 2 -0.5771625 -0.4568356 -0.2470397 -0.4182197 -0.2455627 -0.4217511
## LZLGE.L.ADC LZHGE.L.ADC GLNU_area.L.ADC ZSNU.L.ADC ZSP.L.ADC GLNU_norm.L.ADC
## 1  0.6651854  1.077189  0.5782984  0.5919629  1.6748354  1.2251432
## 2 -0.2262535 -0.366391  -0.1967001 -0.2013479 -0.5696719  -0.4167154
## ZSNU_norm.L.ADC GLVAR_area.L.ADC ZSVAR.L.ADC Entropy_area.L.ADC
## 1  1.6570978  1.012871  0.6758567  1.7010816
## 2 -0.5636387 -0.344514 -0.2298832 -0.5785992
## Max_cooc.H.ADC Average_cooc.H.ADC Variance_cooc.H.ADC Entropy_cooc.H.ADC
## 1  0.7039103  1.6967547  1.7053247  1.7011475
## 2 -0.2394253 -0.5771274 -0.5800424 -0.5786216
## DAVE_cooc.H.ADC DVAR_cooc.H.ADC DENT_cooc.H.ADC SAVE_cooc.H.ADC
## 1  1.5698813  1.4861394  1.7017575  1.6967573
## 2 -0.5339732 -0.5054896 -0.5788291 -0.5771283
## SVAR_cooc.H.ADC SENT_cooc.H.ADC ASM_cooc.H.ADC Contrast_cooc.H.ADC
## 1  1.6206816  1.6803084  0.6607170  1.3858879
## 2 -0.5512522 -0.5715335 -0.2247337 -0.4713904
## Dissimilarity_cooc.H.ADC Inv_diff_cooc.H.ADC Inv_diff_norm_cooc.H.ADC
## 1  1.5698813  1.5546888  1.7028145
## 2 -0.5339732 -0.5288057 -0.5791886
## IDM_cooc.H.ADC IDM_norm_cooc.H.ADC Inv_var_cooc.H.ADC Correlation_cooc.H.ADC
## 1  1.4136874  1.7054539  1.4364367  1.1993586
## 2 -0.4808461 -0.5800864 -0.4885839 -0.4079451
## Autocorrelation_cooc.H.ADC Tendency_cooc.H.ADC Shade_cooc.H.ADC
## 1  1.6722184  1.6206816  0.3887230
## 2 -0.5687818 -0.5512522 -0.1322187
## Prominence_cooc.H.ADC IC1_d.H.ADC IC2_d.H.ADC Coarseness_vdif.H.ADC
## 1  1.5404751 -0.5455177  1.5085932  0.6780216
## 2 -0.5239711  0.1855502 -0.5131269 -0.2306196
## Contrast_vdif.H.ADC Busyness_vdif.H.ADC Complexity_vdif.H.ADC
## 1  1.5316725  0.6153610  1.503704
## 2 -0.5209771 -0.2093065 -0.511464
## Strength_vdif.H.ADC SRE_align.H.ADC LRE_align.H.ADC GLNU_align.H.ADC
## 1  0.3677298  1.7071497  1.7038845  0.5901231
## 2 -0.1250782 -0.5806632 -0.5795526 -0.2007222
## RLNU_align.H.ADC RP_align.H.ADC LGRE_align.H.ADC HGRE_align.H.ADC
## 1  0.5924412  1.706814  1.0946139  1.7100780
## 2 -0.2015106 -0.580549 -0.3723177 -0.5816592
## LGSRE_align.H.ADC HGSRE_align.H.ADC LGHRE_align.H.ADC HGLRE_align.H.ADC

```



