STT371 FINAL PROJECT (Model 1)

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Helper Packages

```
library(ggplot2)
library(lattice)
library(caret)
library(readr)
library(rsample)
library(modeldata)
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(tidyverse)

## ── Attaching packages
## ─────────────────────────────────────────
## tidyverse 1.3.2 ──

## ✓ tibble  3.1.8     ✓ stringr 1.4.1
## ✓ tidyr   1.2.1     ✓ forcats 0.5.2
## ✓ purrr   0.3.5
## ── Conflicts ──────────────────────────────────────────── tidyverse_conflict
## s() ──
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::lag()    masks stats::lag()
## ✗ purrr::lift()   masks caret::lift()

library(ROCR)
library(pROC)

## Type 'citation("pROC")' for a citation.
##
## Attaching package: 'pROC'
```

```
##
## The following objects are masked from 'package:stats':
##
##     cov, smooth, var

library(xgboost)

##
## Attaching package: 'xgboost'
##
## The following object is masked from 'package:dplyr':
##
##     slice

library(recipes)

##
## Attaching package: 'recipes'
##
## The following object is masked from 'package:stringr':
##
##     fixed
##
## The following object is masked from 'package:stats':
##
##     step
```

Loading dataset

```
radiomics<- read.csv("radiomics.csv")

head(radiomics)

##   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.PE
## T
## 1        5622.519          3.214263               15.91400           2.21213
## 7
## 2        8356.832          4.848032               21.09429           2.34832
## 4
## 3       16832.003          3.163721               19.52154           2.12125
## 1
## 4       29100.294          2.027384               20.12864           1.85957
## 2
## 5        7769.379          4.815431               21.01721           2.21972
## 5
## 6        9563.905          3.699578               18.53249           2.13698
## 4
##    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_mas
## s.PET
## 1                    15.91400       0.065378        14.91400             0.8
## 11086
## 2                    21.09429       0.049942        20.09429             0.5
## 87732
## 3                    19.52154       0.053762        18.52154             0.3
## 93189
## 4                    20.12864       0.052217        19.12864             0.8
## 66799
## 5                    21.01721       0.050116        20.01721             0.5
## 25997
## 6                    18.53249       0.056497        17.53249             0.3
## 08017
##    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.PE
## T
## 1          22.87750             205.6627           10.688721        11.85783
## 8
## 2          21.90654             226.6299           10.291026        13.99356
## 8
## 3          27.25065             208.9461           10.878250        12.28155
## 9
## 4          17.81061             102.6657           10.238635         7.47398
## 2
## 5          15.35938             142.2193            9.829042        10.23769
## 0
## 6          23.34637             181.6257           10.702694        11.66080
## 5
##    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                11.857
## 838
## 2         6.489125       0.003596           325.10017                13.993
## 568
## 3         6.587702       0.003198           236.08136                12.281
## 559
## 4         6.108770       0.003680            99.77033                 7.473
## 982
## 5         6.049095       0.004001           184.16098                10.237
## 690
## 6         6.460137       0.003268           223.23109                11.660
## 805
##    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        9.166
## 018
## 2    566.7718    0.060570    546.1829    0.086532    650.3679        7.817
## 915
## 3    769.6933    0.040391    735.9377    0.040694    904.7157        8.877
## 842
## 4    393.5484    0.043346    360.6300    0.076789    591.1260       83.352
## 565
## 5    300.9426    0.091138    295.8022    0.101787    321.5044       10.245
## 976
## 6    617.0878    0.041385    567.5274    0.065899    836.6098        9.390
## 127
##    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 Dissimilarity_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               0.130
## 158
## 2          1472.727          0.004991          1836.812               0.108
## 781
## 3          1318.500          0.004849          5694.966               0.309
## 012
## 4          1388.818          0.007300          2734.362               0.120
## 339
## 5          1889.628          0.003929          6544.325               0.470
## 904
## 6          1501.696          0.004877          7061.132               0.374
## 988
##    RLNU_norm_align.H.PET GLVAR_align.H.PET RLVAR_align.H.PET Entropy_align.
## H.PET
## 1               0.805658         271.94120          0.166759             3.6
## 65844
## 2               0.881876         263.05257          0.089416             3.8
## 07145
## 3               0.559747         231.23849          0.633026             2.9
## 62910
## 4               0.733600         302.00409          0.279758             3.9
## 63763
## 5               0.516961          63.36076          0.708711             2.6
## 15080
## 6               0.492823         187.63061          0.894173             2.9
## 53297
##    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        0.12
```

```
5177
## 2     0.007054      2730.177      23.91083    171.00253   0.829245        0.10
6933
## 3     0.027806     99597.669      42.33586     36.25834   0.312626        0.33
0695
## 4     0.066848     39940.885     160.59767    604.01684   0.425782        0.11
7405
## 5     0.047180    166256.576      23.73782     17.00253   0.245387        0.35
1578
## 6     0.115459    288928.476      28.02885     17.76569   0.181354        0.37
1297
##    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                0.42
7805
```

```
## 2          0.158456              0.936467           0.164222              0.28
4054
## 3          0.439777              0.957440           0.421156              0.43
1424
## 4          0.254836              0.980367           0.261941              0.51
5299
## 5          0.509374              0.964322           0.439330              0.33
9500
## 6          0.504966              0.961979           0.468899              0.37
9680
##   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        20.13
## 918
## 2  138.464377    0.116457  128.987889    0.195656   189.79771        13.47
## 643
## 3   14.973723    0.247502   10.310508    1.043890   117.40582        38.33
## 586
## 4  106.496868    0.073436   88.831921    0.286957   297.89713       131.17
## 762
## 5    9.015688    0.284427    6.692377    3.360406    31.91043        35.02
## 885
## 6   10.745985    0.252353    6.482655    5.046844   107.42661        36.93
## 970
##   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.A
DC
## 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.AD
C
## 1        2621.908           0.39370                1.52762          1.9397
5
## 2        3814.097           0.27791                1.37006          1.7613
0
## 3        5638.645           0.21884                1.32876          1.5793
0
## 4       11033.100           0.21644                1.64907          1.6367
3
## 5        5670.769           0.22562                1.35892          1.6145
7
## 6        6099.528           0.30552                1.70690          1.7285
9
##    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 Average_cooc.L.ADC
## 1       0.44709      0.30093        0.01362           24.26969
## 2       0.82074      0.67629        0.00769           34.15443
## 3       0.87392      0.61784        0.00984           17.40595
## 4       0.74359      0.60699        0.00893           26.20041
## 5       0.90372      0.79509        0.00863           27.03123
## 6       0.66644      0.42207        0.00548           33.31549
##   Variance_cooc.L.ADC Entropy_cooc.L.ADC DAVE_cooc.L.ADC DVAR_cooc.L.ADC
## 1           135.95808            9.35172         9.33833        95.10941
## 2            60.59539            9.52569         6.58341        31.97649
## 3           159.14565            9.93157         8.05607        81.58702
## 4            57.02199            9.50974         5.46198        23.67951
## 5            65.76514            9.76494         6.96837        33.58727
## 6           176.68232           10.64861         9.13371        70.36682
##   DENT_cooc.L.ADC SAVE_cooc.L.ADC SVAR_cooc.L.ADC SENT_cooc.L.ADC
## 1         4.68745        48.53685        361.5607         4.49616
## 2         4.18551        68.30632        167.0920         2.32433
## 3         4.48343        34.80936        490.1310         5.16708
## 4         3.95039        52.39829        174.5978         4.55938
## 5         4.26293        54.05993        180.9453         4.48500
## 6         4.65758        66.62846        552.9789         3.08233
##   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 Prominence_cooc.
## L.ADC
## 1               633.7211            361.5607    7639.8939               5171
## 54.08
## 2              1189.3065            167.0920   -1156.8109               1129
## 37.29
## 3               388.8025            490.1310   17093.4493              12960
## 59.93
```

```
## 4            716.6097            174.5978      616.3283             886
05.95
## 5            755.2618            180.9453      592.0947            1133
20.37
## 6           1209.5645            552.9789    -1837.1897            5902
87.94
##    IC1_.L.ADC IC2_.L.ADC Coarseness_vdif_.L.ADC Contrast_vdif_.L.ADC
## 1    -0.11842    0.83912                0.02135              0.71307
## 2    -0.05061    0.63924                0.01258              0.23808
## 3    -0.07274    0.73740                0.00784              0.40394
## 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               0.04
038
## 2         1157.5280           0.00615         1335.5219               0.04
066
## 3          478.4817           0.01531          528.1310               0.03
656
## 4          757.7992           0.00954          909.4492               0.03
841
## 5          815.1979           0.00741          917.7657               0.03
626
## 6         1335.9421           0.00607         1478.8704               0.02
516
##    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          0.0
3781
## 2     0.00662   1681.2171        24.10984   524.4053   0.89683          0.0
4002
## 3     0.02376    734.9103        34.98083   798.7819   0.82545          0.0
3416
## 4     0.01300   1204.1618        90.93063  1994.0215   0.86029          0.0
3768
## 5     0.00840   1283.7978        24.73040   600.5032   0.87065          0.0
3520
## 6     0.00644   1779.7534        19.65712   741.6164   0.91756          0.0
2479
##    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                  0.3
## 4381
## 2        0.06993             0.92757            0.07472                  0.3
## 8679
## 3        0.09608             0.93697            0.09823                  0.4
## 9736
## 4        0.09588             0.94673            0.09742                  0.5
## 5321
## 5        0.07991             0.92793            0.08208                  0.3
## 7325
## 6        0.09995             0.94500            0.10213                  0.5
## 5665
##    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         3.99
## 028
## 2    1355.552     0.02483    1302.738     0.03376    1584.380        10.95
## 282
## 3    1293.549     0.02152    1196.086     0.04888    2953.476        19.42
## 358
## 4    1353.634     0.02049    1283.290     0.04521    1725.853        44.63
## 370
## 5    1328.345     0.02373    1252.666     0.04477    1783.557        13.08
## 842
```

```
## 6    1363.271     0.01864    1280.446     0.06832    1716.544        14.22
012
##    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 Dissimilarity_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.AD
## C
## 1     0.96152               0.01818             4.78265             0.0177
## 4
## 2     0.91270               0.01162             1.49489             0.0097
## 9
## 3     0.92904               0.00742             1.99390             0.0274
## 4
## 4     0.85241               0.00544             1.11708             0.0184
## 6
## 5     0.92596               0.01002             1.72379             0.0125
## 7
## 6     0.98684               0.00959             3.20701             0.0087
## 3
##    Complexity_vdif.W.ADC Strength_vdif.W.ADC SRE_align.W.ADC LRE_align.W.AD
## C
## 1              94483.95           120.21874         0.99193         1.0449
## 5
## 2             123984.35            70.45906         0.99469         1.0348
## 4
## 3             322896.60           118.12334         0.99389         1.0391
## 7
## 4             270786.27            41.10745         0.99307         1.0414
## 3
## 5             183481.75            68.98942         0.99446         1.0368
## 1
## 6             408132.18           116.30778         0.99699         1.0254
## 0
##    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

summary(radiomics)

##   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.P
ET
##   Min.   : 1.487         Min.   :1.730    Min.   : 13.84   Min.   :-0.06102
1
##   1st Qu.:14.899         1st Qu.:1.963    1st Qu.: 39.34   1st Qu.: 0.00307
8
##   Median :18.320         Median :2.123    Median : 51.36   Median : 0.00556
0
##   Mean   :21.078         Mean   :2.593    Mean   : 62.59   Mean   : 0.00502
2
##   3rd Qu.:27.985         3rd Qu.:3.553    3rd Qu.: 75.90   3rd Qu.: 0.01670
8
##   Max.   :75.896         Max.   :5.105    Max.   :306.76   Max.   : 0.04082
0
##   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.P
ET
##   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.PE
T
##   Min.   : 10.98       Min.   :  6.961      Min.   :0.2847   Min.   :0.20
61
##   1st Qu.: 27.29       1st Qu.: 22.247      1st Qu.:0.6649   1st Qu.:0.51
17
##   Median : 41.35       Median : 31.747      Median :0.7906   Median :0.65
08
##   Mean   : 44.56       Mean   : 36.355      Mean   :0.8943   Mean   :0.71
24
##   3rd Qu.: 53.41       3rd Qu.: 42.708      3rd Qu.:0.9866   3rd Qu.:0.79
64
##   Max.   :148.69       Max.   :137.273      Max.   :1.9731   Max.   :1.62
48
##   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.PE
T
##   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
```

