homework4.R

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```
diabetes <- read.csv("C:/Users/siddh/Desktop/Rutgers Spring 19/MULTI/diabetes.csv")

summary(diabetes)
```

```
##   Pregnancies        Glucose       BloodPressure     SkinThickness
##  Min.   : 0.000   Min.   :  0.0   Min.   :  0.00   Min.   : 0.00
##  1st Qu.: 1.000   1st Qu.: 99.0   1st Qu.: 62.00   1st Qu.: 0.00
##  Median : 3.000   Median :117.0   Median : 72.00   Median :23.00
##  Mean   : 3.845   Mean   :120.9   Mean   : 69.11   Mean   :20.54
##  3rd Qu.: 6.000   3rd Qu.:140.2   3rd Qu.: 80.00   3rd Qu.:32.00
##  Max.   :17.000   Max.   :199.0   Max.   :122.00   Max.   :99.00
##     Insulin           BMI        DiabetesPedigreeFunction      Age
##  Min.   :  0.0   Min.   : 0.00   Min.   :0.0780           Min.   :21.00
##  1st Qu.:  0.0   1st Qu.:27.30   1st Qu.:0.2437           1st Qu.:24.00
##  Median : 30.5   Median :32.00   Median :0.3725           Median :29.00
##  Mean   : 79.8   Mean   :31.99   Mean   :0.4719           Mean   :33.24
##  3rd Qu.:127.2   3rd Qu.:36.60   3rd Qu.:0.6262           3rd Qu.:41.00
##  Max.   :846.0   Max.   :67.10   Max.   :2.4200           Max.   :81.00
##     Outcome
##  Min.   :0.000
##  1st Qu.:0.000
##  Median :0.000
##  Mean   :0.349
##  3rd Qu.:1.000
##  Max.   :1.000
```

```
#columns
#PregnanciesNumber of times pregnant
#GlucosePlasma glucose concentration a 2 hours in an oral glucose tolerance test
#BloodPressureDiastolic blood pressure (mm Hg)
#SkinThicknessTriceps skin fold thickness (mm)
#Insulin2-Hour serum insulin (mu U/ml)
#BMIBody mass index (weight in kg/(height in m)^2)
#DiabetesPedigreeFunctionDiabetes pedigree function
#AgeAge (years)
#OutcomeClass variable (0 or 1) 268 of 768 are 1, the others are 0
head(diabetes)
```

```
##   Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 1           6     148            72            35       0 33.6
## 2           1      85            66            29       0 26.6
## 3           8     183            64             0       0 23.3
## 4           1      89            66            23      94 28.1
## 5           0     137            40            35     168 43.1
## 6           5     116            74             0       0 25.6
##   DiabetesPedigreeFunction Age Outcome
## 1                    0.627  50       1
## 2                    0.351  31       0
## 3                    0.672  32       1
## 4                    0.167  21       0
## 5                    2.288  33       1
## 6                    0.201  30       0
```

```
structure(diabetes)
```

```
##   Pregnancies Glucose BloodPressure SkinThickness Insulin  BMI
## 1           6     148            72            35       0 33.6
## 2           1      85            66            29       0 26.6
## 3           8     183            64             0       0 23.3
## 4           1      89            66            23      94 28.1
## 5           0     137            40            35     168 43.1
## 6           5     116            74             0       0 25.6
## 7           3      78            50            32      88 31.0
```

```
## 8            10   115          0              0          0 35.3
## 9             2   197         70             45        543 30.5
## 10            8   125         96              0          0  0.0
## 11            4   110         92              0          0 37.6
## 12           10   168         74              0          0 38.0
## 13           10   139         80              0          0 27.1
## 14            1   189         60             23        846 30.1
## 15            5   166         72             19        175 25.8
## 16            7   100          0              0          0 30.0
## 17            0   118         84             47        230 45.8
## 18            7   107         74              0          0 29.6
## 19            1   103         30             38         83 43.3
## 