```

## 1      1.0760014      1.7093907      1.1710039      1.7053139
## 2      -0.3659869      -0.5814254      -0.3983006      -0.5800387
## GLNU_norm_align.H.ADC RLNU_norm_align.H.ADC GLVAR_align.H.ADC
## 1      0.9735389      1.7053279      1.7100152
## 2      -0.3311357      -0.5800435      -0.5816378
## RLVAR_align.H.ADC Entropy_align.H.ADC SZSE.H.ADC LZSE.H.ADC LGLZE.H.ADC
## 1      1.0687509      1.7093530      1.7049082      1.6336887      1.0589022
## 2      -0.3635207      -0.5814126      -0.5799008      -0.5556764      -0.3601708
## HGLZE.H.ADC SZLGE.H.ADC SZHGE.H.ADC LZLGE.H.ADC LZHGE.H.ADC GLNU_area.H.ADC
## 1      1.709075      1.0114862      1.7031396      1.0813161      1.5698347      0.5919958
## 2      -0.581318      -0.3440429      -0.5792992      -0.3677946      -0.5339574      -0.2013591
## ZSNU.H.ADC ZSP.H.ADC GLNU_norm.H.ADC ZSNU_norm.H.ADC GLVAR_area.H.ADC
## 1      0.5972096      1.7013318      0.9745507      1.692802      1.7072803
## 2      -0.2031325      -0.5786843      -0.3314798      -0.575783      -0.5807076
## ZSVAR.H.ADC Entropy_area.H.ADC Max_cooc.W.ADC Average_cooc.W.ADC
## 1      0.8431301      1.7066118      0.6868122      1.199285
## 2      -0.2867790      -0.5804802      -0.2336096      -0.407920
## Variance_cooc.W.ADC DAVE_cooc.W.ADC DVAR_cooc.W.ADC DENT_cooc.W.ADC
## 1      0.7283676      1.3033631      0.7679414      1.6768624
## 2      -0.2477441      -0.4433208      -0.2612045      -0.5703613
## SAVE_cooc.W.ADC SVAR_cooc.W.ADC SENT_cooc.W.ADC ASM_cooc.W.ADC
## 1      1.1909017      0.6843706      1.2023295      0.6601442
## 2      -0.4050686      -0.2327791      -0.4089556      -0.2245389
## Contrast_cooc.W.ADC Dissimilarity_cooc.W.ADC Inv_diff_cooc.W.ADC
## 1      0.7994120      1.3033631      1.3827605
## 2      -0.2719088      -0.4433208      -0.4703267
## Inv_diff_norm_cooc.W.ADC IDM_cooc.W.ADC