Exploratory Breast cancer –

Below we summarise the dataset.

The data is limited to the training dataset.

Data frame:crs$dataset[crs$train, c(crs$input, crs$risk, crs$target)] 398 observations and 31 variables Maximum # NAs:0

Levels Storage

radius\_mean double

texture\_mean double

perimeter\_mean double

area\_mean double

smoothness\_mean double

compactness\_mean double concavity\_mean double concave.points\_mean double symmetry\_mean double fractal\_dimension\_mean double radius\_se double

texture\_se double

perimeter\_se double area\_se double smoothness\_se double

compactness\_se double concavity\_se double concave.points\_se double

symmetry\_se double fractal\_dimension\_se double radius\_worst double

texture\_worst double

perimeter\_worst double area\_worst double smoothness\_worst double

compactness\_worst double concavity\_worst double concave.points\_worst double symmetry\_worst double fractal\_dimension\_worst double diagnosis 2 integer

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|Variable |Levels|

+---------+------+

|diagnosis| B,M |

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For the simple distribution tables below the 1st and 3rd Qu. refer to the first and third quartiles, indicating that 25%

of the observations have values of that variable which are less than or greater than (respectively) the value listed.

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean Min. : 6.981 Min. : 9.71 Min. : 43.79 Min. : 143.5 Min. :0.05263

1st Qu.:11.693 1st Qu.:16.36 1st Qu.: 75.18 1st Qu.: 419.9 1st Qu.:0.08496

Median :13.355 Median :18.90 Median : 86.21 Median : 546.4 Median :0.09432

Mean :14.119 Mean :19.30 Mean : 91.89 Mean : 656.4 Mean :0.09581 3rd Qu.:15.725 3rd Qu.:21.86 3rd Qu.:103.28 3rd Qu.: 765.4 3rd Qu.:0.10505 Max. :28.110 Max. :33.81 Max. :188.50 Max. :2501.0 Max. :0.16340

compactness\_mean concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean Min. :0.01938 Min. :0.00000 Min. :0.00000 Min. :0.1060 Min. :0.04996

1st Qu.:0.06173 1st Qu.:0.02694 1st Qu.:0.01977 1st Qu.:0.1613 1st Qu.:0.05751

Median :0.08844 Median :0.05935 Median :0.03263 Median :0.1784 Median :0.06128

Mean :0.10323 Mean :0.08875 Mean :0.04860 Mean :0.1801 Mean :0.06264 3rd Qu.:0.12957 3rd Qu.:0.12582 3rd Qu.:0.07391 3rd Qu.:0.1946 3rd Qu.:0.06587 Max. :0.34540 Max. :0.42680 Max. :0.20120 Max. :0.2906 Max. :0.09744

radius\_se texture\_se perimeter\_se area\_se smoothness\_se Min. :0.1115 Min. :0.3602 Min. : 0.757 Min. : 7.228 Min. :0.001713

1st Qu.:0.2316 1st Qu.:0.8425 1st Qu.: 1.581 1st Qu.: 18.025 1st Qu.:0.005114

Median :0.3156 Median :1.1270 Median : 2.257 Median : 24.065 Median :0.006423

Mean :0.4114 Mean :1.2212 Mean : 2.899 Mean : 41.628 Mean :0.007006 3rd Qu.:0.4749 3rd Qu.:1.4775 3rd Qu.: 3.318 3rd Qu.: 44.867 3rd Qu.:0.008247 Max. :2.8730 Max. :4.8850 Max. :21.980 Max. :542.200 Max. :0.023330

compactness\_se concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se Min. :0.002252 Min. :0.00000 Min. :0.000000 Min. :0.007882 Min. :0.0008948

1st Qu.:0.012363 1st Qu.:0.01430 1st Qu.:0.007439 1st Qu.:0.014993 1st Qu.:0.0021775

Median :0.019160 Median :0.02415 Median :0.010915 Median :0.018700 Median :0.0030410

Mean :0.025212 Mean :0.03187 Mean :0.011665 Mean :0.020583 Mean :0.0037148 3rd Qu.:0.032135 3rd Qu.:0.04216 3rd Qu.:0.014905 3rd Qu.:0.023670 3rd Qu.:0.0045450 Max. :0.135400 Max. :0.39600 Max. :0.052790 Max. :0.078950 Max. :0.0298400

radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst Min. : 7.93 Min. :12.02 Min. : 50.41 Min. : 185.2 Min. :0.07117

1st Qu.:13.02 1st Qu.:21.16 1st Qu.: 83.92 1st Qu.: 516.0 1st Qu.:0.11447

Median :14.90 Median :25.58 Median : 96.72 Median : 679.0 Median :0.13020

Mean :16.29 Mean :25.68 Mean :107.35 Mean : 887.6 Mean :0.13177 3rd Qu.:18.54 3rd Qu.:29.45 3rd Qu.:124.70 3rd Qu.:1045.5 3rd Qu.:0.14580 Max. :36.04 Max. :47.16 Max. :251.20 Max. :4254.0 Max. :0.22260

compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst Min. :0.02729 Min. :0.0000 Min. :0.00000 Min. :0.1565 Min. :0.05504

1st Qu.:0.13670 1st Qu.:0.1051 1st Qu.:0.06301 1st Qu.:0.2491 1st Qu.:0.07083

Median :0.20925 Median :0.2225 Median :0.09777 Median :0.2808 Median :0.07909

Mean :0.25403 Mean :0.2735 Mean :0.11446 Mean :0.2890 Mean :0.08369 3rd Qu.:0.34358 3rd Qu.:0.3795 3rd Qu.:0.16085 3rd Qu.:0.3167 3rd Qu.:0.09218 Max. :1.05800 Max. :1.2520 Max. :0.29100 Max. :0.6638 Max. :0.20750

diagnosis B:252 M:146

Rattle timestamp: 2018-11-01 14:15:28 tsraj

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Below is a description of the dataset.

The data is limited to the training dataset.

crs$dataset[crs$train, c(crs$input, crs$risk, crs$target)]

31 Variables 398 Observations

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radius\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 340 1 14.12 3.888 9.494 10.404 11.692 13.355 15.725 19.536 20.923

lowest : 6.981 7.691 7.760 8.196 8.571, highest: 24.630 25.220 27.220 27.420 28.110

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texture\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 352 1 19.3 4.717 13.09 14.07 16.36 18.90 21.86 24.93 27.21

lowest : 9.71 10.38 10.72 10.82 10.89, highest: 29.97 30.62 30.72 31.12 33.81

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perimeter\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 372 1 91.89 26.75 60.32 66.59 75.18 86.21 103.28 129.22 140.22

lowest : 43.79 47.92 48.34 51.71 54.34, highest: 166.20 171.50 182.10 186.90 188.50

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area\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 383 1 656.4 369.1 273.7 328.2 419.9 546.3 765.4 1191.9 1349.5

lowest : 143.5 170.4 181.0 201.9 221.3, highest: 1841.0 1878.0 2250.0 2499.0 2501.0

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smoothness\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 349 1 0.09581 0.01628 0.07494 0.07919 0.08496 0.09432 0.10505 0.11413 0.11971

lowest : 0.05263 0.06251 0.06429 0.06576 0.06613, highest: 0.13710 0.13980 0.14250 0.14470 0.16340

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compactness\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 385 1 0.1032 0.05925 0.04042 0.04725 0.06173 0.08844 0.12957 0.18366 0.21103

lowest : 0.01938 0.02344 0.02650 0.02675 0.03212, highest: 0.27760 0.28320 0.28390 0.28670 0.34540

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concavity\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 381 1 0.08875 0.08684 0.00500 0.01342 0.02694 0.05935 0.12582 0.21295 0.24901

lowest : 0.0000000 0.0009737 0.0011940 0.0014610 0.0014870, highest: 0.3635000 0.3754000 0.4108000

0.4264000 0.4268000

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concave.points\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 381 1 0.0486 0.04243 0.005639 0.011101 0.019765 0.032635 0.073910 0.100660 0.128090

lowest : 0.000000 0.001852 0.002924 0.002941 0.003261, highest: 0.168900 0.182300 0.184500 0.187800 0.201200

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symmetry\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 330 1 0.1801 0.02962 0.1422 0.1493 0.1613 0.1784 0.1946 0.2131 0.2307

lowest : 0.1060 0.1167 0.1203 0.1220 0.1305, highest: 0.2595 0.2597 0.2655 0.2678 0.2906

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fractal\_dimension\_mean

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 361 1 0.06264 0.007649 0.05389 0.05532 0.05751 0.06128 0.06586 0.07198 0.07604

lowest : 0.04996 0.05025 0.05044 0.05054 0.05096, highest: 0.08980 0.09296 0.09502 0.09575 0.09744

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radius\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 382 1 0.4114 0.273 0.1601 0.1843 0.2316 0.3156 0.4749 0.7967 1.0006

lowest : 0.1115 0.1153 0.1194 0.1199 0.1267, highest: 1.2960 1.3700 1.5090 2.5470 2.8730

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texture\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 375 1 1.221 0.5829 0.5369 0.6335 0.8425 1.1270 1.4775 1.9089 2.1898

lowest : 0.3602 0.3871 0.3981 0.4064 0.4125, highest: 2.9270 3.1200 3.6470 3.8960 4.8850

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perimeter\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 376 1 2.899 1.92 1.140 1.295 1.581 2.258 3.318 5.398 7.239

lowest : 0.7570 0.8439 0.8484 0.8730 0.9680, highest: 9.6350 9.8070 10.0500 18.6500 21.9800

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area\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 377 1 41.63 38.28 11.46 13.30 18.02 24.07 44.87 94.00 123.26

lowest : 7.228 7.254 8.205 8.322 9.006, highest: 199.700 224.100 233.000 525.600 542.200

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smoothness\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 391 1 0.007006 0.002967 0.003617 0.004124 0.005114 0.006423 0.008247 0.010380 0.012220

lowest : 0.001713 0.002667 0.002826 0.002838 0.002866, highest: 0.016040 0.017210 0.018350 0.021770 0.023330

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compactness\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 380 1 0.02521 0.01862 0.007104 0.008847 0.012363 0.019160 0.032135 0.049442 0.062496

lowest : 0.002252 0.003710 0.003746 0.004660 0.004693, highest: 0.086680 0.093680 0.095860 0.098060 0.135400

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concavity\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 376 1 0.03187 0.02732 0.003162 0.007074 0.014300 0.024150 0.042158 0.059243 0.079261

lowest : 0.0000000 0.0007929 0.0009737 0.0011280 0.0014870, highest: 0.1278000 0.1435000 0.1535000

0.3038000 0.3960000

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concave.points\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 367 1 0.01166 0.006505 0.003616 0.005283 0.007439 0.010915 0.014905 0.018649 0.022367

lowest : 0.000000 0.001852 0.002386 0.002924 0.002941, highest: 0.028530 0.029190 0.033220 0.034870 0.052790

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symmetry\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 363 1 0.02058 0.008425 0.01168 0.01282 0.01499 0.01870 0.02367 0.03088 0.03510

lowest : 0.007882 0.010130 0.010540 0.010550 0.010620, highest: 0.051680 0.055430 0.056280 0.059630 0.078950

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fractal\_dimension\_se

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 386 1 0.003715 0.002308 0.001464 0.001687 0.002178 0.003041 0.004545 0.006149 0.007753

lowest : 0.0008948 0.0009502 0.0009683 0.0010020 0.0010580, highest: 0.0122000 0.0123300 0.0129800

0.0219300 0.0298400

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radius\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 336 1 16.29 5.299 10.51 11.25 13.02 14.91 18.54 23.71 26.05

lowest : 7.930 8.678 8.964 9.262 9.414, highest: 30.790 31.010 32.490 33.120 36.040

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texture\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 367 1 25.68 6.821 16.40 17.90 21.16 25.58 29.45 33.47 36.04

lowest : 12.02 12.49 12.87 14.20 14.82, highest: 41.61 41.78 41.85 42.79 47.16

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perimeter\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 377 1 107.3 36.88 67.87 72.16 83.92 96.72 124.70 157.96 178.67

lowest : 50.41 54.49 57.26 58.36 59.16, highest: 211.50 211.70 214.00 220.80 251.20

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area\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 382 1 887.6 585.4 330.2 385.1 516.0 679.0 1045.5 1690.4 2074.2

lowest : 185.2 223.6 242.2 259.2 268.6, highest: 2944.0 3143.0 3216.0 3432.0 4254.0

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smoothness\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 321 1 0.1318 0.02633 0.09444 0.10294 0.11447 0.13020 0.14580 0.16157 0.17133

lowest : 0.07117 0.08125 0.08409 0.08567 0.08774, highest: 0.19090 0.20060 0.20980 0.21840 0.22260

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compactness\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 384 1 0.254 0.1743 0.06871 0.08805 0.13670 0.20925 0.34358 0.44674 0.58107

lowest : 0.02729 0.03432 0.04327 0.04619 0.04712, highest: 0.86630 0.86810 0.93270 0.93790 1.05800

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concavity\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 380 1 0.2735 0.2358 0.01630 0.04316 0.10512 0.22255 0.37955 0.58725 0.68795

lowest : 0.000000 0.003581 0.004955 0.005518 0.005579, highest: 0.938700 0.960800 1.105000 1.170000 1.252000

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concave.points\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 354 1 0.1145 0.07649 0.02359 0.03600 0.06301 0.09776 0.16085 0.21123 0.23973

lowest : 0.000000 0.008772 0.009259 0.011110 0.016350, highest: 0.268800 0.273300 0.286700 0.290300 0.291000

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symmetry\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 363 1 0.289 0.06576 0.2102 0.2237 0.2491 0.2809 0.3167 0.3622 0.4087

lowest : 0.1565 0.1566 0.1648 0.1652 0.1712, highest: 0.4882 0.5166 0.5440 0.5774 0.6638

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fractal\_dimension\_worst

n missing distinct Info Mean Gmd .05 .10 .25 .50 .75 .90 .95

398 0 381 1 0.08369 0.01945 0.06165 0.06554 0.07083 0.07909 0.09218 0.10682 0.12036

lowest : 0.05504 0.05521 0.05525 0.05695 0.05737, highest: 0.14090 0.14310 0.14460 0.17300 0.20750

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diagnosis

n missing distinct 398 0 2

Value B M Frequency 252 146

Proportion 0.633 0.367

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Rattle timestamp: 2018-11-01 14:15:28 tsraj

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Basic statistics for each numeric variable of the dataset.

$radius\_mean

X...X.i

|  |  |  |
| --- | --- | --- |
| nobs | 398.000000 | |
| NAs | 0.000000 | |
| Minimum | 6.981000 | |
| Maximum | 28.110000 | |
| 1. Quartile | | 11.692500 |
| 3. Quartile | | 15.725000 |
| Mean | | 14.118786 |
| Median | | 13.355000 |

Sum 5619.277000

SE Mean 0.180193

|  |  |
| --- | --- |
| LCL Mean | 13.764534 |
| UCL Mean | 14.473039 |
| Variance | 12.922932 |
| Stdev | 3.594848 |
| Skewness | 1.041847 |
| Kurtosis | 1.106739 |

$texture\_mean

X...X.i

|  |  |  |
| --- | --- | --- |
| nobs | 398.000000 | |
| NAs | 0.000000 | |
| Minimum | 9.710000 | |
| Maximum | 33.810000 | |
| 1. Quartile | | 16.360000 |
| 3. Quartile | | 21.857500 |
| Mean | | 19.295879 |
| Median | | 18.900000 |
| Sum 7679.760000 | | |
| SE Mean | 0.210969 | |
| LCL Mean | 18.881123 | |
| UCL Mean | 19.710636 | |
| Variance | 17.714221 | |
| Stdev | 4.208827 | |
| Skewness | 0.478610 | |
| Kurtosis | 0.147978 | |

$perimeter\_mean

X...X.i

|  |  |
| --- | --- |
| nobs | 398.000000 |
| NAs | 0.000000 |
| Minimum | 43.790000 |
| Maximum | 188.500000 |
| 1. Quartile | 75.180000 |
| 3. Quartile | 103.275000 |

|  |  |  |
| --- | --- | --- |
| Mean | 91.888040 | |
| Median | 86.210000 | |
| Sum | 36571.440000 | |
| SE Mean | 1.244577 | |
| LCL Mean | | 89.441255 |
| UCL Mean | | 94.334825 |
| Variance | | 616.490573 |
| Stdev | | 24.829228 |
| Skewness | | 1.098810 |
| Kurtosis | | 1.244244 |

$area\_mean

X...X.i

|  |  |
| --- | --- |
| nobs | 398.000000 |
| NAs | 0.000000 |
| Minimum | 143.500000 |
| Maximum | 2501.000000 |
| 1. Quartile | 419.925000 |
| 3. Quartile | 765.375000 |
| Mean | 656.387940 |
| Median | 546.350000 |
| Sum 261242.400000 | |
| SE Mean | 18.291232 |
| LCL Mean | 620.428157 |
| UCL Mean | 692.347723 |
| Variance | 133158.524539 |
| Stdev | 364.908926 |
| Skewness | 1.777673 |
| Kurtosis | 4.114227 |

$smoothness\_mean X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.052630 |
| Maximum | 0.163400 |
| 1. Quartile | 0.084960 |
| 3. Quartile | 0.105050 |
| Mean | 0.095813 |
| Median | 0.094320 |
| Sum | 38.133550 |
| SE Mean | 0.000735 |
| LCL Mean | 0.094369 |
| UCL Mean | 0.097257 |
| Variance | 0.000215 |
| Stdev | 0.014655 |

Skewness 0.596362

Kurtosis 1.055572

$compactness\_mean X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.019380 |
| Maximum | 0.345400 |
| 1. Quartile | 0.061735 |
| 3. Quartile | 0.129575 |
| Mean | 0.103231 |
| Median | 0.088445 |
| Sum | 41.085810 |
| SE Mean | 0.002764 |
| LCL Mean | 0.097796 |
| UCL Mean | 0.108665 |
| Variance | 0.003041 |
| Stdev | 0.055148 |

Skewness 1.206165

Kurtosis 1.428124

$concavity\_mean

X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000000 |
| Maximum | 0.426800 |
| 1. Quartile | 0.026935 |
| 3. Quartile | 0.125825 |
| Mean | 0.088745 |
| Median | 0.059345 |
| Sum | 35.320564 |
| SE Mean | 0.004188 |
| LCL Mean | 0.080511 |
| UCL Mean | 0.096979 |
| Variance | 0.006982 |
| Stdev | 0.083560 |

Skewness 1.465848

Kurtosis 2.047248

$concave.points\_mean X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000000 |
| Maximum | 0.201200 |
| 1. Quartile | 0.019765 |
| 3. Quartile | 0.073910 |
| Mean | 0.048604 |
| Median | 0.032635 |
| Sum | 19.344262 |
| SE Mean | 0.001996 |
| LCL Mean | 0.044679 |
| UCL Mean | 0.052528 |
| Variance | 0.001586 |

Stdev 0.039822

Skewness 1.221588

Kurtosis 1.133587

$symmetry\_mean

X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.106000 |
| Maximum | 0.290600 |
| 1. Quartile | 0.161325 |
| 3. Quartile | 0.194575 |
| Mean | 0.180132 |
| Median | 0.178400 |
| Sum | 71.692500 |
| SE Mean | 0.001348 |
| LCL Mean | 0.177482 |
| UCL Mean | 0.182782 |
| Variance | 0.000723 |
| Stdev | 0.026893 |

Skewness 0.688449

Kurtosis 1.026978

$fractal\_dimension\_mean

X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.049960 |
| Maximum | 0.097440 |
| 1. Quartile | 0.057510 |
| 3. Quartile | 0.065865 |
| Mean | 0.062639 |
| Median | 0.061285 |

Sum 24.930370

|  |  |
| --- | --- |
| SE Mean | 0.000365 |
| LCL Mean | 0.061921 |
| UCL Mean | 0.063357 |
| Variance | 0.000053 |
| Stdev | 0.007289 |

Skewness 1.493695

Kurtosis 3.714497

$radius\_se

X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.111500 |
| Maximum | 2.873000 |
| 1. Quartile | 0.231575 |
| 3. Quartile | 0.474900 |
| Mean | 0.411373 |
| Median | 0.315600 |
| Sum 163.726500 | |
| SE Mean | 0.015048 |
| LCL Mean | 0.381789 |
| UCL Mean | 0.440957 |
| Variance | 0.090125 |
| Stdev | 0.300209 |

Skewness 3.223227

Kurtosis 17.518825

$texture\_se

X. X.i

nobs 398.000000

NAs 0.000000

Minimum 0.360200

Maximum 4.885000

1. Quartile 0.842450

3. Quartile 1.477500

|  |  |  |
| --- | --- | --- |
| Mean | 1.221151 | |
| Median | 1.127000 | |
| Sum | 486.018200 | |
| SE Mean | | 0.028185 |
| LCL Mean | | 1.165741 |
| UCL Mean | | 1.276561 |
| Variance | | 0.316163 |
| Stdev | | 0.562283 |

Skewness 1.776213

Kurtosis 6.219300

$perimeter\_se

X...X.i

|  |  |  |
| --- | --- | --- |
| nobs | 398.000000 | |
| NAs | 0.000000 | |
| Minimum | 0.757000 | |
| Maximum | 21.980000 | |
| 1. Quartile | | 1.580750 |
| 3. Quartile | | 3.318250 |
| Mean | | 2.898559 |
| Median | | 2.257500 |
| Sum 1153.626500 | | |
| SE Mean | 0.108483 | |
| LCL Mean | 2.685287 | |
| UCL Mean | 3.111831 | |
| Variance | 4.683851 | |
| Stdev | 2.164221 | |
| Skewness | 3.597354 | |
| Kurtosis | 21.849325 | |

$area\_se

X...X.i

nobs 398.000000

|  |  |
| --- | --- |
| NAs | 0.000000 |
| Minimum | 7.228000 |
| Maximum | 542.200000 |
| 1. Quartile | 18.025000 |
| 3. Quartile | 44.867500 |
| Mean | 41.628078 |
| Median | 24.065000 |
| Sum 16567.975000 | |
| SE Mean | 2.550935 |
| LCL Mean | 36.613048 |
| UCL Mean | 46.643108 |
| Variance | 2589.893720 |
| Stdev | 50.890998 |

Skewness 5.353892

Kurtosis 43.330859

$smoothness\_se

X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.001713 |
| Maximum | 0.023330 |
| 1. Quartile | 0.005114 |
| 3. Quartile | 0.008247 |
| Mean | 0.007006 |
| Median | 0.006423 |
| Sum | 2.788342 |
| SE Mean | 0.000144 |
| LCL Mean | 0.006723 |
| UCL Mean | 0.007289 |
| Variance | 0.000008 |
| Stdev | 0.002871 |

Skewness 1.713169

Kurtosis 4.972610

$compactness\_se

X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.002252 |
| Maximum | 0.135400 |
| 1. Quartile | 0.012362 |
| 3. Quartile | 0.032135 |
| Mean | 0.025212 |
| Median | 0.019160 |
| Sum | 10.034376 |
| SE Mean | 0.000920 |
| LCL Mean | 0.023404 |
| UCL Mean | 0.027020 |
| Variance | 0.000337 |
| Stdev | 0.018351 |

Skewness 1.824908

Kurtosis 4.657136

$concavity\_se

X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000000 |
| Maximum | 0.396000 |
| 1. Quartile | 0.014300 |
| 3. Quartile | 0.042158 |
| Mean | 0.031870 |
| Median | 0.024150 |
| Sum | 12.684342 |
| SE Mean | 0.001644 |
| LCL Mean | 0.028638 |
| UCL Mean | 0.035103 |

Variance 0.001076

Stdev 0.032803

Skewness 5.411525

Kurtosis 48.778602

$concave.points\_se

X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000000 |
| Maximum | 0.052790 |
| 1. Quartile | 0.007439 |
| 3. Quartile | 0.014905 |
| Mean | 0.011665 |
| Median | 0.010915 |
| Sum | 4.642524 |
| SE Mean | 0.000306 |
| LCL Mean | 0.011063 |
| UCL Mean | 0.012266 |
| Variance | 0.000037 |
| Stdev | 0.006101 |

Skewness 1.345115

Kurtosis 5.291703

$symmetry\_se

X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.007882 |
| Maximum | 0.078950 |
| 1. Quartile | 0.014992 |
| 3. Quartile | 0.023670 |
| Mean | 0.020583 |
| Median | 0.018700 |

|  |  |
| --- | --- |
| Sum | 8.192132 |
| SE Mean | 0.000426 |
| LCL Mean | 0.019746 |
| UCL Mean | 0.021421 |
| Variance | 0.000072 |
| Stdev | 0.008497 |

Skewness 2.215117

Kurtosis 8.092737

$fractal\_dimension\_se X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000895 |
| Maximum | 0.029840 |
| 1. Quartile | 0.002178 |
| 3. Quartile | 0.004545 |
| Mean | 0.003715 |
| Median | 0.003041 |
| Sum | 1.478483 |
| SE Mean | 0.000131 |
| LCL Mean | 0.003458 |
| UCL Mean | 0.003971 |
| Variance | 0.000007 |
| Stdev | 0.002604 |

Skewness 4.165446

Kurtosis 30.963162

$radius\_worst

X. X.i

|  |  |
| --- | --- |
| nobs | 398.000000 |
| NAs | 0.000000 |
| Minimum | 7.930000 |
| Maximum | 36.040000 |