20            1   115         70             30         96 34.6
## 21            3   126         88             41        235 39.3
## 22            8    99         84              0          0 35.4
## 23            7   196         90              0          0 39.8
## 24            9   119         80             35          0 29.0
## 25           11   143         94             33        146 36.6
## 26           10   125         70             26        115 31.1
## 27            7   147         76              0          0 39.4
## 28            1    97         66             15        140 23.2
## 29           13   145         82             19        110 22.2
## 30            5   117         92              0          0 34.1
## 31            5   109         75             26          0 36.0
## 32            3   158         76             36        245 31.6
## 33            3    88         58             11         54 24.8
## 34            6    92         92              0          0 19.9
## 35           10   122         78             31          0 27.6
## 36            4   103         60             33        192 24.0
## 37           11   138         76              0          0 33.2
## 38            9   102         76             37          0 32.9
## 39            2    90         68             42          0 38.2
## 40            4   111         72             47        207 37.1
## 41            3   180         64             25         70 34.0
## 42            7   133         84              0          0 40.2
## 43            7   106         92             18          0 22.7
## 44            9   171        110             24        240 45.4
## 45            7   159         64              0          0 27.4
## 46            0   180         66             39          0 42.0
## 47            1   146         56              0          0 29.7
## 48            2    71         70             27          0 28.0
## 49            7   103         66             32          0 39.1
## 50            7   105          0              0          0  0.0
## 51            1   103         80             11         82 19.4
## 52            1   101         50             15         36 24.2
## 53            5    88         66             21         23 24.4
## 54            8   176         90             34        300 33.7
## 55            7   150         66             42        342 34.7
## 56            1    73         50             10          0 23.0
## 57            7   187         68             39        304 37.7
## 58            0   100         88             60        110 46.8
## 59            0   146         82              0          0 40.5
## 60            0   105         64             41        142 41.5
## 61            2    84          0              0          0  0.0
## 62            8   133         72              0          0 32.9
## 63            5    44         62              0          0 25.0
## 64            2   141         58             34        128 25.4
## 65            7   114         66              0          0 32.8
## 66            5    99         74             27          0 29.0
## 67            0   109         88             30          0 32.5
## 68            2   109         92              0          0 42.7
## 69            1    95         66             13         38 19.6
## 70            4   146         85             27        100 28.9
## 71            2   100         66             20         90 32.9
## 72            5   139         64             35        140 28.6
## 73           13   126         90              0          0 43.4
## 74            4   129         86             20        270 35.1
## 75            1    79         75             30          0 32.0
## 76            1     0         48             20          0 24.7
## 77            7    62         78              0          0 32.6
## 78            5    95         72             33          0 37.7
## 79            0   131          0              0          0 43.2
## 80            2   112         66             22          0 25.0
```