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##    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.   :0.98
47
##    1st Qu.:12641          1st Qu.:  8.460      1st Qu.:0.9715   1st Qu.:1.05
71
##    Median :17160          Median : 23.324      Median :0.9893   Median :1.08
90
##    Mean   :19663          Mean   : 39.906      Mean   :1.2275   Mean   :1.36
39
##    3rd Qu.:21957          3rd Qu.: 55.792      3rd Qu.:1.9080   3rd Qu.:2.07
23
##    Max.   :69560          Max.   :295.545      Max.   :2.0211   Max.   :2.41
67
##    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
```

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##    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
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## 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
```

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##   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.PE
## T
## 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.P
## ET
## 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
```

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##  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.PE
## T
##   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.AD
C
##    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.   :0.0353
7
##    1st Qu.:1.419          1st Qu.:1.660    1st Qu.: 0.01935   1st Qu.:0.2721
2
##    Median :1.530          Median :1.775    Median : 0.03492   Median :0.3443
2
##    Mean   :1.892          Mean   :2.192    Mean   : 0.03625   Mean   :0.3903
7
##    3rd Qu.:2.633          3rd Qu.:2.840    3rd Qu.: 0.04998   3rd Qu.:0.4521
9
##    Max.   :4.304          Max.   :4.526    Max.   : 0.10334   Max.   :0.9410
4
##    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.AD
C
##    Min.   : 11.84        Min.   :  9.012       Min.   :0.3876   Min.   :0.28
99
##    1st Qu.: 29.77        1st Qu.: 21.457       1st Qu.:0.6664   1st Qu.:0.45
74
```

```
## Median : 43.04         Median : 31.121        Median :0.8188    Median :0.59
59
## Mean   : 49.96         Mean    : 36.797        Mean    :0.9163   Mean    :0.66
95
## 3rd Qu.: 60.53         3rd Qu.: 45.643         3rd Qu.:0.9657    3rd Qu.:0.78
32
## Max.   :146.27         Max.    :126.071        Max.    :1.9194   Max.    :1.60
07
## 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.    :0.357
## 5
##    1st Qu.:  339.3   1st Qu.: 104430       1st Qu.:-0.105700   1st Qu.:0.607
## 6
##    Median :  1241.6  Median : 193879       Median :-0.069750   Median :0.694
## 5
##    Mean    :  1925.1  Mean    : 271202      Mean    :-0.082097   Mean    :0.830
## 7
##    3rd Qu.:  2696.2  3rd Qu.: 358073       3rd Qu.:-0.049570   3rd Qu.:0.913
## 5
##    Max.    :17923.8  Max.    :1477801      Max.    :-0.000042   Max.    :1.883
## 1
##    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.    :1.01
## 3
##    1st Qu.: 5699           1st Qu.:  3.5323     1st Qu.:0.9595   1st Qu.:1.09
## 9
##    Median : 7329           Median :  6.7704     Median :0.9763   Median :1.15
## 8
##    Mean    : 7989          Mean    : 11.7712    Mean    :1.2112  Mean    :1.44
## 4
##    3rd Qu.: 8949           3rd Qu.: 10.9074     3rd Qu.:1.8500   3rd Qu.:2.12
## 4
##    Max.    :19146          Max.    :124.5108    Max.    :2.0115  Max.    :2.69
## 5
##    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
```

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##    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.:0.09566
##    Median : 0.009940     Median :1.840       Median :0.22381
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##   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.AD
## C
##   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
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##   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
```

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## 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.AD
C
## 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
```

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##   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
```

Processing the dataset

#Check for null and missing values

```
sum(is.na(radiomics))
```

```
## [1] 0
```

Checking for normality of the dataset using shapiro-test

```
library(dplyr)
X1 <- radiomics %>%
  select_if(is.numeric)
```

#If the p-value of the test is greater than α = .05, then the data is assumed to be normally distributed.

```
X2 <- apply(X1,2,shapiro.test)
```

since all variable were tested, we need to determine which variables are skewed.

```
normaldata <- unlist(lapply(X2, function(x) x$p.value))
sum(normaldata>0,05)
```

```
## [1] 435
```

```
skew <- names(normaldata[normaldata>0.05])
skew
```

```
## [1] "Entropy_cooc.W.ADC"
```

#the result shows that an "Entropy_cooc.W.ADC" is skewed or not normally distributed. # normalizing the skewed data

```
Nor <- log(radiomics$Entropy_cooc.W.ADC)
shapiro.test(Nor)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  Nor
## W = 0.97991, p-value = 0.006324
```

Get the correlation of the whole dataset expect the categorical variables

```
library(dplyr)
newdf1 = select(radiomics, -c("Institution","Failure.binary", "Failure"))
cor.newdf1 = cor(newdf1)
corr = round(cor.newdf1,2)
head(corr)
```

```
##                    Entropy_cooc.W.ADC GLNU_align.H.PET Min_hist.PET
## Entropy_cooc.W.ADC               1.00             0.39         0.02
## GLNU_align.H.PET                 0.39             1.00        -0.03
## Min_hist.PET                     0.02            -0.03         1.00
## Max_hist.PET                     0.08             0.04         0.91
```

```
## Mean_hist.PET                          0.04            -0.02              0.98
## Variance_hist.PET                      0.05             0.00              0.78
##                         Max_hist.PET Mean_hist.PET Variance_hist.PET
## Entropy_cooc.W.ADC              0.08          0.04              0.05
## GLNU_align.H.PET               0.04         -0.02              0.00
## Min_hist.PET                   0.91          0.98              0.78
## Max_hist.PET                   1.00          0.95              0.88
## Mean_hist.PET                  0.95          1.00              0.85
## Variance_hist.PET              0.88          0.85              1.00
##                         Standard_Deviation_hist.PET Skewness_hist.PET
## Entropy_cooc.W.ADC                             0.05              0.03
## GLNU_align.H.PET                               0.00             -0.01
## Min_hist.PET                                   0.90              0.14
## Max_hist.PET                                   0.97              0.25
## Mean_hist.PET                                  0.95              0.09
## Variance_hist.PET                              0.92              0.03
##                         Kurtosis_hist.PET Energy_hist.PET Entropy_hist.PET
## Entropy_cooc.W.ADC                   0.08           -0.04             0.14
## GLNU_align.H.PET                     0.07            0.00             0.08
## Min_hist.PET                        -0.04            0.09             0.56
## Max_hist.PET                         0.12            0.08             0.64
## Mean_hist.PET                       -0.07            0.08             0.58
## Variance_hist.PET                   -0.07            0.00             0.35
##                         AUC_hist.PET H_suv.PET Volume.PET X3D_surface.PET
## Entropy_cooc.W.ADC              0.04     -0.02       0.12            0.18
## GLNU_align.H.PET               -0.02     -0.06       0.12            0.37
## Min_hist.PET                    0.51      0.86       0.37            0.25
## Max_hist.PET                    0.53      0.87       0.50            0.39
## Mean_hist.PET                   0.51      0.90       0.41            0.29
## Variance_hist.PET               0.25      0.81       0.32            0.27
##                         ratio_3ds_vol.PET ratio_3ds_vol_norm.PET irregularity.P
## ET
## Entropy_cooc.W.ADC                  -0.03                   0.13             0.
## 00
## GLNU_align.H.PET                    -0.09                   0.20            -0.
## 11
## Min_hist.PET                         0.13                   0.20             0.
## 47
## Max_hist.PET                         0.08                   0.32             0.
## 45
## Mean_hist.PET                        0.09                   0.22             0.
## 45
## Variance_hist.PET                   -0.02                   0.19             0.
## 19
##                         tumor_length.PET Compactness_v1.PET Compactness_v2.PET
## Entropy_cooc.W.ADC                  0.20              -0.07              -0.11
## GLNU_align.H.PET                    0.31               0.00              -0.11
## Min_hist.PET                        0.40               0.24               0.33
## Max_hist.PET                        0.57               0.27               0.35
## Mean_hist.PET                       0.45               0.25               0.35
```

```
## Variance_hist.PET                       0.37            0.13            0.23
##                         Spherical_disproportion.PET Sphericity.PET Asphericity.
PET
## Entropy_cooc.W.ADC                             0.13           -0.10              0
.13
## GLNU_align.H.PET                              0.20           -0.14              0
.20
## Min_hist.PET                                  0.20            0.32              0
.19
## Max_hist.PET                                  0.32            0.33              0
.30
## Mean_hist.PET                                 0.22            0.34              0
.20
## Variance_hist.PET                             0.19            0.21              0
.19
##                         Center_of_mass.PET Max_3D_diam.PET Major_axis_length.PE
T
## Entropy_cooc.W.ADC                    0.17            0.09                     0.1
1
## GLNU_align.H.PET                      0.22            0.12                     0.1
5
## Min_hist.PET                          0.25            0.51                     0.5
6
## Max_hist.PET                          0.47            0.65                     0.7
0
## Mean_hist.PET                         0.31            0.56                     0.6
1
## Variance_hist.PET                     0.48            0.44                     0.5
0
##                         Minor_axis_length.PET Least_axis_length.PET Elongation.
PET
## Entropy_cooc.W.ADC                       0.17                  0.16              0
.06
## GLNU_align.H.PET                         0.26                  0.25              0
.03
## Min_hist.PET                             0.47                  0.47              0
.33
## Max_hist.PET                             0.65                  0.64              0
.33
## Mean_hist.PET                            0.52                  0.53              0
.32
## Variance_hist.PET                        0.38                  0.41              0
.06
##                         Flatness.PET Max_cooc.L.PET Average_cooc.L.PET
## Entropy_cooc.W.ADC              0.07          -0.02              -0.05
## GLNU_align.H.PET                0.06           0.04              -0.15
## Min_hist.PET                    0.36           0.10               0.44
## Max_hist.PET                    0.37           0.13               0.33
## Mean_hist.PET                   0.36           0.10               0.45
## Variance_hist.PET               0.12           0.03               0.19
```

```
##                      Variance_cooc.L.PET Entropy_cooc.L.PET DAVE_cooc.L.PET
## Entropy_cooc.W.ADC                 -0.16               0.02           -0.15
## GLNU_align.H.PET                   -0.24              -0.04           -0.23
## Min_hist.PET                        0.30               0.56            0.42
## Max_hist.PET                        0.11               0.55            0.24
## Mean_hist.PET                       0.25               0.57            0.38
## Variance_hist.PET                   0.04               0.29            0.10
##                      DVAR_cooc.L.PET DENT_cooc.L.PET SAVE_cooc.L.PET
## Entropy_cooc.W.ADC             -0.18           -0.03           -0.05
## GLNU_align.H.PET               -0.19           -0.12           -0.15
## Min_hist.PET                    0.39            0.53            0.44
## Max_hist.PET                    0.27            0.48            0.33
## Mean_hist.PET                   0.34            0.52            0.45
## Variance_hist.PET               0.14            0.24            0.19
##                      SVAR_cooc.L.PET SENT_cooc.L.PET ASM_cooc.L.PET
## Entropy_cooc.W.ADC             -0.12            0.03          -0.02
## GLNU_align.H.PET               -0.20           -0.05           0.05
## Min_hist.PET                    0.27            0.50           0.10
## Max_hist.PET                    0.10            0.47           0.12
## Mean_hist.PET                   0.23            0.49           0.10
## Variance_hist.PET               0.05            0.23           0.03
##                      Contrast_cooc.L.PET Dissimilarity_cooc.L.PET
## Entropy_cooc.W.ADC                 -0.20                    -0.15
## GLNU_align.H.PET                   -0.26                    -0.23
## Min_hist.PET                        0.31                     0.42
## Max_hist.PET                        0.10                     0.24
## Mean_hist.PET                       0.26                     0.38
## Variance_hist.PET                   0.03                     0.10
##                      Inv_diff_cooc.L.PET Inv_diff_norm_cooc.L.PET IDM_cooc.L
## .PET
## Entropy_cooc.W.ADC                  0.13                     0.05
## 0.14
## GLNU_align.H.PET                    0.13                    -0.01
## 0.17
## Min_hist.PET                        0.42                     0.53
## 0.35
## Max_hist.PET                        0.58                     0.57
## 0.54
## Mean_hist.PET                       0.44                     0.53
## 0.38
## Variance_hist.PET                   0.29                     0.28
## 0.26
##                      IDM_norm_cooc.L.PET Inv_var_cooc.L.PET
## Entropy_cooc.W.ADC                  0.04               0.14
## GLNU_align.H.PET                   -0.02               0.16
## Min_hist.PET                        0.53               0.35
## Max_hist.PET                        0.56               0.55
## Mean_hist.PET                       0.53               0.38
## Variance_hist.PET                   0.27               0.27
##                      Correlation_cooc.L.PET Autocorrelation_cooc.L.PET
```

