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

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

|Variable |Levels|

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

|diagnosis| B,M |

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

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

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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

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Missing Value Summary

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


   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
```

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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 concave.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                    1                    1                    1
fractal_dimension_worst          radius_mean           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 0.01026151350.029850746
12:       smoothness_mean 0.0067744858 0.01023496260.039800995
13:            area_mean 0.0050643620 0.0172027459 0.034825871
14:           symmetry_se 0.0047192465 0.0112897273 0.029850746
15:        compactness_se 0.0041147552 0.01430726700.029850746
16:        symmetry_worst 0.0038544677 0.02456846970.024875622
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 0.00199443090.009950249
21:     concave.points_se 0.0014685044 0.00198866780.009950249
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
---
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

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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

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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

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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

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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

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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

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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

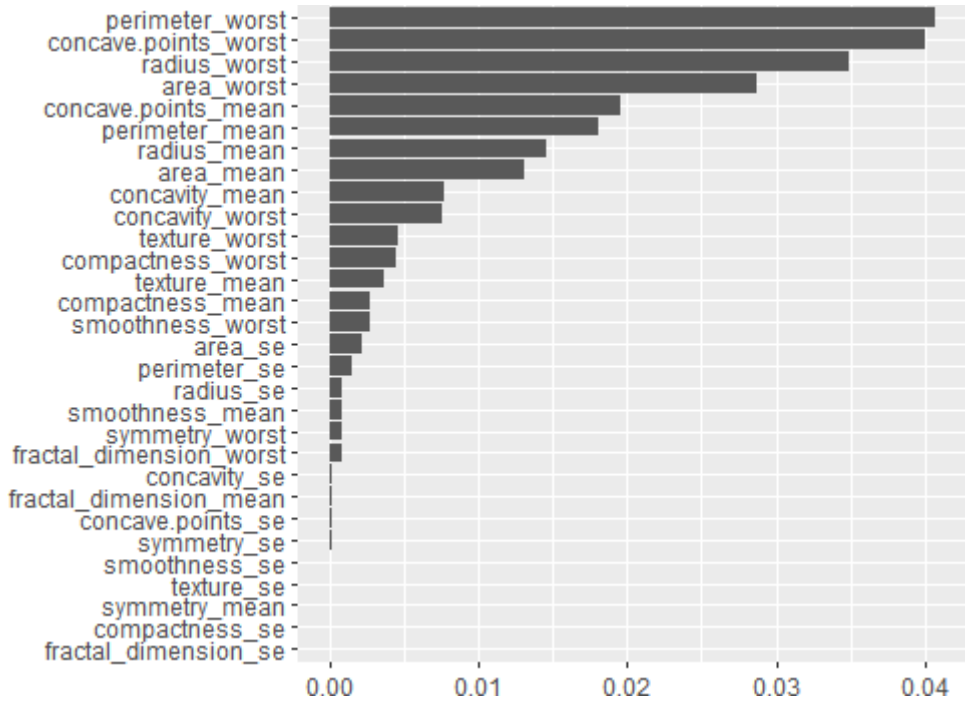
compactness_se 0.00002739726

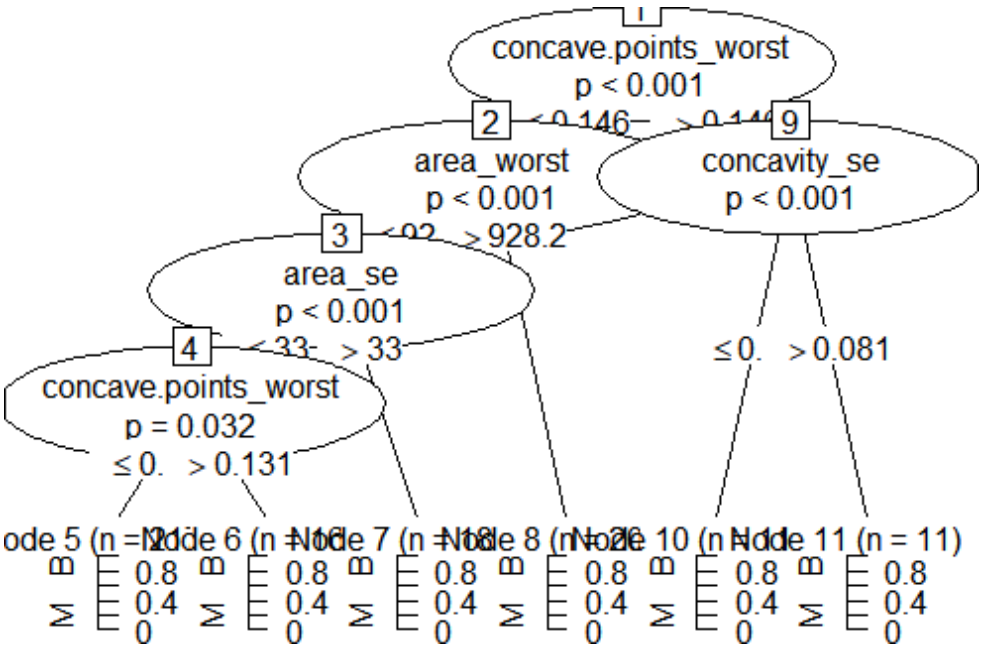
fractal_dimension_se 0.00000000000

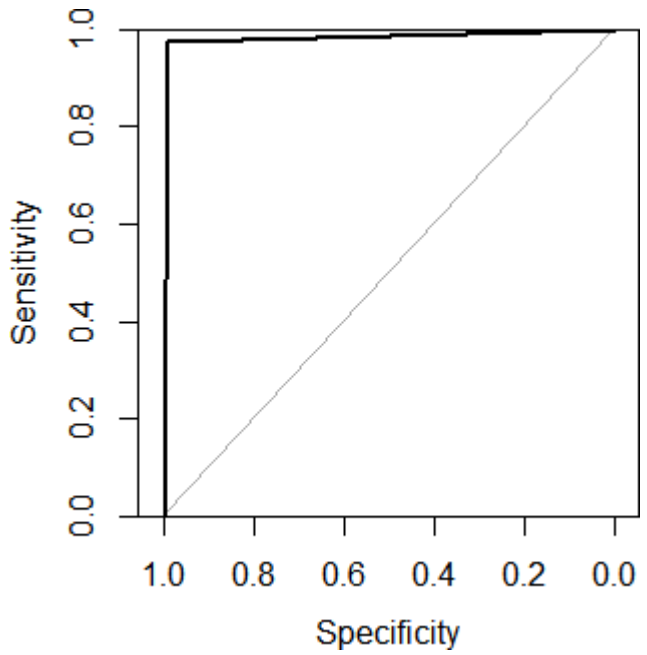
symmetry_mean -0.00006849315

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

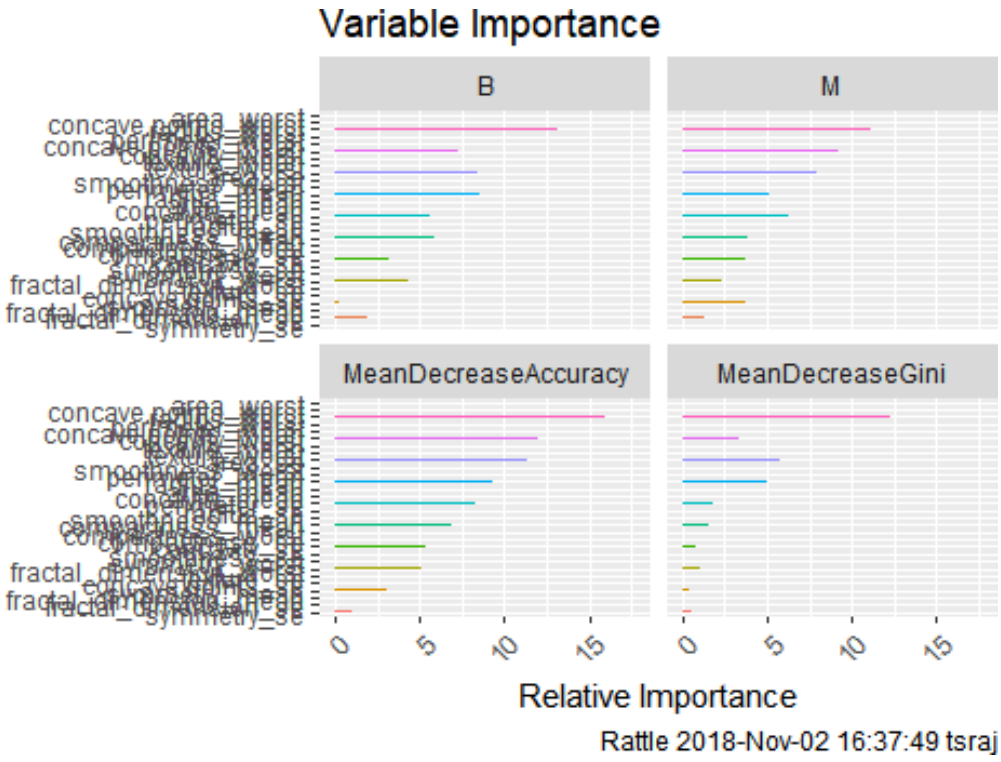
==========