```
## 80    2   112   66    22     0 25.0
## 81    3   113   44    13     0 22.4
## 82    2    74    0     0     0  0.0
## 83    7    83   78    26    71 29.3
## 84    0   101   65    28     0 24.6
## 85    5   137  108     0     0 48.8
## 86    2   110   74    29   125 32.4
## 87   13   106   72    54     0 36.6
## 88    2   100   68    25    71 38.5
## 89   15   136   70    32   110 37.1
## 90    1   107   68    19     0 26.5
## 91    1    80   55     0     0 19.1
## 92    4   123   80    15   176 32.0
## 93    7    81   78    40    48 46.7
## 94    4   134   72     0     0 23.8
## 95    2   142   82    18    64 24.7
## 96    6   144   72    27   228 33.9
## 97    2    92   62    28     0 31.6
## 98    1    71   48    18    76 20.4
## 99    6    93   50    30    64 28.7
## 100   1   122   90    51   220 49.7
## 101   1   163   72     0     0 39.0
## 102   1   151   60     0     0 26.1
## 103   0   125   96     0     0 22.5
## 104   1    81   72    18    40 26.6
## 105   2    85   65     0     0 39.6
## 106   1   126   56    29   152 28.7
## 107   1    96  122     0     0 22.4
## 108   4   144   58    28   140 29.5
## 109   3    83   58    31    18 34.3
## 110   0    95   85    25    36 37.4
## 111   3   171   72    33   135 33.3
## 112   8   155   62    26   495 34.0
## 113   1    89   76    34    37 31.2
## 114   4    76   62     0     0 34.0
## 115   7   160   54    32   175 30.5
## 116   4   146   92     0     0 31.2
## 117   5   124   74     0     0 34.0
## 118   5    78   48     0     0 33.7
## 119   4    97   60    23     0 28.2
## 120   4    99   76    15    51 23.2
## 121   0   162   76    56   100 53.2
## 122   6   111   64    39     0 34.2
## 123   2   107   74    30   100 33.6
## 124   5   132   80     0     0 26.8
## 125   0   113   76     0     0 33.3
## 126   1    88   30    42    99 55.0
## 127   3   120   70    30   135 42.9
## 128   1   118   58    36    94 33.3
## 129   1   117   88    24   145 34.5
## 130   0   105   84     0     0 27.9
## 131   4   173   70    14   168 29.7
## 132   9   122   56     0     0 33.3
## 133   3   170   64    37   225 34.5
## 134   8    84   74    31     0 38.3
## 135   2    96   68    13    49 21.1
## 136   2   125   60    20   140 33.8
## 137   0   100   70    26    50 30.8
## 138   0    93   60    25    92 28.7
## 139   0   129   80     0     0 31.2
## 140   5   105   72    29   325 36.9
## 141   3   128   78     0     0 21.1
## 142   5   106   82    30     0 39.5
## 143   2   108   52    26    63 32.5
## 144  10   108   66     0     0 32.4
## 145   4   154   62    31   284 32.8
## 146   0   102   75    23     0  0.0
## 147   9    57   80    37     0 32.8
## 148   2   106   64    35   119 30.5
## 149   5   147   78     0     0 33.7
## 150   2    90   70    17     0 27.3
## 151   1   136   74    50   204 37.4
## 152   4   114   65     0     0 21.9
```

```
## 153    9   156    86    28   155 34.3
## 154    1   153    82    42   485 40.6
## 155    8   188    78     0     0 47.9
## 156    7   152    88    44     0 50.0
## 157    2    99    52    15    94 24.6
## 158    1   109    56    21   135 25.2
## 159    2    88    74    19    53 29.0
## 160   17   163    72    41   114 40.9
## 161    4   151    90    38     0 29.7
## 162    7   102    74    40   105 37.2
## 163    0   114    80    34   285 44.2
## 164    2   100    64    23     0 29.7
## 165    0   131    88     0     0 31.6
## 166    6   104    74    18   156 29.9
## 167    3   148    66    25     0 32.5
## 168    4   120    68     0     0 29.6
## 169    4   110    66     0     0 31.9
## 170    3   111    90    12    78 28.4
## 171    6   102    82     0     0 30.8
## 172    6   134    70    23   130 35.4
## 173    2    87     0    23     0 28.9
## 174    1    79    