1. Quartile 13.015000

3. Quartile 18.540000

|  |  |  |
| --- | --- | --- |
| Mean | 16.290515 | |
| Median | 14.905000 | |
| Sum | 6483.625000 | |
| SE Mean | 0.248516 | |
| LCL Mean | | 15.801944 |
| UCL Mean | | 16.779086 |
| Variance | | 24.580498 |
| Stdev | | 4.957872 |
| Skewness | | 1.172147 |
| Kurtosis | | 1.061266 |

$texture\_worst

X...X.i

|  |  |
| --- | --- |
| nobs | 398.000000 |
| NAs | 0.000000 |
| Minimum | 12.020000 |
| Maximum | 47.160000 |
| 1. Quartile | 21.157500 |
| 3. Quartile | 29.452500 |
| Mean | 25.682513 |
| Median | 25.580000 |
| Sum 10221.640000 | |
| SE Mean | 0.302136 |
| LCL Mean | 25.088526 |
| UCL Mean | 26.276499 |
| Variance | 36.331887 |
| Stdev | 6.027594 |
| Skewness | 0.363188 |
| Kurtosis | -0.093897 |

$perimeter\_worst

X...X.i

|  |  |
| --- | --- |
| nobs | 398.000000 |
| NAs | 0.000000 |
| Minimum | 50.410000 |
| Maximum | 251.200000 |
| 1. Quartile | 83.922500 |
| 3. Quartile | 124.700000 |
| Mean | 107.348291 |
| Median | 96.715000 |
| Sum 42724.620000 | |
| SE Mean | 1.732094 |
| LCL Mean | 103.943069 |
| UCL Mean | 110.753514 |
| Variance | 1194.059133 |
| Stdev | 34.555161 |
| Skewness | 1.203223 |
| Kurtosis | 1.182513 |

$area\_worst

X...X.i

|  |  |
| --- | --- |
| nobs | 398.000000 |
| NAs | 0.000000 |
| Minimum | 185.200000 |
| Maximum | 4254.000000 |
| 1. Quartile | 516.050000 |
| 3. Quartile | 1045.500000 |
| Mean | 887.579146 |
| Median | 678.950000 |
| Sum 353256.500000 | |
| SE Mean | 29.798152 |
| LCL Mean | 828.997247 |
| UCL Mean | 946.161044 |
| Variance | 353396.091075 |
| Stdev | 594.471270 |
| Skewness | 1.932651 |

Kurtosis 4.551019

$smoothness\_worst X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.071170 |
| Maximum | 0.222600 |
| 1. Quartile | 0.114475 |
| 3. Quartile | 0.145800 |
| Mean | 0.131771 |
| Median | 0.130200 |
| Sum | 52.445050 |
| SE Mean | 0.001184 |
| LCL Mean | 0.129444 |
| UCL Mean | 0.134099 |
| Variance | 0.000558 |
| Stdev | 0.023624 |

Skewness 0.507653

Kurtosis 0.650222

$compactness\_worst X. X.i

nobs 398.000000

NAs 0.000000

|  |  |  |
| --- | --- | --- |
| Minimum | | 0.027290 |
| Maximum | | 1.058000 |
| 1. Quartile | | 0.136700 |
| 3. Quartile | | 0.343575 |
| Mean | | 0.254028 |
| Median | | 0.209250 |
| Sum | 101.103110 | |
| SE Mean | 0.008358 | |
| LCL Mean 0.237597 | | |

UCL Mean 0.270459

Variance 0.027802

Stdev 0.166739

Skewness 1.530263

Kurtosis 3.078009

$concavity\_worst

X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000000 |
| Maximum | 1.252000 |
| 1. Quartile | 0.105125 |
| 3. Quartile | 0.379550 |
| Mean | 0.273545 |
| Median | 0.222550 |
| Sum 108.870790 | |
| SE Mean | 0.010969 |
| LCL Mean | 0.251979 |
| UCL Mean | 0.295110 |
| Variance | 0.047891 |
| Stdev | 0.218841 |

Skewness 1.211683

Kurtosis 1.701479

$concave.points\_worst X. X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.000000 |
| Maximum | 0.291000 |
| 1. Quartile | 0.063010 |
| 3. Quartile | 0.160850 |
| Mean | 0.114463 |

|  |  |
| --- | --- |
| Median | 0.097765 |
| Sum | 45.556271 |
| SE Mean | 0.003384 |
| LCL Mean | 0.107811 |
| UCL Mean 0.121115 | |
| Variance | 0.004556 |
| Stdev | 0.067501 |

Skewness 0.494460

Kurtosis -0.610604

$symmetry\_worst

X...X.i

nobs 398.000000

NAs 0.000000

|  |  |
| --- | --- |
| Minimum | 0.156500 |
| Maximum | 0.663800 |
| 1. Quartile | 0.249100 |
| 3. Quartile | 0.316675 |
| Mean | 0.288996 |
| Median | 0.280850 |
| Sum 115.020400 | |
| SE Mean | 0.003162 |
| LCL Mean | 0.282780 |
| UCL Mean | 0.295212 |
| Variance | 0.003979 |
| Stdev | 0.063078 |

Skewness 1.479430

Kurtosis 4.785210

$fractal\_dimension\_worst

X. X.i

nobs 398.000000

NAs 0.000000

Minimum 0.055040

|  |  |
| --- | --- |
| Maximum | 0.207500 |
| 1. Quartile | 0.070830 |
| 3. Quartile | 0.092180 |
| Mean | 0.083692 |
| Median | 0.079090 |
| Sum | 33.309470 |
| SE Mean | 0.000944 |
| LCL Mean | 0.081836 |
| UCL Mean | 0.085548 |
| Variance | 0.000355 |
| Stdev | 0.018837 |

Skewness 1.783988

Kurtosis 5.839617

Rattle timestamp: 2018-11-01 14:15:28 tsraj

======================================================================

Kurtosis for each numeric variable of the dataset. Larger values mean sharper peaks and flatter tails.

Positive values indicate an acute peak around the mean. Negative values indicate a smaller peak around the mean.

radius\_mean texture\_mean perimeter\_mean area\_mean 1.1067391 0.1479779 1.2442441 4.1142267

smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean 1.0555719 1.4281244 2.0472480 1.1335867

symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se 1.0269776 3.7144970 17.5188254 6.2192997

perimeter\_se area\_se smoothness\_se compactness\_se 21.8493253 43.3308592 4.9726102 4.6571356

concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se 48.7786015 5.2917032 8.0927374 30.9631618

radius\_worst texture\_worst perimeter\_worst area\_worst 1.0612662 -0.0938968 1.1825133 4.5510192

smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst 0.6502218 3.0780089 1.7014786 -0.6106038

symmetry\_worst fractal\_dimension\_worst 4.7852100 5.8396169

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======================================================================

Skewness for each numeric variable of the dataset. Positive means the right tail is longer.

radius\_mean texture\_mean perimeter\_mean area\_mean 1.0418472 0.4786104 1.0988098 1.7776732

smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean 0.5963615 1.2061645 1.4658483 1.2215884

symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se 0.6884491 1.4936946 3.2232268 1.7762127

perimeter\_se area\_se smoothness\_se compactness\_se 3.5973539 5.3538916 1.7131694 1.8249084

concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se 5.4115255 1.3451151 2.2151175 4.1654462

radius\_worst texture\_worst perimeter\_worst area\_worst 1.1721472 0.3631878 1.2032233 1.9326515

smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst 0.5076533 1.5302633 1.2116833 0.4944602

symmetry\_worst fractal\_dimension\_worst 1.4794301 1.7839884

Rattle timestamp: 2018-11-01 14:15:28 tsraj

======================================================================

Missing Value Summary

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{ O O }

==> V <== No need for mice. This data set is completely observed.

\ \|/ /

`-----'

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean 569 1 1 1 1 1 1

0 0 0 0 0 0

concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se 569 1 1 1 1 1 1

0 0 0 0 0 0

perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se symmetry\_se 569 1 1 1 1 1 1 1

0 0 0 0 0 0 0

fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst 569 1 1 1 1 1 1

0 0 0 0 0 0

compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 569 | 1 |  | 1 |  | 1 |  | 1 |  | 1 |
| 0 |  | 0 |  | 0 |  | 0 |  | 0 |  |
| diagnosis |  |  |  |  |  |  |  |  |  |
| 569 1 0 |  |  |  |  |  |  |  |  |  |

0 0

Rattle timestamp: 2018-11-01 14:15:28 tsraj

orrelation summary using the 'Pearson' covariance.

Note that only correlations between numeric variables are reported.

fractal\_dimension\_mean smoothness\_se texture\_se symmetry\_se fractal\_dimension\_mean 1.000000000 0.43612446 0.120852587 0.33376323

smoothness\_se 0.436124462 1.00000000 0.382812381 0.41330943

texture\_se 0.120852587 0.38281238 1.000000000 0.39336019

symmetry\_se 0.333763232 0.41330943 0.393360188 1.00000000

|  |  |  |
| --- | --- | --- |
| fractal\_dimension\_se | | 0.716382838 0.41887447 0.221335351 0.29566605 |
| fractal\_dimension\_worst | | 0.769490624 0.10586898 -0.087263091 0.06047760 |
| smoothness\_worst | | 0.537624924 0.35312595 -0.084557686 0.01329026 |
| symmetry\_worst | | 0.352706880 -0.09878602 -0.138328477 0.41319724 |
| symmetry\_mean | | 0.485563007 0.22989474 0.118112073 0.46629324 |
| concavity\_se | | 0.481611527 0.25865299 0.152531127 0.30392948 |
| smoothness\_mean | | 0.605284766 0.38633869 0.073021817 0.23555009 |
| compactness\_se | | 0.602561377 0.35487603 0.177307772 0.35908562 |
| texture\_worst | | -0.049624135 -0.10362569 0.390277233 -0.06599484 |
| texture\_mean | | -0.074723745 -0.01615385 0.383031292 0.02255500 |
| concave.points\_se | | 0.388027367 0.32631159 0.150432438 0.29809097 |
| compactness\_worst | | 0.498035075 -0.02918206 -0.115409712 0.06440122 |
| compactness\_mean | | 0.599207106 0.17551523 0.005919014 0.24316711 |
| concavity\_worst | | 0.393495634 -0.03932172 -0.087717868 0.05692927 |
| concavity\_mean | | 0.384566345 0.12613541 0.058986271 0.21401785 |
| radius\_se | -0.007467023 0.17956456 0.190140880 0.22785103 | |
| perimeter\_se | 0.025929241 0.16771511 0.180818391 0.23656776 | |
| concave.points\_worst | 0.217642488 -0.08812530 -0.153068372 -0.01875548 | |
| area\_se | -0.085393608 0.09548615 0.091778594 0.13175134 | |
| concave.points\_mean | 0.210065988 0.06215367 0.008823168 0.12645282 | |
| area\_worst | -0.203471329 -0.17782375 -0.092216337 -0.10520944 | |
| perimeter\_worst | -0.177720359 -0.21847053 -0.120663879 -0.10187748 | |
| radius\_worst | -0.226073305 -0.23320419 -0.125956719 -0.12177103 | |
| area\_mean | -0.255101426 -0.16070979 -0.076651286 -0.05868565 | |
| perimeter\_mean | -0.234443400 -0.20227490 -0.103016429 -0.06861081 | |
| radius\_mean | -0.285749859 -0.22564803 -0.111831026 -0.09193073 | |

fractal\_dimension\_se fractal\_dimension\_worst smoothness\_worst fractal\_dimension\_mean 0.7163828379 0.76949062 0.53762492

smoothness\_se 0.4188744696 0.10586898 0.35312595

texture\_se 0.2213353507 -0.08726309 -0.08455769

symmetry\_se 0.2956660489 0.06047760 0.01329026

fractal\_dimension\_se 1.0000000000 0.63173005 0.22684260

fractal\_dimension\_worst 0.6317300456 1.00000000 0.62267430

smoothness\_worst 0.2268425979 0.62267430 1.00000000

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| symmetry\_worst | 0.1422880802 | 0.53327988 | 0.48858539 | |
| symmetry\_mean | 0.3705158052 | 0.43303316 | 0.43152843 | |
| concavity\_se | 0.7461881883 | 0.45454244 | 0.19782785 | |
| smoothness\_mean | 0.3347094321 | 0.52075814 | | 0.82023482 |
| compactness\_se | 0.7943913795 | 0.63983628 | | 0.29794675 |
| texture\_worst | -0.0001537862 | 0.22067159 | | 0.21773049 |
| texture\_mean | 0.0468335845 | 0.11747503 | | 0.06792960 |
| concave.points\_se | 0.6306179255 | 0.35979108 | | 0.26479215 |
| compactness\_worst | 0.4427199096 | 0.83420749 | | 0.58016572 |
| compactness\_mean | 0.5460847943 | 0.71896603 | | 0.59419222 |
| concavity\_worst | 0.4480664534 | 0.70770292 | | 0.52444019 |
| concavity\_mean | 0.5109294614 | 0.53571811 | | 0.45743688 |

radius\_se 0.2164825184 0.04803061 0.15285447

perimeter\_se 0.2256327242 0.08006531 0.14960015

concave.points\_worst 0.2730844354 0.54555741 0.56125161

area\_se 0.1259924543 0.01948520 0.13255270

concave.points\_mean 0.3099729508 0.39995808 0.46692163

|  |  |  |  |
| --- | --- | --- | --- |
| area\_worst | 0.0038989121 | 0.09891603 | 0.21233635 |
| perimeter\_worst | 0.0225876377 | 0.16098516 | 0.24350199 |
| radius\_worst | -0.0143552510 | 0.11673458 | 0.22144951 |
| area\_mean | -0.0014307009 | 0.02222391 | 0.12654494 |
| perimeter\_mean | 0.0109573505 | 0.07446124 | 0.15556171 |
| radius\_mean | -0.0279876440 | 0.02976188 | 0.12262012 |

symmetry\_worst symmetry\_mean concavity\_se smoothness\_mean compactness\_se fractal\_dimension\_mean 0.35270688 0.48556301 0.48161153 0.605284766 0.6025614

smoothness\_se -0.09878602 0.22989474 0.25865299 0.386338693 0.3548760

texture\_se -0.13832848 0.11811207 0.15253113 0.073021817 0.1773078

symmetry\_se 0.41319724 0.46629324 0.30392948 0.235550091 0.3590856

fractal\_dimension\_se 0.14228808 0.37051581 0.74618819 0.334709432 0.7943914

fractal\_dimension\_worst 0.53327988 0.43303316 0.45454244 0.520758140 0.6398363

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| smoothness\_worst | 0.48858539 | 0.43152843 0.19782785 | 0.820234825 | 0.2979467 |
| symmetry\_worst | 1.00000000 | 0.70304318 0.22654126 | 0.401407657 | 0.3259791 |
| symmetry\_mean | 0.70304318 | 1.00000000 0.39719821 | 0.560413278 | 0.4905492 |

concavity\_se 0.22654126 0.39719821 1.00000000 0.273866901 0.7806716

smoothness\_mean 0.40140766 0.56041328 0.27386690 1.000000000 0.3771792

|  |  |  |
| --- | --- | --- |
| compactness\_se | 0.32597906 0.49054923 0.78067158 0.377179159 | 1.0000000 |
| texture\_worst | 0.24860624 0.10386737 0.07738186 0.050532786 | 0.1464986 |
| texture\_mean | 0.11404178 0.08627767 0.11564575 -0.005033315 | 0.1832011 |
| concave.points\_se | 0.17559643 0.44198517 0.77855608 0.415003042 | 0.7350280 |
| compactness\_worst | 0.61211045 0.49104533 0.47885734 0.494471723 | 0.7207137 |

compactness\_mean 0.52684682 0.61778726 0.56508366 0.678409492 0.7714533

concavity\_worst 0.52735622 0.45949862 0.67843201 0.458283619 0.6885796

concavity\_mean 0.40731151 0.52734799 0.70567534 0.545032360 0.7113222

radius\_se 0.06649558 0.27803622 0.32020613 0.318859395 0.3360836

perimeter\_se 0.07495364 0.28189726 0.33579084 0.320018855 0.3861979

concave.points\_worst 0.49721674 0.44455644 0.44583168 0.516718277 0.5211210

area\_se 0.04830560 0.21292461 0.25509985 0.264001478 0.2725681

concave.points\_mean 0.37025386 0.48036426 0.44305431 0.574290577 0.5294739

|  |  |  |  |
| --- | --- | --- | --- |
| area\_worst | 0.19295179 0.19055623 0.17885921 | 0.222390254 | 0.2085872 |
| perimeter\_worst | 0.25754399 0.22821052 0.20857273 | 0.253123556 | 0.2658989 |
| radius\_worst | 0.23426148 0.19624560 0.17180577 | 0.225993788 | 0.2097769 |
| area\_mean | 0.13483956 0.16935108 0.18960448 | 0.192046067 | 0.2159668 |

perimeter\_mean 0.18689691 0.20012342 0.20463348 0.219779728 0.2521267

radius\_mean 0.16147077 0.16418755 0.17028987 0.181111675 0.2047959

texture\_worst texture\_mean concave.points\_se compactness\_worst fractal\_dimension\_mean -0.0496241353 -0.074723745 0.38802737 0.49803508

smoothness\_se -0.1036256913 -0.016153850 0.32631159 -0.02918206

texture\_se 0.3902772333 0.383031292 0.15043244 -0.11540971

symmetry\_se -0.0659948363 0.022555000 0.29809097 0.06440122

fractal\_dimension\_se -0.0001537862 0.046833584 0.63061793 0.44271991

fractal\_dimension\_worst 0.2206715864 0.117475031 0.35979108 0.83420749

|  |  |  |  |
| --- | --- | --- | --- |
| smoothness\_worst | 0.2177304941 0.067929601 | 0.26479215 | 0.58016572 |
| symmetry\_worst | 0.2486062373 0.114041778 | 0.17559643 | 0.61211045 |
| symmetry\_mean | 0.1038673717 0.086277671 | 0.44198517 | 0.49104533 |
| concavity\_se | 0.0773818608 0.115645746 | 0.77855608 | 0.47885734 |

smoothness\_mean 0.0505327856 -0.005033315 0.41500304 0.49447172

compactness\_se 0.1464986134 0.183201144 0.73502795 0.72071366

texture\_worst 1.0000000000 0.909079320 0.06296549 0.35742027

|  |  |  |  |
| --- | --- | --- | --- |
| texture\_mean | 0.9090793202 1.000000000 | 0.14183743 | 0.26665478 |
| concave.points\_se | 0.0629654927 0.141837432 | 1.00000000 | 0.47104732 |
| compactness\_worst | 0.3574202669 0.266654785 | 0.47104732 | 1.00000000 |
| compactness\_mean | 0.2501280401 0.234388579 | 0.64094515 | 0.87516821 |
| concavity\_worst | 0.3677108805 0.300683005 | 0.59521060 | 0.88876476 |
| concavity\_mean | 0.2848349436 0.293086525 | 0.71222854 | 0.74748161 |

radius\_se 0.1970527575 0.285185949 0.49279562 0.26483293

perimeter\_se 0.2060648369 0.296595381 0.51587595 0.31910629

concave.points\_worst 0.3611725527 0.297197451 0.61892706 0.79869138

area\_se 0.1898802053 0.260034428 0.39468455 0.25864738

concave.points\_mean 0.2922086927 0.299625165 0.62786430 0.66515310

|  |  |  |  |
| --- | --- | --- | --- |
| area\_worst | 0.3476136471 0.342291878 | 0.34234382 | 0.41534132 |
| perimeter\_worst | 0.3711606547 0.360306122 | 0.38350662 | 0.50947316 |
| radius\_worst | 0.3647675781 0.352121728 | 0.34875349 | 0.45555088 |
| area\_mean | 0.2848923357 0.320022426 | 0.35927998 | 0.37019008 |
| perimeter\_mean | 0.3048038753 0.330635257 | 0.38718343 | 0.43934037 |
| radius\_mean | 0.2980554611 0.323826834 | 0.35524560 | 0.39570641 |

compactness\_mean concavity\_worst concavity\_mean radius\_se perimeter\_se fractal\_dimension\_mean 0.599207106 0.39349563 0.38456635 -0.007467023 0.02592924

smoothness\_se 0.175515230 -0.03932172 0.12613541 0.179564555 0.16771511

texture\_se 0.005919014 -0.08771787 0.05898627 0.190140880 0.18081839

symmetry\_se 0.243167111 0.05692927 0.21401785 0.227851028 0.23656776

|  |  |  |  |
| --- | --- | --- | --- |
| fractal\_dimension\_se | 0.546084794 | 0.44806645 | 0.51092946 0.216482518 0.22563272 |
| fractal\_dimension\_worst | 0.718966027 | 0.70770292 | 0.53571811 0.048030610 0.08006531 |
| smoothness\_worst | 0.594192217 | 0.52444019 | 0.45743688 0.152854473 0.14960015 |
| symmetry\_worst | 0.526846825 | 0.52735622 | 0.40731151 0.066495579 0.07495364 |
| symmetry\_mean | 0.617787256 | 0.45949862 | 0.52734799 0.278036220 0.28189726 |

concavity\_se 0.565083664 0.67843201 0.70567534 0.320206129 0.33579084

smoothness\_mean 0.678409492 0.45828362 0.54503236 0.318859395 0.32001885

|  |  |  |
| --- | --- | --- |
| compactness\_se | 0.771453261 | 0.68857961 0.71132221 0.336083625 0.38619794 |
| texture\_worst | 0.250128040 | 0.36771088 0.28483494 0.197052758 0.20606484 |
| texture\_mean | 0.234388579 | 0.30068301 0.29308652 0.285185949 0.29659538 |
| concave.points\_se | 0.640945149 | 0.59521060 0.71222854 0.492795621 0.51587595 |

compactness\_worst 0.875168207 0.88876476 0.74748161 0.264832931 0.31910629

compactness\_mean 1.000000000 0.82959776 0.88558312 0.473736092 0.52439353

concavity\_worst 0.829597760 1.00000000 0.88493652 0.378588412 0.41668565

concavity\_mean 0.885583116 0.88493652 1.00000000 0.634796917 0.66641378

radius\_se 0.473736092 0.37858841 0.63479692 1.000000000 0.97899133

perimeter\_se 0.524393527 0.41668565 0.66641378 0.978991334 1.00000000

concave.points\_worst 0.820908407 0.86124255 0.85801649 0.520772548 0.54833268

area\_se 0.435158968 0.37244795 0.61097455 0.954849504 0.94934934

concave.points\_mean 0.836175812 0.75471579 0.91960482 0.702972658 0.72269782

area\_worst 0.504682409 0.52808421 0.66363304 0.765154748 0.75426375

|  |  |  |
| --- | --- | --- |
| perimeter\_worst 0.583254532 | 0.60450978 | 0.71558195 0.725868831 0.73403105 |
| radius\_worst 0.528554797 | 0.56035876 | 0.67393194 0.723504168 0.71413161 |
| area\_mean 0.492599453 | 0.49579140 | 0.67380665 0.753863243 0.75627153 |
| perimeter\_mean 0.549388318 | 0.55019236 | 0.70272312 0.705502269 0.71344428 |
| radius\_mean 0.497888043 | 0.51181490 | 0.66206268 0.694092923 0.69611321 |
| concave.points\_worst | area\_se concav | e.points\_mean area\_worst |

fractal\_dimension\_mean 0.21764249 -0.08539361 0.210065988 -0.203471329

smoothness\_se -0.08812530 0.09548615 0.062153675 -0.177823753

texture\_se -0.15306837 0.09177859 0.008823168 -0.092216337

symmetry\_se -0.01875548 0.13175134 0.126452822 -0.105209437

fractal\_dimension\_se 0.27308444 0.12599245 0.309972951 0.003898912

fractal\_dimension\_worst 0.54555741 0.01948520 0.399958077 0.098916031

|  |  |  |
| --- | --- | --- |
| smoothness\_worst | 0.56125161 0.13255270 | 0.466921632 0.212336355 |
| symmetry\_worst | 0.49721674 0.04830560 | 0.370253862 0.192951792 |
| symmetry\_mean | 0.44455644 0.21292461 | 0.480364260 0.190556232 |
| concavity\_se | 0.44583168 0.25509985 | 0.443054306 0.178859213 |
| smoothness\_mean | 0.51671828 0.26400148 | 0.574290577 0.222390254 |
| compactness\_se | 0.52112096 0.27256813 | 0.529473913 0.208587247 |
| texture\_worst | 0.36117255 0.18988021 | 0.292208693 0.347613647 |
| texture\_mean | 0.29719745 0.26003443 | 0.299625165 0.342291878 |
| concave.points\_se | 0.61892706 0.39468455 | 0.627864297 0.342343824 |
| compactness\_worst | 0.79869138 0.25864738 | 0.665153100 0.415341324 |
| compactness\_mean | 0.82090841 0.43515897 | 0.836175812 0.504682409 |
| concavity\_worst | 0.86124255 0.37244795 | 0.754715788 0.528084208 |
| concavity\_mean | 0.85801649 0.61097455 | 0.919604820 0.663633040 |