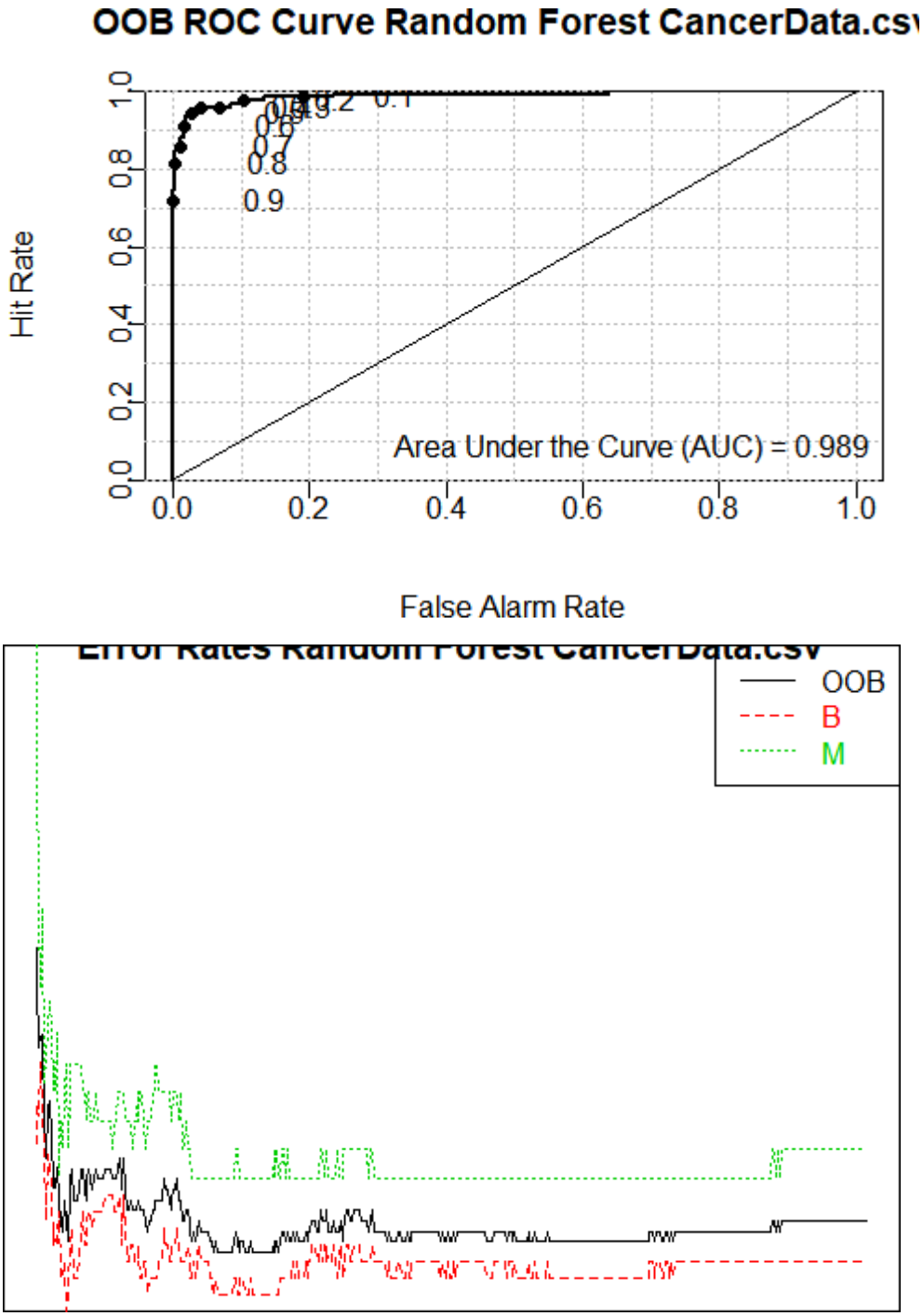
| | B | M | MeanDecreaseAccuracy | MeanDecreaseGini |
|---|---|---|---|---|
| area_worst | 15.13 | 10.84 | 17.79 | 13.78 |
| concave.points_worst | 13.84 | 11.08 | 17.58 | 12.86 |
| radius_worst | 13.19 | 11.08 | 15.99 | 12.32 |
| perimeter_worst | 13.16 | 10.67 | 15.65 | 14.85 |
| concave.points_mean | 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 |

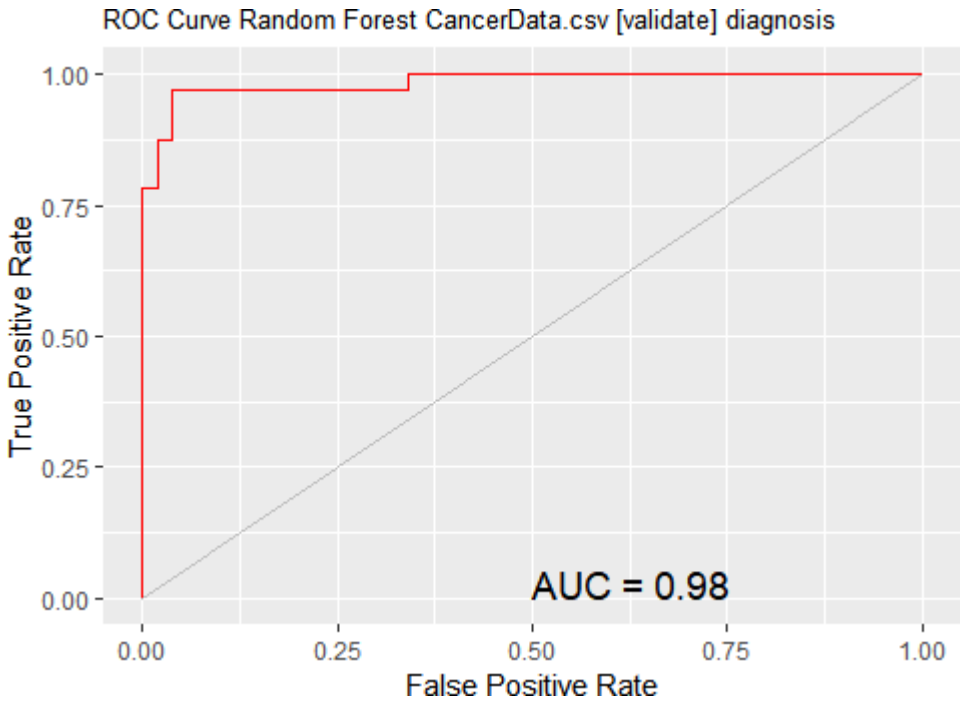
Time taken: 0.33 secs

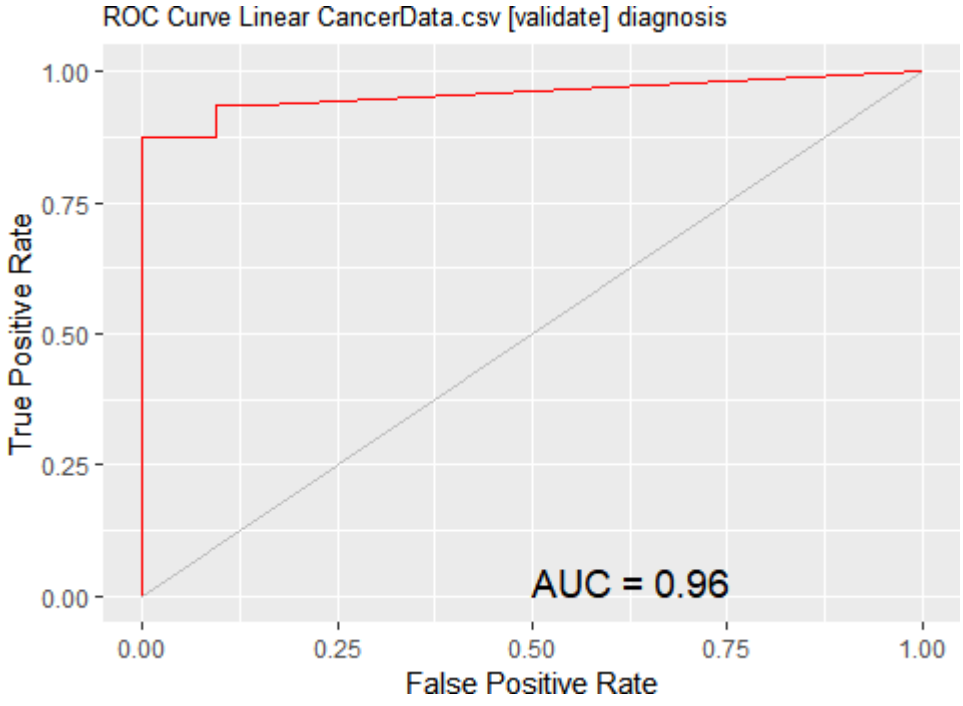
Rattle timestamp: 2018-11-02 16:37:44 tsraj




OOB ROC Curve Random Forest CancerData.csv
Hit Rate
False Alarm Rate
0.0
0.2
0.4
0.6
0.8
1.0
0.9
0.8
0.7
0.6
Area Under the Curve (AUC) = 0.989


OOB
B
M




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

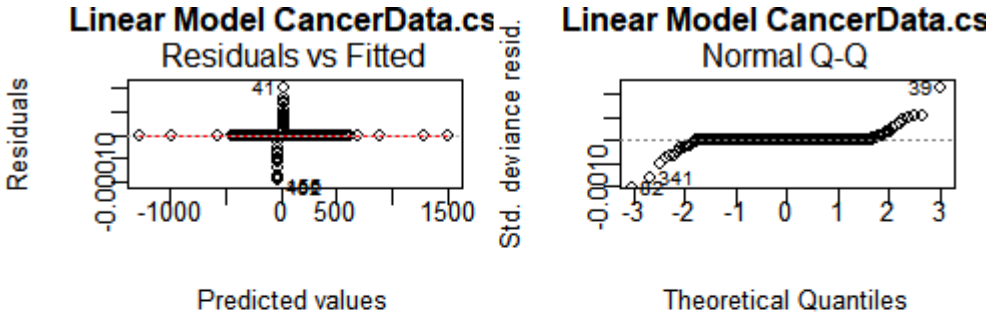
fractal_dimension_worst 1 0.000 367 0.00 0.9996653