60    42    48 43.5
## 175    2    75    64    24    55 29.7
## 176    8   179    72    42   130 32.7
## 177    6    85    78     0     0 31.2
## 178    0   129   110    46   130 67.1
## 179    5   143    78     0     0 45.0
## 180    5   130    82     0     0 39.1
## 181    6    87    80     0     0 23.2
## 182    0   119    64    18    92 34.9
## 183    1     0    74    20    23 27.7
## 184    5    73    60     0     0 26.8
## 185    4   141    74     0     0 27.6
## 186    7   194    68    28     0 35.9
## 187    8   181    68    36   495 30.1
## 188    1   128    98    41    58 32.0
## 189    8   109    76    39   114 27.9
## 190    5   139    80    35   160 31.6
## 191    3   111    62     0     0 22.6
## 192    9   123    70    44    94 33.1
## 193    7   159    66     0     0 30.4
## 194   11   135     0     0     0 52.3
## 195    8    85    55    20     0 24.4
## 196    5   158    84    41   210 39.4
## 197    1   105    58     0     0 24.3
## 198    3   107    62    13    48 22.9
## 199    4   109    64    44    99 34.8
## 200    4   148    60    27   318 30.9
## 201    0   113    80    16     0 31.0
## 202    1   138    82     0     0 40.1
## 203    0   108    68    20     0 27.3
## 204    2    99    70    16    44 20.4
## 205    6   103    72    32   190 37.7
## 206    5   111    72    28     0 23.9
## 207    8   196    76    29   280 37.5
## 208    5   162   104     0     0 37.7
## 209    1    96    64    27    87 33.2
## 210    7   184    84    33     0 35.5
## 211    2    81    60    22     0 27.7
## 212    0   147    85    54     0 42.8
## 213    7   179    95    31     0 34.2
## 214    0   140    65    26   130 42.6
## 215    9   112    82    32   175 34.2
## 216   12   151    70    40   271 41.8
## 217    5   109    62    41   129 35.8
## 218    6   125    68    30   120 30.0
## 219    5    85    74    22     0 29.0
## 220    5   112    66     0     0 37.8
## 221    0   177    60    29   478 34.6
## 222    2   158    90     0     0 31.6
## 223    7   119     0     0     0 25.2
## 224    7   142    60    33   190 28.8
## 225    1   100    66    15    56 23.6
```

```
## 226     1    87    78    27    32 34.6
## 227     0   101    76     0     0 35.7
## 228     3   162    52    38     0 37.2
## 229     4   197    70    39   744 36.7
## 230     0   117    80    31    53 45.2
## 231     4   142    86     0     0 44.0
## 232     6   134    80    37   370 46.2
## 233     1    79    80    25    37 25.4
## 234     4   122    68     0     0 35.0
## 235     3    74    68    28    45 29.7
## 236     4   171    72     0     0 43.6
## 237     7   181    84    21   192 35.9
## 238     0   179    90    27     0 44.1
## 239     9   164    84    21     0 30.8
## 240     0   104    76     0     0 18.4
## 241     1    91    64    24     0 29.2
## 242     4    91    70    32    88 33.1
## 243     3   139    54     0     0 25.6
## 244     6   119    50    22   176 27.1
## 245     2   146    76    35   194 38.2
## 246     9   184    85    15     0 30.0
## 247    10   122    68     0     0 31.2
## 248     0   165    90    33   680 52.3
## 249     9   124    70    33   402 35.4
## 250     1   111    86    19     0 30.1
## 251     9   106    52     0     0 31.2
## 252     2   129    84     0     0 28.0
## 253     2    90    80    14    55 24.4
## 254     0    86    68    32     0 35.8
## 255    12    92    62     7   258 27.6
## 256     1   113    64    35     0 33.6
## 257     3   111    56    39     0 30.1
## 258     2   114    68    22     0 28.7
## 259     1   193    50    16   375 25.9
## 260    11   155    76    28   150 33.3
## 261     3   191    68    15   130 30.9
## 262     3   141     0     0     0 30.0
## 263     4    95    70    32     0 32.1
## 264     3   142    80    15     0 32.4
## 265     4   123    62     0     0 32.0
## 266     5    96    74    18    67 33.6
## 267     0   138     0     0     0 36.3
## 268     2   128    64    