IDM_norm_cooc.W.ADC
## 1      1.7038802      1.3112119      1.7073083
## 2      -0.5795511      -0.4459904      -0.5807171
## Inv_var_cooc.W.ADC Correlation_cooc.W.ADC Autocorrelation_cooc.W.ADC
## 1      1.3074526      1.2225367      0.8447953
## 2      -0.4447118      -0.4158288      -0.2873453
## Tendency_cooc.W.ADC Shade_cooc.W.ADC Prominence_cooc.W.ADC IC1_d.W.ADC
## 1      0.6843706      0.2567335      0.3775512      -0.6756692
## 2      -0.2327791      -0.0873243      -0.1284188      0.2298194
## IC2_d.W.ADC Coarseness_vdif.W.ADC Contrast_vdif.W.ADC Busyness_vdif.W.ADC
## 1      1.6012140      0.7114542      0.6249552      1.0116700
## 2      -0.5446306      -0.2419912      -0.2125698      -0.3441054
## Complexity_vdif.W.ADC Strength_vdif.W.ADC SRE_align.W.ADC LRE_align.W.ADC
## 1      0.6003182      0.5784705      1.7073214      1.7065667
## 2      -0.2041899      -0.1967587      -0.5807216      -0.5804649
## GLNU_align.W.ADC RLNU_align.W.ADC RP_align.W.ADC LGRE_align.W.ADC
## 1      0.6326468      0.5857336      1.7071535      0.6918953
## 2      -0.2151860      -0.1992291      -0.5806645      -0.2353386
## HGRE_align.W.ADC LGSRE_align.W.ADC HGSRE_align.W.ADC LGHRE_align.W.ADC
## 1      0.8626770      0.6918084      0.8616174      0.6894568
## 2      -0.2934276      -0.2353090      -0.2930672      -0.2345091
## HGLRE_align.W.ADC GLNU_norm_align.W.ADC RLNU_norm_align.W.ADC
## 1      0.866512      0.9154487      1.7063312
## 2      -0.294732      -0.3113771      -0.5803848
## GLVAR_align.W.ADC RLVAR_align.W.ADC Entropy_align.W.ADC SZSE.W.ADC LZSE.W.ADC
## 1      0.7640782      0.9834635      1.661714      1.7066974      1.6823970
## 2      -0.2598905      -0.3345114      -0.565209      -0.5805093      -0.5722439
## LGLZE.W.ADC HGLZE.W.ADC SZLGE.W.ADC SZHGE.W.ADC LZLGE.W.ADC LZHGE.W.ADC

```

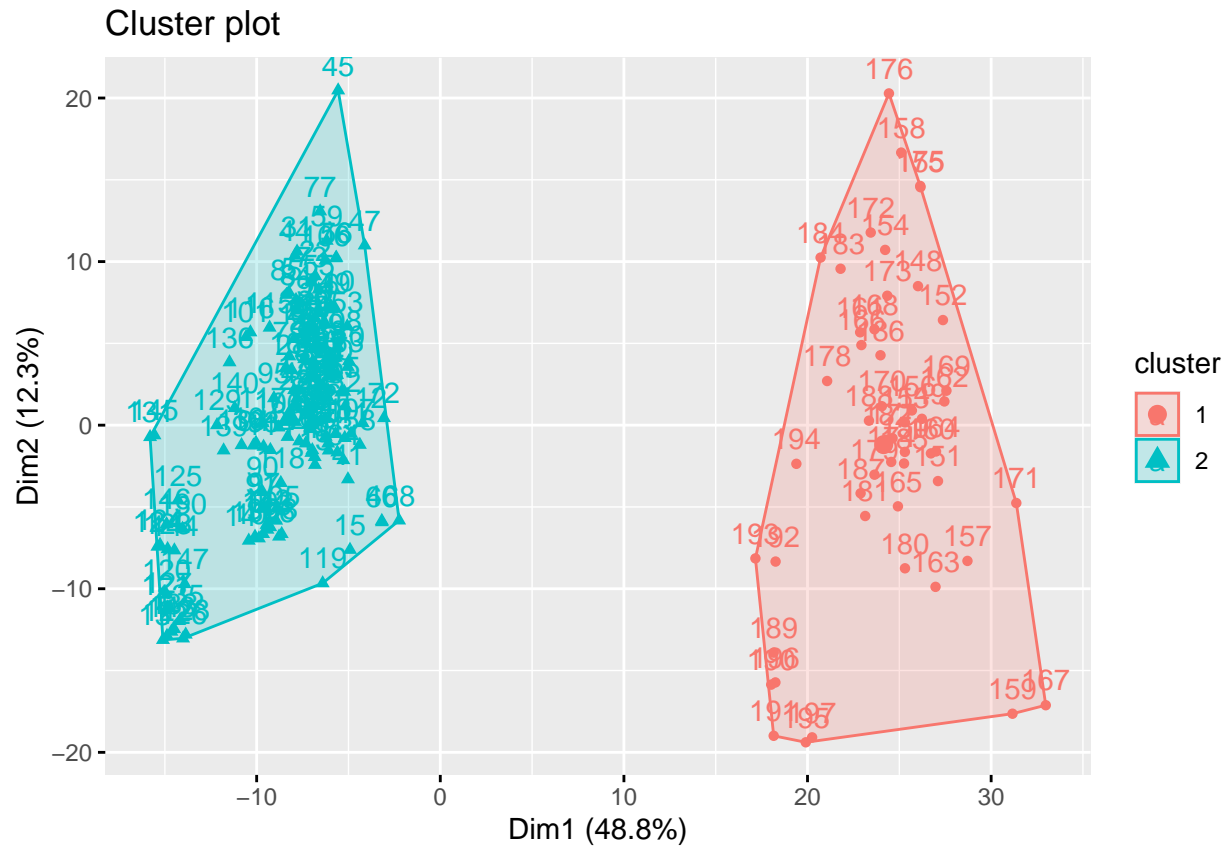
```