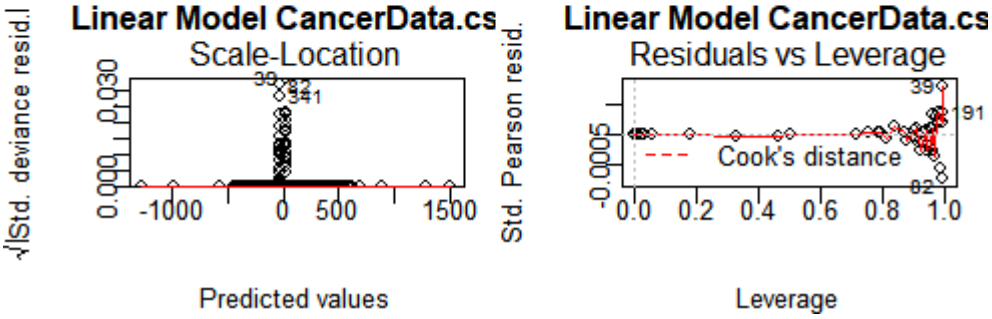
---

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

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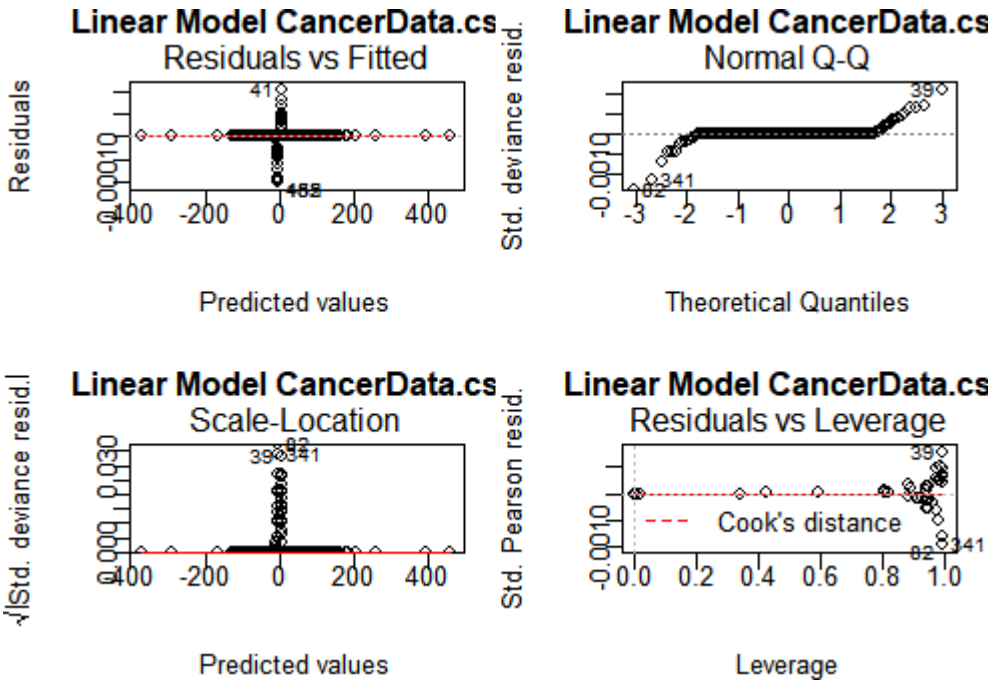



Summary of the Extreme Boost model:

##### 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:

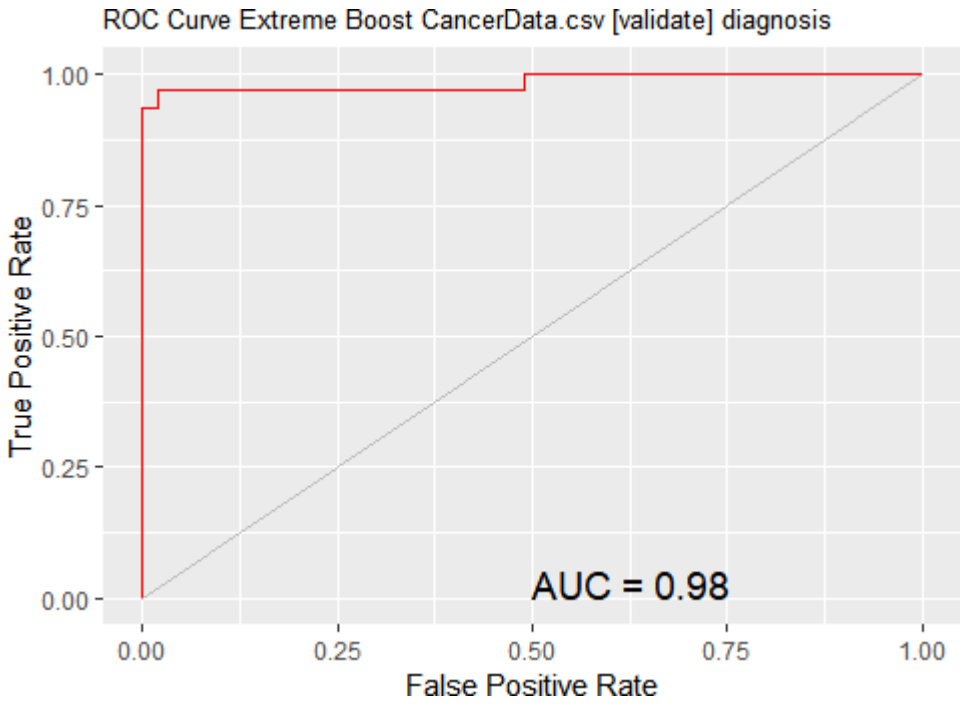
```
Call:
ada(diagnosis ~ ., data = crs$dataset[crs$train, c(crs$input,
   crs$target)], control = rpart::rpart.control(maxdepth = 6,
   cp = 0.01, minsplit = 20, xval = 10), iter = 50)

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"
```

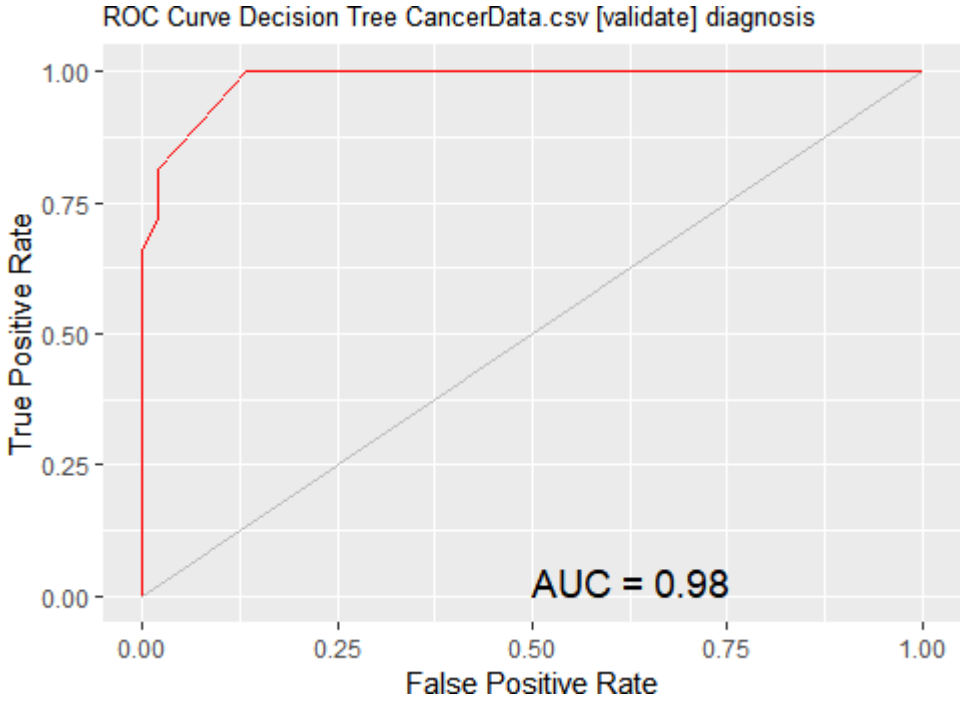
Frequency of variables actually used:

| 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 | 1 | 1 | 1 |
| fractal_dimension_worst | radius_mean | 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