42     0 40.0
## 269     0   102    52     0     0 25.1
## 270     2   146     0     0     0 27.5
## 271    10   101    86    37     0 45.6
## 272     2   108    62    32    56 25.2
## 273     3   122    78     0     0 23.0
## 274     1    71    78    50    45 33.2
## 275    13   106    70     0     0 34.2
## 276     2   100    70    52    57 40.5
## 277     7   106    60    24     0 26.5
## 278     0   104    64    23   116 27.8
## 279     5   114    74     0     0 24.9
## 280     2   108    62    10   278 25.3
## 281     0   146    70     0     0 37.9
## 282    10   129    76    28   122 35.9
## 283     7   133    88    15   155 32.4
## 284     7   161    86     0     0 30.4
## 285     2   108    80     0     0 27.0
## 286     7   136    74    26   135 26.0
## 287     5   155    84    44   545 38.7
## 288     1   119    86    39   220 45.6
## 289     4    96    56    17    49 20.8
## 290     5   108    72    43    75 36.1
## 291     0    78    88    29    40 36.9
## 292     0   107    62    30    74 36.6
## 293     2   128    78    37   182 43.3
## 294     1   128    48    45   194 40.5
## 295     0   161    50     0     0 21.9
## 296     6   151    62    31   120 35.5
## 297     2   146    70    38   360 28.0
## 298     0   126    84    29   215 30.7
```

## 298	0	126	84	29	215	30.7
## 299	14	100	78	25	184	36.6
## 300	8	112	72	0	0	23.6
## 301	0	167	0	0	0	32.3
## 302	2	144	58	33	135	31.6
## 303	5	77	82	41	42	35.8
## 304	5	115	98	0	0	52.9
## 305	3	150	76	0	0	21.0
## 306	2	120	76	37	105	39.7
## 307	10	161	68	23	132	25.5
## 308	0	137	68	14	148	24.8
## 309	0	128	68	19	180	30.5
## 310	2	124	68	28	205	32.9
## 311	6	80	66	30	0	26.2
## 312	0	106	70	37	148	39.4
## 313	2	155	74	17	96	26.6
## 314	3	113	50	10	85	29.5
## 315	7	109	80	31	0	35.9
## 316	2	112	68	22	94	34.1
## 317	3	99	80	11	64	19.3
## 318	3	182	74	0	0	30.5
## 319	3	115	66	39	140	38.1
## 320	6	194	78	0	0	23.5
## 321	4	129	60	12	231	27.5
## 322	3	112	74	30	0	31.6
## 323	0	124	70	20	0	27.4
## 324	13	152	90	33	29	26.8
## 325	2	112	75	32	0	35.7
## 326	1	157	72	21	168	25.6
## 327	1	122	64	32	156	35.1
## 328	10	179	70	0	0	35.1
## 329	2	102	86	36	120	45.5
## 330	6	105	70	32	68	30.8
## 331	8	118	72	19	0	23.1
## 332	2	87	58	16	52	32.7
## 333	1	180	0	0	0	43.3
## 334	12	106	80	0	0	23.6
## 335	1	95	60	18	58	23.9
## 336	0	165	76	43	255	47.9
## 337	0	117	0	0	0	33.8
## 338	5	115	76	0	0	31.2
## 339	9	152	78	34	171	34.2
## 340	7	178	84	0	0	39.9
## 341	1	130	70	13	105	25.9
## 342	1	95	74	21	73	25.9
## 343	1	0	68	35	0	32.0
## 344	5	122	86	0	0	34.7
## 345	8	95	72	0	0	36.8
## 346	8	126	88	36	108	38.5
## 347	1	139	46	19	83	28.7
## 348	3	116	0	0	0	23.5
## 349	3	99	62	19	74	21.8
## 350	5	0	80	32	0	41.0
## 351	4	92	80	0	0	42.2
## 352	4	137	84	0	0	31.2
## 353	3	61	82	28	0	34.4
## 354	1	90	62	12	43	27.2
## 355	3	90	78	0	0	42.7
## 356	9	165	88	0	0	30.4
## 357	1	125	50	40	167	33.3
## 358	13	129	0	30	0	39.9
## 359	12	88	74	40	54	35.3
## 360	1	196	76	36	249	36.5
## 361	5	189	64	33	325	31.2
## 362	5	158	70	0	0	29.8
## 363	5	103	108	37	0	39.2
## 364	4	146	78	0	0	38.5
## 365	4	147	74	25	293	34.9
## 366	5	99	54	28	83	34.0
## 367	6	124	72	0	0	27.6
## 368	0	101	64	17	0	21.0
## 369	3	81	86	16	66	27.5
## 370	1	133	102	28	140	32.8

```
## 371     3   173       82        48   465 38.4
## 372     0   118       64        23    89  0.0
## 373     0    84       64        22    66 35.8
## 374     2   105       58        40    94 34.9
## 375     2   122       52        43   158 36.2
## 376    12   140       82        43   325 39.2
## 377     0    98       82        15    84 25.2
## 378     1    87       60        37    75 37.2
## 379     4   156       75         0     0 48.3
## 380     0    93      100        39    72 43.4
## 381     1   107       72        30    82 30.8
## 382     0   105       68        22     0 20.0
## 383     1   109       60         8   182 25.4
## 384     1    90       62        18    59 25.1
## 385     1   125       