## 1  0.6918923  0.8639228  0.6899145  0.8602645  0.6450074  0.8755515
## 2 -0.2353375 -0.2938513 -0.2346648 -0.2926070 -0.2193903 -0.2978066
##   GLNU_area.W.ADC ZSNU.W.ADC  ZSP.W.ADC GLNU_norm.W.ADC ZSNU_norm.W.ADC
## 1      0.6327545  0.5822861  1.7050925      0.9137899      1.699026
## 2     -0.2152226 -0.1980565 -0.5799634     -0.3108129     -0.577900
##   GLVAR_area.W.ADC ZSVAR.W.ADC Entropy_area.W.ADC
## 1      0.7713592  1.0785430      1.672228
## 2     -0.2623671 -0.3668514     -0.568785
##
## Clustering vector:
##  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140
##  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2
## 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160
##  2  2  2  2  2  2  2  1  1  1  1  1  1  1  1  1  1  1  1  1
## 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180
##  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1
## 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197
##  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1
##
## Within cluster sum of squares by cluster:
## [1] 21068.8 23826.7
## (between_SS / total_SS =  46.7 %)
##
## Available components:
##
## [1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss"
## [6] "betweenss"    "size"         "iter"         "ifault"

```

final data

```
fviz_cluster(final, data = x_train)
```



Hierarchical

For reproducibility

```
set.seed(123)
```

Dissimilarity matrix

```
d <- dist(x_train, method = "euclidean")
```

Hierarchical clustering using Complete Linkage

```
hcl <- hclust(d, method = "complete" )
```

For reproducibility

```
set.seed(123)
```

## Compute maximum or complete linkage clustering with agnes

```
hc2 <- agnes(x_train, method = "complete")
```

## Agglomerative coefficient

```
hc2$ac
```

```
## [1] 0.8488437
```

```
##[1] 0.8488437 # methods to assess
```

```
m <- c("average", "single", "complete", "ward")  
names(m) <- c("average", "single", "complete", "ward")
```

## function to compute coefficient

```
ac <- function(x) {  
  agnes(x_train, method = x)$ac  
}
```

## get agglomerative coefficient for each linkage method

```
purrr::map_dbl(m, ac)
```

```
##   average   single complete    ward  
## 0.7618315 0.7097208 0.8488437 0.9655196
```

## average single complete ward

```
##0.7618315 0.7097208 0.8488437 0.9655196
```

## compute divisive hierarchical clustering

```
hc4 <- diana(x_train)
```

## Divise coefficient; amount of clustering structure found