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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

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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

==========

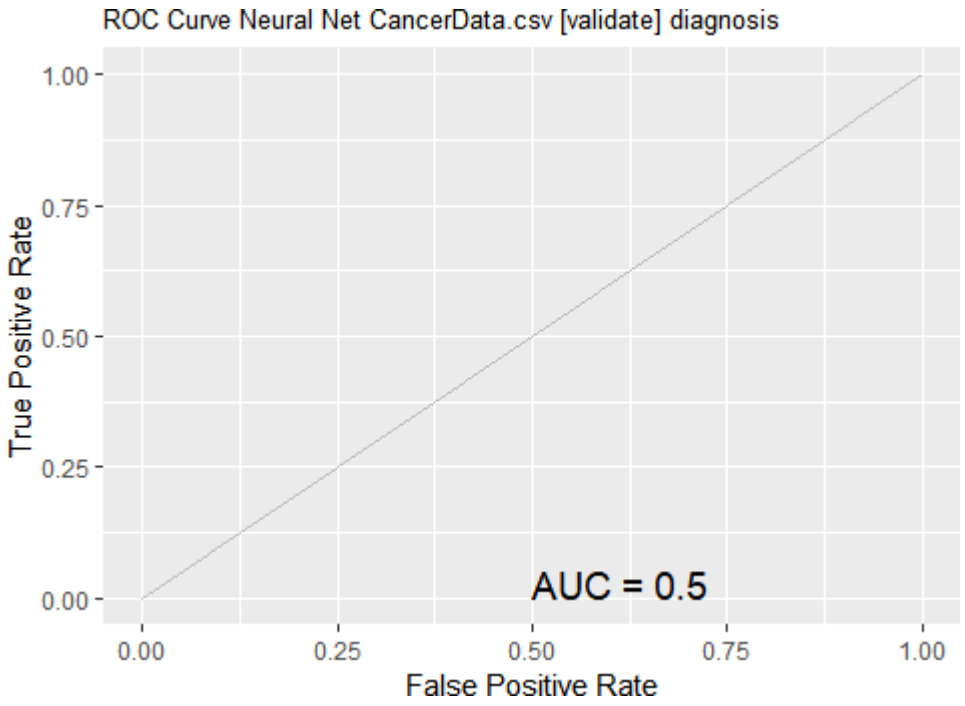
Area under the ROC curve for the glm model on CancerData.csv [validate] is 0.9581

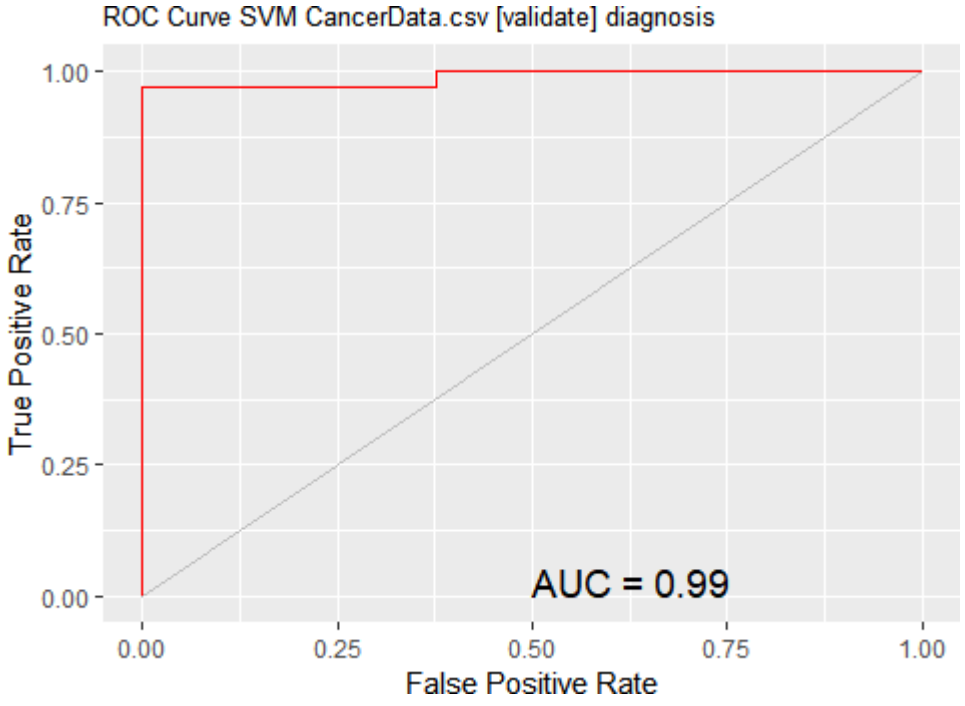
Rattle timestamp: 2018-11-02 16:57:32 tsraj

==========

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 |

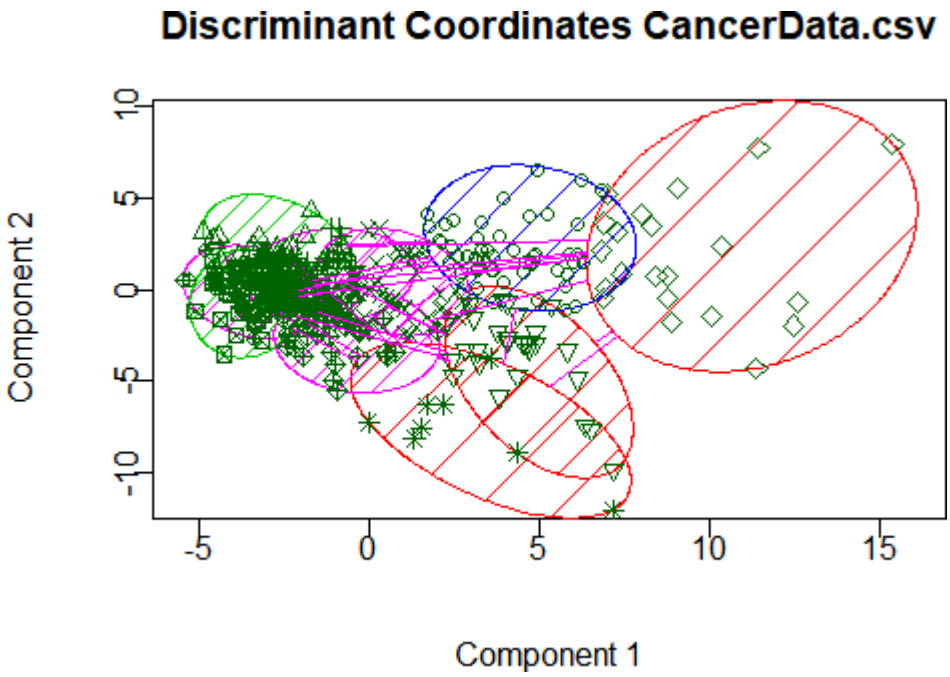
| | perimeter_se | area_se | smoothness_se | compactness_se | concavity_se | concave.points_se | symmetry_se |
|---|---|---|---|---|---|---|---|
| 1 | 0.20955948 | 0.16350870 | 0.2276182 | 0.20809637 | 0.09668706 | 0.3012262 | 0.1666486 |
| 2 | 0.04203378 | 0.02393148 | 0.1464443 | 0.08670333 | 0.04056017 | 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 |