```
## Entropy_cooc.W.ADC                            0.19                       -0.07
## GLNU_align.H.PET                              0.17                       -0.17
## Min_hist.PET                                  0.24                        0.28
## Max_hist.PET                                  0.39                        0.14
## Mean_hist.PET                                 0.28                        0.30
## Variance_hist.PET                             0.21                        0.08
##                    Tendency_cooc.L.PET Shade_cooc.L.PET Prominence_cooc.L.
## PET
## Entropy_cooc.W.ADC                -0.12            -0.06                  -0
## .15
## GLNU_align.H.PET                  -0.20            -0.13                  -0
## .23
## Min_hist.PET                       0.27             0.12                   0
## .13
## Max_hist.PET                       0.10             0.08                  -0
## .04
## Mean_hist.PET                      0.23             0.05                   0
## .07
## Variance_hist.PET                  0.05             0.07                  -0
## .04
##                    IC1_.L.PET IC2_.L.PET Coarseness_vdif_.L.PET
## Entropy_cooc.W.ADC       0.08      -0.03                  -0.06
## GLNU_align.H.PET         0.25      -0.12                  -0.08
## Min_hist.PET            -0.06       0.38                   0.07
## Max_hist.PET            0.06       0.34                   0.02
## Mean_hist.PET          -0.01       0.36                   0.04
## Variance_hist.PET       0.07       0.16                  -0.05
##                    Contrast_vdif_.L.PET Busyness_vdif_.L.PET
## Entropy_cooc.W.ADC                -0.12                 0.13
## GLNU_align.H.PET                  -0.21                 0.26
## Min_hist.PET                       0.10                 0.32
## Max_hist.PET                      -0.06                 0.50
## Mean_hist.PET                      0.03                 0.36
## Variance_hist.PET                 -0.10                 0.32
##                    Complexity_vdif_.L.PET Strength_vdif_.L.PET SRE_align.L
## .PET
## Entropy_cooc.W.ADC                  -0.14                -0.12
## 0.02
## GLNU_align.H.PET                    -0.20                -0.27             -
## 0.05
## Min_hist.PET                         0.41                 0.01
## 0.53
## Max_hist.PET                         0.25                -0.13
## 0.54
## Mean_hist.PET                        0.35                -0.08
## 0.53
## Variance_hist.PET                    0.10                -0.17
## 0.26
##                    LRE_align.L.PET GLNU_align.L.PET RLNU_align.L.PET
## Entropy_cooc.W.ADC            0.05             0.16             0.15
```

```
##  GLNU_align.H.PET               0.00              0.30              0.29
##  Min_hist.PET                   0.52              0.30              0.34
##  Max_hist.PET                   0.57              0.51              0.50
##  Mean_hist.PET                  0.53              0.35              0.39
##  Variance_hist.PET              0.28              0.33              0.36
##                   RP_align.L.PET LGRE_align.L.PET HGRE_align.L.PET
##  Entropy_cooc.W.ADC             0.02            -0.03            -0.07
##  GLNU_align.H.PET              -0.05             0.02            -0.17
##  Min_hist.PET                   0.53             0.26             0.31
##  Max_hist.PET                   0.54             0.30             0.16
##  Mean_hist.PET                  0.53             0.20             0.33
##  Variance_hist.PET              0.26             0.08             0.10
##                   LGSRE_align.L.PET HGSRE_align.L.PET LGHRE_align.L.PET
##  Entropy_cooc.W.ADC             -0.03             -0.07             -0.02
##  GLNU_align.H.PET                0.02             -0.18              0.03
##  Min_hist.PET                    0.27              0.31              0.24
##  Max_hist.PET                    0.30              0.16              0.30
##  Mean_hist.PET                   0.21              0.32              0.19
##  Variance_hist.PET              0.08              0.09              0.08
##                   HGLRE_align.L.PET GLNU_norm_align.L.PET
##  Entropy_cooc.W.ADC             -0.06                  0.00
##  GLNU_align.H.PET               -0.15                  0.03
##  Min_hist.PET                    0.32                  0.23
##  Max_hist.PET                    0.18                  0.29
##  Mean_hist.PET                   0.34                  0.21
##  Variance_hist.PET              0.11                  0.08
##                   RLNU_norm_align.L.PET GLVAR_align.L.PET RLVAR_align.L.P
## ET
##  Entropy_cooc.W.ADC                  0.01            -0.13               0.
## 10
##  GLNU_align.H.PET                   -0.06            -0.21               0.
## 18
##  Min_hist.PET                        0.53             0.33               0.
## 25
##  Max_hist.PET                        0.52             0.14               0.
## 42
##  Mean_hist.PET                       0.53             0.29               0.
## 28
##  Variance_hist.PET                  0.25             0.07               0.
## 21
##                   Entropy_align.L.PET SZSE.L.PET LZSE.L.PET LGLZE.L.PET
##  Entropy_cooc.W.ADC               0.03       0.00       0.12      -0.02
##  GLNU_align.H.PET                -0.04      -0.09       0.16       0.02
##  Min_hist.PET                     0.55       0.53       0.33       0.27
##  Max_hist.PET                     0.55       0.52       0.45       0.31
##  Mean_hist.PET                    0.56       0.52       0.36       0.21
##  Variance_hist.PET               0.29       0.26       0.21       0.08
##                   HGLZE.L.PET SZLGE.L.PET SZHGE.L.PET LZLGE.L.PET LZHGE.L
## .PET
##  Entropy_cooc.W.ADC       -0.07      -0.03      -0.09       0.02
```

```
0.00
## GLNU_align.H.PET        -0.18        0.00        -0.20        0.11        -
0.02
## Min_hist.PET             0.32        0.28         0.33        0.17
0.25
## Max_hist.PET             0.17        0.30         0.17        0.29
0.16
## Mean_hist.PET            0.33        0.22         0.33        0.13
0.28
## Variance_hist.PET        0.10        0.07         0.10        0.10
0.09
##                    GLNU_area.L.PET ZSNU.L.PET ZSP.L.PET GLNU_norm.L.PET
## Entropy_cooc.W.ADC            0.15       0.14      0.00            0.00
## GLNU_align.H.PET             0.29       0.28     -0.09            0.03
## Min_hist.PET                 0.31       0.35      0.53            0.23
## Max_hist.PET                 0.51       0.50      0.51            0.29
## Mean_hist.PET                0.35       0.40      0.52            0.21
## Variance_hist.PET            0.33       0.36      0.25            0.08
##                    ZSNU_norm.L.PET GLVAR_area.L.PET ZSVAR.L.PET
## Entropy_cooc.W.ADC            0.00            -0.13        0.16
## GLNU_align.H.PET             -0.09            -0.22        0.25
## Min_hist.PET                  0.53             0.34        0.18
## Max_hist.PET                  0.49             0.15        0.43
## Mean_hist.PET                 0.52             0.30        0.23
## Variance_hist.PET             0.23             0.08        0.24
##                    Entropy_area.L.PET Max_cooc.H.PET Average_cooc.H.PET
## Entropy_cooc.W.ADC               0.04          -0.04               0.00
## GLNU_align.H.PET                -0.02          -0.03              -0.07
## Min_hist.PET                     0.55          -0.34               0.39
## Max_hist.PET                     0.57          -0.37               0.38
## Mean_hist.PET                    0.57          -0.38               0.37
## Variance_hist.PET                0.30          -0.43               0.11
##                    Variance_cooc.H.PET Entropy_cooc.H.PET DAVE_cooc.H.PET
## Entropy_cooc.W.ADC                0.05              -0.07           -0.03
## GLNU_align.H.PET                 -0.01              -0.10           -0.11
## Min_hist.PET                      0.73               0.70            0.69
## Max_hist.PET                      0.76               0.72            0.65
## Mean_hist.PET                     0.77               0.71            0.69
## Variance_hist.PET                 0.52               0.50            0.39
##                    DVAR_cooc.H.PET DENT_cooc.H.PET SAVE_cooc.H.PET
## Entropy_cooc.W.ADC           -0.03            0.18            0.04
## GLNU_align.H.PET             -0.10            0.09           -0.05
## Min_hist.PET                  0.62            0.61            0.45
## Max_hist.PET                  0.58            0.62            0.45
## Mean_hist.PET                 0.63            0.61            0.44
## Variance_hist.PET            0.34            0.34            0.18
##                    SVAR_cooc.H.PET SENT_cooc.H.PET ASM_cooc.H.PET
## Entropy_cooc.W.ADC           0.18            0.09           -0.05
## GLNU_align.H.PET             0.08            0.06           -0.01
## Min_hist.PET                 0.66            0.61           -0.32
```

```
## Max_hist.PET                        0.70                     0.63               -0.33
## Mean_hist.PET                       0.69                     0.63               -0.35
## Variance_hist.PET                   0.44                     0.49               -0.38
##                     Contrast_cooc.H.PET Dissimilarity_cooc.H.PET
## Entropy_cooc.W.ADC                 -0.06                    -0.03
## GLNU_align.H.PET                   -0.12                    -0.11
## Min_hist.PET                        0.67                     0.69
## Max_hist.PET                        0.61                     0.65
## Mean_hist.PET                       0.68                     0.69
## Variance_hist.PET                   0.39                     0.39
##                     Inv_diff_cooc.H.PET Inv_diff_norm_cooc.H.PET IDM_cooc.H
## .PET
## Entropy_cooc.W.ADC                  0.04                     0.04
## 0.04
## GLNU_align.H.PET                    0.03                    -0.03
## 0.03
## Min_hist.PET                       -0.12                     0.49               -
## 0.23
## Max_hist.PET                       -0.08                     0.51               -
## 0.21
## Mean_hist.PET                      -0.13                     0.49               -
## 0.26
## Variance_hist.PET                  -0.27                     0.23               -
## 0.37
##                     IDM_norm_cooc.H.PET Inv_var_cooc_.H.PET
## Entropy_cooc.W.ADC                  0.03                0.03
## GLNU_align.H.PET                   -0.03                0.06
## Min_hist.PET                        0.51                0.43
## Max_hist.PET                        0.53                0.50
## Mean_hist.PET                       0.51                0.44
## Variance_hist.PET                   0.25                0.40
##                     Correlation_cooc.H.PET Autocorrelation_cooc.H.PET
## Entropy_cooc.W.ADC                    0.19                      -0.01
## GLNU_align.H.PET                      0.17                      -0.07
## Min_hist.PET                          0.31                       0.25
## Max_hist.PET                          0.46                       0.24
## Mean_hist.PET                         0.35                       0.23
## Variance_hist.PET                     0.28                      -0.01
##                     Tendency_cooc.H.PET Shade_cooc.H.PET Prominence_cooc.H.
## PET
## Entropy_cooc.W.ADC                  0.11            -0.06                    0
## .12
## GLNU_align.H.PET                    0.05            -0.01                    0
## .09
## Min_hist.PET                        0.69            -0.37                    0
## .71
## Max_hist.PET                        0.77            -0.41                    0
## .81
## Mean_hist.PET                       0.75            -0.44                    0
## .79
```

```
## Variance_hist.PET                          0.55             -0.26             0
.64
##                        IC1_d.H.PET IC2_d.H.PET Coarseness_vdif.H.PET
## Entropy_cooc.W.ADC          -0.18        0.15                 -0.04
## GLNU_align.H.PET            -0.15        0.11                  0.03
## Min_hist.PET                 0.13        0.43                  0.11
## Max_hist.PET                 0.01        0.56                  0.11
## Mean_hist.PET                0.10        0.47                  0.10
## Variance_hist.PET            0.04        0.36                  0.04
##                        Contrast_vdif.H.PET Busyness_vdif.H.PET
## Entropy_cooc.W.ADC                   -0.02               -0.05
## GLNU_align.H.PET                     -0.10               -0.06
## Min_hist.PET                         -0.28                0.09
## Max_hist.PET                         -0.33                0.15
## Mean_hist.PET                        -0.29                0.10
## Variance_hist.PET                    -0.37                0.02
##                        Complexity_vdif.H.PET Strength_vdif.H.PET SRE_align.H.P
ET
## Entropy_cooc.W.ADC                      0.02               -0.18           0.
01
## GLNU_align.H.PET                       -0.02               -0.09          -0.
06
## Min_hist.PET                            0.37               -0.10           0.
66
## Max_hist.PET                            0.30               -0.14           0.
67
## Mean_hist.PET                           0.35               -0.12           0.
67
## Variance_hist.PET                       0.14               -0.12           0.
40
##                        LRE_align.H.PET RLNU_align.H.PET RP_align.H.PET
## Entropy_cooc.W.ADC                0.10             0.14           0.00
## GLNU_align.H.PET                  0.04             0.28          -0.07
## Min_hist.PET                     -0.09             0.41           0.69
## Max_hist.PET                     -0.05             0.57           0.69
## Mean_hist.PET                    -0.10             0.47           0.69
## Variance_hist.PET                -0.24             0.45           0.42
##                        LGRE_align.H.PET HGRE_align.H.PET LGSRE_align.H.PET
## Entropy_cooc.W.ADC                -0.02             0.00             -0.02
## GLNU_align.H.PET                   0.05            -0.07              0.05
## Min_hist.PET                       0.16             0.27              0.16
## Max_hist.PET                       0.18             0.27              0.18
## Mean_hist.PET                      0.17             0.25              0.17
## Variance_hist.PET                  0.10             0.01              0.10
##                        HGSRE_align.H.PET LGHRE_align.H.PET HGLRE_align.H.PET
## Entropy_cooc.W.ADC                 -0.01             -0.01              0.05
## GLNU_align.H.PET                   -0.10              0.06              0.06
## Min_hist.PET                        0.46              0.16             -0.25
## Max_hist.PET                        0.44              0.19             -0.23
## Mean_hist.PET                       0.43              0.17             -0.26
```