```
hc4$dc
```

```
## [1] 0.8427741
```

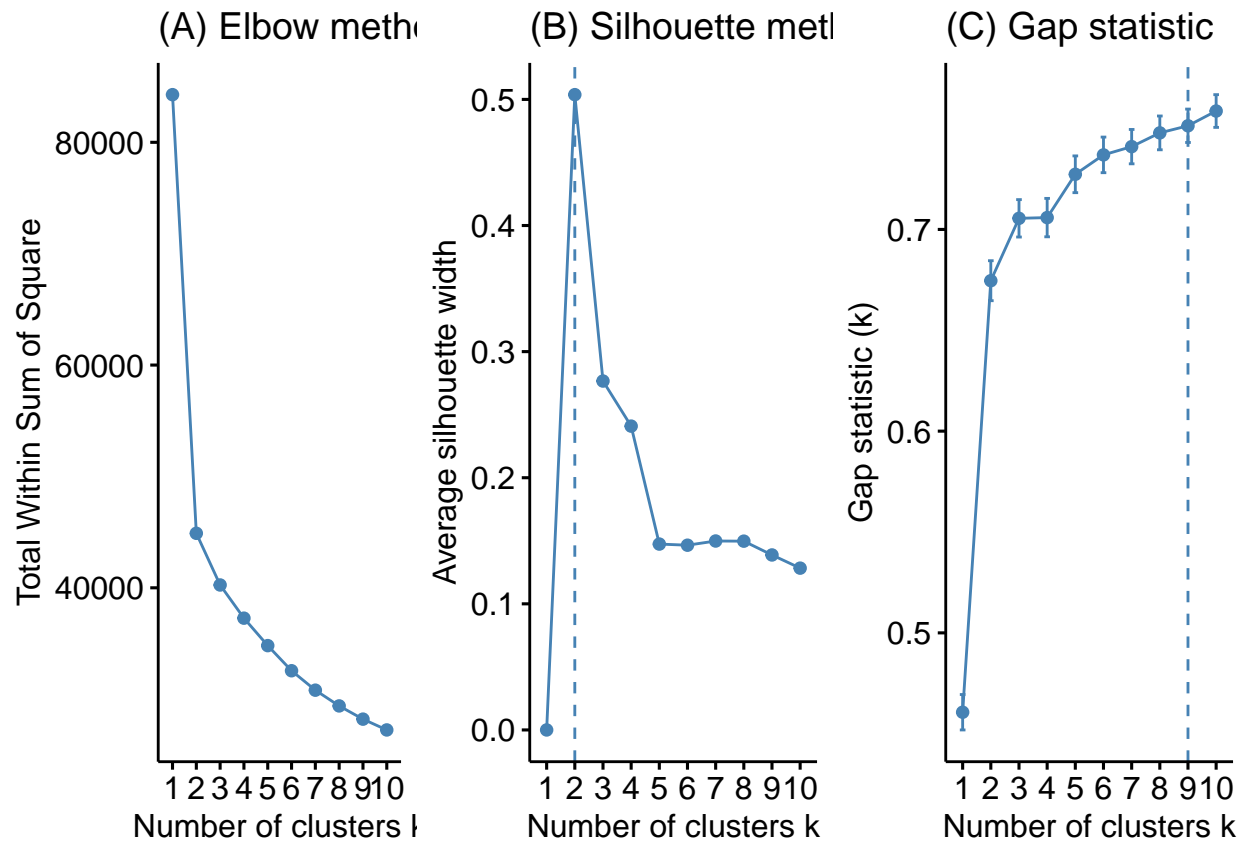
```
###[1] 0.8427741
```

## Plot cluster results

```
p1 <- fviz_nbclust(x_train, FUN = hcut, method = "wss",  
                  k.max = 10) +  
  ggtitle("(A) Elbow method")  
p2 <- fviz_nbclust(x_train, FUN = hcut, method = "silhouette",  
                  k.max = 10) +  
  ggtitle("(B) Silhouette method")  
p3 <- fviz_nbclust(x_train, FUN = hcut, method = "gap_stat",  
                  k.max = 10) +  
  ggtitle("(C) Gap statistic")
```

## Display plots side by side