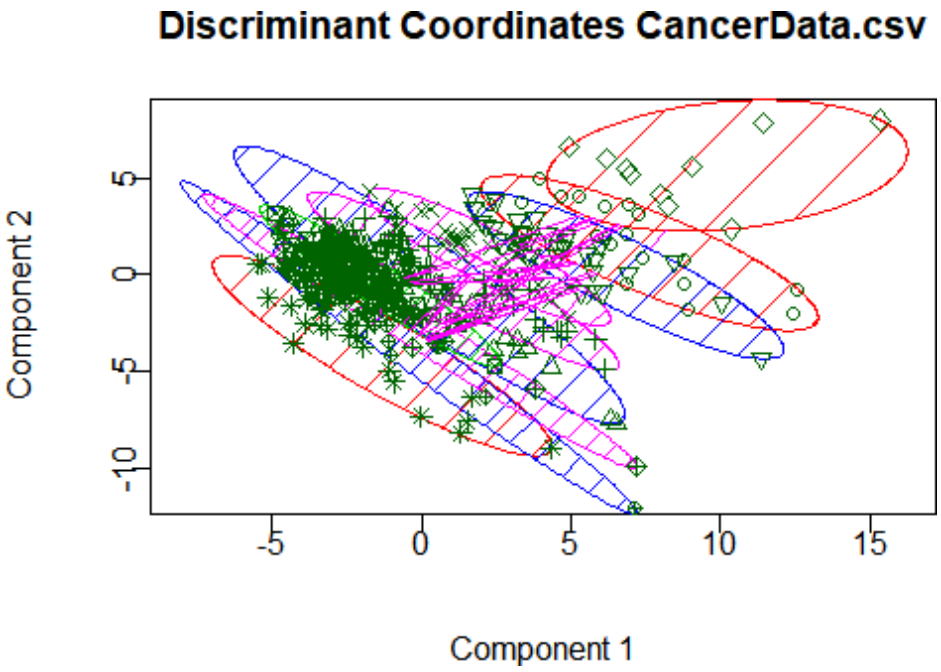
| | fractal_dimension_se | radius_worst | texture_worst | perimeter_worst | area_worst | smoothness_worst |
|---|---|---|---|---|---|---|
| 1 | 0.10233356 | 0.5592316 | 0.4824548 | 0.5301444 | 0.38415692 | 0.4426595 |
| 2 | 0.04315801 | 0.2543634 | 0.2911123 | 0.2347618 | 0.12751379 | 0.2840236 |
| 3 | 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 |

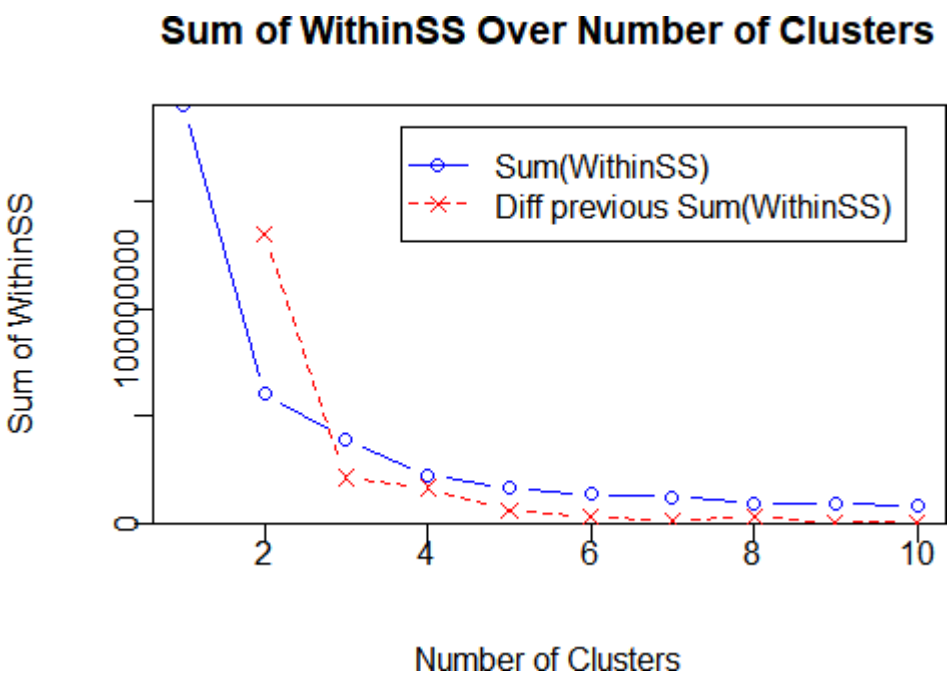
| | compactness_worst | concavity_worst | concave.points_worst | symmetry_worst | fractal_dimension_worst |
|---|---|---|---|---|---|
| 1 | 0.28483577 | 0.32263763 | 0.6403185 | 0.2821081 | 0.1863149 |
| 2 | 0.13169639 | 0.11680871 | 0.2562333 | 0.2132059 | 0.1124926 |
| 3 | 0.14824708 | 0.15227370 | 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 |