radius\_se 0.52077255 0.95484950 0.702972658 0.765154748

perimeter\_se 0.54833268 0.94934934 0.722697820 0.754263747

concave.points\_worst 1.00000000 0.52168842 0.905998889 0.741307514

area\_se 0.52168842 1.00000000 0.686508334 0.812994665

concave.points\_mean 0.90599889 0.68650833 1.000000000 0.804401025

|  |  |  |
| --- | --- | --- |
| area\_worst | 0.74130751 0.81299466 | 0.804401025 1.000000000 |
| perimeter\_worst | 0.81232113 0.75719745 | 0.850952011 0.977288954 |
| radius\_worst | 0.78274208 0.75428022 | 0.824324045 0.983358653 |
| area\_mean | 0.71445554 0.80925972 | 0.818247636 0.956636477 |
| perimeter\_mean | 0.76666294 0.74790252 | 0.846512598 0.939755713 |
| radius\_mean | 0.73880162 0.73938743 | 0.816735079 0.939020893 |

perimeter\_worst radius\_worst area\_mean perimeter\_mean radius\_mean fractal\_dimension\_mean -0.17772036 -0.22607331 -0.255101426 -0.23444340 -0.28574986

smoothness\_se -0.21847053 -0.23320419 -0.160709787 -0.20227490 -0.22564803

texture\_se -0.12066388 -0.12595672 -0.076651286 -0.10301643 -0.11183103

symmetry\_se -0.10187748 -0.12177103 -0.058685646 -0.06861081 -0.09193073

|  |  |  |  |
| --- | --- | --- | --- |
| fractal\_dimension\_se | | 0.02258764 -0.01435525 -0.001430701 | 0.01095735 -0.02798764 |
| fractal\_dimension\_worst | | 0.16098516 0.11673458 0.022223907 | 0.07446124 0.02976188 |
| smoothness\_worst | | 0.24350199 0.22144951 0.126544942 | 0.15556171 0.12262012 |
| symmetry\_worst | | 0.25754399 0.23426148 0.134839564 | 0.18689691 0.16147077 |
| symmetry\_mean | | 0.22821052 0.19624560 0.169351077 | 0.20012342 0.16418755 |
| concavity\_se | 0.20857273 0.17180577 0.189604478 0.20463348 0.17028987 | | |
| smoothness\_mean | 0.25312356 0.22599379 0.192046067 0.21977973 0.18111168 | | |
| compactness\_se | 0.26589895 0.20977688 0.215966769 0.25212665 0.20479593 | | |
| texture\_worst | 0.37116065 0.36476758 0.284892336 0.30480388 0.29805546 | | |
| texture\_mean | 0.36030612 0.35212173 0.320022426 0.33063526 0.32382683 | | |
| concave.points\_se | 0.38350662 0.34875349 0.359279978 0.38718343 0.35524560 | | |
| compactness\_worst | 0.50947316 0.45555088 0.370190083 0.43934037 0.39570641 | | |

compactness\_mean 0.58325453 0.52855480 0.492599453 0.54938832 0.49788804

concavity\_worst 0.60450978 0.56035876 0.495791400 0.55019236 0.51181490

concavity\_mean 0.71558195 0.67393194 0.673806655 0.70272312 0.66206268

radius\_se 0.72586883 0.72350417 0.753863243 0.70550227 0.69409292

perimeter\_se 0.73403105 0.71413161 0.756271534 0.71344428 0.69611321

concave.points\_worst 0.81232113 0.78274208 0.714455539 0.76666294 0.73880162

area\_se 0.75719745 0.75428022 0.809259725 0.74790252 0.73938743

concave.points\_mean 0.85095201 0.82432404 0.818247636 0.84651260 0.81673508

area\_worst 0.97728895 0.98335865 0.956636477 0.93975571 0.93902089

|  |  |  |
| --- | --- | --- |
| perimeter\_worst | 1.00000000 0.99363899 0.955826400 | 0.96867680 0.96330305 |
| radius\_worst | 0.99363899 1.00000000 0.959434591 | 0.96792697 0.96797562 |
| area\_mean | 0.95582640 0.95943459 1.000000000 | 0.98585967 0.98643614 |
| perimeter\_mean | 0.96867680 0.96792697 0.985859668 | 1.00000000 0.99780552 |
| radius\_mean | 0.96330305 0.96797562 0.986436139 | 0.99780552 1.00000000 |

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ote that principal components on only the numeric variables is calculated, and so we can not use this

approach to remove categoric variables from consideration.

Any numeric variables with relatively large rotation values (negative or positive) in any of the first few components are generally variables that you may wish to include in the modelling.

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======================================================================

Standard deviations (1, .., p=30):

[1] 3.65780455 2.41578714 1.63820769 1.40902230 1.27711782 1.11086209 0.79905620 0.66896147

[9] 0.64107847 0.59919658 0.53468236 0.52136259 0.47345429 0.37065584 0.31014574 0.27060943

[17] 0.24031296 0.21937967 0.20767970 0.17870685 0.17007524 0.16315915 0.14490167 0.12457951

[25] 0.12311722 0.09014509 0.08389143 0.03755692 0.02769073 0.01146920

Rotation (n x k) = (30 x 30):

PC1 PC2 PC3 PC4 PC5

|  |  |
| --- | --- |
| radius\_mean | 0.214342118 0.238402121 0.0239610977 -0.04732229 0.0230903397 |
| texture\_mean | 0.101436140 0.069869776 -0.0419034673 0.60336502 0.0218690631 |
| perimeter\_mean | 0.223345595 0.220020120 0.0233894491 -0.04666199 0.0218575121 |
| area\_mean | 0.216909810 0.235861082 -0.0245644686 -0.05825836 0.0021092174 |
| smoothness\_mean | 0.151321524 -0.182732349 0.0409229639 -0.12048879 -0.3962580062 |

compactness\_mean 0.240175258 -0.149050965 0.0727444768 -0.02536742 -0.0132632134

concavity\_mean 0.258259421 -0.060618643 -0.0221904128 -0.02701827 0.0899674168

concave.points\_mean 0.260680410 0.035287620 0.0085568073 -0.05688439 -0.0533739313

symmetry\_mean 0.144579325 -0.185970027 0.0004814714 -0.01206818 -0.2837024634

fractal\_dimension\_mean 0.077760144 -0.357432492 0.0004789035 -0.04606434 -0.0430251172

|  |  |
| --- | --- |
| radius\_se | 0.202719194 0.128679119 -0.2866247428 -0.06858069 -0.1105990273 |
| texture\_se | 0.008139894 -0.066823552 -0.3833651921 0.40169165 -0.1085693491 |
| perimeter\_se | 0.208612825 0.118232765 -0.2757498077 -0.06311662 -0.0847799490 |
| area\_se | 0.197816879 0.167938234 -0.2329907659 -0.09080858 -0.0984528509 |
| smoothness\_se | 0.021840742 -0.200742105 -0.3503781469 -0.03845165 -0.2257313187 |
| compactness\_se | 0.177904058 -0.228678311 -0.1161069469 0.01735160 0.2643018246 |
| concavity\_se | 0.153497717 -0.194572537 -0.1616662805 -0.03007771 0.3649003706 |

concave.points\_se 0.185059825 -0.130582207 -0.1997120471 -0.09371025 0.2167502226

symmetry\_se 0.045708678 -0.165871222 -0.3052702687 0.02381113 -0.2549854351

fractal\_dimension\_se 0.114825594 -0.270180521 -0.1799300111 -0.03119591 0.2948048003

|  |  |  |
| --- | --- | --- |
| radius\_worst | 0.223646863 0.223776186 0.0614696755 -0.01958612 -0.0118597931 | |
| texture\_worst | 0.102413810 0.053358365 0.0725391119 0.62953992 -0.0291257798 | |
| perimeter\_worst | 0.232285685 0.204989470 0.0635257128 -0.01706893 -0.0005215206 | |
| area\_worst | 0.220995902 0.223505597 0.0158407814 -0.02931134 -0.0267414154 | |
| smoothness\_worst | | 0.134599796 -0.175550093 0.2104291263 -0.02026657 -0.3600551867 |
| compactness\_worst | | 0.209043143 -0.148258047 0.2458499687 0.07491908 0.0917210736 |
| concavity\_worst | | 0.229809929 -0.103207262 0.1725601332 0.05340529 0.1795542506 |

concave.points\_worst 0.250280958 0.006267768 0.1786764147 -0.01652454 0.0277288946

symmetry\_worst 0.123262886 -0.145331130 0.2584509515 0.07534619 -0.2723400005

fractal\_dimension\_worst 0.140937456 -0.265794140 0.2348652885 0.05262635 0.0855795100 PC6 PC7 PC8 PC9 PC10

|  |  |
| --- | --- |
| radius\_mean | -0.0377816625 0.114813334 -0.1382877651 0.166511532 -0.084820124 |
| texture\_mean | 0.0621711301 -0.002501981 0.2301923988 0.041493914 -0.159175809 |
| perimeter\_mean | -0.0350138212 0.104762754 -0.1464895423 0.169212913 -0.075513348 |
| area\_mean | -0.0124954174 0.041464179 -0.0925408908 0.146723143 |

Summary of the Decision Tree model for Classification (built using 'rpart'):

n= 398

node), split, n, loss, yval, (yprob)

\* denotes terminal node

1) root 398 146 B (0.63316583 0.36683417)

2) perimeter\_worst< 105.95 242 11 B (0.95454545 0.04545455)

4) concave.points\_worst< 0.1589 234 5 B (0.97863248 0.02136752) \*

5) concave.points\_worst>=0.1589 8 2 M (0.25000000 0.75000000) \*

3) perimeter\_worst>=105.95 156 21 M (0.13461538 0.86538462)

6) concave.points\_worst< 0.15075 47 21 M (0.44680851 0.55319149)

12) texture\_worst< 20.645 11 0 B (1.00000000 0.00000000) \*

13) texture\_worst>=20.645 36 10 M (0.27777778 0.72222222)

26) radius\_worst< 16.825 12 3 B (0.75000000 0.25000000) \*

27) radius\_worst>=16.825 24 1 M (0.04166667 0.95833333) \*

7) concave.points\_worst>=0.15075 109 0 M (0.00000000 1.00000000) \*

Classification tree:

rpart(formula = diagnosis ~ ., data = crs$dataset[crs$train, c(crs$input, crs$target)], method = "class", model = TRUE,

parms = list(split = "information"), control = rpart.control(usesurrogate = 0, maxsurrogate = 0))

Variables actually used in tree construction:

[1] concave.points\_worst perimeter\_worst radius\_worst texture\_worst

Root node error: 146/398 = 0.36683

n= 398

CP nsplit rel error xerror xstd

|  |  |
| --- | --- |
| 1 0.780822 | 0 1.000000 1.00000 0.065854 |
| 2 0.037671 | 1 0.219178 0.28767 0.041981 |
| 3 0.027397 | 4 0.102740 0.21918 0.037155 |
| 4 0.010000 | 5 0.075342 0.15753 0.031885 |

Time taken: 0.06 secs

Rattle timestamp: 2018-11-01 14:57:30 tsraj

Summary of the Random Forest Model

==================================

Number of observations used to build the model: 398 Missing value imputation is active.

Call:

randomForest(formula = diagnosis ~ .,

data = crs$dataset[crs$train, c(crs$input, crs$target)],

ntree = 500, mtry = 5, importance = TRUE, replace = FALSE, na.action = randomForest::na.roughfix)

Type of random forest: classification Number of trees: 500

No. of variables tried at each split: 5

OOB estimate of error rate: 3.77% Confusion matrix:

B M class.error

B 245 7 0.02777778

M 8 138 0.05479452

Analysis of the Area Under the Curve (AUC)

==========================================

Call:

roc.default(response = crs$rf$y, predictor = as.numeric(crs$rf$predicted))

Data: as.numeric(crs$rf$predicted) in 252 controls (crs$rf$y B) < 146 cases (crs$rf$y M). Area under the curve: 0.9587

95% CI: 0.9376-0.9798 (DeLong)

Variable Importance

===================

B M MeanDecreaseAccuracy MeanDecreaseGini

|  |  |
| --- | --- |
| area\_worst 15.13 10.84 | 17.79 13.78 |
| concave.points\_worst 13.84 11.08 | 17.58 12.86 |
| radius\_worst 13.19 11.08 | 15.99 12.32 |
| perimeter\_worst 13.16 10.67 | 15.65 14.85 |
| concave.points\_mean 9.53 10.94 | 13.77 13.81 |
| concavity\_worst 7.32 9.27 | 11.99 3.33 |
| texture\_mean 8.28 9.79 | 11.95 2.10 |
| texture\_worst 8.63 10.24 | 11.74 2.30 |
| area\_se 8.40 7.98 | 11.33 5.83 |
| smoothness\_worst 6.42 8.05 | 10.23 1.57 |
| perimeter\_mean 8.58 5.62 | 9.60 7.04 |
| radius\_mean 8.55 5.14 | 9.37 4.99 |
| area\_mean 8.50 5.28 | 9.30 4.07 |
| concavity\_mean 5.31 6.54 | 9.03 3.90 |
| perimeter\_se 5.63 6.26 | 8.33 1.88 |
| radius\_se 5.66 4.59 | 7.60 1.23 |
| smoothness\_mean 4.07 6.30 | 7.34 0.92 |
| compactness\_mean 5.84 3.89 | 6.92 1.51 |
| compactness\_worst 4.29 4.11 | 6.37 1.44 |
| compactness\_se 4.34 2.83 | 5.35 0.59 |
| concavity\_se 3.20 3.77 | 5.33 0.76 |
| smoothness\_se 3.65 3.47 | 5.30 0.58 |
| symmetry\_worst 3.45 4.67 | 5.15 1.17 |
| fractal\_dimension\_worst 4.31 2.39 | 5.05 1.06 |
| texture\_se 3.97 1.92 | 4.44 0.55 |
| concave.points\_se 3.70 2.72 | 4.39 0.51 |
| symmetry\_mean 0.22 3.69 | 3.03 0.45 |
| fractal\_dimension\_mean 2.10 1.25 | 2.57 0.43 |

fractal\_dimension\_se 1.96 1.34 2.56 0.64

symmetry\_se 0.96 0.48 1.03 0.55

Time taken: 0.46 secs

Rattle timestamp: 2018-11-01 14:58:16 tsraj

Summary of the Random Forest Model

==================================

Number of observations used to build the model: 398 Missing value imputation is active.

Call:

randomForest(formula = diagnosis ~ .,

data = crs$dataset[crs$train, c(crs$input, crs$target)],

ntree = 500, mtry = 5, importance = TRUE, replace = FALSE, na.action = randomForest::na.roughfix)

Type of random forest: classification Number of trees: 500

No. of variables tried at each split: 5

OOB estimate of error rate: 3.77% Confusion matrix:

B M class.error

B 245 7 0.02777778

M 8 138 0.05479452

Analysis of the Area Under the Curve (AUC)

==========================================

Call:

roc.default(response = crs$rf$y, predictor = as.numeric(crs$rf$predicted))

Data: as.numeric(crs$rf$predicted) in 252 controls (crs$rf$y B) < 146 cases (crs$rf$y M).

Area under the curve: 0.9587

95% CI: 0.9376-0.9798 (DeLong)

Variable Importance

===================

B M MeanDecreaseAccuracy MeanDecreaseGini

|  |  |
| --- | --- |
| area\_worst 15.13 10.84 | 17.79 13.78 |
| concave.points\_worst 13.84 11.08 | 17.58 12.86 |
| radius\_worst 13.19 11.08 | 15.99 12.32 |
| perimeter\_worst 13.16 10.67 | 15.65 14.85 |
| concave.points\_mean 9.53 10.94 | 13.77 13.81 |
| concavity\_worst 7.32 9.27 | 11.99 3.33 |
| texture\_mean 8.28 9.79 | 11.95 2.10 |
| texture\_worst 8.63 10.24 | 11.74 2.30 |
| area\_se 8.40 7.98 | 11.33 5.83 |
| smoothness\_worst 6.42 8.05 | 10.23 1.57 |
| perimeter\_mean 8.58 5.62 | 9.60 7.04 |
| radius\_mean 8.55 5.14 | 9.37 4.99 |
| area\_mean 8.50 5.28 | 9.30 4.07 |
| concavity\_mean 5.31 6.54 | 9.03 3.90 |
| perimeter\_se 5.63 6.26 | 8.33 1.88 |
| radius\_se 5.66 4.59 | 7.60 1.23 |
| smoothness\_mean 4.07 6.30 | 7.34 0.92 |
| compactness\_mean 5.84 3.89 | 6.92 1.51 |
| compactness\_worst 4.29 4.11 | 6.37 1.44 |
| compactness\_se 4.34 2.83 | 5.35 0.59 |
| concavity\_se 3.20 3.77 | 5.33 0.76 |
| smoothness\_se 3.65 3.47 | 5.30 0.58 |
| symmetry\_worst 3.45 4.67 | 5.15 1.17 |
| fractal\_dimension\_worst 4.31 2.39 | 5.05 1.06 |
| texture\_se 3.97 1.92 | 4.44 0.55 |
| concave.points\_se 3.70 2.72 | 4.39 0.51 |

symmetry\_mean 0.22 3.69 3.03 0.45

fractal\_dimension\_mean 2.10 1.25 2.57 0.43

fractal\_dimension\_se 1.96 1.34 2.56 0.64

symmetry\_se 0.96 0.48 1.03 0.55

Time taken: 0.46 secs

Rattle timestamp: 2018-11-01 14:58:16 tsraj

Summary of the Extreme Boost model:

Call:

ada(diagnosis ~ ., data = crs$dataset[crs$train, c(crs$input, crs$target)], control = rpart::rpart.control(maxdepth = 6, cp = 0.01, minsplit = 20, xval = 10), iter = 50)

Loss: exponential Method: discrete Iteration: 50

Final Confusion Matrix for Data: Final Prediction

True value B M B 252 0

M 5 141

Train Error: 0.013

Out-Of-Bag Error: 0.015 iteration= 45

Additional Estimates of number of iterations:

train.err1 train.kap1 29 29

Variables actually used in tree construction:

[1] "area\_mean" "area\_se" "area\_worst"

[4] "compactness\_mean" "compactness\_se" "compactness\_worst"

[7] "concave.points\_mean" "concave.points\_se" "concave.points\_worst"

[10] "concavity\_se" "concavity\_worst" "fractal\_dimension\_mean"

[13] "fractal\_dimension\_se" "fractal\_dimension\_worst" "perimeter\_mean"

[16] "perimeter\_se" "perimeter\_worst" "radius\_mean"

[19] "radius\_se" "radius\_worst" "smoothness\_mean"

[22] "smoothness\_se" "smoothness\_worst" "symmetry\_mean"

[25] "symmetry\_se" "symmetry\_worst" "texture\_mean"

[28] "texture\_se" "texture\_worst"

Frequency of variables actually used:

|  |  |  |  |
| --- | --- | --- | --- |
| concave.points\_worst | area\_worst | texture\_mean | texture\_worst |
| 19 | 14 14 | 14 |  |
| concave.points\_mean | perimeter\_worst | area\_se | smoothness\_worst |
| 13 | 13 10 | 10 |  |

concavity\_worst radius\_worst symmetry\_se smoothness\_se 9 7 7 5

perimeter\_mean perimeter\_se smoothness\_mean concave.points\_se 3 3 3 2

concavity\_se fractal\_dimension\_mean fractal\_dimension\_se symmetry\_worst 2 2 2 2

area\_mean compactness\_mean compactness\_se compactness\_worst

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1  fractal\_dimension\_worst | 1 | 1  radius\_mean | 1  radius\_se | symmetry\_mean |
| 1 | 1 | 1 | 1 |  |
| texture\_se |  |  |  |  |
| 1 |  |  |  |  |

Time taken: 0.98 secs

Rattle timestamp: 2018-11-01 15:03:23 tsraj

Summary of the Extreme Boost model:

##### xgb.Booster raw: 23.7 Kb

call:

xgb.train(params = params, data = dtrain, nrounds = nrounds,

watchlist = watchlist, verbose = verbose, print\_every\_n = print\_every\_n, early\_stopping\_rounds = early\_stopping\_rounds, maximize = maximize, save\_period = save\_period, save\_name = save\_name, xgb\_model = xgb\_model, callbacks = callbacks, max\_depth = 6, eta = 0.3, num\_parallel\_tree = 1,

nthread = 2, metrics = "error", objective = "binary:logistic") params (as set within xgb.train):

max\_depth = "6", eta = "0.3", num\_parallel\_tree = "1", nthread = "2", metrics = "error", objective = "binary:logistic", silent = "1"

xgb.attributes:

niter callbacks:

cb.print.evaluation(period = print\_every\_n) cb.evaluation.log()

# of features: 31 niter: 50

nfeatures : 31 formula :

diagnosis ~ .

<environment: 0x000000002f1abcc8>

dimnames : (Intercept) radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst

evaluation\_log: iter train\_error

1 0.030151

2 0.012563

---

49 0.000000

50 0.000000

Final iteration error rate:

iter train\_error 1: 50 0

Importance/Frequency of variables actually used: Feature Gain Cover Frequency

1: perimeter\_worst 0.2860119772 0.0627899319 0.024875622

2: concave.points\_worst 0.2320516602 0.1667852537 0.069651741

3: area\_worst 0.2253040203 0.1535258518 0.119402985

4: concave.points\_mean 0.0837341558 0.0753190603 0.054726368

5: texture\_worst 0.0361342148 0.1025161365 0.109452736

6: texture\_mean 0.0350176633 0.0579703156 0.114427861

7: concavity\_worst 0.0266885075 0.0410815982 0.054726368

8: radius\_worst 0.0101222899 0.0449659147 0.029850746

9: radius\_mean 0.0097028514 0.0251147195 0.009950249

10: area\_se 0.0081110684 0.0544375224 0.079601990

11: fractal\_dimension\_se 0.0079110708 0.0102615135 0.029850746

12: smoothness\_mean 0.0067744858 0.0102349626 0.039800995

13: area\_mean 0.0050643620 0.0172027459 0.034825871

14: symmetry\_se 0.0047192465 0.0112897273 0.029850746

15: compactness\_se 0.0041147552 0.0143072670 0.029850746

16: symmetry\_worst 0.0038544677 0.0245684697 0.024875622

17: smoothness\_worst 0.0036052689 0.0315560044 0.044776119

18: radius\_se 0.0030701463 0.0228321335 0.014925373

19: concavity\_se 0.0017202681 0.0035817455 0.014925373

20: perimeter\_mean 0.0016395510 0.0019944309 0.009950249

21: concave.points\_se 0.0014685044 0.0019886678 0.009950249

22: compactness\_mean 0.0013108865 0.0028414750 0.014925373

23: smoothness\_se 0.0007095682 0.0420139479 0.014925373

24: fractal\_dimension\_mean 0.0005352605 0.0083152521 0.004975124

25: texture\_se 0.0003713217 0.0115063923 0.009950249

26: compactness\_worst 0.0002524276 0.0009989603 0.004975124 Feature Gain Cover Frequency

Time taken: 2.28 secs

ummary of the SVM model (built using ksvm):

Support Vector Machine object of class "ksvm"

SV type: C-svc (classification) parameter : cost C = 1

Linear (vanilla) kernel function.

Number of Support Vectors : 31

Objective Function Value : -18.0672 Training error : 0.01005

Probability model included.

Time taken: 0.83 secs

Rattle timestamp: 2018-11-01 15:06:00 tsraj

======================================================================

Rattle timestamp: 2018-11-01 15:04:22 tsraj

Summary of the SVM model (built using ksvm):

Support Vector Machine object of class "ksvm"

SV type: C-svc (classification) parameter : cost C = 1

Spline kernel function.

Number of Support Vectors : 65

Objective Function Value : -791315.5 Training error : 0.075377

Probability model included.

Time taken: 0.34 secs

Rattle timestamp: 2018-11-01 15:07:04 tsraj

Summary of the SVM model (built using ksvm):

Support Vector Machine object of class "ksvm"

SV type: C-svc (classification) parameter : cost C = 1

Spline kernel function.

Number of Support Vectors : 65

Objective Function Value : -791315.5 Training error : 0.075377

Probability model included.