```
gridExtra::grid.arrange(p1, p2, p3, nrow = 1)
```



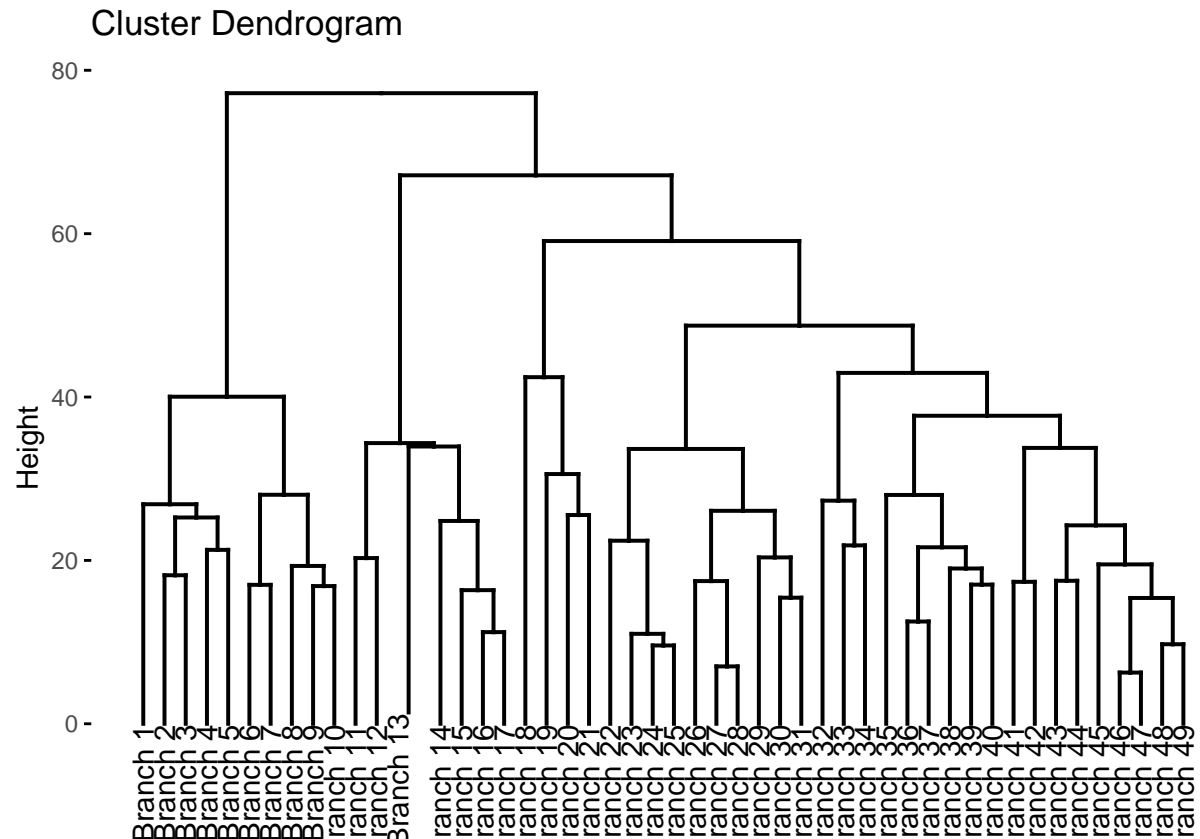
```
# Construct dendrogram
```

```
hc5 <- hclust(d, method = "ward.D2" )
dend_plot <- fviz_dend(hc5)
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =
## "none")' instead.
```

```
dend_data <- attr(dend_plot, "dendrogram")
dend_cuts <- cut(dend_data, h = 6)
fviz_dend(dend_cuts$upper[[1]])
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =
## "none")' instead.
```