70        24   110 24.3
## 386     1   119       54        13    50 22.3
## 387     5   116       74        29     0 32.3
## 388     8   105      100        36     0 43.3
## 389     5   144       82        26   285 32.0
## 390     3   100       68        23    81 31.6
## 391     1   100       66        29   196 32.0
## 392     5   166       76         0     0 45.7
## 393     1   131       64        14   415 23.7
## 394     4   116       72        12    87 22.1
## 395     4   158       78         0     0 32.9
## 396     2   127       58        24   275 27.7
## 397     3    96       56        34   115 24.7
## 398     0   131       66        40     0 34.3
## 399     3    82       70         0     0 21.1
## 400     3   193       70        31     0 34.9
## 401     4    95       64         0     0 32.0
## 402     6   137       61         0     0 24.2
## 403     5   136       84        41    88 35.0
## 404     9    72       78        25     0 31.6
## 405     5   168       64         0     0 32.9
## 406     2   123       48        32   165 42.1
## 407     4   115       72         0     0 28.9
## 408     0   101       62         0     0 21.9
## 409     8   197       74         0     0 25.9
## 410     1   172       68        49   579 42.4
## 411     6   102       90        39     0 35.7
## 412     1   112       72        30   176 34.4
## 413     1   143       84        23   310 42.4
## 414     1   143       74        22    61 26.2
## 415     0   138       60        35   167 34.6
## 416     3   173       84        33   474 35.7
## 417     1    97       68        21     0 27.2
## 418     4   144       82        32     0 38.5
## 419     1    83       68         0     0 18.2
## 420     3   129       64        29   115 26.4
## 421     1   119       88        41   170 45.3
## 422     2    94       68        18    76 26.0
## 423     0   102       64        46    78 40.6
## 424     2   115       64        22     0 30.8
## 425     8   151       78        32   210 42.9
## 426     4   184       78        39   277 37.0
## 427     0    94        0         0     0  0.0
## 428     1   181       64        30   180 34.1
## 429     0   135       94        46   145 40.6
## 430     1    95       82        25   180 35.0
## 431     2    99        0         0     0 22.2
## 432     3    89       74        16    85 30.4
## 433     1    80       74        11    60 30.0
## 434     2   139       75         0     0 25.6
## 435     1    90       68         8     0 24.5
## 436     0   141        0         0     0 42.4
## 437    12   140       85        33     0 37.4
## 438     5   147       75         0     0 29.9
## 439     1    97       70        15     0 18.2
## 440     6   107       88         0     0 36.8
## 441     0   189      104        25     0 34.3
## 442     2    83       66        23    50 32.2
## 443     4   117       64        27   120 33.2
```

```
## 444         8      108          70             0          0 30.5
## 445         4      117          62            12          0 29.7
## 446         0      180          78            63         14 59.4
## 447         1      100          72            12         70 25.3
## 448         0       95          80            45         92 36.5
## 449         0      104          64            37         64 33.6
## 450         0      120          74            18         63 30.5
## 451         1       82          64            13         95 21.2
## 452         2      134          70             0          0 28.9
## 453         0       91          68            32        210 39.9
## 454         2      119           0             0          0 19.6
## 455         2      100          54            28        105 37.8
## 456        14      175          62            30          0 33.6
## 457         1      135          54             0          0 26.7
## 458         5       86          68            28         71 30.2
## 459        10      