Time taken: 0.34 secs

Rattle timestamp: 2018-11-01 15:07:04 tsraj

======================================================================

Summary of the Logistic Regression model (built using glm):

Call:

glm(formula = diagnosis ~ ., family = binomial(link = "logit"), data = crs$dataset[crs$train, c(crs$input, crs$target)])

Deviance Residuals:

Min 1Q Median 3Q Max

-0.000095996 -0.000000021 -0.000000021 0.000000021 0.000101360

Coefficients:

Estimate Std. Error z value Pr(>|z|) (Intercept) -1000.61483 761248.66277 -0.001 0.999

|  |  |
| --- | --- |
| radius\_mean | -97.90782 192161.08689 -0.001 1.000 |
| texture\_mean | -1.52749 7268.53089 0.000 1.000 |
| perimeter\_mean | 11.62036 24789.12937 0.000 1.000 |
| area\_mean | 0.06996 1137.59682 0.000 1.000 |
| smoothness\_mean | 3596.94249 3367674.12125 0.001 0.999 |
| compactness\_mean | -2219.66177 1451428.51974 -0.002 0.999 |
| concavity\_mean | 1711.09728 1494923.49969 0.001 0.999 |
| concave.points\_mean | 847.30879 2188675.78519 0.000 1.000 |
| symmetry\_mean | 103.60976 962422.22431 0.000 1.000 |

fractal\_dimension\_mean -1178.76821 4084532.43591 0.000 1.000

|  |  |  |
| --- | --- | --- |
| radius\_se | -234.05834 502063.31914 0.000 1.000 | |
| texture\_se | -51.78826 48967.44486 -0.001 0.999 | |
| perimeter\_se | 22.28591 58783.97084 0.000 1.000 | |
| area\_se | | 2.84002 5668.17774 0.001 1.000 |
| smoothness\_se | | 9005.17574 9414262.67903 0.001 0.999 |
| compactness\_se | | 6422.96812 3353945.21733 0.002 0.998 |
| concavity\_se | | -1121.20300 2735903.33151 0.000 1.000 |
| concave.points\_se | | 1217.94946 6789082.78846 0.000 1.000 |
| symmetry\_se | | -4547.31819 2578593.62926 -0.002 0.999 |
| fractal\_dimension\_se | | -69157.70783 23592060.24330 -0.003 0.998 |
| radius\_worst | | 82.16787 59057.50106 0.001 0.999 |
| texture\_worst | | 8.39038 6938.98401 0.001 0.999 |
| perimeter\_worst | | -4.56604 9812.89418 0.000 1.000 |
| area\_worst | | -0.31656 923.31265 0.000 1.000 |
| smoothness\_worst | | -1011.75729 1964421.59749 -0.001 1.000 |
| compactness\_worst | | -438.62888 625576.98058 -0.001 0.999 |
| concavity\_worst | | -57.93867 508525.22171 0.000 1.000 |

concave.points\_worst 137.35946 827468.28456 0.000 1.000

symmetry\_worst 497.70771 379439.01635 0.001 0.999

fractal\_dimension\_worst 5759.84337 2409902.55103 0.002 0.998

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 5.2317e+02 on 397 degrees of freedom Residual deviance: 9.8798e-08 on 367 degrees of freedom AIC: 62

Number of Fisher Scoring iterations: 25

Log likelihood: -0.000 (31 df)

Null/Residual deviance difference: 523.170 (30 df)

Chi-square p-value: 0.00000000

Pseudo R-Square (optimistic): 1.00000000

==== ANOVA ====

Analysis of Deviance Table

Model: binomial, link: logit

Response: diagnosis

Terms added sequentially (first to last)

Df Deviance Resid. Df Resid. Dev Pr(>Chi)

|  |  |  |  |
| --- | --- | --- | --- |
| NULL | 397 | 523.17 |  |
| radius\_mean | 1 288.301 | 396 | 234.87 < 2.2e-16 \*\*\* |
| texture\_mean | 1 30.665 | 395 | 204.20 3.066e-08 \*\*\* |
| perimeter\_mean | 1 51.493 | 394 | 152.71 7.184e-13 \*\*\* |

area\_mean 1 3.341 393 149.37 0.0675854 .

smoothness\_mean 1 32.183 392 117.19 1.403e-08 \*\*\*

compactness\_mean 1 0.221 391 116.97 0.6383247

concavity\_mean 1 10.594 390 106.37 0.0011344 \*\*

concave.points\_mean 1 5.976 389 100.40 0.0145041 \*

symmetry\_mean 1 0.050 388 100.35 0.8227536

fractal\_dimension\_mean 1 3.232 387 97.11 0.0721929 .

radius\_se 1 0.612 386 96.50 0.4342138

texture\_se 1 15.411 385 81.09 8.650e-05 \*\*\*

perimeter\_se 1 0.051 384 81.04 0.8212168

area\_se 1 13.504 383 67.54 0.0002380 \*\*\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| smoothness\_se | 1 4.136 | | 382 | 63.40 0.0419689 \* |
| compactness\_se | 1 4.120 | | 381 | 59.28 0.0423710 \* |
| concavity\_se | 1 12.684 | | 380 | 46.60 0.0003687 \*\*\* |
| concave.points\_se | 1 0.423 | | 379 | 46.17 0.5155001 |
| symmetry\_se | 1 1.820 | | 378 | 44.35 0.1773220 |
| fractal\_dimension\_se 1 1.976 | | | 377 | 42.38 0.1598142 |
| radius\_worst 1 42.377 | | | 376 | 0.00 7.528e-11 \*\*\* |
| texture\_worst 1 0.000 | | | 375 | 0.00 0.9993888 |
| perimeter\_worst 1 0.000 | | | 374 | 0.00 0.9997021 |
| area\_worst 1 0.000 373 0.00 1.0000000 | | | | |
| smoothness\_worst | | 1 0.000 | 372 | 0.00 0.9998906 |
| compactness\_worst | | 1 0.000 | 371 | 0.00 1.0000000 |
| concavity\_worst | | 1 0.000 | 370 | 0.00 0.9998360 |
| concave.points\_worst | | 1 0.000 | 369 | 0.00 0.9999952 |
| symmetry\_worst | | 1 0.000 | 368 | 0.00 0.9998467 |

fractal\_dimension\_worst 1 0.000 367 0.00 0.9996653

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Time taken: 0.32 secs

Rattle timestamp: 2018-11-01 15:07:50 tsraj

Summary of the Probit Regression model (built using glm):

Call:

glm(formula = diagnosis ~ ., family = binomial(link = "probit"), data = crs$dataset[crs$train, c(crs$input, crs$target)])

Deviance Residuals:

Min 1Q Median 3Q Max

-0.000101599 -0.000000021 -0.000000021 0.000000021 0.000104597

|  |  |  |
| --- | --- | --- |
| Coefficients:  Estimate Std. Error z value Pr(>|z|) | |  |
| (Intercept) -283.85110 124970.41277 -0.002 | | 0.998 |
| radius\_mean -28.53109 34548.05278 -0.001 | | 0.999 |
| texture\_mean -0.42295 1163.55866 0.000 | | 1.000 |
| perimeter\_mean 3.33211 4248.88082 0.001 | | 0.999 |
| area\_mean | 0.02250 202.52746 0.000 1.000 | |
| smoothness\_mean | 1075.18012 632014.55799 0.002 0.999 | |
| compactness\_mean | -653.78728 253896.16900 -0.003 0.998 | |
| concavity\_mean | 498.70895 274485.43359 0.002 0.999 | |
| concave.points\_mean | 263.34841 361254.35356 0.001 0.999 | |
| symmetry\_mean | 25.26393 180776.47282 0.000 1.000 | |

fractal\_dimension\_mean -379.18181 693712.24471 -0.001 1.000

|  |  |  |
| --- | --- | --- |
| radius\_se | -77.94629 89882.69645 -0.001 0.999 | |
| texture\_se | -14.51040 8175.76852 -0.002 0.999 | |
| perimeter\_se | 6.70496 10286.00298 0.001 0.999 | |
| area\_se | 0.90847 1004.37254 0.001 0.999 | |
| smoothness\_se | 2703.57495 1724445.17885 0.002 0.999 | |
| compactness\_se | 1844.90459 520710.84313 0.004 0.997 | |
| concavity\_se | -301.43906 436469.75082 -0.001 0.999 | |
| concave.points\_se | 329.45611 1139075.51994 0.000 1.000 | |
| symmetry\_se | -1343.13647 445655.90081 -0.003 0.998 | |
| fractal\_dimension\_se | | -20322.56752 4111721.07940 -0.005 0.996 |
| radius\_worst | | 24.30690 10271.15053 0.002 0.998 |
| texture\_worst | | 2.38335 1141.28075 0.002 0.998 |
| perimeter\_worst | | -1.41333 1664.15664 -0.001 0.999 |

|  |  |
| --- | --- |
| area\_worst | -0.09123 164.80735 -0.001 1.000 |
| smoothness\_worst | -311.74885 373902.02654 -0.001 0.999 |
| compactness\_worst | -120.39599 105239.51604 -0.001 0.999 |
| concavity\_worst | -20.05196 91807.31076 0.000 1.000 |
| concave.points\_worst | 41.42246 139853.31978 0.000 1.000 |
| symmetry\_worst | 147.47438 68501.67910 0.002 0.998 |

fractal\_dimension\_worst 1681.60016 394145.19857 0.004 0.997

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 523.17040256182 on 397 degrees of freedom Residual deviance: 0.00000010545 on 367 degrees of freedom AIC: 62

Number of Fisher Scoring iterations: 25

Log likelihood: -0.000 (31 df)

Null/Residual deviance difference: 523.170 (30 df)

Chi-square p-value: 0.00000000

Pseudo R-Square (optimistic): 1.00000000

==== ANOVA ====

Analysis of Deviance Table

Model: binomial, link: probit

Response: diagnosis

Terms added sequentially (first to last)

Df Deviance Resid. Df Resid. Dev Pr(>Chi)

NULL 397 523.17

|  |  |  |  |
| --- | --- | --- | --- |
| radius\_mean | 1 287.392 | 396 | 235.78 < 2.2e-16 \*\*\* |
| texture\_mean | 1 30.090 | 395 | 205.69 4.124e-08 \*\*\* |
| perimeter\_mean | 1 53.582 | 394 | 152.11 2.480e-13 \*\*\* |

area\_mean 1 3.753 393 148.35 0.0527222 .

smoothness\_mean 1 32.534 392 115.82 1.171e-08 \*\*\*

compactness\_mean 1 0.280 391 115.54 0.5967093

concavity\_mean 1 9.832 390 105.71 0.0017151 \*\*

concave.points\_mean 1 6.230 389 99.48 0.0125605 \*

symmetry\_mean 1 0.034 388 99.44 0.8536301

fractal\_dimension\_mean 1 2.806 387 96.64 0.0938964 .

radius\_se 1 0.566 386 96.07 0.4519414

texture\_se 1 14.575 385 81.50 0.0001347 \*\*\*

perimeter\_se 1 0.104 384 81.39 0.7471212

area\_se 1 13.796 383 67.60 0.0002038 \*\*\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| smoothness\_se | 1 3.707 | | 382 | 63.89 0.0541832 . |
| compactness\_se | 1 4.434 | | 381 | 59.46 0.0352264 \* |
| concavity\_se | 1 12.843 | | 380 | 46.61 0.0003387 \*\*\* |
| concave.points\_se | 1 0.309 | | 379 | 46.30 0.5783642 |
| symmetry\_se | 1 1.792 | | 378 | 44.51 0.1806390 |
| fractal\_dimension\_se 1 2.206 | | | 377 | 42.30 0.1374391 |
| radius\_worst 1 42.304 | | | 376 | 0.00 7.812e-11 \*\*\* |
| texture\_worst 1 0.000 | | | 375 | 0.00 0.9992524 |
| perimeter\_worst 1 0.000 | | | 374 | 0.00 0.9996586 |
| area\_worst 1 0.000 373 0.00 1.0000000 | | | | |
| smoothness\_worst | | 1 0.000 | 372 | 0.00 0.9998507 |
| compactness\_worst | | 1 0.000 | 371 | 0.00 1.0000000 |
| concavity\_worst | | 1 0.000 | 370 | 0.00 0.9997467 |
| concave.points\_worst | | 1 0.000 | 369 | 0.00 1.0000000 |
| symmetry\_worst | | 1 0.000 | 368 | 0.00 0.9998162 |

fractal\_dimension\_worst 1 0.000 367 0.00 0.9996156

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Time taken: 0.35 secs

Rattle timestamp: 2018-11-01 15:09:49 tsraj

Summary of the Neural Net model (built using nnet):

A 30-10-1 network with 351 weights.

Inputs: radius\_mean, texture\_mean, perimeter\_mean, area\_mean, smoothness\_mean, compactness\_mean, concavity\_mean, concave.points\_mean, symmetry\_mean, fractal\_dimension\_mean, radius\_se, texture\_se, perimeter\_se, area\_se, smoothness\_se, compactness\_se, concavity\_se, concave.points\_se, symmetry\_se, fractal\_dimension\_se, radius\_worst, texture\_worst, perimeter\_worst, area\_worst, smoothness\_worst, compactness\_worst, concavity\_worst, concave.points\_worst, symmetry\_worst, fractal\_dimension\_worst.

Output: as.factor(diagnosis).

Sum of Squares Residuals: 146.0000.

Neural Network build options: skip-layer connections; entropy fitting.

In the following table:

b represents the bias associated with a node h1 represents hidden layer node 1

i1 represents input node 1 (i.e., input variable 1) o represents the output node

Weights for node h1:

b->h1 i1->h1 i2->h1 i3->h1 i4->h1 i5->h1 i6->h1 i7->h1 i8->h1 i9->h1 i10->h1 i11->h1

-0.66 0.23 0.29 -0.31 -0.68 -0.36 0.27 0.23 -0.31 -0.18 0.31 -0.02

i12->h1 i13->h1 i14->h1 i15->h1 i16->h1 i17->h1 i18->h1 i19->h1 i20->h1 i21->h1 i22->h1 i23->h1 0.29 -0.50 0.39 0.25 -0.16 -0.55 -0.52 0.25 -0.65 -0.15 -0.03 -0.20

i24->h1 i25->h1 i26->h1 i27->h1 i28->h1 i29->h1 i30->h1 0.30 -0.16 -0.04 0.49 0.56 0.44 0.41

Weights for node h2:

b->h2 i1->h2 i2->h2 i3->h2 i4->h2 i5->h2 i6->h2 i7->h2 i8->h2 i9->h2 i10->h2 i11->h2 0.51 0.38 0.22 0.47 -0.41 0.15 -0.22 0.46 -0.08 -0.41 0.33 -0.54

i12->h2 i13->h2 i14->h2 i15->h2 i16->h2 i17->h2 i18->h2 i19->h2 i20->h2 i21->h2 i22->h2 i23->h2 0.56 0.59 0.64 0.13 -0.68 -0.51 0.55 0.05 0.15 0.31 -0.15 0.24

i24->h2 i25->h2 i26->h2 i27->h2 i28->h2 i29->h2 i30->h2

0.02 0.33 -0.44 -0.47 -0.68 0.07 0.30

Weights for node h3:

b->h3 i1->h3 i2->h3 i3->h3 i4->h3 i5->h3 i6->h3 i7->h3 i8->h3 i9->h3 i10->h3 i11->h3 0.35 -0.01 0.09 0.65 -0.36 -0.41 -0.56 0.50 -0.53 -0.19 -0.24 -0.62

i12->h3 i13->h3 i14->h3 i15->h3 i16->h3 i17->h3 i18->h3 i19->h3 i20->h3 i21->h3 i22->h3 i23->h3 0.23 -0.47 -0.14 -0.28 0.33 0.44 -0.07 -0.08 0.51 -0.17 -0.26 0.07

i24->h3 i25->h3 i26->h3 i27->h3 i28->h3 i29->h3 i30->h3

-0.01 -0.52 0.14 -0.18 -0.62 0.70 -0.04

Weights for node h4:

b->h4 i1->h4 i2->h4 i3->h4 i4->h4 i5->h4 i6->h4 i7->h4 i8->h4 i9->h4 i10->h4 i11->h4

-0.37 -0.06 -0.07 -0.12 0.41 0.37 0.03 -0.19 -0.46 0.05 0.29 -0.18

i12->h4 i13->h4 i14->h4 i15->h4 i16->h4 i17->h4 i18->h4 i19->h4 i20->h4 i21->h4 i22->h4 i23->h4

-0.51 -0.16 0.55 0.51 -0.57 -0.56 -0.02 0.09 0.21 0.62 0.06 0.66 i24->h4 i25->h4 i26->h4 i27->h4 i28->h4 i29->h4 i30->h4

0.07 -0.39 0.08 0.50 -0.64 0.12 0.45

Weights for node h5:

b->h5 i1->h5 i2->h5 i3->h5 i4->h5 i5->h5 i6->h5 i7->h5 i8->h5 i9->h5 i10->h5 i11->h5

-0.21 -0.54 -0.44 0.08 -0.61 0.57 0.30 0.64 0.16 -0.42 0.51 -0.59

i12->h5 i13->h5 i14->h5 i15->h5 i16->h5 i17->h5 i18->h5 i19->h5 i20->h5 i21->h5 i22->h5 i23->h5

-0.23 0.31 -0.19 0.69 -0.37 0.26 -0.18 -0.16 0.53 -0.42 -0.65 -0.30 i24->h5 i25->h5 i26->h5 i27->h5 i28->h5 i29->h5 i30->h5

-0.49 -0.69 0.68 0.26 0.17 -0.22 0.23

Weights for node h6:

b->h6 i1->h6 i2->h6 i3->h6 i4->h6 i5->h6 i6->h6 i7->h6 i8->h6 i9->h6 i10->h6 i11->h6

-0.25 0.06 -0.52 -0.13 0.58 0.14 0.28 0.23 0.53 0.25 0.34 -0.02

i12->h6 i13->h6 i14->h6 i15->h6 i16->h6 i17->h6 i18->h6 i19->h6 i20->h6 i21->h6 i22->h6 i23->h6

-0.17 0.33 0.57 0.46 0.47 0.68 -0.44 -0.61 0.16 -0.65 0.20 0.55 i24->h6 i25->h6 i26->h6 i27->h6 i28->h6 i29->h6 i30->h6

-0.44 0.05 0.43 -0.24 0.63 -0.07 -0.59

Weights for node h7:

b->h7 i1->h7 i2->h7 i3->h7 i4->h7 i5->h7 i6->h7 i7->h7 i8->h7 i9->h7 i10->h7 i11->h7 0.50 0.35 0.31 -0.15 0.14 0.30 0.50 -0.63 -0.54 -0.44 0.65 0.27

i12->h7 i13->h7 i14->h7 i15->h7 i16->h7 i17->h7 i18->h7 i19->h7 i20->h7 i21->h7 i22->h7 i23->h7

-0.49 -0.66 0.60 -0.56 0.19 0.04 -0.28 -0.38 -0.41 -0.14 -0.01 0.09 i24->h7 i25->h7 i26->h7 i27->h7 i28->h7 i29->h7 i30->h7

0.17 -0.45 0.61 -0.17 -0.07 -0.44 -0.22

Weights for node h8:

b->h8 i1->h8 i2->h8 i3->h8 i4->h8 i5->h8 i6->h8 i7->h8 i8->h8 i9->h8 i10->h8 i11->h8

-0.67 -0.07 0.57 -0.64 0.31 -0.04 -0.70 0.40 -0.31 -0.02 0.64 0.12

i12->h8 i13->h8 i14->h8 i15->h8 i16->h8 i17->h8 i18->h8 i19->h8 i20->h8 i21->h8 i22->h8 i23->h8

-0.25 -0.17 -0.17 -0.33 0.68 -0.26 0.48 -0.51 0.24 -0.58 -0.58 -0.58 i24->h8 i25->h8 i26->h8 i27->h8 i28->h8 i29->h8 i30->h8

-0.41 0.31 0.18 0.09 0.35 -0.62 -0.17

Weights for node h9:

b->h9 i1->h9 i2->h9 i3->h9 i4->h9 i5->h9 i6->h9 i7->h9 i8->h9 i9->h9 i10->h9 i11->h9 0.44 0.36 -0.62 -0.55 0.31 -0.52 0.06 0.40 0.10 -0.07 -0.43 0.60

i12->h9 i13->h9 i14->h9 i15->h9 i16->h9 i17->h9 i18->h9 i19->h9 i20->h9 i21->h9 i22->h9 i23->h9

-0.63 0.12 0.36 -0.67 -0.58 -0.41 0.56 0.57 0.29 -0.28 0.25 -0.39 i24->h9 i25->h9 i26->h9 i27->h9 i28->h9 i29->h9 i30->h9

0.43 -0.29 -0.36 0.08 -0.61 0.36 -0.12

Weights for node h10:

b->h10 i1->h10 i2->h10 i3->h10 i4->h10 i5->h10 i6->h10 i7->h10 i8->h10 i9->h10 i10->h10 0.14 -0.25 -0.20 0.50 -0.15 0.10 -0.20 -0.69 0.50 -0.33 0.24

i11->h10 i12->h10 i13->h10 i14->h10 i15->h10 i16->h10 i17->h10 i18->h10 i19->h10 i20->h10 i21->h10

-0.17 -0.38 -0.09 -0.66 -0.37 -0.70 0.04 0.26 -0.57 0.59 -0.15

i22->h10 i23->h10 i24->h10 i25->h10 i26->h10 i27->h10 i28->h10 i29->h10 i30->h10

-0.42 0.43 0.46 0.46 0.62 -0.35 0.68 0.30 -0.65

Weights for node o:

b->o h1->o h2->o h3->o h4->o h5->o h6->o h7->o h8->o h9->o h10->o i1->o

-0.05 0.32 0.40 -0.53 -0.33 -0.30 -0.40 -0.56 0.27 -0.45 -0.10 -5.38

i2->o i3->o i4->o i5->o i6->o i7->o i8->o i9->o i10->o i11->o i12->o i13->o

-7.27 -31.40 -182.28 0.38 0.32 -0.12 -0.55 -0.24 -0.61 -0.64 -0.36 -1.45

i14->o i15->o i16->o i17->o i18->o i19->o i20->o i21->o i22->o i23->o i24->o i25->o

-7.74 0.00 -0.64 -0.18 -0.46 -0.64 -0.33 -5.97 -9.47 -34.21 -219.97 0.48

i26->o i27->o i28->o i29->o i30->o

-0.38 -0.46 -0.15 -0.35 -0.38

Time taken: 0.09 secs

Rattle timestamp: 2018-11-01 15:11:00 tsraj

A 30-10-1 network with 351 weights.

Inputs: radius\_mean, texture\_mean, perimeter\_mean, area\_mean, smoothness\_mean, compactness\_mean, concavity\_mean, concave.points\_mean, symmetry\_mean, fractal\_dimension\_mean, radius\_se, texture\_se, perimeter\_se, area\_se, smoothness\_se, compactness\_se, concavity\_se, concave.points\_se, symmetry\_se, fractal\_dimension\_se, radius\_worst, texture\_worst, perimeter\_worst, area\_worst, smoothness\_worst, compactness\_worst, concavity\_worst, concave.points\_worst, symmetry\_worst, fractal\_dimension\_worst.

Output: as.factor(diagnosis).

Sum of Squares Residuals: 146.0000.

Neural Network build options: skip-layer connections; entropy fitting.