```
## Ward's method
```

```
hc5 <- hclust(d, method = "ward.D2" )
```

### Cut tree into 4 groups

```
sub_grp <- cutree(hc5, k = 2)
```

### Number of members in each cluster

```
table(sub_grp)
```

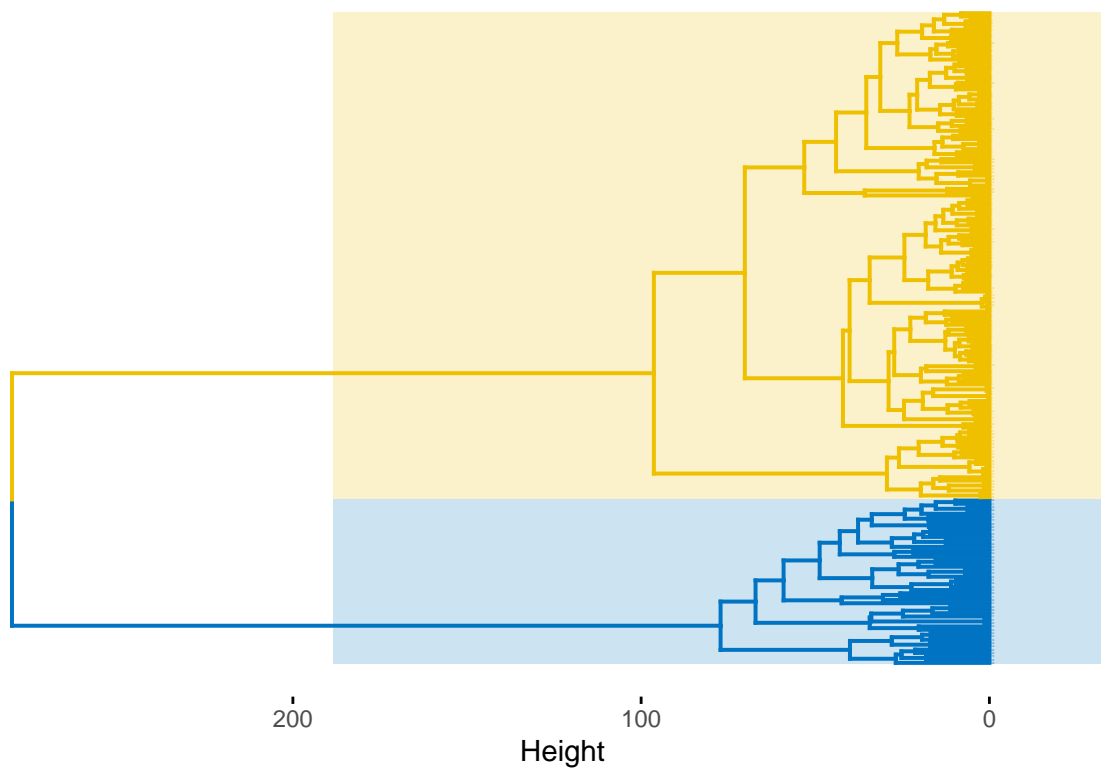
```
## sub_grp
## 1 2
## 147 50
```

### Plot full dendrogram

```
fviz_dend(
  hc5,
  k = 2,
  horiz = TRUE,
  rect = TRUE,
  rect_fill = TRUE,
  rect_border = "jco",
  k_colors = "jco",
  cex = 0.1
)
```

## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.

## Cluster Dendrogram



## create full dendrogram

```
dend_plot <- fviz_dend(hc5)
```

## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.

extract plot info



```
dend_data <- attr(dend_plot, "dendrogram")
```

## cut the dendrogram

```
dend_cuts <- cut(dend_data, h = 70.5)
```

## designated height

## Create sub dendrogram plots