148          84            48        237 37.6
## 460         9      134          74            33         60 25.9
## 461         9      120          72            22         56 20.8
## 462         1       71          62             0          0 21.8
## 463         8       74          70            40         49 35.3
## 464         5       88          78            30          0 27.6
## 465        10      115          98             0          0 24.0
## 466         0      124          56            13        105 21.8
## 467         0       74          52            10         36 27.8
## 468         0       97          64            36        100 36.8
## 469         8      120           0             0          0 30.0
## 470         6      154          78            41        140 46.1
## 471         1      144          82            40          0 41.3
## 472         0      137          70            38          0 33.2
## 473         0      119          66            27          0 38.8
## 474         7      136          90             0          0 29.9
## 475         4      114          64             0          0 28.9
## 476         0      137          84            27          0 27.3
## 477         2      105          80            45        191 33.7
## 478         7      114          76            17        110 23.8
## 479         8      126          74            38         75 25.9
## 480         4      132          86            31          0 28.0
## 481         3      158          70            30        328 35.5
## 482         0      123          88            37          0 35.2
## 483         4       85          58            22         49 27.8
## 484         0       84          82            31        125 38.2
## 485         0      145           0             0          0 44.2
## 486         0      135          68            42        250 42.3
## 487         1      139          62            41        480 40.7
## 488         0      173          78            32        265 46.5
## 489         4       99          72            17          0 25.6
## 490         8      194          80             0          0 26.1
## 491         2       83          65            28         66 36.8
## 492         2       89          90            30          0 33.5
## 493         4       99          68            38          0 32.8
## 494         4      125          70            18        122 28.9
## 495         3       80           0             0          0  0.0
## 496         6      166          74             0          0 26.6
## 497         5      110          68             0          0 26.0
## 498         2       81          72            15         76 30.1
## 499         7      195          70            33        145 25.1
## 500         6      154          74            32        193 29.3
## 501         2      117          90            19         71 25.2
## 502         3       84          72            32          0 37.2
## 503         6        0          68            41          0 39.0
## 504         7       94          64            25         79 33.3
## 505         3       96          78            39          0 37.3
## 506        10       75          82             0          0 33.3
## 507         0      180          90            26         90 36.5
## 508         1      130          60            23        170 28.6
## 509         2       84          50            23         76 30.4
## 510         8      120          78             0          0 25.0
## 511        12       84          72            31          0 29.7
## 512         0      139          62            17        210 22.1
## 513         9       91          68             0          0 24.2
## 514         2       91          62             0          0 27.3
## 515         3       99          54            19         86 25.6
## 516         3      163          70            18        105 31.6
```