In the following table:

b represents the bias associated with a node h1 represents hidden layer node 1

i1 represents input node 1 (i.e., input variable 1) o represents the output node

Weights for node h1:

b->h1 i1->h1 i2->h1 i3->h1 i4->h1 i5->h1 i6->h1 i7->h1 i8->h1 i9->h1 i10->h1 i11->h1

-0.66 0.23 0.29 -0.31 -0.68 -0.36 0.27 0.23 -0.31 -0.18 0.31 -0.02

i12->h1 i13->h1 i14->h1 i15->h1 i16->h1 i17->h1 i18->h1 i19->h1 i20->h1 i21->h1 i22->h1 i23->h1 0.29 -0.50 0.39 0.25 -0.16 -0.55 -0.52 0.25 -0.65 -0.15 -0.03 -0.20

i24->h1 i25->h1 i26->h1 i27->h1 i28->h1 i29->h1 i30->h1 0.30 -0.16 -0.04 0.49 0.56 0.44 0.41

Weights for node h2:

b->h2 i1->h2 i2->h2 i3->h2 i4->h2 i5->h2 i6->h2 i7->h2 i8->h2 i9->h2 i10->h2 i11->h2 0.51 0.38 0.22 0.47 -0.41 0.15 -0.22 0.46 -0.08 -0.41 0.33 -0.54

i12->h2 i13->h2 i14->h2 i15->h2 i16->h2 i17->h2 i18->h2 i19->h2 i20->h2 i21->h2 i22->h2 i23->h2 0.56 0.59 0.64 0.13 -0.68 -0.51 0.55 0.05 0.15 0.31 -0.15 0.24

i24->h2 i25->h2 i26->h2 i27->h2 i28->h2 i29->h2 i30->h2 0.02 0.33 -0.44 -0.47 -0.68 0.07 0.30

Weights for node h3:

b->h3 i1->h3 i2->h3 i3->h3 i4->h3 i5->h3 i6->h3 i7->h3 i8->h3 i9->h3 i10->h3 i11->h3 0.35 -0.01 0.09 0.65 -0.36 -0.41 -0.56 0.50 -0.53 -0.19 -0.24 -0.62

i12->h3 i13->h3 i14->h3 i15->h3 i16->h3 i17->h3 i18->h3 i19->h3 i20->h3 i21->h3 i22->h3 i23->h3 0.23 -0.47 -0.14 -0.28 0.33 0.44 -0.07 -0.08 0.51 -0.17 -0.26 0.07

i24->h3 i25->h3 i26->h3 i27->h3 i28->h3 i29->h3 i30->h3

-0.01 -0.52 0.14 -0.18 -0.62 0.70 -0.04

Weights for node h4:

b->h4 i1->h4 i2->h4 i3->h4 i4->h4 i5->h4 i6->h4 i7->h4 i8->h4 i9->h4 i10->h4 i11->h4

-0.37 -0.06 -0.07 -0.12 0.41 0.37 0.03 -0.19 -0.46 0.05 0.29 -0.18

i12->h4 i13->h4 i14->h4 i15->h4 i16->h4 i17->h4 i18->h4 i19->h4 i20->h4 i21->h4 i22->h4 i23->h4

-0.51 -0.16 0.55 0.51 -0.57 -0.56 -0.02 0.09 0.21 0.62 0.06 0.66 i24->h4 i25->h4 i26->h4 i27->h4 i28->h4 i29->h4 i30->h4

0.07 -0.39 0.08 0.50 -0.64 0.12 0.45

Weights for node h5:

b->h5 i1->h5 i2->h5 i3->h5 i4->h5 i5->h5 i6->h5 i7->h5 i8->h5 i9->h5 i10->h5 i11->h5

-0.21 -0.54 -0.44 0.08 -0.61 0.57 0.30 0.64 0.16 -0.42 0.51 -0.59

i12->h5 i13->h5 i14->h5 i15->h5 i16->h5 i17->h5 i18->h5 i19->h5 i20->h5 i21->h5 i22->h5 i23->h5

-0.23 0.31 -0.19 0.69 -0.37 0.26 -0.18 -0.16 0.53 -0.42 -0.65 -0.30 i24->h5 i25->h5 i26->h5 i27->h5 i28->h5 i29->h5 i30->h5

-0.49 -0.69 0.68 0.26 0.17 -0.22 0.23

Weights for node h6:

b->h6 i1->h6 i2->h6 i3->h6 i4->h6 i5->h6 i6->h6 i7->h6 i8->h6 i9->h6 i10->h6 i11->h6

-0.25 0.06 -0.52 -0.13 0.58 0.14 0.28 0.23 0.53 0.25 0.34 -0.02

i12->h6 i13->h6 i14->h6 i15->h6 i16->h6 i17->h6 i18->h6 i19->h6 i20->h6 i21->h6 i22->h6 i23->h6

-0.17 0.33 0.57 0.46 0.47 0.68 -0.44 -0.61 0.16 -0.65 0.20 0.55 i24->h6 i25->h6 i26->h6 i27->h6 i28->h6 i29->h6 i30->h6

-0.44 0.05 0.43 -0.24 0.63 -0.07 -0.59

Weights for node h7:

b->h7 i1->h7 i2->h7 i3->h7 i4->h7 i5->h7 i6->h7 i7->h7 i8->h7 i9->h7 i10->h7 i11->h7 0.50 0.35 0.31 -0.15 0.14 0.30 0.50 -0.63 -0.54 -0.44 0.65 0.27

i12->h7 i13->h7 i14->h7 i15->h7 i16->h7 i17->h7 i18->h7 i19->h7 i20->h7 i21->h7 i22->h7 i23->h7

-0.49 -0.66 0.60 -0.56 0.19 0.04 -0.28 -0.38 -0.41 -0.14 -0.01 0.09 i24->h7 i25->h7 i26->h7 i27->h7 i28->h7 i29->h7 i30->h7

0.17 -0.45 0.61 -0.17 -0.07 -0.44 -0.22

Weights for node h8:

b->h8 i1->h8 i2->h8 i3->h8 i4->h8 i5->h8 i6->h8 i7->h8 i8->h8 i9->h8 i10->h8 i11->h8

-0.67 -0.07 0.57 -0.64 0.31 -0.04 -0.70 0.40 -0.31 -0.02 0.64 0.12

i12->h8 i13->h8 i14->h8 i15->h8 i16->h8 i17->h8 i18->h8 i19->h8 i20->h8 i21->h8 i22->h8 i23->h8

-0.25 -0.17 -0.17 -0.33 0.68 -0.26 0.48 -0.51 0.24 -0.58 -0.58 -0.58 i24->h8 i25->h8 i26->h8 i27->h8 i28->h8 i29->h8 i30->h8

-0.41 0.31 0.18 0.09 0.35 -0.62 -0.17

Weights for node h9:

b->h9 i1->h9 i2->h9 i3->h9 i4->h9 i5->h9 i6->h9 i7->h9 i8->h9 i9->h9 i10->h9 i11->h9 0.44 0.36 -0.62 -0.55 0.31 -0.52 0.06 0.40 0.10 -0.07 -0.43 0.60

i12->h9 i13->h9 i14->h9 i15->h9 i16->h9 i17->h9 i18->h9 i19->h9 i20->h9 i21->h9 i22->h9 i23->h9

-0.63 0.12 0.36 -0.67 -0.58 -0.41 0.56 0.57 0.29 -0.28 0.25 -0.39 i24->h9 i25->h9 i26->h9 i27->h9 i28->h9 i29->h9 i30->h9

0.43 -0.29 -0.36 0.08 -0.61 0.36 -0.12

Weights for node h10:

b->h10 i1->h10 i2->h10 i3->h10 i4->h10 i5->h10 i6->h10 i7->h10 i8->h10 i9->h10 i10->h10 0.14 -0.25 -0.20 0.50 -0.15 0.10 -0.20 -0.69 0.50 -0.33 0.24

i11->h10 i12->h10 i13->h10 i14->h10 i15->h10 i16->h10 i17->h10 i18->h10 i19->h10 i20->h10 i21->h10

-0.17 -0.38 -0.09 -0.66 -0.37 -0.70 0.04 0.26 -0.57 0.59 -0.15

i22->h10 i23->h10 i24->h10 i25->h10 i26->h10 i27->h10 i28->h10 i29->h10 i30->h10

-0.42 0.43 0.46 0.46 0.62 -0.35 0.68 0.30 -0.65

Weights for node o:

b->o h1->o h2->o h3->o h4->o h5->o h6->o h7->o h8->o h9->o h10->o i1->o

-0.05 0.32 0.40 -0.53 -0.33 -0.30 -0.40 -0.56 0.27 -0.45 -0.10 -5.38

i2->o i3->o i4->o i5->o i6->o i7->o i8->o i9->o i10->o i11->o i12->o i13->o

-7.27 -31.40 -182.28 0.38 0.32 -0.12 -0.55 -0.24 -0.61 -0.64 -0.36 -1.45

i14->o i15->o i16->o i17->o i18->o i19->o i20->o i21->o i22->o i23->o i24->o i25->o

-7.74 0.00 -0.64 -0.18 -0.46 -0.64 -0.33 -5.97 -9.47 -34.21 -219.97 0.48

i26->o i27->o i28->o i29->o i30->o

-0.38 -0.46 -0.15 -0.35 -0.38

Time taken: 0.07 secs

Rattle timestamp: 2018-11-01 15:11:57 tsraj

Area under the ROC curve for the rpart model on CancerData.csv [validate] is 0.9487

Rattle timestamp: 2018-11-01 15:13:00 tsraj

======================================================================

Area under the ROC curve for the xgb model on CancerData.csv [validate] is 0.9917

Rattle timestamp: 2018-11-01 15:13:00 tsraj

======================================================================

Area under the ROC curve for the rf model on CancerData.csv [validate] is 0.9841

Rattle timestamp: 2018-11-01 15:13:01 tsraj

======================================================================

Area under the ROC curve for the glm model on CancerData.csv [validate] is 0.9581

Rattle timestamp: 2018-11-01 15:13:02 tsraj

======================================================================

Area under the ROC curve for the nnet model on CancerData.csv [validate] is 0.5000

Rattle timestamp: 2018-11-01 15:13:02 tsraj

Area under the ROC curve for the rpart model on CancerData.csv [validate] is 0.9487

Rattle timestamp: 2018-11-01 15:13:33 tsraj

======================================================================

Area under the ROC curve for the xgb model on CancerData.csv [validate] is 0.9917

Rattle timestamp: 2018-11-01 15:13:33 tsraj

======================================================================

Area under the ROC curve for the rf model on CancerData.csv [validate] is 0.9841

Rattle timestamp: 2018-11-01 15:13:33 tsraj

======================================================================

Area under the ROC curve for the glm model on CancerData.csv [validate] is 0.9581

Rattle timestamp: 2018-11-01 15:13:34 tsraj

======================================================================

Area under the ROC curve for the nnet model on CancerData.csv [validate] is 0.5000

Rattle timestamp: 2018-11-01 15:13:34 tsraj

Error matrix for the Decision Tree model on CancerData.csv (counts):

Predicted Actual B M Error

B 352 5 1.4

M 15 197 7.1

Error matrix for the Decision Tree model on CancerData.csv (proportions):

Predicted Actual B M Error

B 61.9 0.9 1.4

M 2.6 34.6 7.1

Overall error: 3.5%, Averaged class error: 4.25%

Rattle timestamp: 2018-11-01 15:14:36 tsraj

======================================================================

Error matrix for the Random Forest model on CancerData.csv (counts):

Predicted Actual B M Error

B 355 2 0.6

M 4 208 1.9

Error matrix for the Random Forest model on CancerData.csv (proportions):

Predicted Actual B M Error

B 62.4 0.4 0.6

M 0.7 36.6 1.9

Overall error: 1%, Averaged class error: 1.25%

Rattle timestamp: 2018-11-01 15:14:36 tsraj

======================================================================

Error matrix for the SVM model on CancerData.csv (counts):

Predicted Actual B M Error

B 331 26 7.3

M 28 184 13.2

Error matrix for the SVM model on CancerData.csv (proportions):

Predicted

Actual B M Error B 58.2 4.6 7.3

M 4.9 32.3 13.2

Overall error: 9.5%, Averaged class error: 10.25%

Rattle timestamp: 2018-11-01 15:14:36 tsraj

======================================================================

Error matrix for the Linear model on CancerData.csv (counts):

Predicted Actual B M Error

B 352 5 1.4

M 5 207 2.4

Error matrix for the Linear model on CancerData.csv (proportions):

Predicted Actual B M Error

B 61.9 0.9 1.4

M 0.9 36.4 2.4

Overall error: 1.7%, Averaged class error: 1.9%

Rattle timestamp: 2018-11-01 15:14:36 tsraj

======================================================================

Error matrix for the Neural Net model on CancerData.csv (counts):

Predicted Actual B M Error

B 357 0 0

M 212 0 100

Error matrix for the Neural Net model on CancerData.csv (proportions):

Predicted Actual B M Error

B 62.7 0 0

M 37.3 0 100

Overall error: 37.3%, Averaged class error: 50%

Rattle timestamp: 2018-11-01 15:14:36 tsraj

Summary Decision Tree model (built using rpart) on CancerData.csv by probability cutoffs.

Recall Caseload Precision

0 1.0000000 1.0000000 0.3725835

0.0213675213675 0.9905660 0.9701230 0.3804348

0.25 0.9528302 0.3831283 0.9266055

0.75 0.9292453 0.3550088 0.9752475

0.9583333333333 0.8867925 0.3356766 0.9842932

1 0.7358491 0.2759227 0.9936306

1.0 0.0000000 0.0000000 1.0000000

Rattle timestamp: 2018-11-01 17:16:41 tsraj

======================================================================

The area under the Risk and Recall curves for Decision Tree model

Area under the Recall (green) curve: 98% (0.976)

Rattle timestamp: 2018-11-01 17:16:42 tsraj

======================================================================

Summary Extreme Boost model (built using xgb) on CancerData.csv by probability cutoffs.

The sequence has been truncated to just 100 from 490.

Recall Caseload Precision 0.00020011382 1.00000000 1.00000000 0.3725835

0.0002478994429 1.00000000 0.98066784 0.3799283

0.0002715170558 1.00000000 0.96836555 0.3847550

0.0003008110216 1.00000000 0.95606327 0.3897059

0.0003222170926 1.00000000 0.94024605 0.3962617

0.000361145474 1.00000000 0.93145870 0.4000000

0.0003779999388 1.00000000 0.92267135 0.4038095

0.0004021935747 1.00000000 0.91036907 0.4092664

0.0004462691722 1.00000000 0.90158172 0.4132554

0.0004618838138 1.00000000 0.88927944 0.4189723

0.0004876778694 1.00000000 0.87521968 0.4257028

0.0005152804079 1.00000000 0.86643234 0.4300203

0.0005266146036 1.00000000 0.85413005 0.4362140

0.0005664617056 1.00000000 0.83128295 0.4482030

0.0005896180519 1.00000000 0.81898067 0.4549356

0.0006142104976 1.00000000 0.81019332 0.4598698

0.0006508078077 1.00000000 0.79613357 0.4679912

0.0006864480674 1.00000000 0.78734622 0.4732143

0.0007097688504 1.00000000 0.77855888 0.4785553

0.0007395144203 1.00000000 0.76625659 0.4862385

0.000794324209 1.00000000 0.75746924 0.4918794

0.0008577474509 1.00000000 0.74868190 0.4976526

0.0008956011152 1.00000000 0.73989455 0.5035629

0.0009268695139 1.00000000 0.72934974 0.5108434

0.0009553827113 1.00000000 0.72056239 0.5170732

0.000993526075 1.00000000 0.71353251 0.5221675

0.0010224645957 1.00000000 0.70474517 0.5286783

0.0010753752431 1.00000000 0.69595782 0.5353535

0.0011456098873 1.00000000 0.68541301 0.5435897

0.0011843921384 1.00000000 0.67662566 0.5506494

0.0012489745859 1.00000000 0.66783831 0.5578947

0.0013400976313 1.00000000 0.65729350 0.5668449

0.0014259951422 1.00000000 0.64850615 0.5745257

0.0015227971599 1.00000000 0.63971880 0.5824176

0.001588984509 1.00000000 0.63093146 0.5905292

0.0017315800069 1.00000000 0.62214411 0.5988701

0.0018909320934 1.00000000 0.61335677 0.6074499

0.0020361798815 1.00000000 0.60281195 0.6180758

0.0022338468116 1.00000000 0.59402460 0.6272189

0.0025132596493 1.00000000 0.58523726 0.6366366

0.0027079826687 1.00000000 0.57644991 0.6463415

0.0027971777599 1.00000000 0.56766257 0.6563467

0.0029055066407 1.00000000 0.56063269 0.6645768

0.0031024166383 1.00000000 0.55184534 0.6751592

0.0035062162206 1.00000000 0.54305800 0.6860841

0.0039484756999 1.00000000 0.53251318 0.6996700

0.0043755820952 1.00000000 0.52372583 0.7114094

0.0050587309524 1.00000000 0.51493849 0.7235495

0.0059412182309 1.00000000 0.50615114 0.7361111

0.0067070452496 1.00000000 0.49736380 0.7491166

0.0070689176209 0.99528302 0.48857645 0.7589928

0.0076389159076 0.99528302 0.47978910 0.7728938

0.0092537375167 0.99528302 0.47100176 0.7873134

0.0105618489906 0.99528302 0.46221441 0.8022814

0.0108782229945 0.99528302 0.45342707 0.8178295

0.0163095220923 0.99528302 0.44463972 0.8339921

0.0179338473827 0.99528302 0.43585237 0.8508065

0.0211464185268 0.99528302 0.42706503 0.8683128

0.0246634613723 0.99528302 0.42003515 0.8828452

0.032096054405 0.99528302 0.41124780 0.9017094

0.0387517176569 0.99528302 0.40246046 0.9213974

0.0696671009064 0.99528302 0.39367311 0.9419643

0.0949085280299 0.99528302 0.38488576 0.9634703

0.1421777755022 0.99056604 0.37609842 0.9813084

0.7053359746933 0.98584906 0.36731107 1.0000000

0.8709681630135 0.96226415 0.35852373 1.0000000

0.9191648364067 0.93867925 0.34973638 1.0000000

0.9542414546013 0.91509434 0.34094903 1.0000000

0.9642020463943 0.89150943 0.33216169 1.0000000

0.9758301973343 0.86792453 0.32337434 1.0000000

0.9826594591141 0.83490566 0.31107206 1.0000000

0.9864323735237 0.81132075 0.30228471 1.0000000

0.9912557601929 0.78773585 0.29349736 1.0000000

0.9935803413391 0.76415094 0.28471002 1.0000000

0.994782269001 0.74056604 0.27592267 1.0000000

0.995125234127 0.72169811 0.26889279 1.0000000

0.995714366436 0.69811321 0.26010545 1.0000000

0.996067404747 0.67452830 0.25131810 1.0000000

0.9967898726463 0.65094340 0.24253076 1.0000000

0.9981338381767 0.62735849 0.23374341 1.0000000

0.9983183145523 0.60377358 0.22495606 1.0000000

0.9985632300377 0.58018868 0.21616872 1.0000000

0.9987875819206 0.55660377 0.20738137 1.0000000

0.9988604784012 0.53301887 0.19859402 1.0000000

0.9988974332809 0.50471698 0.18804921 1.0000000

0.99895632267 0.48113208 0.17926186 1.0000000

0.9990074038506 0.45754717 0.17047452 1.0000000

0.999091386795 0.42924528 0.15992970 1.0000000

0.9991641044617 0.40566038 0.15114236 1.0000000

0.9992083907127 0.36320755 0.13532513 1.0000000

0.9992380142212 0.33962264 0.12653779 1.0000000

0.99928855896 0.31603774 0.11775044 1.0000000

0.9993268251419 0.29245283 0.10896309 1.0000000

0.9993545413017 0.26886792 0.10017575 1.0000000

0.9993959665298 0.22641509 0.08435852 1.0000000

0.9994580149651 0.19339623 0.07205624 1.0000000

0.99948823452 0.14622642 0.05448155 1.0000000

0.9995451569557 0.06603774 0.02460457 1.0000000

0.9995892643929 0.03773585 0.01405975 1.0000000

1.0 0.00000000 0.00000000 1.0000000

Rattle timestamp: 2018-11-01 17:17:14 tsraj

======================================================================

The area under the Risk and Recall curves for Extreme Boost model

Area under the Recall (green) curve: 100% (0.999)

Rattle timestamp: 2018-11-01 17:17:14 tsraj

======================================================================

Summary Random Forest model (built using rf) on CancerData.csv by probability cutoffs.

The sequence has been truncated to just 100 from 143.

Recall Caseload Precision

0 1.0000000 1.0000000 0.3725835

0.002 1.0000000 0.8137083 0.4578834

0.006 1.0000000 0.6924429 0.5380711

0.008 1.0000000 0.6485062 0.5745257

0.012 1.0000000 0.6045694 0.6162791

0.014 1.0000000 0.5905097 0.6309524

0.018 1.0000000 0.5694200 0.6543210

0.02 1.0000000 0.5571178 0.6687697

0.022 1.0000000 0.5553603 0.6708861

0.026 1.0000000 0.5465729 0.6816720

0.028 1.0000000 0.5377856 0.6928105

0.032 1.0000000 0.5307557 0.7019868

0.034 1.0000000 0.5272408 0.7066667

0.038 0.9952830 0.5149385 0.7201365

0.04 0.9952830 0.5131810 0.7226027

0.044 0.9952830 0.5043937 0.7351916

0.046 0.9952830 0.5008787 0.7403509

0.048 0.9952830 0.4991213 0.7429577

0.054 0.9952830 0.4956063 0.7482270

0.056 0.9952830 0.4920914 0.7535714

0.06 0.9952830 0.4780316 0.7757353

0.062 0.9952830 0.4762742 0.7785978

0.066 0.9952830 0.4674868 0.7932331

0.068 0.9952830 0.4657293 0.7962264

0.074 0.9952830 0.4639719 0.7992424

0.086 0.9952830 0.4569420 0.8115385

0.088 0.9952830 0.4534271 0.8178295

0.1 0.9952830 0.4446397 0.8339921

0.102 0.9952830 0.4411248 0.8406375

0.108 0.9952830 0.4376098 0.8473896

0.11 0.9952830 0.4358524 0.8508065

0.112 0.9952830 0.4323374 0.8577236

0.118 0.9952830 0.4288225 0.8647541

0.128 0.9952830 0.4270650 0.8683128

0.134 0.9952830 0.4235501 0.8755187

0.136 0.9952830 0.4217926 0.8791667

0.144 0.9952830 0.4165202 0.8902954

0.15 0.9952830 0.4147627 0.8940678

0.164 0.9952830 0.4112478 0.9017094

0.168 0.9952830 0.4094903 0.9055794

0.18 0.9952830 0.4059754 0.9134199

0.198 0.9952830 0.4024605 0.9213974

0.204 0.9952830 0.4007030 0.9254386

0.224 0.9952830 0.3971880 0.9336283

0.226 0.9952830 0.3954306 0.9377778

0.258 0.9952830 0.3919156 0.9461883

0.26 0.9952830 0.3901582 0.9504505

0.264 0.9952830 0.3884007 0.9547511

0.268 0.9952830 0.3848858 0.9634703

0.316 0.9952830 0.3831283 0.9678899

0.354 0.9952830 0.3796134 0.9768519

0.474 0.9952830 0.3778559 0.9813953

0.492 0.9858491 0.3725835 0.9858491

0.496 0.9811321 0.3708260 0.9857820

0.528 0.9811321 0.3690685 0.9904762

0.664 0.9764151 0.3655536 0.9951923

0.674 0.9716981 0.3637961 0.9951691

0.68 0.9622642 0.3602812 0.9951220

0.696 0.9575472 0.3585237 0.9950980

0.726 0.9433962 0.3532513 0.9950249

0.744 0.9433962 0.3514938 1.0000000

0.76 0.9386792 0.3497364 1.0000000

0.79 0.9292453 0.3462214 1.0000000

0.792 0.9245283 0.3444640 1.0000000

0.816 0.9103774 0.3391916 1.0000000

0.824 0.9056604 0.3374341 1.0000000

0.828 0.8962264 0.3339192 1.0000000

0.832 0.8915094 0.3321617 1.0000000

0.848 0.8820755 0.3286467 1.0000000

0.85 0.8679245 0.3233743 1.0000000

0.852 0.8632075 0.3216169 1.0000000

0.856 0.8537736 0.3181019 1.0000000

0.874 0.8490566 0.3163445 1.0000000

0.878 0.8349057 0.3110721 1.0000000

0.882 0.8301887 0.3093146 1.0000000

0.89 0.8207547 0.3057996 1.0000000

0.894 0.8160377 0.3040422 1.0000000

0.9 0.8113208 0.3022847 1.0000000

0.91 0.7924528 0.2952548 1.0000000

0.914 0.7877358 0.2934974 1.0000000

0.926 0.7783019 0.2899824 1.0000000

0.928 0.7735849 0.2882250 1.0000000

0.932 0.7641509 0.2847100 1.0000000

0.936 0.7405660 0.2759227 1.0000000

0.94 0.7358491 0.2741652 1.0000000

0.944 0.7122642 0.2653779 1.0000000

0.95 0.7075472 0.2636204 1.0000000

0.964 0.6886792 0.2565905 1.0000000

0.966 0.6792453 0.2530756 1.0000000

0.972 0.6698113 0.2495606 1.0000000

0.974 0.6509434 0.2425308 1.0000000

0.98 0.6226415 0.2319859 1.0000000

0.982 0.6084906 0.2267135 1.0000000

0.984 0.5943396 0.2214411 1.0000000

0.988 0.5660377 0.2108963 1.0000000

0.99 0.5424528 0.2021090 1.0000000

0.994 0.5094340 0.1898067 1.0000000

0.996 0.4716981 0.1757469 1.0000000

1 0.3537736 0.1318102 1.0000000

1.0 0.0000000 0.0000000 1.0000000

Rattle timestamp: 2018-11-01 17:17:23 tsraj

======================================================================

The area under the Risk and Recall curves for Random Forest model

Area under the Recall (green) curve: 100% (0.999)

Rattle timestamp: 2018-11-01 17:17:23 tsraj

======================================================================

Summary Linear model (built using glm) on CancerData.csv by probability cutoffs.

Recall Caseload Precision

|  |  |
| --- | --- |
| 0 | 1.0000000 1.0000000 0.3725835 |
| 1e-13 | 0.9858491 0.4165202 0.8818565 |
| 3e-12 | 0.9858491 0.4130053 0.8893617 |
| 4.63e-11 | 0.9858491 0.4112478 0.8931624 |
| 1.016e-10 | 0.9858491 0.4094903 0.8969957 |
| 3.122e-10 | 0.9858491 0.4077329 0.9008621 |
| 4.445e-10 | 0.9858491 0.4059754 0.9047619 |
| 5.857e-10 | 0.9858491 0.4042179 0.9086957 |
| 6.758e-10 | 0.9858491 0.4024605 0.9126638 |

7.003e-10 0.9858491 0.4007030 0.9166667

9.125e-10 0.9858491 0.3989455 0.9207048

0.0000000010371 0.9858491 0.3971880 0.9247788

0.0000000011892 0.9858491 0.3954306 0.9288889

0.0000000017847 0.9858491 0.3936731 0.9330357

0.0000000028089 0.9858491 0.3919156 0.9372197

0.0000000043087 0.9858491 0.3901582 0.9414414

0.0000000047833 0.9858491 0.3884007 0.9457014

0.0000000050312 0.9858491 0.3866432 0.9500000

0.0000000051612 0.9858491 0.3848858 0.9543379

0.0000000843796 0.9858491 0.3831283 0.9587156

0.0000001769536 0.9858491 0.3813708 0.9631336

0.0000013399978 0.9858491 0.3796134 0.9675926

0.0000047574925 0.9858491 0.3778559 0.9720930

0.0000564450847 0.9811321 0.3760984 0.9719626

0.0079358754521 0.9764151 0.3743409 0.9718310

0.6299784833914 0.9764151 0.3725835 0.9764151

0.6627636394277 0.9764151 0.3708260 0.9810427

0.9999999850255 0.9764151 0.3690685 0.9857143

0.9999999945297 0.9764151 0.3673111 0.9904306

0.9999999965944 0.9716981 0.3655536 0.9903846

0.9999999976513 0.9669811 0.3637961 0.9903382

0.9999999977641 0.9622642 0.3620387 0.9902913

0.9999999983468 0.9575472 0.3602812 0.9902439

0.9999999987343 0.9575472 0.3585237 0.9950980

0.9999999987933 0.9528302 0.3567663 0.9950739

0.9999999989862 0.9481132 0.3550088 0.9950495

0.9999999991045 0.9433962 0.3532513 0.9950249

0.9999999991897 0.9386792 0.3514938 0.9950000

0.9999999992543 0.9339623 0.3497364 0.9949749

0.9999999993005 0.9292453 0.3479789 0.9949495

0.9999999993182 0.9245283 0.3462214 0.9949239

0.9999999994228 0.9198113 0.3444640 0.9948980

0.9999999996621 0.9150943 0.3427065 0.9948718

0.999999999715 0.9103774 0.3409490 0.9948454

0.9999999997249 0.9056604 0.3391916 0.9948187

0.9999999997561 0.9009434 0.3374341 0.9947917

0.9999999997581 0.8962264 0.3356766 0.9947644

0.9999999998389 0.8915094 0.3339192 0.9947368

0.9999999999611 0.8867925 0.3321617 0.9947090

0.9999999999977 0.8820755 0.3304042 0.9946809

1 0.8820755 0.3286467 1.0000000

1.0 0.0000000 0.0000000 1.0000000

Rattle timestamp: 2018-11-01 17:17:33 tsraj

======================================================================

The area under the Risk and Recall curves for Linear model

Area under the Recall (green) curve: 99% (0.994)

Rattle timestamp: 2018-11-01 17:17:33 tsraj

Summary of the Random Forest Model

==================================

Number of observations used to build the model: 398 Missing value imputation is active.