```
## Variance_hist.PET                     0.17              0.10              -0.34
##                     GLNU_norm_align.H.PET RLNU_norm_align.H.PET
## Entropy_cooc.W.ADC                  -0.04                 -0.01
## GLNU_align.H.PET                    -0.06                 -0.08
## Min_hist.PET                        -0.27                  0.76
## Max_hist.PET                        -0.30                  0.75
## Mean_hist.PET                       -0.32                  0.76
## Variance_hist.PET                   -0.44                  0.51
##                     GLVAR_align.H.PET RLVAR_align.H.PET Entropy_align.H.PET
## Entropy_cooc.W.ADC              0.06              0.10                0.08
## GLNU_align.H.PET               0.00              0.15                0.02
## Min_hist.PET                   0.73             -0.38                0.75
## Max_hist.PET                   0.77             -0.33                0.81
## Mean_hist.PET                  0.78             -0.38                0.79
## Variance_hist.PET              0.54             -0.42                0.58
##                     SZSE.H.PET LZSE.H.PET LGLZE.H.PET HGLZE.H.PET SZLGE.H.P
## ET
## Entropy_cooc.W.ADC        0.00       0.15       -0.02        0.07       -0.
## 02
## GLNU_align.H.PET         -0.08       0.10        0.05        0.00        0.
## 05
## Min_hist.PET              0.78      -0.22        0.16        0.28        0.
## 16
## Max_hist.PET              0.79      -0.21        0.19        0.32        0.
## 18
## Mean_hist.PET             0.79      -0.22        0.17        0.26        0.
## 16
## Variance_hist.PET         0.56      -0.17        0.11        0.05        0.
## 10
##                     SZHGE.H.PET LZLGE.H.PET LZHGE.H.PET GLNU_area.H.PET
## Entropy_cooc.W.ADC        -0.02        0.17        0.09            0.12
## GLNU_align.H.PET          -0.12        0.17        0.09            0.25
## Min_hist.PET               0.61       -0.26       -0.27            0.30
## Max_hist.PET               0.60       -0.23       -0.26            0.46
## Mean_hist.PET              0.58       -0.25       -0.26            0.34
## Variance_hist.PET          0.35       -0.21       -0.21            0.28
##                     ZSNU.H.PET ZSP.H.PET GLNU_norm.H.PET ZSNU_norm.H.PET
## Entropy_cooc.W.ADC        0.12     -0.03           -0.03           -0.01
## GLNU_align.H.PET          0.24     -0.10           -0.06           -0.07
## Min_hist.PET              0.49      0.86           -0.27            0.85
## Max_hist.PET              0.62      0.85           -0.30            0.85
## Mean_hist.PET             0.55      0.87           -0.31            0.87
## Variance_hist.PET         0.54      0.69           -0.44            0.67
##                     GLVAR_area.H.PET ZSVAR_H.PET Entropy_area.H.PET
## Entropy_cooc.W.ADC              0.07        0.14                0.08
## GLNU_align.H.PET               -0.01        0.11                0.03
## Min_hist.PET                    0.72       -0.25                0.63
## Max_hist.PET                    0.77       -0.24                0.70
## Mean_hist.PET                   0.77       -0.25                0.66
## Variance_hist.PET               0.53       -0.20                0.43
```

```
##                       Max_cooc.W.PET Average_cooc.W.PET Variance_cooc.W.PET
## Entropy_cooc.W.ADC             -0.07               0.05                0.04
## GLNU_align.H.PET              -0.01              -0.01               -0.01
## Min_hist.PET                  -0.23               0.89                0.77
## Max_hist.PET                  -0.25               0.95                0.86
## Mean_hist.PET                 -0.26               0.96                0.83
## Variance_hist.PET             -0.31               0.88                0.99
##                       Entropy_cooc.W.PET DAVE_cooc.W.PET DVAR_cooc.W.PET
## Entropy_cooc.W.ADC                  0.04           -0.03           -0.03
## GLNU_align.H.PET                   -0.02           -0.08           -0.07
## Min_hist.PET                        0.82            0.91            0.82
## Max_hist.PET                        0.86            0.91            0.86
## Mean_hist.PET                       0.85            0.94            0.86
## Variance_hist.PET                   0.64            0.85            0.96
##                       DENT_cooc.W.PET SAVE_cooc.W.PET SVAR_cooc.W.PET
## Entropy_cooc.W.ADC               0.01            0.05            0.07
## GLNU_align.H.PET                -0.06           -0.01            0.02
## Min_hist.PET                     0.84            0.89            0.72
## Max_hist.PET                     0.85            0.95            0.84
## Mean_hist.PET                    0.86            0.96            0.78
## Variance_hist.PET                0.64            0.88            0.99
##                       SENT_cooc.W.PET ASM_cooc.W.PET Contrast_cooc.W.PET
## Entropy_cooc.W.ADC               0.06          -0.06               -0.04
## GLNU_align.H.PET                 0.00           0.01               -0.08
## Min_hist.PET                     0.76          -0.15                0.84
## Max_hist.PET                     0.80          -0.15                0.85
## Mean_hist.PET                    0.78          -0.17                0.88
## Variance_hist.PET                0.58          -0.21                0.93
##                       Dissimilarity_cooc.W.PET Inv_diff_cooc.W.PET
## Entropy_cooc.W.ADC                       -0.03                0.04
## GLNU_align.H.PET                         -0.08                0.01
## Min_hist.PET                              0.91               -0.06
## Max_hist.PET                              0.91               -0.04
## Mean_hist.PET                             0.94               -0.08
## Variance_hist.PET                         0.85               -0.27
##                       Inv_diff_norm_cooc.W.PET IDM_cooc.W.PET IDM_norm_cooc.W
## .PET
## Entropy_cooc.W.ADC                        0.05           0.04
## 0.04
## GLNU_align.H.PET                         -0.01           0.02                -
## 0.02
## Min_hist.PET                              0.52          -0.21
## 0.53
## Max_hist.PET                              0.57          -0.19
## 0.56
## Mean_hist.PET                             0.53          -0.24
## 0.53
## Variance_hist.PET                         0.27          -0.38
## 0.27
##                       Inv_var_cooc.W.PET Correlation_cooc.W.PET
```

```
## Entropy_cooc.W.ADC                  0.05                          0.19
## GLNU_align.H.PET                    0.01                          0.17
## Min_hist.PET                       -0.15                          0.25
## Max_hist.PET                       -0.12                          0.41
## Mean_hist.PET                      -0.17                          0.29
## Variance_hist.PET                  -0.34                          0.23
##                     Autocorrelation_cooc.W.PET Tendency_cooc.W.PET
## Entropy_cooc.W.ADC                        0.07                0.07
## GLNU_align.H.PET                          0.01                0.02
## Min_hist.PET                              0.80                0.72
## Max_hist.PET                              0.88                0.84
## Mean_hist.PET                             0.88                0.78
## Variance_hist.PET                         0.95                0.99
##                     Shade_cooc.W.PET Prominence_cooc.W.PET IC1_d.W.PET
## Entropy_cooc.W.ADC              0.06                  0.07       -0.14
## GLNU_align.H.PET               0.03                  0.03       -0.07
## Min_hist.PET                   0.28                  0.28        0.00
## Max_hist.PET                   0.46                  0.46       -0.09
## Mean_hist.PET                  0.33                  0.34       -0.02
## Variance_hist.PET              0.72                  0.74       -0.09
##                     IC2_d.W.PET Coarseness_vdif.W.PET Contrast_vdif.W.PET
## Entropy_cooc.W.ADC         0.10                 -0.07               -0.13
## GLNU_align.H.PET          0.04                 -0.11               -0.18
## Min_hist.PET              0.51                  0.04                0.78
## Max_hist.PET              0.61                 -0.03                0.66
## Mean_hist.PET             0.54                  0.01                0.76
## Variance_hist.PET         0.41                 -0.09                0.65
##                     Busyness_vdif.W.PET Complexity_vdif.W.PET
## Entropy_cooc.W.ADC                 0.01                  0.07
## GLNU_align.H.PET                  0.10                  0.04
## Min_hist.PET                     -0.33                  0.61
## Max_hist.PET                     -0.32                  0.79
## Mean_hist.PET                    -0.35                  0.68
## Variance_hist.PET                -0.41                  0.94
##                     Strength_vdif.W.PET SRE_align.W.PET LRE_align.W.PET
## Entropy_cooc.W.ADC                -0.03            0.02            0.06
## GLNU_align.H.PET                  -0.14           -0.05            0.03
## Min_hist.PET                      0.46            0.60            0.17
## Max_hist.PET                      0.46            0.61            0.20
## Mean_hist.PET                     0.42            0.60            0.17
## Variance_hist.PET                 0.48            0.33           -0.04
##                     GLNU_align.W.PET RLNU_align.W.PET RP_align.W.PET
## Entropy_cooc.W.ADC              0.15             0.15           0.02
## GLNU_align.H.PET               0.30             0.29          -0.06
## Min_hist.PET                   0.10             0.38           0.62
## Max_hist.PET                   0.28             0.54           0.63
## Mean_hist.PET                  0.14             0.44           0.62
## Variance_hist.PET              0.07             0.41           0.35
##                     LGRE_align.W.PET HGRE_align.W.PET LGSRE_align.W.PET
## Entropy_cooc.W.ADC             -0.06             0.07             -0.07
```

```
## GLNU_align.H.PET                  -0.06              0.00            -0.07
## Min_hist.PET                       -0.22              0.80            -0.18
## Max_hist.PET                       -0.27              0.88            -0.23
## Mean_hist.PET                      -0.29              0.88            -0.26
## Variance_hist.PET                  -0.41              0.95            -0.40
##                   HGSRE_align.W.PET LGHRE_align.W.PET HGLRE_align.W.PET
## Entropy_cooc.W.ADC             0.06             -0.04              0.08
## GLNU_align.H.PET               0.00             -0.02              0.02
## Min_hist.PET                   0.80             -0.33              0.79
## Max_hist.PET                   0.88             -0.36              0.88
## Mean_hist.PET                  0.88             -0.39              0.88
## Variance_hist.PET              0.96             -0.44              0.94
##                   GLNU_norm_align.W.PET RLNU_norm_align.W.PET
## Entropy_cooc.W.ADC                -0.05                  0.01
## GLNU_align.H.PET                  -0.06                 -0.06
## Min_hist.PET                      -0.24                  0.67
## Max_hist.PET                      -0.27                  0.68
## Mean_hist.PET                     -0.29                  0.68
## Variance_hist.PET                 -0.40                  0.41
##                   GLVAR_align.W.PET RLVAR_align.W.PET Entropy_align.W.PET
## Entropy_cooc.W.ADC             0.05              0.08                0.07
## GLNU_align.H.PET               0.00              0.12                0.01
## Min_hist.PET                   0.78             -0.35                0.76
## Max_hist.PET                   0.88             -0.30                0.82
## Mean_hist.PET                  0.84             -0.36                0.80
## Variance_hist.PET             1.00             -0.40                0.58
##                   SZSE.W.PET LZSE.W.PET LGLZE.W.PET HGLZE.W.PET SZLGE.W.P
ET
## Entropy_cooc.W.ADC      0.00       0.07       -0.04        0.06       -0.
04
## GLNU_align.H.PET       -0.08       0.11       -0.04        0.00       -0.
06
## Min_hist.PET            0.69      -0.35       -0.22        0.80       -0.
11
## Max_hist.PET            0.69      -0.34       -0.26        0.89       -0.
16
## Mean_hist.PET           0.69      -0.36       -0.29        0.88       -0.
18
## Variance_hist.PET       0.43      -0.34       -0.42        0.96       -0.
34
##                   SZHGE.W.PET LZLGE.W.PET LZHGE.W.PET GLNU_area.W.PET
## Entropy_cooc.W.ADC       0.05        0.01        0.14            0.14
## GLNU_align.H.PET        -0.01        0.03        0.17            0.27
## Min_hist.PET             0.80       -0.30        0.55            0.19
## Max_hist.PET             0.88       -0.30        0.66            0.37
## Mean_hist.PET            0.87       -0.31        0.64            0.23
## Variance_hist.PET        0.97       -0.27        0.67            0.16
##                   ZSNU.W.PET ZSP.W.PET GLNU_norm.W.PET ZSNU_norm.W.PET
## Entropy_cooc.W.ADC      0.14      0.00           -0.03            0.00
## GLNU_align.H.PET        0.26     -0.09           -0.05           -0.07
```