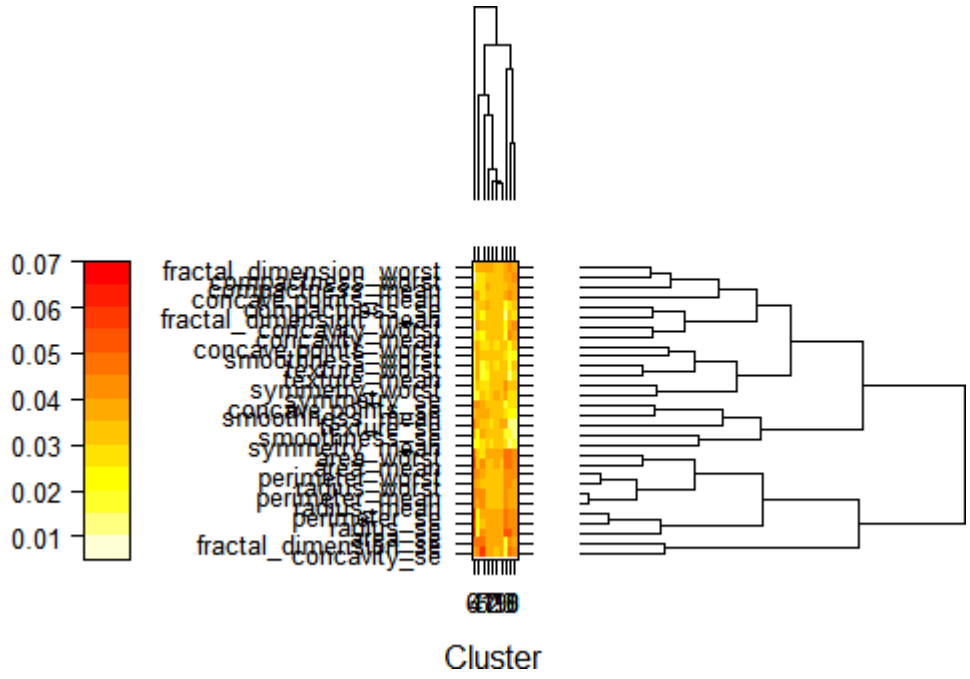
| | compactness_worst | concavity_worst | concave.points_worst | symmetry_worst | fractal_dimension_worst |
|---|---|---|---|---|---|
| 1 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| 2 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 3 | 0.04 | 0.04 | 0.02 | 0.03 | 0.04 |
| 4 | 0.03 | 0.04 | 0.04 | 0.03 | 0.04 |
| 5 | 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 |

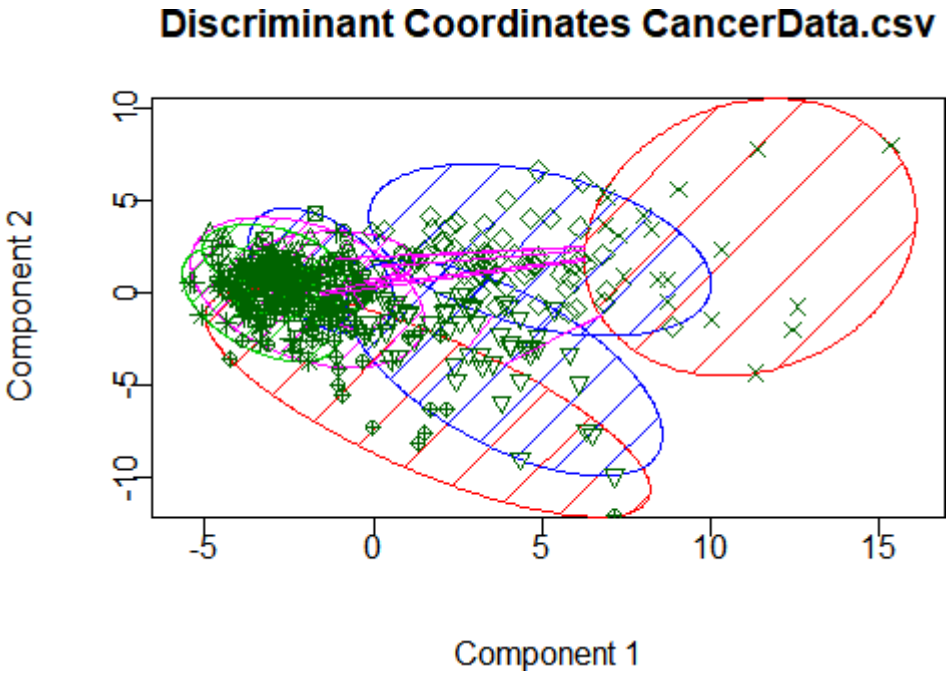
Within cluster sum of squares:

[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

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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

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

General cluster statistics:


$n

[1] 398
```

# Cluster Dendrogram CancerData.csv

*Rattle 2018-Nov-02 17:08:05 tsraj*