Call:

randomForest(formula = diagnosis ~ .,

data = crs$dataset[crs$train, c(crs$input, crs$target)],

ntree = 500, mtry = 5, importance = TRUE, replace = FALSE, na.action = randomForest::na.roughfix)

Type of random forest: classification Number of trees: 500

No. of variables tried at each split: 5

OOB estimate of error rate: 3.77% Confusion matrix:

B M class.error

B 245 7 0.02777778

M 8 138 0.05479452

Analysis of the Area Under the Curve (AUC)

==========================================

Call:

roc.default(response = crs$rf$y, predictor = as.numeric(crs$rf$predicted))

Data: as.numeric(crs$rf$predicted) in 252 controls (crs$rf$y B) < 146 cases (crs$rf$y M). Area under the curve: 0.9587

95% CI: 0.9376-0.9798 (DeLong)

Variable Importance

===================

B M MeanDecreaseAccuracy MeanDecreaseGini

|  |  |
| --- | --- |
| area\_worst 15.13 10.84 | 17.79 13.78 |
| concave.points\_worst 13.84 11.08 | 17.58 12.86 |
| radius\_worst 13.19 11.08 | 15.99 12.32 |
| perimeter\_worst 13.16 10.67 | 15.65 14.85 |
| concave.points\_mean 9.53 10.94 | 13.77 13.81 |
| concavity\_worst 7.32 9.27 | 11.99 3.33 |
| texture\_mean 8.28 9.79 | 11.95 2.10 |
| texture\_worst 8.63 10.24 | 11.74 2.30 |
| area\_se 8.40 7.98 | 11.33 5.83 |
| smoothness\_worst 6.42 8.05 | 10.23 1.57 |
| perimeter\_mean 8.58 5.62 | 9.60 7.04 |
| radius\_mean 8.55 5.14 | 9.37 4.99 |
| area\_mean 8.50 5.28 | 9.30 4.07 |

|  |  |
| --- | --- |
| concavity\_mean 5.31 6.54 | 9.03 3.90 |
| perimeter\_se 5.63 6.26 | 8.33 1.88 |
| radius\_se 5.66 4.59 | 7.60 1.23 |
| smoothness\_mean 4.07 6.30 | 7.34 0.92 |
| compactness\_mean 5.84 3.89 | 6.92 1.51 |
| compactness\_worst 4.29 4.11 | 6.37 1.44 |
| compactness\_se 4.34 2.83 | 5.35 0.59 |
| concavity\_se 3.20 3.77 | 5.33 0.76 |
| smoothness\_se 3.65 3.47 | 5.30 0.58 |
| symmetry\_worst 3.45 4.67 | 5.15 1.17 |
| fractal\_dimension\_worst 4.31 2.39 | 5.05 1.06 |
| texture\_se 3.97 1.92 | 4.44 0.55 |
| concave.points\_se 3.70 2.72 | 4.39 0.51 |
| symmetry\_mean 0.22 3.69 | 3.03 0.45 |
| fractal\_dimension\_mean 2.10 1.25 | 2.57 0.43 |
| fractal\_dimension\_se 1.96 1.34 | 2.56 0.64 |
| symmetry\_se 0.96 0.48 | 1.03 0.55 |

Time taken: 0.30 secs

Rattle timestamp: 2018-11-02 16:27:50 tsraj

Summary of the Random Forest Model

==================================

Number of observations used to build the model: 398 Missing value imputation is active.

Random Forest using Conditional Inference Trees

Number of trees: 500

Response: diagnosis

Inputs: radius\_mean, texture\_mean, perimeter\_mean, area\_mean, smoothness\_mean, compactness\_mean, concavity\_mean, concave.points\_mean, symmetry\_mean, fractal\_dimension\_mean, radius\_se, texture\_se, perimeter\_se, area\_se, smoothness\_se, compactness\_se, concavity\_se, concave.points\_se, symmetry\_se,

fractal\_dimension\_se, radius\_worst, texture\_worst, perimeter\_worst, area\_worst, smoothness\_worst, compactness\_worst, concavity\_worst, concave.points\_worst, symmetry\_worst, fractal\_dimension\_worst

Number of observations: 398

Variable Importance

===================

Importance perimeter\_worst 0.03954794521

concave.points\_worst 0.03890410959

radius\_worst 0.03447945205

area\_worst 0.02839726027

concave.points\_mean 0.02002739726

|  |  |  |
| --- | --- | --- |
| perimeter\_mean | | 0.01805479452 |
| radius\_mean | | 0.01502739726 |
| area\_mean | | 0.01323287671 |
| concavity\_mean | | 0.00765753425 |
| concavity\_worst | | 0.00739726027 |
| texture\_worst | | 0.00442465753 |
| texture\_mean | | 0.00431506849 |
| compactness\_worst | | 0.00398630137 |
| compactness\_mean | | 0.00305479452 |
| smoothness\_worst | | 0.00260273973 |
| area\_se | 0.00231506849 | |
| radius\_se | 0.00139726027 | |
| perimeter\_se | 0.00121917808 | |
| symmetry\_worst | 0.00098630137 | |

smoothness\_mean 0.00089041096

fractal\_dimension\_worst 0.00082191781

smoothness\_se 0.00030136986

concavity\_se 0.00019178082

symmetry\_se 0.00013698630

fractal\_dimension\_mean 0.00012328767

texture\_se 0.00004109589

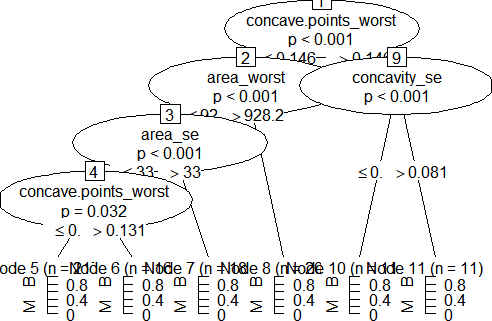
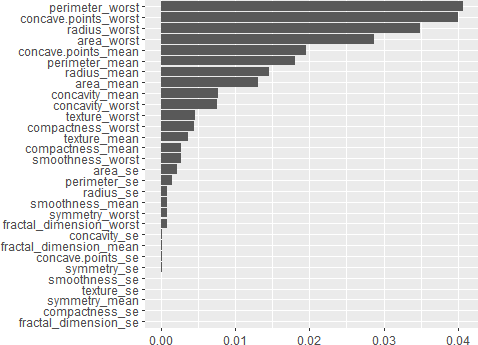
concave.points\_se 0.00004109589

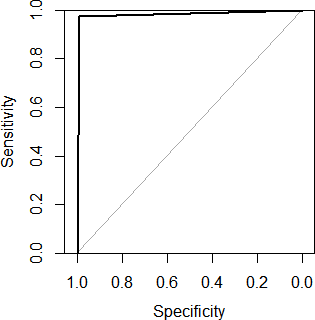
compactness\_se 0.00002739726

fractal\_dimension\_se 0.00000000000

symmetry\_mean -0.00006849315

Time taken: 2.61 secs

Rattle timestamp: 2018-11-02 16:30:54 tsraj



Summary of the Random Forest Model

==================================

Number of observations used to build the model: 398 Missing value imputation is active.

Call:

randomForest(formula = diagnosis ~ .,

data = crs$dataset[crs$train, c(crs$input, crs$target)],

ntree = 500, mtry = 5, importance = TRUE, replace = FALSE, na.action = randomForest::na.roughfix)

Type of random forest: classification Number of trees: 500

No. of variables tried at each split: 5

OOB estimate of error rate: 3.77% Confusion matrix:

B M class.error

B 245 7 0.02777778

M 8 138 0.05479452

Analysis of the Area Under the Curve (AUC)

==========================================

Call:

roc.default(response = crs$rf$y, predictor = as.numeric(crs$rf$predicted))

Data: as.numeric(crs$rf$predicted) in 252 controls (crs$rf$y B) < 146 cases (crs$rf$y M). Area under the curve: 0.9587

95% CI: 0.9376-0.9798 (DeLong)

Variable Importance

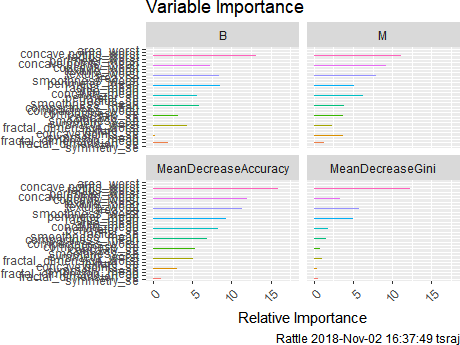
===================

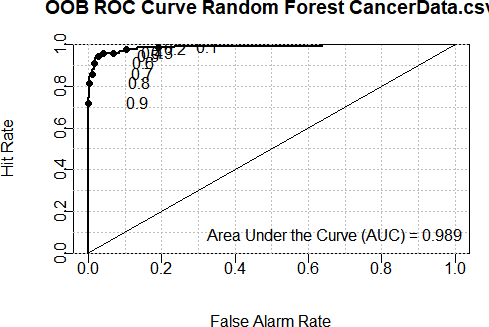
B M MeanDecreaseAccuracy MeanDecreaseGini

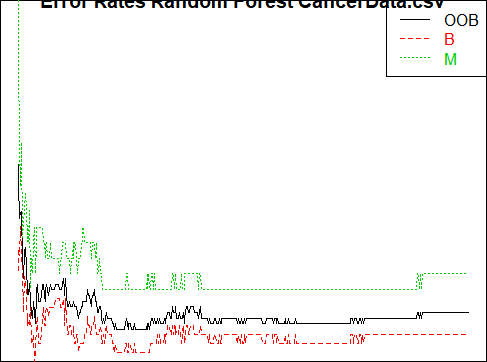
|  |  |
| --- | --- |
| area\_worst 15.13 10.84 | 17.79 13.78 |
| concave.points\_worst 13.84 11.08 | 17.58 12.86 |
| radius\_worst 13.19 11.08 | 15.99 12.32 |
| perimeter\_worst 13.16 10.67 | 15.65 14.85 |
| concave.points\_mean 9.53 10.94 | 13.77 13.81 |
| concavity\_worst 7.32 9.27 | 11.99 3.33 |
| texture\_mean 8.28 9.79 | 11.95 2.10 |
| texture\_worst 8.63 10.24 | 11.74 2.30 |
| area\_se 8.40 7.98 | 11.33 5.83 |
| smoothness\_worst 6.42 8.05 | 10.23 1.57 |
| perimeter\_mean 8.58 5.62 | 9.60 7.04 |
| radius\_mean 8.55 5.14 | 9.37 4.99 |
| area\_mean 8.50 5.28 | 9.30 4.07 |
| concavity\_mean 5.31 6.54 | 9.03 3.90 |
| perimeter\_se 5.63 6.26 | 8.33 1.88 |
| radius\_se 5.66 4.59 | 7.60 1.23 |
| smoothness\_mean 4.07 6.30 | 7.34 0.92 |
| compactness\_mean 5.84 3.89 | 6.92 1.51 |
| compactness\_worst 4.29 4.11 | 6.37 1.44 |
| compactness\_se 4.34 2.83 | 5.35 0.59 |

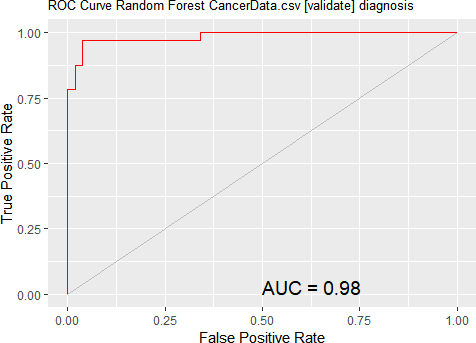
|  |  |  |
| --- | --- | --- |
| concavity\_se 3.20 3.77 | 5.33 | 0.76 |
| smoothness\_se 3.65 3.47 | 5.30 | 0.58 |
| symmetry\_worst 3.45 4.67 | 5.15 | 1.17 |
| fractal\_dimension\_worst 4.31 2.39 | 5.05 | 1.06 |
| texture\_se 3.97 1.92 | 4.44 | 0.55 |
| concave.points\_se 3.70 2.72 | 4.39 | 0.51 |
| symmetry\_mean 0.22 3.69 | 3.03 | 0.45 |
| fractal\_dimension\_mean 2.10 1.25 | 2.57 | 0.43 |
| fractal\_dimension\_se 1.96 1.34 | 2.56 | 0.64 |
| symmetry\_se 0.96 0.48 | 1.03 | 0.55 |

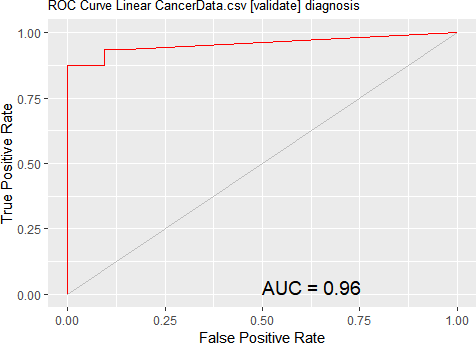
Time taken: 0.33 secs

Rattle timestamp: 2018-11-02 16:37:44 tsraj









Summary of the Logistic Regression model (built using glm):

Call:

glm(formula = diagnosis ~ ., family = binomial(link = "logit"), data = crs$dataset[crs$train, c(crs$input, crs$target)])

Deviance Residuals:

Min 1Q Median 3Q Max

-0.000095996 -0.000000021 -0.000000021 0.000000021 0.000101360

Coefficients:

Estimate Std. Error z value Pr(>|z|) (Intercept) -1000.61483 761248.66277 -0.001 0.999

|  |  |
| --- | --- |
| radius\_mean | -97.90782 192161.08689 -0.001 1.000 |
| texture\_mean | -1.52749 7268.53089 0.000 1.000 |
| perimeter\_mean | 11.62036 24789.12937 0.000 1.000 |
| area\_mean | 0.06996 1137.59682 0.000 1.000 |
| smoothness\_mean | 3596.94249 3367674.12125 0.001 0.999 |
| compactness\_mean | -2219.66177 1451428.51974 -0.002 0.999 |
| concavity\_mean | 1711.09728 1494923.49969 0.001 0.999 |
| concave.points\_mean | 847.30879 2188675.78519 0.000 1.000 |
| symmetry\_mean | 103.60976 962422.22431 0.000 1.000 |

fractal\_dimension\_mean -1178.76821 4084532.43591 0.000 1.000

|  |  |  |  |
| --- | --- | --- | --- |
| radius\_se | -234.05834 502063.31914 0.000 1.000 | | |
| texture\_se | -51.78826 48967.44486 -0.001 0.999 | | |
| perimeter\_se | 22.28591 58783.97084 0.000 1.000 | | |
| area\_se | | 2.84002 5668.17774 0.001 1.000 | |
| smoothness\_se | | 9005.17574 9414262.67903 0.001 0.999 | |
| compactness\_se | | 6422.96812 3353945.21733 0.002 0.998 | |
| concavity\_se | | -1121.20300 2735903.33151 0.000 1.000 | |
| concave.points\_se | | 1217.94946 6789082.78846 0.000 1.000 | |
| symmetry\_se | | -4547.31819 2578593.62926 -0.002 0.999 | |
| fractal\_dimension\_se | | -69157.70783 23592060.24330 -0.003 0.998 | |
| radius\_worst | | 82.16787 59057.50106 0.001 0.999 | |
| texture\_worst | | | 8.39038 6938.98401 0.001 0.999 |
| perimeter\_worst | | | -4.56604 9812.89418 0.000 1.000 |
| area\_worst | | | -0.31656 923.31265 0.000 1.000 |
| smoothness\_worst | | | -1011.75729 1964421.59749 -0.001 1.000 |
| compactness\_worst | | | -438.62888 625576.98058 -0.001 0.999 |
| concavity\_worst | | | -57.93867 508525.22171 0.000 1.000 |
| concave.points\_worst | | | 137.35946 827468.28456 0.000 1.000 |
| symmetry\_worst | | | 497.70771 379439.01635 0.001 0.999 |

fractal\_dimension\_worst 5759.84337 2409902.55103 0.002 0.998

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 5.2317e+02 on 397 degrees of freedom Residual deviance: 9.8798e-08 on 367 degrees of freedom AIC: 62

Number of Fisher Scoring iterations: 25

Log likelihood: -0.000 (31 df)

Null/Residual deviance difference: 523.170 (30 df)

Chi-square p-value: 0.00000000

Pseudo R-Square (optimistic): 1.00000000

==== ANOVA ====

Analysis of Deviance Table

Model: binomial, link: logit

Response: diagnosis

Terms added sequentially (first to last)

Df Deviance Resid. Df Resid. Dev Pr(>Chi)

|  |  |  |  |
| --- | --- | --- | --- |
| NULL | 397 | 523.17 |  |
| radius\_mean | 1 288.301 | 396 | 234.87 < 2.2e-16 \*\*\* |
| texture\_mean | 1 30.665 | 395 | 204.20 3.066e-08 \*\*\* |
| perimeter\_mean | 1 51.493 | 394 | 152.71 7.184e-13 \*\*\* |

area\_mean 1 3.341 393 149.37 0.0675854 .

smoothness\_mean 1 32.183 392 117.19 1.403e-08 \*\*\*

compactness\_mean 1 0.221 391 116.97 0.6383247

concavity\_mean 1 10.594 390 106.37 0.0011344 \*\*

concave.points\_mean 1 5.976 389 100.40 0.0145041 \*

symmetry\_mean 1 0.050 388 100.35 0.8227536

fractal\_dimension\_mean 1 3.232 387 97.11 0.0721929 .

radius\_se 1 0.612 386 96.50 0.4342138

texture\_se 1 15.411 385 81.09 8.650e-05 \*\*\*

perimeter\_se 1 0.051 384 81.04 0.8212168

area\_se 1 13.504 383 67.54 0.0002380 \*\*\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| smoothness\_se | 1 4.136 | | 382 | 63.40 0.0419689 \* |
| compactness\_se | 1 4.120 | | 381 | 59.28 0.0423710 \* |
| concavity\_se | 1 12.684 | | 380 | 46.60 0.0003687 \*\*\* |
| concave.points\_se | 1 0.423 | | 379 | 46.17 0.5155001 |
| symmetry\_se | 1 1.820 | | 378 | 44.35 0.1773220 |
| fractal\_dimension\_se 1 1.976 | | | 377 | 42.38 0.1598142 |
| radius\_worst 1 42.377 | | | 376 | 0.00 7.528e-11 \*\*\* |
| texture\_worst 1 0.000 | | | 375 | 0.00 0.9993888 |
| perimeter\_worst 1 0.000 | | | 374 | 0.00 0.9997021 |
| area\_worst 1 0.000 373 0.00 1.0000000 | | | | |
| smoothness\_worst | | 1 0.000 | 372 | 0.00 0.9998906 |
| compactness\_worst | | 1 0.000 | 371 | 0.00 1.0000000 |
| concavity\_worst | | 1 0.000 | 370 | 0.00 0.9998360 |
| concave.points\_worst | | 1 0.000 | 369 | 0.00 0.9999952 |
| symmetry\_worst | | 1 0.000 | 368 | 0.00 0.9998467 |

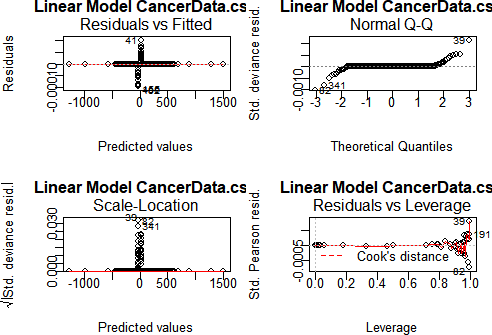
fractal\_dimension\_worst 1 0.000 367 0.00 0.9996653

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Time taken: 0.36 secs

Rattle timestamp: 2018-11-02 16:44:07 tsraj



Summary of the Probit Regression model (built using glm):

Call:

glm(formula = diagnosis ~ ., family = binomial(link = "probit"), data = crs$dataset[crs$train, c(crs$input, crs$target)])

Deviance Residuals:

Min 1Q Median 3Q Max

-0.000101599 -0.000000021 -0.000000021 0.000000021 0.000104597

|  |  |  |
| --- | --- | --- |
| Coefficients:  Estimate Std. Error z value Pr(>|z|) | |  |
| (Intercept) -283.85110 124970.41277 -0.002 | | 0.998 |
| radius\_mean -28.53109 34548.05278 -0.001 | | 0.999 |
| texture\_mean -0.42295 1163.55866 0.000 | | 1.000 |
| perimeter\_mean 3.33211 4248.88082 0.001 | | 0.999 |
| area\_mean | 0.02250 202.52746 0.000 1.000 | |
| smoothness\_mean | 1075.18012 632014.55799 0.002 0.999 | |
| compactness\_mean | -653.78728 253896.16900 -0.003 0.998 | |
| concavity\_mean | 498.70895 274485.43359 0.002 0.999 | |
| concave.points\_mean | 263.34841 361254.35356 0.001 0.999 | |
| symmetry\_mean | 25.26393 180776.47282 0.000 1.000 | |

fractal\_dimension\_mean -379.18181 693712.24471 -0.001 1.000

|  |  |  |
| --- | --- | --- |
| radius\_se | -77.94629 89882.69645 -0.001 0.999 | |
| texture\_se | -14.51040 8175.76852 -0.002 0.999 | |
| perimeter\_se | 6.70496 10286.00298 0.001 0.999 | |
| area\_se | 0.90847 1004.37254 0.001 0.999 | |
| smoothness\_se | 2703.57495 1724445.17885 0.002 0.999 | |
| compactness\_se | 1844.90459 520710.84313 0.004 0.997 | |
| concavity\_se | -301.43906 436469.75082 -0.001 0.999 | |
| concave.points\_se | 329.45611 1139075.51994 0.000 1.000 | |
| symmetry\_se | -1343.13647 445655.90081 -0.003 0.998 | |
| fractal\_dimension\_se | | -20322.56752 4111721.07940 -0.005 0.996 |
| radius\_worst | | 24.30690 10271.15053 0.002 0.998 |
| texture\_worst | | 2.38335 1141.28075 0.002 0.998 |
| perimeter\_worst | | -1.41333 1664.15664 -0.001 0.999 |
| area\_worst | | -0.09123 164.80735 -0.001 1.000 |
| smoothness\_worst | | -311.74885 373902.02654 -0.001 0.999 |
| compactness\_worst | | -120.39599 105239.51604 -0.001 0.999 |
| concavity\_worst | | -20.05196 91807.31076 0.000 1.000 |
| concave.points\_worst | | 41.42246 139853.31978 0.000 1.000 |
| symmetry\_worst | | 147.47438 68501.67910 0.002 0.998 |

fractal\_dimension\_worst 1681.60016 394145.19857 0.004 0.997

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 523.17040256182 on 397 degrees of freedom Residual deviance: 0.00000010545 on 367 degrees of freedom AIC: 62

Number of Fisher Scoring iterations: 25

Log likelihood: -0.000 (31 df)

Null/Residual deviance difference: 523.170 (30 df)

Chi-square p-value: 0.00000000

Pseudo R-Square (optimistic): 1.00000000

==== ANOVA ====

Analysis of Deviance Table

Model: binomial, link: probit

Response: diagnosis

Terms added sequentially (first to last)

Df Deviance Resid. Df Resid. Dev Pr(>Chi)

|  |  |  |  |
| --- | --- | --- | --- |
| NULL | 397 | 523.17 |  |
| radius\_mean | 1 287.392 | 396 | 235.78 < 2.2e-16 \*\*\* |
| texture\_mean | 1 30.090 | 395 | 205.69 4.124e-08 \*\*\* |
| perimeter\_mean | 1 53.582 | 394 | 152.11 2.480e-13 \*\*\* |

area\_mean 1 3.753 393 148.35 0.0527222 .

smoothness\_mean 1 32.534 392 115.82 1.171e-08 \*\*\*

compactness\_mean 1 0.280 391 115.54 0.5967093

concavity\_mean 1 9.832 390 105.71 0.0017151 \*\*

concave.points\_mean 1 6.230 389 99.48 0.0125605 \*

symmetry\_mean 1 0.034 388 99.44 0.8536301

fractal\_dimension\_mean 1 2.806 387 96.64 0.0938964 .

radius\_se 1 0.566 386 96.07 0.4519414

texture\_se 1 14.575 385 81.50 0.0001347 \*\*\*

perimeter\_se 1 0.104 384 81.39 0.7471212

area\_se 1 13.796 383 67.60 0.0002038 \*\*\*

smoothness\_se 1 3.707 382 63.89 0.0541832 .

compactness\_se 1 4.434 381 59.46 0.0352264 \*

concavity\_se 1 12.843 380 46.61 0.0003387 \*\*\*

concave.points\_se 1 0.309 379 46.30 0.5783642

symmetry\_se 1 1.792 378 44.51 0.1806390

fractal\_dimension\_se 1 2.206 377 42.30 0.1374391

|  |  |  |  |
| --- | --- | --- | --- |
| radius\_worst | 1 42.304 | 376 | 0.00 7.812e-11 \*\*\* |
| texture\_worst | 1 0.000 | 375 | 0.00 0.9992524 |
| perimeter\_worst | 1 0.000 | 374 | 0.00 0.9996586 |
| area\_worst | 1 0.000 | 373 | 0.00 1.0000000 |

|  |  |  |  |
| --- | --- | --- | --- |
| smoothness\_worst | 1 0.000 | 372 | 0.00 0.9998507 |
| compactness\_worst | 1 0.000 | 371 | 0.00 1.0000000 |
| concavity\_worst | 1 0.000 | 370 | 0.00 0.9997467 |
| concave.points\_worst | 1 0.000 | 369 | 0.00 1.0000000 |
| symmetry\_worst | 1 0.000 | 368 | 0.00 0.9998162 |

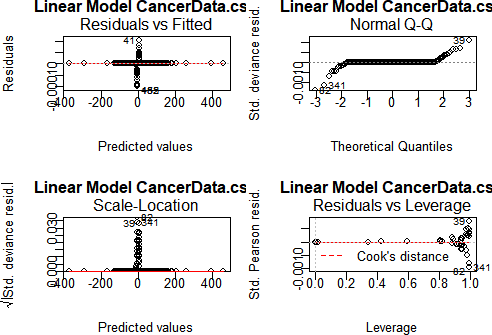
fractal\_dimension\_worst 1 0.000 367 0.00 0.9996156

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Time taken: 0.34 secs

Rattle timestamp: 2018-11-02 16:48:28 tsraj



Summary of the Extreme Boost model:

##### xgb.Booster raw: 23.7 Kb

call:

xgb.train(params = params, data = dtrain, nrounds = nrounds,

watchlist = watchlist, verbose = verbose, print\_every\_n = print\_every\_n, early\_stopping\_rounds = early\_stopping\_rounds, maximize = maximize, save\_period = save\_period, save\_name = save\_name, xgb\_model = xgb\_model, callbacks = callbacks, max\_depth = 6, eta = 0.3, num\_parallel\_tree = 1,

nthread = 2, metrics = "error", objective = "binary:logistic") params (as set within xgb.train):

max\_depth = "6", eta = "0.3", num\_parallel\_tree = "1", nthread = "2", metrics = "error", objective = "binary:logistic", silent = "1"

xgb.attributes:

niter callbacks:

cb.print.evaluation(period = print\_every\_n) cb.evaluation.log()

# of features: 31 niter: 50

nfeatures : 31 formula :

diagnosis ~ .