```
## Min_hist.PET               0.44       0.78          -0.24                 0.79
## Max_hist.PET               0.58       0.78          -0.27                 0.79
## Mean_hist.PET              0.49       0.79          -0.28                 0.80
## Variance_hist.PET          0.48       0.54          -0.40                 0.56
##                      GLVAR_area.W.PET ZSVAR.W.PET Entropy_area.W.PET Min_his
t.ADC
## Entropy_cooc.W.ADC               0.06        0.08               0.07
-0.20
## GLNU_align.H.PET                 0.00        0.10               0.02
-0.23
## Min_hist.PET                     0.78       -0.36               0.68
0.17
## Max_hist.PET                     0.88       -0.35               0.74
0.11
## Mean_hist.PET                    0.84       -0.36               0.71
0.16
## Variance_hist.PET               1.00       -0.32               0.48
0.05
##                      Max_hist.ADC Mean_hist.ADC Variance_hist.ADC
## Entropy_cooc.W.ADC           0.18          0.02              0.29
## GLNU_align.H.PET             0.06         -0.09              0.15
## Min_hist.PET                 0.46          0.44              0.19
## Max_hist.PET                 0.52          0.44              0.25
## Mean_hist.PET               0.46          0.42              0.19
## Variance_hist.PET            0.25          0.16              0.10
##                      Standard_Deviation_hist.ADC Skewness_hist.ADC
## Entropy_cooc.W.ADC                          0.22             -0.03
## GLNU_align.H.PET                            0.08              0.00
## Min_hist.PET                                0.35              0.14
## Max_hist.PET                                0.41              0.21
## Mean_hist.PET                               0.35              0.19
## Variance_hist.PET                           0.18              0.21
##                      Kurtosis_hist.ADC Energy_hist.ADC Entropy_hist.ADC
## Entropy_cooc.W.ADC                0.02           -0.06             0.16
## GLNU_align.H.PET                 -0.01            0.03             0.05
## Min_hist.PET                      0.17            0.10             0.56
## Max_hist.PET                      0.23            0.11             0.59
## Mean_hist.PET                     0.19            0.10             0.56
## Variance_hist.PET                 0.19            0.03             0.30
##                      AUC_hist.ADC Volume.ADC X3D_surface.ADC ratio_3ds_vol.A
DC
## Entropy_cooc.W.ADC           0.03       0.10            0.26             -0.
23
## GLNU_align.H.PET            -0.03       0.11            0.22             -0.
23
## Min_hist.PET                 0.53       0.35            0.28              0.
24
## Max_hist.PET                 0.56       0.47            0.39              0.
19
## Mean_hist.PET                0.54       0.39            0.32              0.
```

```
22
## Variance_hist.PET              0.29        0.30          0.21              0.
05
##                    ratio_3ds_vol_norm.ADC irregularity.ADC Compactness_v1.
ADC
## Entropy_cooc.W.ADC                   0.07            -0.06              -0
.04
## GLNU_align.H.PET                    -0.03            -0.10               0
.02
## Min_hist.PET                         0.51             0.49               0
.26
## Max_hist.PET                         0.55             0.49               0
.27
## Mean_hist.PET                        0.51             0.49               0
.26
## Variance_hist.PET                    0.25             0.24               0
.12
##                    Compactness_v2.ADC Spherical_disproportion.ADC
## Entropy_cooc.W.ADC              -0.12                        0.07
## GLNU_align.H.PET                -0.05                       -0.03
## Min_hist.PET                     0.35                        0.51
## Max_hist.PET                     0.32                        0.55
## Mean_hist.PET                    0.35                        0.51
## Variance_hist.PET                0.16                        0.25
##                    Sphericity.ADC Asphericity.ADC Center_of_mass.ADC
## Entropy_cooc.W.ADC          -0.03            0.11               0.21
## GLNU_align.H.PET            -0.05           -0.01               0.15
## Min_hist.PET                 0.49            0.38               0.11
## Max_hist.PET                 0.48            0.44               0.21
## Mean_hist.PET                0.49            0.38               0.13
## Variance_hist.PET            0.24            0.19               0.09
##                    Max_3D_diam.ADC Major_axis_length.ADC Minor_axis_length
.ADC
## Entropy_cooc.W.ADC            0.27                  0.27
0.25
## GLNU_align.H.PET              0.19                  0.17
0.20
## Min_hist.PET                  0.41                  0.48
0.39
## Max_hist.PET                  0.49                  0.56
0.48
## Mean_hist.PET                 0.44                  0.50
0.41
## Variance_hist.PET             0.27                  0.30
0.25
##                    Least_axis_length.ADC Elongation.ADC Flatness.ADC
## Entropy_cooc.W.ADC                  0.24           0.06         0.07
## GLNU_align.H.PET                    0.20           0.04         0.07
## Min_hist.PET                        0.39           0.41         0.41
## Max_hist.PET                        0.47           0.44         0.44
```

```
## Mean_hist.PET                                0.43          0.41            0.43
## Variance_hist.PET                            0.27          0.19            0.22
##                       Max_cooc.L.ADC Average_cooc.L.ADC Variance_cooc.L.ADC
## Entropy_cooc.W.ADC            -0.01               0.00               -0.09
## GLNU_align.H.PET               0.05              -0.08               -0.17
## Min_hist.PET                   0.15               0.47                0.25
## Max_hist.PET                   0.19               0.45                0.21
## Mean_hist.PET                  0.15               0.44                0.23
## Variance_hist.PET              0.08               0.17                0.09
##                       Entropy_cooc.L.ADC DAVE_cooc.L.ADC DVAR_cooc.L.ADC
## Entropy_cooc.W.ADC                  0.04           -0.10           -0.11
## GLNU_align.H.PET                   -0.06           -0.17           -0.20
## Min_hist.PET                        0.54            0.40            0.25
## Max_hist.PET                        0.55            0.35            0.19
## Mean_hist.PET                       0.54            0.39            0.24
## Variance_hist.PET                   0.27            0.17            0.10
##                       DENT_cooc.L.ADC SAVE_cooc.L.ADC SVAR_cooc.L.ADC
## Entropy_cooc.W.ADC             -0.01            0.00           -0.07
## GLNU_align.H.PET               -0.10           -0.08           -0.14
## Min_hist.PET                    0.52            0.47            0.24
## Max_hist.PET                    0.51            0.45            0.20
## Mean_hist.PET                   0.51            0.44            0.22
## Variance_hist.PET               0.25            0.17            0.09
##                       SENT_cooc.L.ADC ASM_cooc.L.ADC Contrast_cooc.L.ADC
## Entropy_cooc.W.ADC             0.07           -0.02               -0.14
## GLNU_align.H.PET               0.03            0.06               -0.20
## Min_hist.PET                   0.39            0.12                0.25
## Max_hist.PET                   0.44            0.14                0.19
## Mean_hist.PET                  0.42            0.12                0.24
## Variance_hist.PET              0.27            0.05                0.10
##                       Dissimilarity_cooc.L.ADC Inv_diff_cooc.L.ADC
## Entropy_cooc.W.ADC                       -0.10                0.10
## GLNU_align.H.PET                         -0.17                0.06
## Min_hist.PET                              0.40                0.44
## Max_hist.PET                              0.35                0.51
## Mean_hist.PET                             0.39                0.46
## Variance_hist.PET                         0.17                0.24
##                       Inv_diff_norm_cooc.L.ADC IDM_cooc.L.ADC IDM_norm_cooc.L
## .ADC
## Entropy_cooc.W.ADC                        0.04           0.11
## 0.03
## GLNU_align.H.PET                         -0.03           0.08                -
## 0.04
## Min_hist.PET                              0.53           0.39
## 0.53
## Max_hist.PET                              0.55           0.47
## 0.55
## Mean_hist.PET                             0.53           0.41
## 0.53
## Variance_hist.PET                         0.27           0.22
```

```
0.27
##                          Inv_var_cooc.L.ADC Correlation_cooc.L.ADC
## Entropy_cooc.W.ADC                    0.11                   0.10
## GLNU_align.H.PET                      0.08                   0.07
## Min_hist.PET                          0.39                   0.31
## Max_hist.PET                          0.47                   0.38
## Mean_hist.PET                         0.41                   0.32
## Variance_hist.PET                     0.22                   0.15
##                          Autocorrelation_.L.ADC Tendency_cooc.L.ADC Shade_.L.ADC
## Entropy_cooc.W.ADC                      -0.03               -0.07        -0.13
## GLNU_align.H.PET                        -0.10               -0.14        -0.11
## Min_hist.PET                             0.35                0.24         0.07
## Max_hist.PET                             0.32                0.20         0.07
## Mean_hist.PET                            0.32                0.22         0.09
## Variance_hist.PET                        0.08                0.09         0.10
##                          Prominence_cooc.L.ADC IC1_.L.ADC IC2_.L.ADC
## Entropy_cooc.W.ADC                     -0.11        0.20      -0.07
## GLNU_align.H.PET                       -0.16        0.17      -0.09
## Min_hist.PET                            0.09       -0.07       0.38
## Max_hist.PET                            0.05       -0.07       0.39
## Mean_hist.PET                           0.08       -0.06       0.37
## Variance_hist.PET                       0.03        0.03       0.15
##                          Coarseness_vdif_.L.ADC Contrast_vdif_.L.ADC
## Entropy_cooc.W.ADC                      -0.18               -0.23
## GLNU_align.H.PET                        -0.06               -0.18
## Min_hist.PET                             0.06                0.10
## Max_hist.PET                             0.04                0.05
## Mean_hist.PET                            0.05                0.09
## Variance_hist.PET                       -0.02                0.00
##                          Busyness_vdif_.L.ADC Complexity_vdif_.L.ADC
## Entropy_cooc.W.ADC                     0.28                  0.08
## GLNU_align.H.PET                       0.20                 -0.13
## Min_hist.PET                           0.31                  0.45
## Max_hist.PET                           0.38                  0.43
## Mean_hist.PET                          0.34                  0.45
## Variance_hist.PET                      0.27                  0.25
##                          Strength_vdif_.L.ADC SRE_align.L.ADC LRE_align.L.ADC
## Entropy_cooc.W.ADC                    -0.31            0.02            0.06
## GLNU_align.H.PET                      -0.22           -0.05           -0.01
## Min_hist.PET                          -0.04            0.53            0.52
## Max_hist.PET                          -0.09            0.54            0.56
## Mean_hist.PET                         -0.06            0.53            0.53
## Variance_hist.PET                     -0.10            0.26            0.28
##                          GLNU_align.L.ADC RLNU_align.L.ADC RP_align.L.ADC
## Entropy_cooc.W.ADC                 0.24             0.27           0.01
## GLNU_align.H.PET                   0.14             0.17          -0.05
## Min_hist.PET                       0.27             0.28           0.53
## Max_hist.PET                       0.34             0.31           0.54
## Mean_hist.PET                      0.30             0.29           0.53
## Variance_hist.PET                  0.24             0.18           0.26
```