```
p1 <- fviz_dend(dend_cuts$lower[[1]])
```

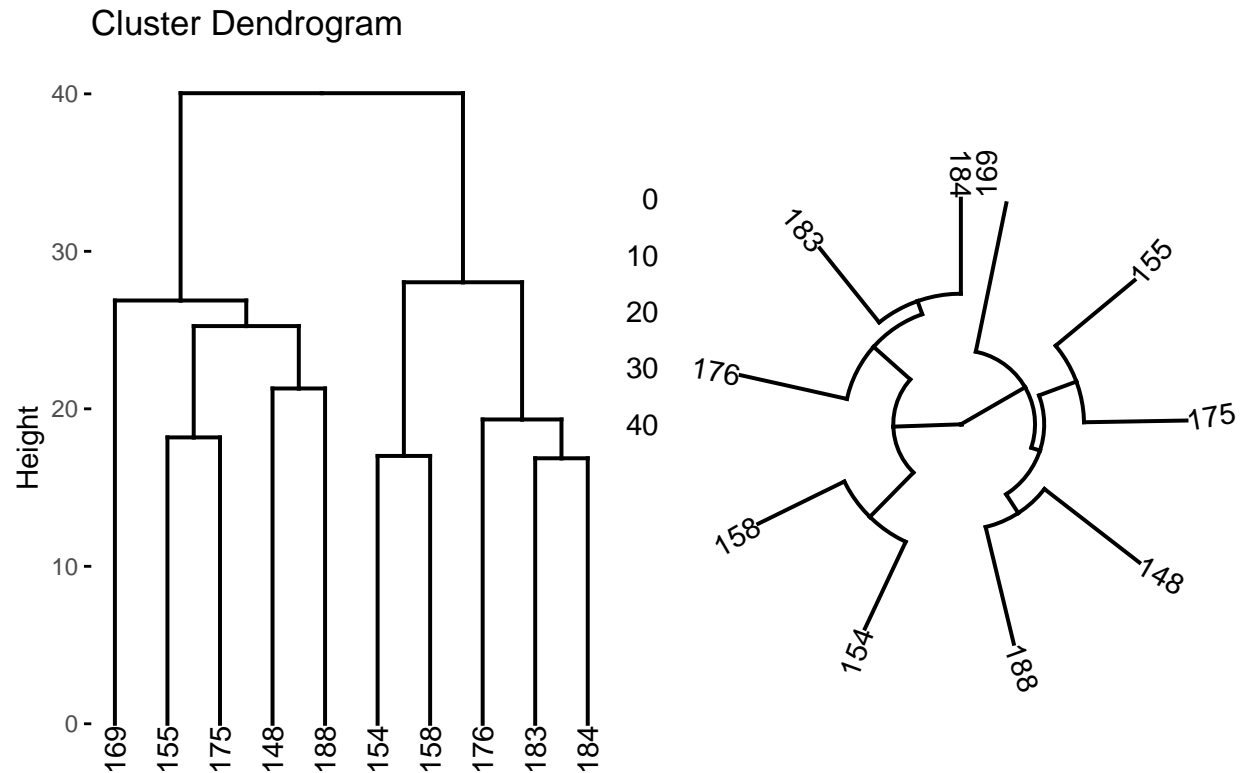
```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

```
p2 <- fviz_dend(dend_cuts$lower[[1]], type = 'circular')
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

## Side by side plots

```
gridExtra::grid.arrange(p1, p2, nrow = 1)
```



```
##Model-based # Apply GMM model
```

```
df1_mc <- Mclust(x_train)
summary(df1_mc)
```

```
## -----
## Gaussian finite mixture model fitted by EM algorithm
## -----
##
## Mclust VEI (diagonal, equal shape) model with 9 components:
##
## log-likelihood  n  df      BIC      ICL
##      -40533.33 197 4316 -103869 -103869
##
## Clustering table:
##   1  2  3  4  5  6  7  8  9
## 110 20  3  2 12 10 25  9  6
```

### Observations with high uncertainty

```
plot(df1_mc, what = 'BIC',
      legendArgs = list(x = "bottomright", ncol = 5))

probabilities <- df1_mc$z
```

```

probabilities <- probabilities %>%
  as.data.frame() %>%
  mutate(id = row_number()) %>%
  tidyr::gather(cluster, probability, -id)

ggplot(probabilities, aes(probability)) +
  geom_histogram() +
  facet_wrap(~ cluster, nrow = 2)

uncertainty <- data.frame(
  id = 1:nrow(x_train),
  cluster = df1_mc$classification,
  uncertainty = df1_mc$uncertainty
)

uncertainty %>%
  group_by(cluster) %>%
  filter(uncertainty > 0.0001) %>%
  ggplot(aes(uncertainty, reorder(id, uncertainty))) +
  geom_point() +
  facet_wrap(~ cluster, scales = 'free_y', nrow = 1)

cluster2 <- x_train %>%
  scale() %>%
  as.data.frame() %>%
  mutate(cluster = df1_mc$classification) %>%
  filter(cluster == 2) %>%
  select(-cluster)

cluster2 %>%
  tidyr::gather(product, std_count) %>%
  group_by(product) %>%
  summarize(avg = mean(std_count)) %>%
  ggplot(aes(avg, reorder(product, avg))) +
  geom_point() +
  labs(x = "Average standardized consumption", y = NULL)

```