<environment: 0x000000002b4471f0>

dimnames : (Intercept) radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst

evaluation\_log: iter train\_error

1 0.030151

2 0.012563

---

49 0.000000

50 0.000000

Final iteration error rate: iter train\_error

1: 50 0

Importance/Frequency of variables actually used: Feature Gain Cover Frequency

1: perimeter\_worst 0.2860119772 0.0627899319 0.024875622

2: concave.points\_worst 0.2320516602 0.1667852537 0.069651741

3: area\_worst 0.2253040203 0.1535258518 0.119402985

4: concave.points\_mean 0.0837341558 0.0753190603 0.054726368

5: texture\_worst 0.0361342148 0.1025161365 0.109452736

6: texture\_mean 0.0350176633 0.0579703156 0.114427861

7: concavity\_worst 0.0266885075 0.0410815982 0.054726368

8: radius\_worst 0.0101222899 0.0449659147 0.029850746

9: radius\_mean 0.0097028514 0.0251147195 0.009950249

10: area\_se 0.0081110684 0.0544375224 0.079601990

11: fractal\_dimension\_se 0.0079110708 0.0102615135 0.029850746

12: smoothness\_mean 0.0067744858 0.0102349626 0.039800995

13: area\_mean 0.0050643620 0.0172027459 0.034825871

14: symmetry\_se 0.0047192465 0.0112897273 0.029850746

15: compactness\_se 0.0041147552 0.0143072670 0.029850746

16: symmetry\_worst 0.0038544677 0.0245684697 0.024875622

17: smoothness\_worst 0.0036052689 0.0315560044 0.044776119

18: radius\_se 0.0030701463 0.0228321335 0.014925373

19: concavity\_se 0.0017202681 0.0035817455 0.014925373

20: perimeter\_mean 0.0016395510 0.0019944309 0.009950249

21: concave.points\_se 0.0014685044 0.0019886678 0.009950249

22: compactness\_mean 0.0013108865 0.0028414750 0.014925373

23: smoothness\_se 0.0007095682 0.0420139479 0.014925373

24: fractal\_dimension\_mean 0.0005352605 0.0083152521 0.004975124

25: texture\_se 0.0003713217 0.0115063923 0.009950249

26: compactness\_worst 0.0002524276 0.0009989603 0.004975124 Feature Gain Cover Frequency

Time taken: 0.18 secs

Rattle timestamp: 2018-11-02 16:50:23 tsraj

Summary of the Extreme Boost model:

Call:

ada(diagnosis ~ ., data = crs$dataset[crs$train, c(crs$input, crs$target)], control = rpart::rpart.control(maxdepth = 6, cp = 0.01, minsplit = 20, xval = 10), iter = 50)

Loss: exponential Method: discrete Iteration: 50

Final Confusion Matrix for Data: Final Prediction

True value B M B 252 0

M 5 141

Train Error: 0.013

Out-Of-Bag Error: 0.015 iteration= 45

Additional Estimates of number of iterations:

train.err1 train.kap1 29 29

Variables actually used in tree construction:

[1] "area\_mean" "area\_se" "area\_worst"

[4] "compactness\_mean" "compactness\_se" "compactness\_worst"

[7] "concave.points\_mean" "concave.points\_se" "concave.points\_worst"

[10] "concavity\_se" "concavity\_worst" "fractal\_dimension\_mean"

[13] "fractal\_dimension\_se" "fractal\_dimension\_worst" "perimeter\_mean"

[16] "perimeter\_se" "perimeter\_worst" "radius\_mean"

[19] "radius\_se" "radius\_worst" "smoothness\_mean"

[22] "smoothness\_se" "smoothness\_worst" "symmetry\_mean"

[25] "symmetry\_se" "symmetry\_worst" "texture\_mean"

[28] "texture\_se" "texture\_worst"

Frequency of variables actually used:

|  |  |  |  |
| --- | --- | --- | --- |
| concave.points\_worst | area\_worst | texture\_mean | texture\_worst |
| 19 | 14 14 | 14 |  |
| concave.points\_mean | perimeter\_worst | area\_se | smoothness\_worst |
| 13 | 13 10 | 10 |  |

concavity\_worst radius\_worst symmetry\_se smoothness\_se 9 7 7 5

perimeter\_mean perimeter\_se smoothness\_mean concave.points\_se 3 3 3 2

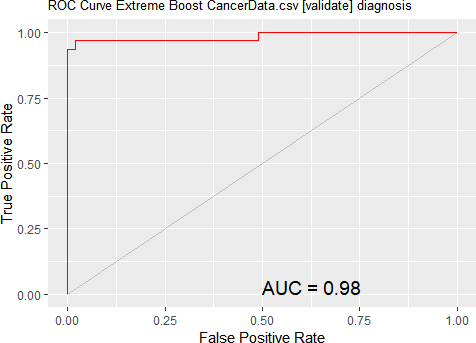
concavity\_se fractal\_dimension\_mean fractal\_dimension\_se symmetry\_worst 2 2 2 2

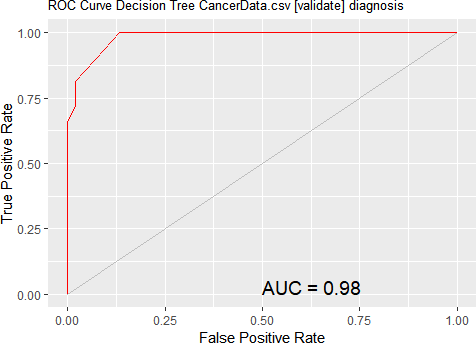
area\_mean compactness\_mean compactness\_se compactness\_worst

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1  fractal\_dimension\_worst | 1 | 1  radius\_mean | 1  radius\_se | symmetry\_mean |
| 1 | 1 | 1 | 1 |  |
| texture\_se |  |  |  |  |
| 1 |  |  |  |  |

Time taken: 1.34 secs

Rattle timestamp: 2018-11-02 16:51:00 tsraj





Summary of the SVM model (built using ksvm):

Support Vector Machine object of class "ksvm"

SV type: C-svc (classification) parameter : cost C = 1

Linear (vanilla) kernel function.

Number of Support Vectors : 31

Objective Function Value : -18.0672 Training error : 0.01005

Probability model included.

Time taken: 0.07 secs

Rattle timestamp: 2018-11-02 16:54:10 tsraj Summary of the SVM model (built using ksvm):

Support Vector Machine object of class "ksvm"

SV type: C-svc (classification) parameter : cost C = 1

Gaussian Radial Basis kernel function. Hyperparameter : sigma = 0.0363422610332654

Number of Support Vectors : 107

Objective Function Value : -48.7126 Training error : 0.015075 Probability model included.

Time taken: 0.06 secs

Rattle timestamp: 2018-11-02 16:55:19 tsraj ummary of the Neural Net model (built using nnet):

A 30-10-1 network with 351 weights.

Inputs: radius\_mean, texture\_mean, perimeter\_mean, area\_mean, smoothness\_mean, compactness\_mean, concavity\_mean, concave.points\_mean, symmetry\_mean, fractal\_dimension\_mean, radius\_se, texture\_se, perimeter\_se, area\_se, smoothness\_se, compactness\_se, concavity\_se, concave.points\_se, symmetry\_se, fractal\_dimension\_se, radius\_worst, texture\_worst, perimeter\_worst, area\_worst, smoothness\_worst, compactness\_worst, concavity\_worst, concave.points\_worst, symmetry\_worst, fractal\_dimension\_worst.

Output: as.factor(diagnosis).

Sum of Squares Residuals: 146.0000.

Neural Network build options: skip-layer connections; entropy fitting.

In the following table:

b represents the bias associated with a node h1 represents hidden layer node 1

i1 represents input node 1 (i.e., input variable 1) o represents the output node

Weights for node h1:

b->h1 i1->h1 i2->h1 i3->h1 i4->h1 i5->h1 i6->h1 i7->h1 i8->h1 i9->h1 i10->h1 i11->h1

-0.66 0.23 0.29 -0.31 -0.68 -0.36 0.27 0.23 -0.31 -0.18 0.31 -0.02

i12->h1 i13->h1 i14->h1 i15->h1 i16->h1 i17->h1 i18->h1 i19->h1 i20->h1 i21->h1 i22->h1 i23->h1 0.29 -0.50 0.39 0.25 -0.16 -0.55 -0.52 0.25 -0.65 -0.15 -0.03 -0.20

i24->h1 i25->h1 i26->h1 i27->h1 i28->h1 i29->h1 i30->h1 0.30 -0.16 -0.04 0.49 0.56 0.44 0.41

Weights for node h2:

b->h2 i1->h2 i2->h2 i3->h2 i4->h2 i5->h2 i6->h2 i7->h2 i8->h2 i9->h2 i10->h2 i11->h2 0.51 0.38 0.22 0.47 -0.41 0.15 -0.22 0.46 -0.08 -0.41 0.33 -0.54

i12->h2 i13->h2 i14->h2 i15->h2 i16->h2 i17->h2 i18->h2 i19->h2 i20->h2 i21->h2 i22->h2 i23->h2 0.56 0.59 0.64 0.13 -0.68 -0.51 0.55 0.05 0.15 0.31 -0.15 0.24

i24->h2 i25->h2 i26->h2 i27->h2 i28->h2 i29->h2 i30->h2 0.02 0.33 -0.44 -0.47 -0.68 0.07 0.30

Weights for node h3:

b->h3 i1->h3 i2->h3 i3->h3 i4->h3 i5->h3 i6->h3 i7->h3 i8->h3 i9->h3 i10->h3 i11->h3 0.35 -0.01 0.09 0.65 -0.36 -0.41 -0.56 0.50 -0.53 -0.19 -0.24 -0.62

i12->h3 i13->h3 i14->h3 i15->h3 i16->h3 i17->h3 i18->h3 i19->h3 i20->h3 i21->h3 i22->h3 i23->h3 0.23 -0.47 -0.14 -0.28 0.33 0.44 -0.07 -0.08 0.51 -0.17 -0.26 0.07

i24->h3 i25->h3 i26->h3 i27->h3 i28->h3 i29->h3 i30->h3

-0.01 -0.52 0.14 -0.18 -0.62 0.70 -0.04

Weights for node h4:

b->h4 i1->h4 i2->h4 i3->h4 i4->h4 i5->h4 i6->h4 i7->h4 i8->h4 i9->h4 i10->h4 i11->h4

-0.37 -0.06 -0.07 -0.12 0.41 0.37 0.03 -0.19 -0.46 0.05 0.29 -0.18

i12->h4 i13->h4 i14->h4 i15->h4 i16->h4 i17->h4 i18->h4 i19->h4 i20->h4 i21->h4 i22->h4 i23->h4

-0.51 -0.16 0.55 0.51 -0.57 -0.56 -0.02 0.09 0.21 0.62 0.06 0.66 i24->h4 i25->h4 i26->h4 i27->h4 i28->h4 i29->h4 i30->h4

0.07 -0.39 0.08 0.50 -0.64 0.12 0.45

Weights for node h5:

b->h5 i1->h5 i2->h5 i3->h5 i4->h5 i5->h5 i6->h5 i7->h5 i8->h5 i9->h5 i10->h5 i11->h5

-0.21 -0.54 -0.44 0.08 -0.61 0.57 0.30 0.64 0.16 -0.42 0.51 -0.59

i12->h5 i13->h5 i14->h5 i15->h5 i16->h5 i17->h5 i18->h5 i19->h5 i20->h5 i21->h5 i22->h5 i23->h5

-0.23 0.31 -0.19 0.69 -0.37 0.26 -0.18 -0.16 0.53 -0.42 -0.65 -0.30 i24->h5 i25->h5 i26->h5 i27->h5 i28->h5 i29->h5 i30->h5

-0.49 -0.69 0.68 0.26 0.17 -0.22 0.23

Weights for node h6:

b->h6 i1->h6 i2->h6 i3->h6 i4->h6 i5->h6 i6->h6 i7->h6 i8->h6 i9->h6 i10->h6 i11->h6

-0.25 0.06 -0.52 -0.13 0.58 0.14 0.28 0.23 0.53 0.25 0.34 -0.02

i12->h6 i13->h6 i14->h6 i15->h6 i16->h6 i17->h6 i18->h6 i19->h6 i20->h6 i21->h6 i22->h6 i23->h6

-0.17 0.33 0.57 0.46 0.47 0.68 -0.44 -0.61 0.16 -0.65 0.20 0.55 i24->h6 i25->h6 i26->h6 i27->h6 i28->h6 i29->h6 i30->h6

-0.44 0.05 0.43 -0.24 0.63 -0.07 -0.59

Weights for node h7:

b->h7 i1->h7 i2->h7 i3->h7 i4->h7 i5->h7 i6->h7 i7->h7 i8->h7 i9->h7 i10->h7 i11->h7 0.50 0.35 0.31 -0.15 0.14 0.30 0.50 -0.63 -0.54 -0.44 0.65 0.27

i12->h7 i13->h7 i14->h7 i15->h7 i16->h7 i17->h7 i18->h7 i19->h7 i20->h7 i21->h7 i22->h7 i23->h7

-0.49 -0.66 0.60 -0.56 0.19 0.04 -0.28 -0.38 -0.41 -0.14 -0.01 0.09 i24->h7 i25->h7 i26->h7 i27->h7 i28->h7 i29->h7 i30->h7

0.17 -0.45 0.61 -0.17 -0.07 -0.44 -0.22

Weights for node h8:

b->h8 i1->h8 i2->h8 i3->h8 i4->h8 i5->h8 i6->h8 i7->h8 i8->h8 i9->h8 i10->h8 i11->h8

-0.67 -0.07 0.57 -0.64 0.31 -0.04 -0.70 0.40 -0.31 -0.02 0.64 0.12

i12->h8 i13->h8 i14->h8 i15->h8 i16->h8 i17->h8 i18->h8 i19->h8 i20->h8 i21->h8 i22->h8 i23->h8

-0.25 -0.17 -0.17 -0.33 0.68 -0.26 0.48 -0.51 0.24 -0.58 -0.58 -0.58 i24->h8 i25->h8 i26->h8 i27->h8 i28->h8 i29->h8 i30->h8

-0.41 0.31 0.18 0.09 0.35 -0.62 -0.17

Weights for node h9:

b->h9 i1->h9 i2->h9 i3->h9 i4->h9 i5->h9 i6->h9 i7->h9 i8->h9 i9->h9 i10->h9 i11->h9 0.44 0.36 -0.62 -0.55 0.31 -0.52 0.06 0.40 0.10 -0.07 -0.43 0.60

i12->h9 i13->h9 i14->h9 i15->h9 i16->h9 i17->h9 i18->h9 i19->h9 i20->h9 i21->h9 i22->h9 i23->h9

-0.63 0.12 0.36 -0.67 -0.58 -0.41 0.56 0.57 0.29 -0.28 0.25 -0.39 i24->h9 i25->h9 i26->h9 i27->h9 i28->h9 i29->h9 i30->h9

0.43 -0.29 -0.36 0.08 -0.61 0.36 -0.12

Weights for node h10:

b->h10 i1->h10 i2->h10 i3->h10 i4->h10 i5->h10 i6->h10 i7->h10 i8->h10 i9->h10 i10->h10 0.14 -0.25 -0.20 0.50 -0.15 0.10 -0.20 -0.69 0.50 -0.33 0.24

i11->h10 i12->h10 i13->h10 i14->h10 i15->h10 i16->h10 i17->h10 i18->h10 i19->h10 i20->h10 i21->h10

-0.17 -0.38 -0.09 -0.66 -0.37 -0.70 0.04 0.26 -0.57 0.59 -0.15

i22->h10 i23->h10 i24->h10 i25->h10 i26->h10 i27->h10 i28->h10 i29->h10 i30->h10

-0.42 0.43 0.46 0.46 0.62 -0.35 0.68 0.30 -0.65

Weights for node o:

b->o h1->o h2->o h3->o h4->o h5->o h6->o h7->o h8->o h9->o h10->o i1->o

-0.05 0.32 0.40 -0.53 -0.33 -0.30 -0.40 -0.56 0.27 -0.45 -0.10 -5.38

i2->o i3->o i4->o i5->o i6->o i7->o i8->o i9->o i10->o i11->o i12->o i13->o

-7.27 -31.40 -182.28 0.38 0.32 -0.12 -0.55 -0.24 -0.61 -0.64 -0.36 -1.45

i14->o i15->o i16->o i17->o i18->o i19->o i20->o i21->o i22->o i23->o i24->o i25->o

-7.74 0.00 -0.64 -0.18 -0.46 -0.64 -0.33 -5.97 -9.47 -34.21 -219.97 0.48

i26->o i27->o i28->o i29->o i30->o

-0.38 -0.46 -0.15 -0.35 -0.38

Time taken: 0.05 secs

Rattle timestamp: 2018-11-02 16:56:25 tsraj

Area under the ROC curve for the rpart model on CancerData.csv [validate] is 0.9835

Rattle timestamp: 2018-11-02 16:57:29 tsraj

======================================================================

Area under the ROC curve for the ada model on CancerData.csv [validate] is 0.9841

Rattle timestamp: 2018-11-02 16:57:30 tsraj

======================================================================

Area under the ROC curve for the rf model on CancerData.csv [validate] is 0.9841

Rattle timestamp: 2018-11-02 16:57:31 tsraj

======================================================================

Area under the ROC curve for the ksvm model on CancerData.csv [validate] is 0.9882

Rattle timestamp: 2018-11-02 16:57:31 tsraj

======================================================================

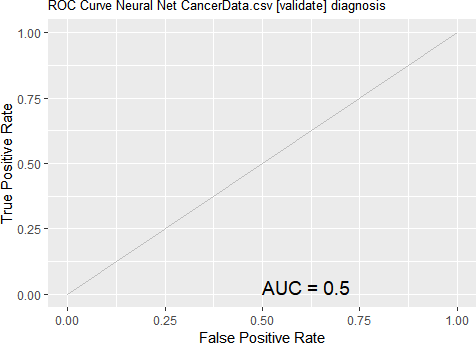
Area under the ROC curve for the glm model on CancerData.csv [validate] is 0.9581

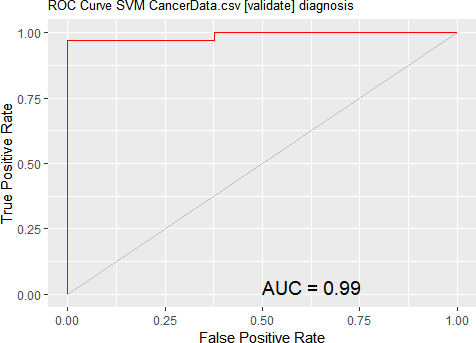
Rattle timestamp: 2018-11-02 16:57:32 tsraj

======================================================================

Area under the ROC curve for the nnet model on CancerData.csv [validate] is 0.5000

Rattle timestamp: 2018-11-02 16:57:32 tsraj





Cluster sizes:

[1] "52 64 39 52 21 27 46 8 52 37"

Data means:

radius\_mean texture\_mean perimeter\_mean area\_mean 0.33781942 0.39775433 0.33237537 0.21755586

smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean

0.38984328 0.25719489 0.20793143 0.24156895

symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se 0.40158131 0.26704129 0.10859066 0.19027388

perimeter\_se area\_se smoothness\_se compactness\_se 0.10090746 0.06430258 0.24484824 0.17243969

concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se 0.08048032 0.22096293 0.17871962 0.09742486

radius\_worst texture\_worst perimeter\_worst area\_worst 0.29742138 0.38880229 0.28357135 0.17262563

smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst 0.40019469 0.21998226 0.21848618 0.39334362

symmetry\_worst fractal\_dimension\_worst 0.26117875 0.18793215

Cluster centers:

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 0.5721520 | 0.4913661 | 0.5648924 0.42620116 | 0.4233790 | 0.3492412 |
| 2 0.3164904 | 0.2857754 | 0.3025070 0.18556469 | 0.2864226 | 0.1362733 |
| 3 0.3033393 | 0.6146505 | 0.2916319 0.17783506 | 0.2902272 | 0.1546932 |
| 4 0.3811641 | 0.3941590 | 0.3756771 0.23811975 | 0.4071968 | 0.2951093 |
| 5 0.7424663 | 0.5428571 | 0.7558335 0.61997677 | 0.5374371 | 0.6158868 |
| 6 0.3478158 | 0.4808821 | 0.3607675 0.21116060 | 0.5700701 | 0.5353614 |
| 7 0.1895098 | 0.2124121 | 0.1804268 0.09837706 | 0.3545164 | 0.1188404 |
| 8 0.1456292 | 0.2822095 | 0.1595432 0.07320255 | 0.5058567 | 0.5099610 |
| 9 0.2134698 | 0.3287823 | 0.2114667 0.11285341 | 0.4554413 | 0.2566950 |
| 10 0.1845497 | 0.4456432 | 0.1744925 0.09542289 | 0.3135716 | 0.1032419 |

concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 0.36770510 | 0.46701426 | 0.4305775 | 0.1924333 0.23529088 0.1978923 |
| 2 | 0.07648555 | 0.11266681 | 0.3028846 | 0.1607618 0.04570546 0.1127180 |
| 3 | 0.11036137 | 0.13532574 | 0.3196933 | 0.1761065 0.08174116 0.2585109 |
| 4 | 0.23000685 | 0.28708900 | 0.3918347 | 0.2433616 0.08213903 0.1209747 |
| 5 | 0.69692507 | 0.75404715 | 0.5764330 | 0.3389196 0.36443789 0.2070810 |
| 6 | 0.45550870 | 0.43429608 | 0.5980900 | 0.4896643 0.10764815 0.1840965 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7 | 0.05415660 | 0.08411023 | 0.3320811 | 0.2673208 0.04999331 0.1257010 |
| 8 | 0.51305061 | 0.28604001 | 0.5916847 | 0.8001527 0.10898515 0.2470717 |
| 9 | 0.14567939 | 0.16859220 | 0.4517147 | 0.3528287 0.07632279 0.2170151 |
| 10 | 0.03706547 | 0.05290608 | 0.3637668 | 0.2454291 0.07836810 0.3645710 |

perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se symmetry\_se

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 0.20955948 0.16350870 | 0.2276182 | 0.20809637 | 0.09668706 | 0.3012262 | 0.1666486 |
| 2 0.04203378 0.02393148 | 0.1464443 | 0.08670333 | 0.04056017 | 0.1397353 | 0.1130744 |
| 3 0.07372625 0.04045441 | 0.1975357 | 0.13194802 | 0.06301722 | 0.1923096 | 0.1406504 |
| 4 0.07842363 0.04651300 | 0.1872147 | 0.16862222 | 0.07926331 | 0.2285839 | 0.1348697 |
| 5 0.35513358 0.30232575 | 0.2761649 | 0.34139525 | 0.16928571 | 0.3498408 | 0.2446872 |
| 6 0.10763480 0.05733107 | 0.2539736 | 0.34325379 | 0.13802376 | 0.2950313 | 0.2388146 |
| 7 0.04382038 0.01837227 | 0.2650038 | 0.07400754 | 0.03542944 | 0.1474019 | 0.1796559 |
| 8 0.10249493 0.03119883 | 0.4580885 | 0.53387396 | 0.39233902 | 0.5148466 | 0.2959560 |
| 9 0.07468947 0.02975752 | 0.3628635 | 0.21536561 | 0.08942648 | 0.2535493 | 0.2070893 |
| 10 0.06856941 0.02765065 | 0.3086872 | 0.08203085 | 0.03048485 | 0.1230720 | 0.2633093 |

fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst

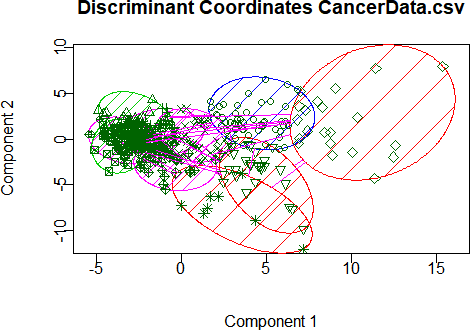
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 0.10233356 | 0.5592316 | 0.4824548 | 0.5301444 0.38415692 | 0.4426595 |
| 2 | 0.04315801 | 0.2543634 | 0.2911123 | 0.2347618 0.12751379 | 0.2840236 |
| 3 | 0.07207324 | 0.2537011 | 0.5879267 | 0.2356078 0.12924305 | 0.3010073 |
| 4 | 0.08178811 | 0.3383343 | 0.3920581 | 0.3251177 0.18604805 | 0.4447676 |
| 5 | 0.14875597 | 0.7012587 | 0.4835623 | 0.6958917 0.52963785 | 0.5035896 |
| 6 | 0.17191541 | 0.3378526 | 0.5359936 | 0.3411783 0.18733160 | 0.6485358 |
| 7 | 0.06375045 | 0.1466026 | 0.2003353 | 0.1330841 0.06500314 | 0.3651149 |
| 8 | 0.47139768 | 0.1098942 | 0.2348463 | 0.1160852 0.04590727 | 0.4502328 |
| 9 | 0.12368292 | 0.1701400 | 0.3200221 | 0.1655030 0.07745291 | 0.4640657 |
| 10 | 0.07370255 | 0.1407588 | 0.4147656 | 0.1268126 0.06182911 | 0.2864886 |

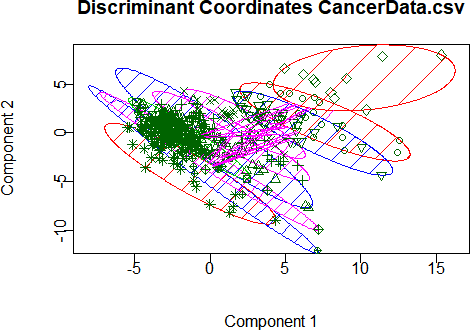
compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst

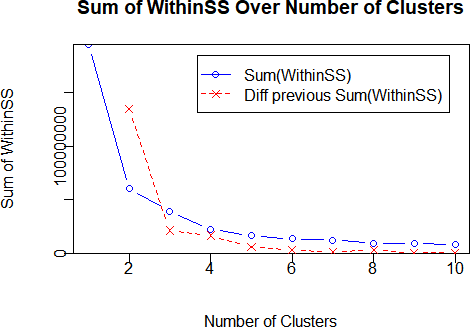
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 0.28483577 | 0.32263763 | 0.6403185 | 0.2821081 | 0.1863149 |
| 2 | 0.13169639 | 0.11680871 | 0.2562333 | 0.2132059 | 0.1124926 |
| 3 | 0.14824708 | 0.15227370 | 0.2963080 | 0.2106223 | 0.1266461 |
| 4 | 0.28471076 | 0.28554620 | 0.5192770 | 0.2978135 | 0.2160504 |
| 5 | 0.44660431 | 0.51743496 | 0.8396334 | 0.3350042 | 0.2603743 |
| 6 | 0.55803569 | 0.52281978 | 0.7046201 | 0.4762979 | 0.4482779 |
| 7 | 0.08882817 | 0.07291087 | 0.1822389 | 0.2078823 | 0.1365091 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 8 | 0.31596909 | 0.44532748 | 0.4301804 | 0.2731618 | 0.4155024 |
| 9 | 0.19634524 | 0.16531288 | 0.3071418 | 0.2471417 | 0.2020328 |
| 10 | 0.06640162 | 0.03844463 | 0.1038917 | 0.2010645 | 0.1095883 |

Within cluster sum of squares:







EWKM: 10 clusters, 0 iterations, 0 restarts, 1 total iterations.

Cluster sizes:

[1] "19 31 79 18 66 61 20 50 22 32"

Data means:

radius\_mean texture\_mean perimeter\_mean area\_mean 0.33781942 0.39775433 0.33237537 0.21755586

smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean 0.38984328 0.25719489 0.20793143 0.24156895

symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se 0.40158131 0.26704129 0.10859066 0.19027388

perimeter\_se area\_se smoothness\_se compactness\_se 0.10090746 0.06430258 0.24484824 0.17243969

concavity\_se concave.points\_se symmetry\_se fractal\_dimension\_se 0.08048032 0.22096293 0.17871962 0.09742486

radius\_worst texture\_worst perimeter\_worst area\_worst 0.29742138 0.38880229 0.28357135 0.17262563

smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst 0.40019469 0.21998226 0.21848618 0.39334362

symmetry\_worst fractal\_dimension\_worst 0.26117875 0.18793215

Cluster centers:

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 0.3753908 | 0.6139113 | 0.3604196 0.23511749 | 0.2949402 | 0.1639373 |
| 2 0.2993882 | 0.3129300 | 0.2854340 0.17270345 | 0.2462033 | 0.1176031 |
| 3 0.2312240 | 0.4822680 | 0.2227274 0.12536988 | 0.3402717 | 0.1592335 |
| 4 0.7749276 | 0.5672660 | 0.7882739 0.65954990 | 0.5357347 | 0.6126686 |
| 5 0.5553792 | 0.4723626 | 0.5482030 0.40750088 | 0.4206997 | 0.3452707 |
| 6 0.3295897 | 0.4548126 | 0.3354317 0.19672479 | 0.5035763 | 0.4233392 |
| 7 0.3538265 | 0.2081950 | 0.3389503 0.21520255 | 0.3291370 | 0.1478590 |
| 8 0.1910284 | 0.2727386 | 0.1812522 0.09921273 | 0.3285763 | 0.1111183 |
| 9 0.3030690 | 0.1692380 | 0.2956854 0.17451075 | 0.3962757 | 0.2246474 |
| 10 0.1802440 | 0.2558610 | 0.1817234 0.09346501 | 0.4744629 | 0.3102714 |

concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 0.12346434 | 0.17797792 | 0.3640303 | 0.1370217 0.08544936 0.20785798 |
| 2 | 0.07578914 | 0.09083916 | 0.2667669 | 0.1618610 0.03549146 0.13477766 |
| 3 | 0.08648823 | 0.10588375 | 0.3642292 | 0.2386001 0.07983828 0.27898485 |
| 4 | 0.69935177 | 0.76838966 | 0.5545022 | 0.3080829 0.37867302 0.21184116 |
| 5 | 0.36051731 | 0.45312669 | 0.4334187 | 0.1941136 0.21692098 0.18284183 |
| 6 | 0.34853004 | 0.34816429 | 0.4927979 | 0.4036592 0.09103214 0.17467415 |
| 7 | 0.09403936 | 0.15860015 | 0.3413326 | 0.1469356 0.05808800 0.10360458 |
| 8 | 0.05120078 | 0.07982594 | 0.3551354 | 0.2446420 0.06583089 0.21088446 |
| 9 | 0.12872433 | 0.18392147 | 0.3361814 | 0.2641782 0.04338880 0.04818395 |
| 10 | 0.19729015 | 0.16865821 | 0.4763170 | 0.4952809 0.06544903 0.16717521 |

perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se symmetry\_se

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 0.07575446 0.04715820 | 0.1583476 | 0.10080828 | 0.05536935 | 0.1900549 | 0.1551827 |
| 2 0.03307808 0.01907468 | 0.1193714 | 0.08328326 | 0.04271204 | 0.1220142 | 0.0871714 |
| 3 0.07281806 0.03235345 | 0.2706262 | 0.13573950 | 0.05806105 | 0.1812906 | 0.2048144 |
| 4 0.37512500 0.32020637 | 0.2778960 | 0.33750413 | 0.16191639 | 0.3534024 | 0.2460585 |
| 5 0.19260336 0.14966436 | 0.2227021 | 0.20023389 | 0.09685989 | 0.2906697 | 0.1615116 |
| 6 0.09057448 0.04704987 | 0.2463597 | 0.27352750 | 0.12360904 | 0.2762443 | 0.1891742 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 7 0.05315460 0.03164371 | 0.1810543 | 0.08362724 | 0.04190884 | 0.1857700 | 0.1107320 |
| 8 0.05716251 0.02413237 | 0.3101143 | 0.09104620 | 0.03754947 | 0.1636992 | 0.2314628 |
| 9 0.04135308 0.02136170 | 0.1730309 | 0.10936190 | 0.05134183 | 0.1657416 | 0.1177656 |
| 10 0.06636521 0.02275399 | 0.3655977 | 0.27512289 | 0.13674006 | 0.2588996 | 0.1966321 |

fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 0.04652858 | 0.3237657 | 0.5947338 | 0.2997948 0.17646739 | 0.2945429 |
| 2 | 0.04077282 | 0.2398412 | 0.3390677 | 0.2201032 0.11881921 | 0.2442265 |
| 3 | 0.08008271 | 0.1872936 | 0.4647198 | 0.1737069 0.08741824 | 0.3439322 |
| 4 | 0.13746397 | 0.7285268 | 0.5018339 | 0.7272717 0.55891991 | 0.4937522 |
| 5 | 0.09829243 | 0.5380647 | 0.4658509 | 0.5090604 0.36320068 | 0.4489503 |
| 6 | 0.14012641 | 0.3063958 | 0.4828788 | 0.3046017 0.16405570 | 0.5685492 |
| 7 | 0.04451999 | 0.2817147 | 0.2058907 | 0.2596593 0.14588576 | 0.3146734 |
| 8 | 0.06935050 | 0.1414963 | 0.2292146 | 0.1278012 0.06242332 | 0.2944106 |
| 9 | 0.06979081 | 0.2456906 | 0.1621178 | 0.2333736 0.12033367 | 0.4149712 |
| 10 | 0.21555862 | 0.1425216 | 0.2449843 | 0.1447563 0.06366435 | 0.4873869 |

compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 0.15417068 | 0.17030478 | 0.3679888 | 0.2734912 | 0.11257828 |
| 2 | 0.12613166 | 0.12052425 | 0.2270135 | 0.1843918 | 0.11389132 |
| 3 | 0.12970658 | 0.10873559 | 0.2249793 | 0.2246417 | 0.13395421 |
| 4 | 0.44164163 | 0.49834487 | 0.8473654 | 0.3233020 | 0.23676155 |
| 5 | 0.28370353 | 0.32898756 | 0.6344892 | 0.2922931 | 0.18773131 |
| 6 | 0.42559887 | 0.41078668 | 0.6050758 | 0.3794243 | 0.34469778 |
| 7 | 0.11796868 | 0.11525240 | 0.3035808 | 0.1995466 | 0.09714351 |
| 8 | 0.06867713 | 0.04889382 | 0.1428902 | 0.1866785 | 0.10282697 |
| 9 | 0.18945546 | 0.17116831 | 0.3435208 | 0.2437683 | 0.19137061 |
| 10 | 0.24593848 | 0.22307907 | 0.3105037 | 0.2608294 | 0.29912764 |

Cluster weights:

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.03 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 |
| 2 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 |
| 3 | 0.04 | 0.01 | 0.04 | 0.05 | 0.02 | 0.04 |
| 4 | 0.04 | 0.04 | 0.04 | 0.03 | 0.04 | 0.03 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 5 | 0.04 | 0.02 | 0.04 | 0.04 | 0.04 | 0.03 |
| 6 | 0.05 | 0.02 | 0.05 | 0.06 | 0.03 | 0.02 |
| 7 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 8 | 0.04 | 0.03 | 0.04 | 0.04 | 0.02 | 0.04 |
| 9 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 10 | 0.04 | 0.03 | 0.04 | 0.05 | 0.03 | 0.03 |

concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 2 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 3 | 0.04 | 0.04 | 0.01 | 0.03 | 0.04 | 0.01 |
| 4 | 0.03 | 0.04 | 0.02 | 0.03 | 0.02 | 0.04 |
| 5 | 0.02 | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 |
| 6 | 0.02 | 0.03 | 0.02 | 0.02 | 0.06 | 0.05 |
| 7 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 8 | 0.04 | 0.04 | 0.02 | 0.03 | 0.04 | 0.01 |
| 9 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 |
| 10 | 0.02 | 0.04 | 0.03 | 0.01 | 0.05 | 0.04 |

perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se symmetry\_se

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.04 | 0.04 | 0.03 | 0.04 | 0.04 | 0.03 | 0.03 |
| 2 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| 3 | 0.04 | 0.05 | 0.02 | 0.03 | 0.05 | 0.03 | 0.03 |
| 4 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.04 | 0.02 |
| 5 | 0.04 | 0.04 | 0.04 | 0.03 | 0.06 | 0.04 | 0.03 |
| 6 | 0.06 | 0.06 | 0.04 | 0.01 | 0.04 | 0.04 | 0.02 |
| 7 | 0.04 | 0.04 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 |
| 8 | 0.04 | 0.04 | 0.01 | 0.03 | 0.04 | 0.03 | 0.03 |
| 9 | 0.04 | 0.04 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 |
| 10 | 0.05 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02 | 0.04 |

fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst smoothness\_worst

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.04 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 2 | 0.04 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 3 | 0.04 | 0.04 | 0.02 | 0.04 | 0.05 | 0.02 |
| 4 | 0.05 | 0.04 | 0.04 | 0.04 | 0.03 | 0.04 |
| 5 | 0.05 | 0.03 | 0.02 | 0.04 | 0.03 | 0.03 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 6 | 0.05 | 0.04 | 0.02 | 0.05 | 0.05 | 0.02 |
| 7 | 0.04 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 8 | 0.04 | 0.04 | 0.03 | 0.04 | 0.04 | 0.02 |
| 9 | 0.04 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 |
| 10 | 0.02 | 0.04 | 0.03 | 0.04 | 0.05 | 0.03 |

compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst fractal\_dimension\_worst

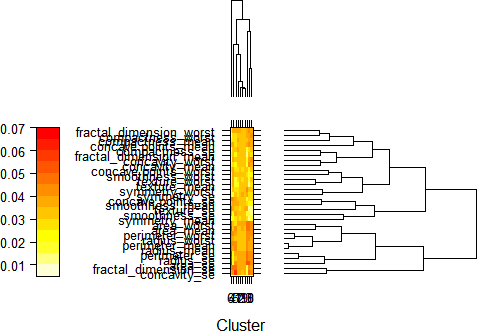
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| 2 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 3 | 0.04 | 0.04 | 0.02 | 0.03 | 0.04 |
| 4 | 0.03 | 0.04 | 0.04 | 0.03 | 0.04 |
| 5 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| 6 | 0.01 | 0.01 | 0.03 | 0.02 | 0.02 |
| 7 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| 8 | 0.04 | 0.04 | 0.03 | 0.03 | 0.04 |
| 9 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 10 | 0.04 | 0.02 | 0.03 | 0.04 | 0.04 |

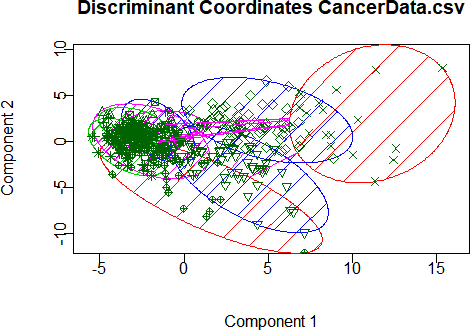
Within cluster sum of squares:

[1] 0 0 0 0 0 0 0 0 0 0

Time taken: 0.00 secs

Rattle timestamp: 2018-11-02 17:04:20 tsraj





Hierachical Cluster

Call:

amap::hclusterpar(x = ., method = "euclidean", link = "ward", nbproc = 1)

Cluster method : ward Distance : euclidean Number of objects: 398

Time taken: 0.10 secs

Rattle timestamp: 2018-11-02 17:07:30 tsraj

Hierachical Cluster

Call:

amap::hclusterpar(x = ., method = "euclidean", link = "ward", nbproc = 1)

Cluster method : ward Distance : euclidean Number of objects: 398

Time taken: 0.10 secs

Rattle timestamp: 2018-11-02 17:07:30 tsraj

======================================================================

Cluster means:

radius\_mean texture\_mean perimeter\_mean area\_mean smoothness\_mean compactness\_mean

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| [1,] | 9.673764 | 17.44218 | 61.84345 287.1255 | 0.09771836 | 0.08393745 |
| [2,] | 14.241316 | 19.26289 | 92.66605 627.7553 | 0.09543895 | 0.10527053 |
| [3,] | 20.763333 | 21.21000 | 138.45714 1349.6000 | 0.10656429 | 0.17728286 |
| [4,] | 12.776000 | 18.41120 | 82.16380 503.6320 | 0.09033180 | 0.07632780 |
| [5,] | 15.380000 | 19.88963 | 100.92889 729.9148 | 0.10011630 | 0.12910815 |
| [6,] | 16.707879 | 20.59121 | 109.39212 872.2364 | 0.09913636 | 0.11994303 |
| [7,] | 24.485000 | 23.25600 | 163.18000 1903.3000 | 0.10252400 | 0.16428200 |
| [8,] | 11.665357 | 18.59643 | 74.84286 418.1774 | 0.09220036 | 0.07731643 |
| [9,] | 13.567500 | 18.55295 | 87.80523 567.4727 | 0.09187773 | 0.09227886 |
| [10,] | 18.969167 | 22.08222 | 125.44167 1123.6778 | 0.09973861 | 0.14688694 |

concavity\_mean concave.points\_mean symmetry\_mean fractal\_dimension\_mean radius\_se texture\_se

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| [1,] | 0.05108395 | 0.01951782 | 0.1841345 | 0.06953564 0.3073036 | 1.527907 |
| [2,] | 0.08384895 | 0.04678842 | 0.1780842 | 0.06173868 0.3359579 | 1.053266 |
| [3,] | 0.22825714 | 0.12210952 | 0.1990048 | 0.06248667 0.8646810 | 1.140667 |
| [4,] | 0.04515686 | 0.02646972 | 0.1728300 | 0.06037000 0.2736560 | 1.118784 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [5,] | 0.12513259 | 0.06452407 | | 0.1871926 | | 0.06351704 0.3939370 | | 1.009711 |
| [6,] | 0.11880848 | 0.07297879 | | 0.1833848 | | 0.05970727 0.5020545 | | 1.212330 |
| [7,] | 0.23825000 | 0.13839100 | | 0.1802600 | | 0.05846600 1.3881900 | | 1.193860 |
| [8,] | 0.04260840 | 0.02458631 | | 0.1745905 | | 0.06280393 0.2860250 | | 1.365424 |
| [9,] | 0.06430564 | 0.03527832 | | 0.1692159 | | 0.06131795 0.2542295 | | 0.991250 |
| [10,] | 0.17175361 | 0.09592167 | | 0.1932694 | | 0.06071222 0.7199750 | | 1.237436 |
| perimeter\_se area\_se smoothness\_se compactness\_se concavity\_se concave.points\_se | | | | | | | | |
| [1,] | 2.105836 18.26076 | | 0.010162691 | | 0.02653996 | 0.03841905 | 0.010788345 | |
| [2,] | 2.462316 29.81711 | | 0.005925211 | | 0.02460945 | 0.02903821 | 0.011402553 | |
| [3,] | 6.074857 117.19429 | | 0.006971524 | | 0.03883048 | 0.05246476 | 0.016564286 | |
| [4,] | 1.876900 21.33740 | | 0.006154480 | | 0.01921192 | 0.02296532 | 0.008731880 | |
| [5,] | 2.774926 36.66630 | | 0.006347037 | | 0.02987389 | 0.04093222 | 0.014015222 | |
| [6,] | 3.511364 53.50818 | | 0.006076242 | | 0.02613955 | 0.03069576 | 0.012893879 | |
| [7,] | 9.970800 238.03000 | | 0.006747800 | | 0.03036800 | 0.04314800 | 0.016171000 | |
| [8,] | 2.022495 20.58694 | | 0.007572143 | | 0.02113699 | 0.02360232 | 0.010154798 | |
| [9,] | 1.861657 21.41295 | | 0.005309864 | | 0.02136716 | 0.02515389 | 0.009973636 | |
| [10,] | 5.014222 85.97500 | | 0.006695889 | | 0.03263725 | 0.04385667 | 0.015943389 | |

symmetry\_se fractal\_dimension\_se radius\_worst texture\_worst perimeter\_worst area\_worst

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [1,] 0.02565527 | 0.005197345 | 10.64991 | 22.38200 | 68.59036 346.3818 |
| [2,] 0.01753084 | 0.003270284 | 16.31105 | 26.03079 | 108.04053 817.0342 |
| [3,] 0.01966952 | 0.004481095 | 26.36000 | 28.25238 | 177.48571 2133.6190 |
| [4,] 0.01974820 | 0.003024686 | 14.09020 | 24.30380 | 91.35420 608.3280 |
| [5,] 0.02132259 | 0.003772444 | 17.57000 | 26.28593 | 116.97037 943.2407 |
| [6,] 0.01859606 | 0.003402970 | 19.99364 | 28.70152 | 132.24242 1235.3333 |
| [7,] 0.01889900 | 0.003560400 | 31.29000 | 30.59500 | 211.13000 3038.0000 |
| [8,] 0.02177214 | 0.003373002 | 12.87095 | 24.82369 | 83.61012 506.2679 |
| [9,] 0.01658682 | 0.003255932 | 15.09295 | 24.73545 | 99.29205 699.3818 |
| [10,] 0.02159444 | 0.004074167 | 22.99056 | 29.35000 | 153.50278 1611.7500 |

smoothness\_worst compactness\_worst concavity\_worst concave.points\_worst symmetry\_worst

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| [1,] | 0.1327040 | 0.1653631 | 0.1525696 | 0.05311673 | 0.2701782 |
| [2,] | 0.1318532 | 0.2806205 | 0.2994221 | 0.12411289 | 0.2899368 |
| [3,] | 0.1471571 | 0.4341190 | 0.5712667 | 0.22855714 | 0.3230952 |
| [4,] | 0.1224558 | 0.1953282 | 0.1832081 | 0.07678162 | 0.2786300 |
| [5,] | 0.1364407 | 0.3411059 | 0.4125333 | 0.15266778 | 0.3091852 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| [6,] | 0.1414200 | 0.3152382 | 0.3578970 | 0.16160424 | 0.3182273 |
| [7,] | 0.1384500 | 0.3477100 | 0.4724400 | 0.22675000 | 0.2663900 |
| [8,] | 0.1270945 | 0.1838368 | 0.1591179 | 0.07442024 | 0.2761167 |
| [9,] | 0.1258345 | 0.2524100 | 0.2448639 | 0.10462295 | 0.2799136 |
| [10,] | 0.1381917 | 0.3562083 | 0.4480861 | 0.18618333 | 0.3167528 |
| fractal\_dimension\_worst | | | | | |
| [1,] | 0.08602382 | | | | |
| [2,] | 0.08531921 | | | | |
| [3,] | 0.09316524 | | | | |
| [4,] | 0.07747180 | | | | |
| [5,] | 0.08985556 | | | | |
| [6,] | 0.08462576 | | | | |
| [7,] | 0.07961900 | | | | |
| [8,] | 0.07917964 | | | | |
| [9,] | 0.08435545 | | | | |
| [10,] | 0.08689722 | | | | |

Rattle timestamp: 2018-11-02 17:08:11 tsraj

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General cluster statistics:

$n

[1] 398