```
##                       LGRE_align.L.ADC HGRE_align.L.ADC LGSRE_align.L.ADC
## Entropy_cooc.W.ADC                0.00            -0.03              0.00
## GLNU_align.H.PET                  0.08            -0.11              0.08
## Min_hist.PET                      0.10             0.38              0.10
## Max_hist.PET                      0.11             0.35              0.11
## Mean_hist.PET                     0.09             0.35              0.09
## Variance_hist.PET                 0.03             0.11              0.03
##                       HGSRE_align.L.ADC LGHRE_align.L.ADC HGLRE_align.L.ADC
## Entropy_cooc.W.ADC                -0.04              0.03             -0.01
## GLNU_align.H.PET                  -0.12              0.10             -0.09
## Min_hist.PET                       0.38              0.10              0.37
## Max_hist.PET                       0.35              0.12              0.34
## Mean_hist.PET                      0.35              0.09              0.34
## Variance_hist.PET                  0.11              0.03              0.10
##                       GLNU_norm_align.L.ADC RLNU_norm_align.L.ADC
## Entropy_cooc.W.ADC                     0.01                  0.00
## GLNU_align.H.PET                       0.05                 -0.06
## Min_hist.PET                           0.31                  0.53
## Max_hist.PET                           0.35                  0.53
## Mean_hist.PET                          0.32                  0.52
## Variance_hist.PET                      0.17                  0.25
##                       GLVAR_align.L.ADC RLVAR_align.L.ADC Entropy_align.L.ADC
## Entropy_cooc.W.ADC                -0.10              0.13                0.04
## GLNU_align.H.PET                  -0.17              0.13               -0.05
## Min_hist.PET                       0.26              0.31                0.54
## Max_hist.PET                       0.21              0.40                0.55
## Mean_hist.PET                      0.24              0.33                0.53
## Variance_hist.PET                  0.10              0.20                0.27
##                       SZSE.L.ADC LZSE.L.ADC LGLZE.L.ADC HGLZE.L.ADC SZLGE.L.A
## DC
## Entropy_cooc.W.ADC          0.01       0.10       -0.01       -0.03        -0.
## 02
## GLNU_align.H.PET           -0.06       0.05        0.07       -0.11         0.
## 06
## Min_hist.PET                0.53       0.41        0.10        0.39         0.
## 10
## Max_hist.PET                0.53       0.50        0.11        0.35         0.
## 11
## Mean_hist.PET               0.53       0.44        0.09        0.35         0.
## 09
## Variance_hist.PET           0.26       0.25        0.03        0.11         0.
## 03
##                       SZHGE.L.ADC LZLGE.L.ADC LZHGE.L.ADC GLNU_area.L.ADC
## Entropy_cooc.W.ADC          -0.04        0.10        0.03            0.25
## GLNU_align.H.PET            -0.12        0.15       -0.04            0.15
## Min_hist.PET                 0.39        0.08        0.32            0.28
## Max_hist.PET                 0.35        0.11        0.33            0.33
## Mean_hist.PET                0.36        0.08        0.30            0.30
## Variance_hist.PET            0.11        0.02        0.09            0.22
##                       ZSNU.L.ADC ZSP.L.ADC GLNU_norm.L.ADC ZSNU_norm.L.ADC
```

```
## Entropy_cooc.W.ADC         0.27      -0.01          0.00           -0.02
## GLNU_align.H.PET           0.17      -0.07          0.05           -0.08
## Min_hist.PET               0.28       0.52          0.31            0.52
## Max_hist.PET               0.31       0.52          0.35            0.51
## Mean_hist.PET              0.29       0.52          0.32            0.51
## Variance_hist.PET          0.17       0.25          0.16            0.25
##                     GLVAR_area.L.ADC ZSVAR.L.ADC Entropy_area.L.ADC
## Entropy_cooc.W.ADC             -0.10        0.11               0.06
## GLNU_align.H.PET               -0.18        0.10              -0.04
## Min_hist.PET                    0.26        0.20               0.54
## Max_hist.PET                    0.22        0.32               0.56
## Mean_hist.PET                   0.25        0.24               0.54
## Variance_hist.PET               0.11        0.17               0.27
##                     Max_cooc.H.ADC Average_cooc.H.ADC Variance_cooc.H.ADC
## Entropy_cooc.W.ADC           -0.01               0.02                0.03
## GLNU_align.H.PET              0.06              -0.05               -0.05
## Min_hist.PET                 0.12               0.54                0.55
## Max_hist.PET                 0.14               0.54                0.56
## Mean_hist.PET                0.11               0.53                0.55
## Variance_hist.PET            0.05               0.25                0.27
##                     Entropy_cooc.H.ADC DAVE_cooc.H.ADC DVAR_cooc.H.ADC
## Entropy_cooc.W.ADC               0.06           -0.03            0.00
## GLNU_align.H.PET                -0.04           -0.11           -0.10
## Min_hist.PET                     0.55            0.54            0.53
## Max_hist.PET                     0.57            0.52            0.51
## Mean_hist.PET                    0.56            0.54            0.52
## Variance_hist.PET                0.28            0.28            0.28
##                     DENT_cooc.H.ADC SAVE_cooc.H.ADC SVAR_cooc.H.ADC
## Entropy_cooc.W.ADC           0.02            0.02            0.06
## GLNU_align.H.PET            -0.06           -0.05            0.00
## Min_hist.PET                 0.55            0.54            0.49
## Max_hist.PET                 0.55            0.54            0.52
## Mean_hist.PET                0.55            0.53            0.49
## Variance_hist.PET            0.28            0.25            0.23
##                     SENT_cooc.H.ADC ASM_cooc.H.ADC Contrast_cooc.H.ADC
## Entropy_cooc.W.ADC           0.04          -0.02               -0.05
## GLNU_align.H.PET            -0.03           0.05               -0.13
## Min_hist.PET                 0.53           0.10                0.51
## Max_hist.PET                 0.56           0.11                0.48
## Mean_hist.PET                0.54           0.10                0.50
## Variance_hist.PET            0.29           0.03                0.27
##                     Dissimilarity_cooc.H.ADC Inv_diff_cooc.H.ADC
## Entropy_cooc.W.ADC                     -0.03                0.09
## GLNU_align.H.PET                       -0.11                0.04
## Min_hist.PET                            0.54                0.44
## Max_hist.PET                            0.52                0.48
## Mean_hist.PET                           0.54                0.44
## Variance_hist.PET                       0.28                0.21
##                     Inv_diff_norm_cooc.H.ADC IDM_cooc.H.ADC IDM_norm_cooc.H
## .ADC
```

```
## Entropy_cooc.W.ADC                            0.04          0.11
0.03
## GLNU_align.H.PET                             -0.03          0.07            -
0.03
## Min_hist.PET                                  0.52          0.38
0.52
## Max_hist.PET                                  0.54          0.43
0.54
## Mean_hist.PET                                 0.52          0.38
0.52
## Variance_hist.PET                             0.26          0.18
0.26
##                      Inv_var_cooc.H.ADC Correlation_cooc.H.ADC
## Entropy_cooc.W.ADC                 0.07                   0.10
## GLNU_align.H.PET                   0.05                   0.08
## Min_hist.PET                       0.37                   0.29
## Max_hist.PET                       0.42                   0.35
## Mean_hist.PET                      0.37                   0.30
## Variance_hist.PET                  0.17                   0.13
##                      Autocorrelation_cooc.H.ADC Tendency_cooc.H.ADC
## Entropy_cooc.W.ADC                         0.03                0.06
## GLNU_align.H.PET                          -0.04                0.00
## Min_hist.PET                               0.52                0.49
## Max_hist.PET                               0.53                0.52
## Mean_hist.PET                              0.51                0.49
## Variance_hist.PET                          0.23                0.23
##                      Shade_cooc.H.ADC Prominence_cooc.H.ADC IC1_d.H.ADC
## Entropy_cooc.W.ADC               0.02                  0.09        0.28
## GLNU_align.H.PET                 0.04                  0.02        0.20
## Min_hist.PET                     0.11                  0.47       -0.01
## Max_hist.PET                     0.18                  0.51        0.02
## Mean_hist.PET                    0.16                  0.47        0.00
## Variance_hist.PET                0.18                  0.23        0.08
##                      IC2_d.H.ADC Coarseness_vdif.H.ADC Contrast_vdif.H.ADC
## Entropy_cooc.W.ADC         -0.10                 -0.17               -0.02
## GLNU_align.H.PET           -0.11                 -0.05               -0.10
## Min_hist.PET                0.38                  0.05                0.52
## Max_hist.PET                0.38                  0.04                0.51
## Mean_hist.PET               0.37                  0.04                0.52
## Variance_hist.PET           0.15                 -0.02                0.27
##                      Busyness_vdif.H.ADC Complexity_vdif.H.ADC
## Entropy_cooc.W.ADC                  0.27                 -0.03
## GLNU_align.H.PET                    0.16                 -0.11
## Min_hist.PET                        0.29                  0.52
## Max_hist.PET                        0.33                  0.51
## Mean_hist.PET                       0.31                  0.52
## Variance_hist.PET                   0.21                  0.27
##                      Strength_vdif.H.ADC SRE_align.H.ADC LRE_align.H.ADC
## Entropy_cooc.W.ADC                 -0.33            0.02            0.05
## GLNU_align.H.PET                   -0.19           -0.05           -0.02
```

```
## Min_hist.PET                              -0.06              0.53           0.53
## Max_hist.PET                              -0.11              0.54           0.56
## Mean_hist.PET                             -0.07              0.53           0.53
## Variance_hist.PET                         -0.11              0.26           0.27
##                  GLNU_align.H.ADC RLNU_align.H.ADC RP_align.H.ADC
## Entropy_cooc.W.ADC            0.26             0.26           0.02
## GLNU_align.H.PET             0.17             0.17          -0.05
## Min_hist.PET                 0.28             0.28           0.53
## Max_hist.PET                 0.32             0.32           0.54
## Mean_hist.PET                0.29             0.29           0.53
## Variance_hist.PET            0.18             0.19           0.26
##                  LGRE_align.H.ADC HGRE_align.H.ADC LGSRE_align.H.ADC
## Entropy_cooc.W.ADC           -0.01             0.02            -0.02
## GLNU_align.H.PET             0.02            -0.05             0.02
## Min_hist.PET                 0.27             0.54             0.26
## Max_hist.PET                 0.28             0.55             0.27
## Mean_hist.PET                0.26             0.54             0.26
## Variance_hist.PET            0.12             0.27             0.11
##                  HGSRE_align.H.ADC LGHRE_align.H.ADC HGLRE_align.H.ADC
## Entropy_cooc.W.ADC            0.02             0.03             0.05
## GLNU_align.H.PET            -0.05             0.05            -0.03
## Min_hist.PET                 0.53             0.30             0.54
## Max_hist.PET                 0.55             0.33             0.56
## Mean_hist.PET                0.53             0.30             0.54
## Variance_hist.PET            0.27             0.16             0.27
##                  GLNU_norm_align.H.ADC RLNU_norm_align.H.ADC
## Entropy_cooc.W.ADC                -0.02                  0.01
## GLNU_align.H.PET                 0.04                 -0.05
## Min_hist.PET                     0.21                  0.53
## Max_hist.PET                     0.22                  0.54
## Mean_hist.PET                    0.20                  0.53
## Variance_hist.PET               0.09                  0.26
##                  GLVAR_align.H.ADC RLVAR_align.H.ADC Entropy_align.H.ADC
## Entropy_cooc.W.ADC            0.02             0.12               0.04
## GLNU_align.H.PET            -0.05             0.12              -0.04
## Min_hist.PET                 0.54             0.27               0.54
## Max_hist.PET                 0.55             0.32               0.56
## Mean_hist.PET                0.54             0.28               0.54
## Variance_hist.PET            0.27             0.14               0.27
##                  SZSE.H.ADC LZSE.H.ADC LGLZE.H.ADC HGLZE.H.ADC SZLGE.H.A
## DC
## Entropy_cooc.W.ADC     0.01       0.11      -0.03        0.02      -0.
## 04
## GLNU_align.H.PET      -0.05       0.01       0.01       -0.05       0.
## 00
## Min_hist.PET           0.53       0.51       0.25        0.53       0.
## 22
## Max_hist.PET           0.54       0.55       0.25        0.55       0.
## 23
## Mean_hist.PET          0.53       0.52       0.24        0.54       0.
```

```
22
## Variance_hist.PET          0.26       0.26       0.10       0.27       0.
09
##                   SZHGE.H.ADC LZLGE.H.ADC LZHGE.H.ADC GLNU_area.H.ADC
## Entropy_cooc.W.ADC       0.00        0.13        0.12            0.26
## GLNU_align.H.PET        -0.06        0.12        0.00            0.17
## Min_hist.PET             0.53        0.32        0.52            0.28
## Max_hist.PET             0.54        0.38        0.55            0.32
## Mean_hist.PET            0.53        0.34        0.51            0.29
## Variance_hist.PET        0.27        0.21        0.26            0.19
##                   ZSNU.H.ADC ZSP.H.ADC GLNU_norm.H.ADC ZSNU_norm.H.ADC
## Entropy_cooc.W.ADC       0.26      0.00           -0.02           -0.01
## GLNU_align.H.PET         0.17     -0.06            0.04           -0.06
## Min_hist.PET             0.28      0.53            0.21            0.53
## Max_hist.PET             0.32      0.54            0.23            0.53
## Mean_hist.PET            0.30      0.53            0.21            0.53
## Variance_hist.PET        0.19      0.26            0.09            0.26
##                   GLVAR_area.H.ADC ZSVAR.H.ADC Entropy_area.H.ADC
## Entropy_cooc.W.ADC             0.01        0.23               0.05
## GLNU_align.H.PET              -0.06        0.13              -0.03
## Min_hist.PET                   0.53        0.27               0.54
## Max_hist.PET                   0.54        0.34               0.56
## Mean_hist.PET                  0.53        0.27               0.54
## Variance_hist.PET              0.26        0.14               0.27
##                   Max_cooc.W.ADC Average_cooc.W.ADC Variance_cooc.W.ADC
## Entropy_cooc.W.ADC          -0.03               0.20                0.28
## GLNU_align.H.PET             0.05               0.08                0.15
## Min_hist.PET                 0.10               0.35                0.18
## Max_hist.PET                 0.12               0.39                0.24
## Mean_hist.PET                0.10               0.34                0.17
## Variance_hist.PET            0.03               0.13                0.09
##                   DAVE_cooc.W.ADC DVAR_cooc.W.ADC DENT_cooc.W.ADC
## Entropy_cooc.W.ADC           0.19            0.28            0.08
## GLNU_align.H.PET             0.04            0.11           -0.03
## Min_hist.PET                 0.40            0.21            0.53
## Max_hist.PET                 0.42            0.26            0.54
## Mean_hist.PET                0.39            0.21            0.52
## Variance_hist.PET            0.20            0.13            0.26
##                   SAVE_cooc.W.ADC SVAR_cooc.W.ADC SENT_cooc.W.ADC
## Entropy_cooc.W.ADC           0.19            0.28            0.13
## GLNU_align.H.PET             0.09            0.16            0.08
## Min_hist.PET                 0.34            0.16            0.38
## Max_hist.PET                 0.39            0.22            0.44
## Mean_hist.PET                0.33            0.15            0.41
## Variance_hist.PET            0.13            0.07            0.28
##                   ASM_cooc.W.ADC Contrast_cooc.W.ADC Dissimilarity_cooc.W
.ADC
## Entropy_cooc.W.ADC          -0.03                0.27
0.19
## GLNU_align.H.PET             0.05                0.11
```

```
0.04
## Min_hist.PET                    0.10                   0.22
0.40
## Max_hist.PET                    0.11                   0.26
0.42
## Mean_hist.PET                   0.10                   0.22
0.39
## Variance_hist.PET              0.03                   0.13
0.20
##                 Inv_diff_cooc.W.ADC Inv_diff_norm_cooc.W.ADC IDM_cooc.W
.ADC
## Entropy_cooc.W.ADC            -0.08                     0.04          -
0.05
## GLNU_align.H.PET             -0.03                    -0.03          -
0.01
## Min_hist.PET                 0.40                     0.53
0.34
## Max_hist.PET                 0.43                     0.55
0.37
## Mean_hist.PET                0.41                     0.53
0.35
## Variance_hist.PET            0.23                     0.27
0.17
##                 IDM_norm_cooc.W.ADC Inv_var_cooc.W.ADC
## Entropy_cooc.W.ADC            0.03              -0.06
## GLNU_align.H.PET             -0.03              -0.02
## Min_hist.PET                 0.53               0.34
## Max_hist.PET                 0.55               0.37
## Mean_hist.PET                0.53               0.34
## Variance_hist.PET            0.27               0.16
##                 Correlation_cooc.W.ADC Autocorrelation_cooc.W.ADC
## Entropy_cooc.W.ADC              0.10                       0.20
## GLNU_align.H.PET               0.07                       0.10
## Min_hist.PET                   0.31                       0.23
## Max_hist.PET                   0.38                       0.27
## Mean_hist.PET                  0.32                       0.21
## Variance_hist.PET             0.15                       0.06
##                 Tendency_cooc.W.ADC Shade_cooc.W.ADC Prominence_cooc.W.
ADC
## Entropy_cooc.W.ADC            0.28             0.18                    0
.31
## GLNU_align.H.PET             0.16             0.03                    0
.17
## Min_hist.PET                 0.16             0.16                    0
.08
## Max_hist.PET                 0.22             0.22                    0
.14
## Mean_hist.PET                0.15             0.18                    0
.07
## Variance_hist.PET            0.07             0.19                    0
```

```
.04
##                           IC1_d.W.ADC IC2_d.W.ADC Coarseness_vdif.W.ADC
## Entropy_cooc.W.ADC            0.21       -0.03                 -0.15
## GLNU_align.H.PET              0.25       -0.10                 -0.04
## Min_hist.PET                 -0.08        0.45                  0.07
## Max_hist.PET                 -0.05        0.45                  0.06
## Mean_hist.PET                -0.06        0.44                  0.06
## Variance_hist.PET             0.02        0.20                 -0.01
##                           Contrast_vdif.W.ADC Busyness_vdif.W.ADC
## Entropy_cooc.W.ADC                     -0.18                0.09
## GLNU_align.H.PET                       -0.15                0.11
## Min_hist.PET                            0.07                0.32
## Max_hist.PET                            0.04                0.35
## Mean_hist.PET                           0.06                0.34
## Variance_hist.PET                       0.00                0.21
##                           Complexity_vdif.W.ADC Strength_vdif.W.ADC SRE_align.W.A
DC
## Entropy_cooc.W.ADC                         0.38               -0.21            0.
03
## GLNU_align.H.PET                           0.22               -0.23           -0.
04
## Min_hist.PET                               0.17               -0.02            0.
53
## Max_hist.PET                               0.25               -0.03            0.
55
## Mean_hist.PET                              0.18               -0.04            0.
53
## Variance_hist.PET                          0.11               -0.06            0.
26
##                           LRE_align.W.ADC GLNU_align.W.ADC RLNU_align.W.ADC
## Entropy_cooc.W.ADC                   0.03             0.21             0.27
## GLNU_align.H.PET                    -0.04             0.13             0.17
## Min_hist.PET                         0.53             0.29             0.27
## Max_hist.PET                         0.55             0.34             0.31
## Mean_hist.PET                        0.53             0.32             0.29
## Variance_hist.PET                    0.27             0.22             0.18
##                           RP_align.W.ADC LGRE_align.W.ADC HGRE_align.W.ADC
## Entropy_cooc.W.ADC                  0.03            -0.01             0.20
## GLNU_align.H.PET                   -0.04             0.08             0.11
## Min_hist.PET                        0.53             0.09             0.22
## Max_hist.PET                        0.55             0.10             0.27
## Mean_hist.PET                       0.53             0.08             0.20
## Variance_hist.PET                   0.26             0.02             0.06
##                           LGSRE_align.W.ADC HGSRE_align.W.ADC LGHRE_align.W.ADC
## Entropy_cooc.W.ADC                    -0.01              0.20              0.01
## GLNU_align.H.PET                       0.07              0.11              0.09
## Min_hist.PET                           0.09              0.22              0.09
## Max_hist.PET                           0.10              0.27              0.10
## Mean_hist.PET                          0.09              0.20              0.08
## Variance_hist.PET                      0.02              0.06              0.02
```

```
##                   HGLRE_align.W.ADC GLNU_norm_align.W.ADC
## Entropy_cooc.W.ADC             0.20                 -0.08
## GLNU_align.H.PET               0.11                  0.01
## Min_hist.PET                   0.22                  0.19
## Max_hist.PET                   0.28                  0.20
## Mean_hist.PET                  0.21                  0.18
## Variance_hist.PET              0.06                  0.08
##                   RLNU_norm_align.W.ADC GLVAR_align.W.ADC RLVAR_align.W.A
## DC
## Entropy_cooc.W.ADC                 0.03              0.29              0.
## 00
## GLNU_align.H.PET                  -0.04              0.15              0.
## 06
## Min_hist.PET                       0.53              0.19              0.
## 22
## Max_hist.PET                       0.54              0.26              0.
## 25
## Mean_hist.PET                      0.53              0.19              0.
## 22
## Variance_hist.PET                  0.26              0.10              0.
## 11
##                   Entropy_align.W.ADC SZSE.W.ADC LZSE.W.ADC LGLZE.W.ADC
## Entropy_cooc.W.ADC               0.11       0.03       0.03       -0.02
## GLNU_align.H.PET                -0.02      -0.04      -0.03        0.07
## Min_hist.PET                     0.52       0.53       0.52        0.09
## Max_hist.PET                     0.54       0.55       0.54        0.10
## Mean_hist.PET                    0.51       0.53       0.52        0.09
## Variance_hist.PET                0.25       0.26       0.25        0.02
##                   HGLZE.W.ADC SZLGE.W.ADC SZHGE.W.ADC LZLGE.W.ADC LZHGE.W
## .ADC
## Entropy_cooc.W.ADC      0.20       -0.03        0.20        0.06
## 0.20
## GLNU_align.H.PET        0.11        0.06        0.11        0.13
## 0.11
## Min_hist.PET            0.22        0.09        0.22        0.06
## 0.23
## Max_hist.PET            0.28        0.10        0.27        0.09
## 0.28
## Mean_hist.PET           0.20        0.09        0.20        0.06
## 0.21
## Variance_hist.PET       0.06        0.02        0.06        0.00
## 0.06
##                   GLNU_area.W.ADC ZSNU.W.ADC ZSP.W.ADC GLNU_norm.W.ADC
## Entropy_cooc.W.ADC           0.21       0.27      0.03           -0.08
## GLNU_align.H.PET             0.13       0.17     -0.04            0.01
## Min_hist.PET                 0.29       0.28      0.53            0.19
## Max_hist.PET                 0.34       0.31      0.55            0.20
## Mean_hist.PET                0.32       0.29      0.53            0.19
## Variance_hist.PET            0.22       0.18      0.26            0.07
##                   ZSNU_norm.W.ADC GLVAR_area.W.ADC ZSVAR.W.ADC
```

```
## Entropy_cooc.W.ADC                     0.02                     0.29          0.04
## GLNU_align.H.PET                       -0.05                     0.15          0.06
## Min_hist.PET                            0.53                     0.19          0.26
## Max_hist.PET                            0.54                     0.26          0.31
## Mean_hist.PET                           0.53                     0.19          0.27
## Variance_hist.PET                       0.27                     0.11          0.11
##                        Entropy_area.W.ADC
## Entropy_cooc.W.ADC                   0.11
## GLNU_align.H.PET                     0.01
## Min_hist.PET                         0.53
## Max_hist.PET                         0.56
## Mean_hist.PET                        0.53
## Variance_hist.PET                    0.27
```

Data preparation and splitting using only the normal dataset

```r
set.seed(123)  # for reproducibility
df <- radiomics %>% mutate_if(is.ordered, factor, ordered = FALSE)
df <- radiomics %>%
  mutate_if(str_detect(names(.), 'Qual|Cond|QC|Qu'), as.numeric)
```

#Split the data intro training (80%) and testing (20%) stratified in Failure.binary column

```r
split = initial_split(df,prop = 0.8 ,strata = "Failure.binary")
churn_train <- training(split)
churn_test  <- testing(split)
```

pre-processing for X and Y using xgboost

```r
xgb_train <- recipe(Failure.binary~ ., data = df) %>%
  step_integer(all_nominal()) %>%
  step_nzv(all_nominal()) %>%
  step_integer(contains("Dissimilarity")) %>%
  step_integer(Failure) %>%
  step_integer(Entropy_cooc.W.ADC) %>%
  step_dummy(all_nominal(), -all_outcomes(), one_hot = TRUE) %>%
  step_center(all_numeric(), -all_outcomes()) %>%
  step_scale(all_numeric(), -all_outcomes()) %>%
  prep(training = churn_train, retain = TRUE) %>%
  juice()

X <- as.matrix(xgb_train[setdiff(names(xgb_train), "Failure.binary")])
Y <- xgb_train$Failure.binary
```

setting optimal parameter list of the dataset

```r
params <- list(
  eta = 0.01,
  max_depth = 3,
```

```
  min_child_weight = 3,
  subsample = 0.5,
  colsample_bytree = 0.5
)

xgb.fit.final <- xgboost(
  params = params,
  data = X,
  label = Y,
  nrounds = 999,
  objective = "binary:logistic",
  verbose = 0
)

summary(xgb.fit.final)

##                 Length Class               Mode
## handle               1 xgb.Booster.handle externalptr
## raw             785948 -none-              raw
## niter                1 -none-              numeric
## evaluation_log       2 data.table          list
## call                14 -none-              call
## params               7 -none-              list
## callbacks            1 -none-              list
## feature_names      430 -none-              character
## nfeatures            1 -none-              numeric
```

#Print the Top 20 important features during Training

```
vip::vip(xgb.fit.final, num_features = 20)
```
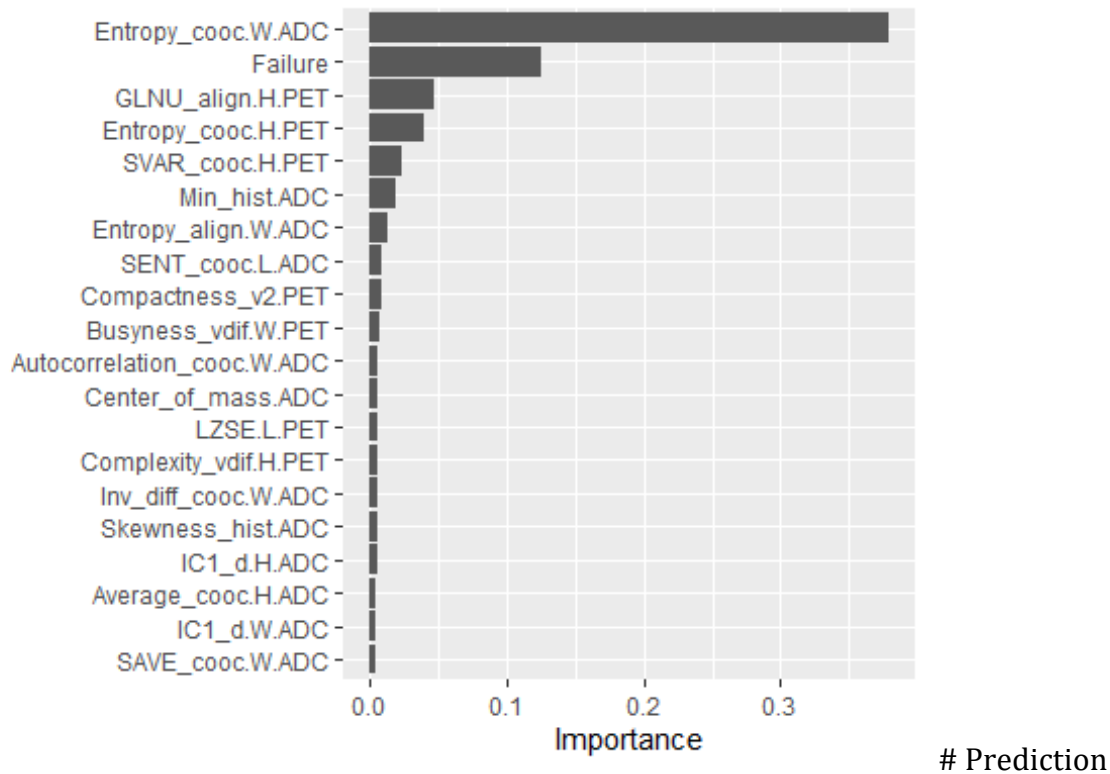
Prediction performance of the model using training dataset

```r
pred1<- predict(xgb.fit.final, X, type = "prob")
pred1
```

```
##    [1] 0.13602911 0.07106893 0.02505960 0.08371103 0.01900459 0.03364744
##    [7] 0.05209239 0.30750337 0.01881937 0.02109086 0.02503883 0.05861882
##   [13] 0.05158914 0.02948564 0.04915456 0.04199300 0.02072110 0.15129486
##   [19] 0.11247509 0.04391078 0.03562692 0.03423865 0.04018723 0.02425043
##   [25] 0.02659191 0.02419078 0.01936527 0.04715919 0.04608043 0.04672393
##   [31] 0.03706987 0.02695230 0.04439969 0.03589959 0.05507927 0.02548452
##   [37] 0.02255010 0.02006899 0.09765087 0.04381431 0.02464576 0.03793909
##   [43] 0.07770278 0.03117807 0.02459992 0.10690666 0.01718573 0.03441044
##   [49] 0.15274496 0.07503485 0.08494538 0.11859956 0.06231431 0.26369166
##   [55] 0.20201597 0.06685468 0.04899563 0.04992967 0.08296737 0.03977751
##   [61] 0.52963424 0.26585168 0.17914422 0.36964315 0.03061545 0.03925291
##   [67] 0.02480686 0.02734019 0.07572389 0.03227406 0.05697452 0.08886154
##   [73] 0.13392362 0.05983334 0.50238997 0.09038277 0.03948849 0.01955672
##   [79] 0.02217333 0.11610545 0.02217301 0.04145312 0.02337357 0.03984397
##   [85] 0.02543643 0.02900151 0.24456424 0.02692634 0.04236835 0.24910747
##   [91] 0.03995832 0.03187898 0.42054051 0.02928787 0.04850687 0.03421248
##   [97] 0.02639781 0.02187014 0.03391486 0.03913980 0.04392671 0.23660645
##  [103] 0.04527782 0.05245632 0.53526598 0.90664101 0.83654505 0.61605543
##  [109] 0.94338703 0.94389796 0.82560271 0.89348006 0.94076037 0.97067899
##  [115] 0.88048530 0.93618435 0.96899724 0.23334581 0.94907576 0.96066725
##  [121] 0.95947838 0.93900710 0.91411024 0.92369103 0.93629295 0.96377742
##  [127] 0.97483093 0.48803073 0.97998261 0.97509617 0.90748227 0.87976116
```

```
## [133] 0.68263215 0.77346951 0.92484474 0.69082457 0.75364035 0.95159274
## [139] 0.91431463 0.68638337 0.60715544 0.83920825 0.93436974 0.95964223
## [145] 0.89456779 0.28457123 0.75563580 0.89310485 0.93133324 0.93222386
## [151] 0.91183239 0.89377600 0.84286785 0.86786169 0.56313920 0.84860742
## [157] 0.74785954

perf1 <- prediction(pred1, churn_train$Failure.binary) %>%
  performance(measure = "tpr", x.measure = "fpr")

par(mfrow = c(1,2))
```
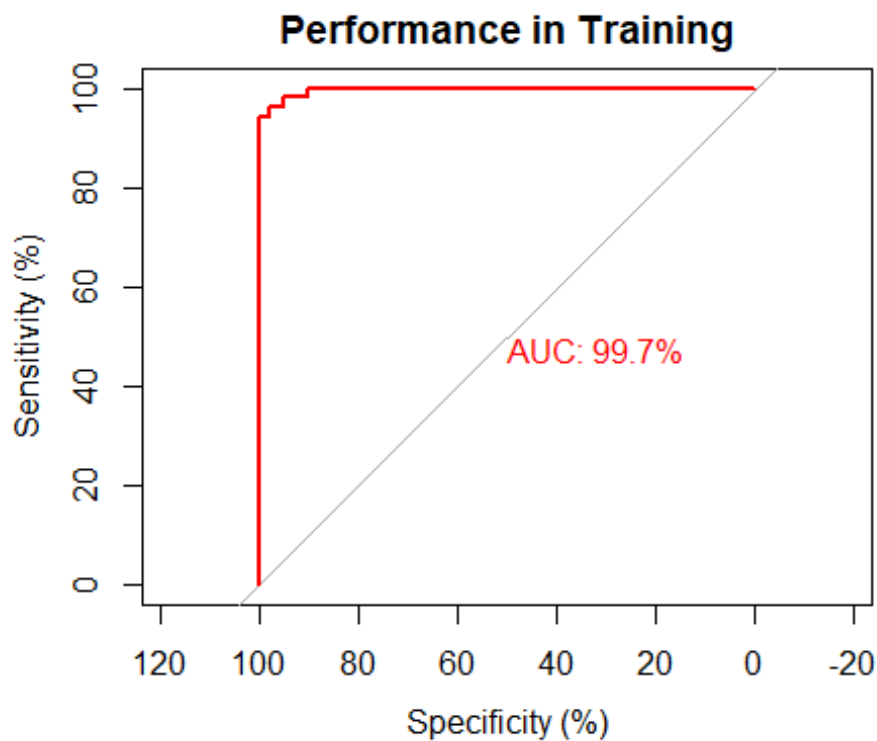
Training model prediction performance

```
roc(churn_train$Failure.binary ~ pred1,
    plot=TRUE, legacy.axes=FALSE,
    percent=TRUE,
    col="red",
    lwd=2,
    print.auc=TRUE,
    main = "Performance in Training")

## Setting levels: control = 0, case = 1

## Setting direction: controls < cases
```



```
##
## Call:
```

```
## roc.formula(formula = churn_train$Failure.binary ~ pred1, plot = TRUE,
legacy.axes = FALSE, percent = TRUE, col = "red", lwd = 2,     print.auc = TR
UE, main = "Performance in Training")
##
## Data: pred1 in 104 controls (churn_train$Failure.binary 0) < 53 cases (chu
rn_train$Failure.binary 1).
## Area under the curve: 99.69%
```

###_____#####_____####

#Print the AUC values during Testing

```
xgb_test <- recipe(Failure.binary~ ., data = churn_test) %>%
  step_integer(all_nominal()) %>%
  step_nzv(all_nominal()) %>%
  step_integer(contains("Dissimilarity")) %>%
  step_integer(Failure) %>%
  step_integer(Entropy_cooc.W.ADC) %>%
  step_dummy(all_nominal(), -all_outcomes(), one_hot = TRUE) %>%
  step_center(all_numeric(), -all_outcomes()) %>%
  step_scale(all_numeric(), -all_outcomes()) %>%
  prep(training = churn_test, retain = TRUE) %>%
  juice()

X1 <- as.matrix(xgb_test[setdiff(names(xgb_test), "Failure.binary")])

pred_test<- predict(xgb.fit.final, X1, type = "prob")
pred_test

##  [1] 0.29879382 0.13751110 0.90211570 0.05873640 0.93720102 0.10162237
##  [7] 0.96291620 0.04752764 0.44643345 0.01468354 0.02466353 0.02075692
## [13] 0.07361513 0.59229016 0.07765508 0.11749804 0.11096532 0.14868310
## [19] 0.05782362 0.07321350 0.83615917 0.11383724 0.06392315 0.46759379
## [25] 0.56781685 0.01773430 0.53330940 0.76302958 0.86820161 0.36777321
## [31] 0.04106364 0.89443403 0.02898749 0.88240421 0.14851306 0.32537222
## [37] 0.04675343 0.03994111 0.03481151 0.56893736

perf2 <- prediction(pred_test, churn_test$Failure.binary) %>%
  performance(measure = "tpr", x.measure = "fpr")
```
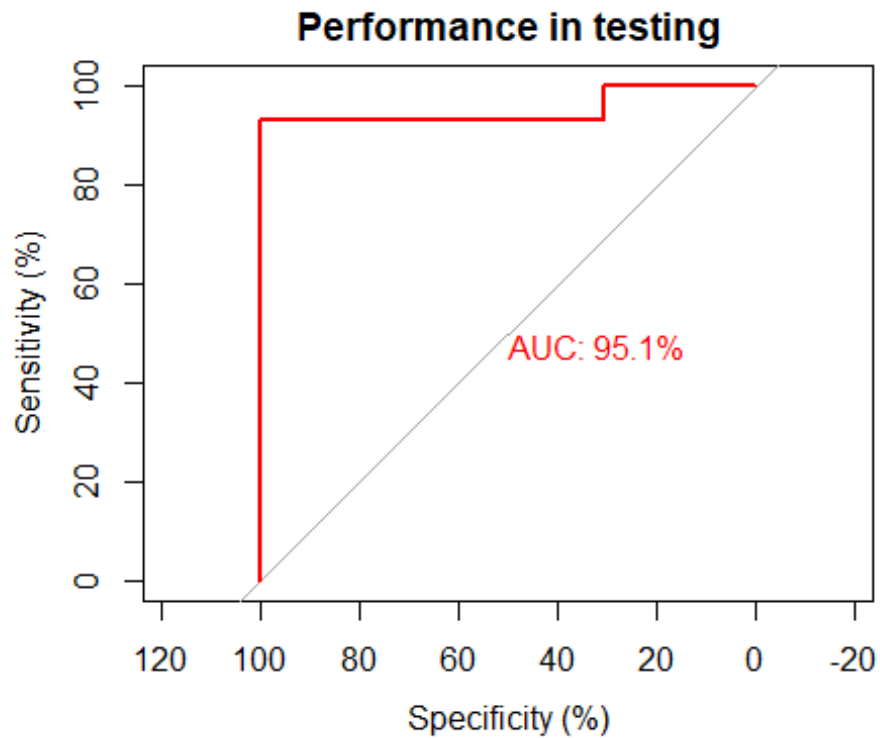
Testing set prediction performance
```
roc(churn_test$Failure.binary ~ pred_test, plot=TRUE, legacy.axes=FALSE,
    percent=TRUE, col="red", lwd=2, print.auc=TRUE, main = "Performance in te
sting")

## Setting levels: control = 0, case = 1

## Setting direction: controls < cases
```

Performance in testing


```
##
## Call:
## roc.formula(formula = churn_test$Failure.binary ~ pred_test,    plot = TR
UE, legacy.axes = FALSE, percent = TRUE, col = "red",    lwd = 2, print.auc
= TRUE, main = "Performance in testing")
##
## Data: pred_test in 26 controls (churn_test$Failure.binary 0) < 14 cases (c
hurn_test$Failure.binary 1).
## Area under the curve: 95.05%
```

END