```
## 516    3   163    70    18   105 31.6
## 517    9   145    88    34   165 30.3
## 518    7   125    86     0     0 37.6
## 519   13    76    60     0     0 32.8
## 520    6   129    90     7   326 19.6
## 521    2    68    70    32    66 25.0
## 522    3   124    80    33   130 33.2
## 523    6   114     0     0     0  0.0
## 524    9   130    70     0     0 34.2
## 525    3   125    58     0     0 31.6
## 526    3    87    60    18     0 21.8
## 527    1    97    64    19    82 18.2
## 528    3   116    74    15   105 26.3
## 529    0   117    66    31   188 30.8
## 530    0   111    65     0     0 24.6
## 531    2   122    60    18   106 29.8
## 532    0   107    76     0     0 45.3
## 533    1    86    66    52    65 41.3
## 534    6    91     0     0     0 29.8
## 535    1    77    56    30    56 33.3
## 536    4   132     0     0     0 32.9
## 537    0   105    90     0     0 29.6
## 538    0    57    60     0     0 21.7
## 539    0   127    80    37   210 36.3
## 540    3   129    92    49   155 36.4
## 541    8   100    74    40   215 39.4
## 542    3   128    72    25   190 32.4
## 543   10    90    85    32     0 34.9
## 544    4    84    90    23    56 39.5
## 545    1    88    78    29    76 32.0
## 546    8   186    90    35   225 34.5
## 547    5   187    76    27   207 43.6
## 548    4   131    68    21   166 33.1
## 549    1   164    82    43    67 32.8
## 550    4   189   110    31     0 28.5
## 551    1   116    70    28     0 27.4
## 552    3    84    68    30   106 31.9
## 553    6   114    88     0     0 27.8
## 554    1    88    62    24    44 29.9
## 555    1    84    64    23   115 36.9
## 556    7   124    70    33   215 25.5
## 557    1    97    70    40     0 38.1
## 558    8   110    76     0     0 27.8
## 559   11   103    68    40     0 46.2
## 560   11    85    74     0     0 30.1
## 561    6   125    76     0     0 33.8
## 562    0   198    66    32   274 41.3
## 563    1    87    68    34    77 37.6
## 564    6    99    60    19    54 26.9
## 565    0    91    80     0     0 32.4
## 566    2    95    54    14    88 26.1
## 567    1    99    72    30    18 38.6
## 568    6    92    62    32   126 32.0
## 569    4   154    72    29   126 31.3
## 570    0   121    66    30   165 34.3
## 571    3    78    70     0     0 32.5
## 572    2   130    96     0     0 22.6
## 573    3   111    58    31    44 29.5
## 574    2    98    60    17   120 34.7
## 575    1   143    86    30   330 30.1
## 576    1   119    44    47    63 35.5
## 577    6   108    44    20   130 24.0
## 578    2   118    80     0     0 42.9
## 579   10   133    68     0     0 27.0
## 580    2   197    70    99     0 34.7
## 581    0   151    90    46     0 42.1
## 582    6   109    60    27     0 25.0
## 583   12   121    78    17     0 26.5
## 584    8   100    76     0     0 38.7
## 585    8   124    76    24   600 28.7
## 586    1    93    56    11     0 22.5
## 587    8   143    66     0     0 34.9
## 588    6   103    66     0     0 24.3
```

## 589	3	176	86	27	156	33.3
## 590	0	73	0	0	0	21.1
## 591	11	111	84	40	0	46.8
## 592	2	112	78	50	140	39.4
## 593	3	132	80	0	0	34.4
## 594	2	82	52	22	115	28.5
## 595	6	123	72	45	230	33.6
## 596	0	188	82	14	185	32.0
## 597	0	67	76	0	0	45.3
## 598	1	89	24	19	25	27.8
## 599	1	173	74	0	0	36.8
## 600	1	109	38	18	120	23.1
## 601	1	108	88	19	0	27.1
## 602	6	96	0	0	0	23.7
## 603	1	124	74	36	0	27.8
## 604	7	150	78	29	126	35.2
## 605	4	183	0	0	0	28.4
## 606	1	124	60	32	0	35.8
## 607	1	181	78	42	293	40.0
## 608	1	92	62	25	41	19.5
## 609	0	152	82	39	272	41.5
## 610	1	111	62	13	182	24.0
## 611	3	106	54	21	158	30.9
## 612	3	174	58	22	194	32.9
## 613	7	168	88	42	321	38.2
## 614	6	105	80	28	0	32.5
## 615	11	138	74	26	144	36.1
## 616	3	106	72	0	0	25.8
## 617	6	117	96	0	0	28.7
## 618	2	68	62	13	15	20.1
## 619	9	112	82	24	0	28.2
## 620	0	119	0	0	0	32.4
## 621	2	112	86	42	160	38.4
## 622	2	92	76	20	0	24.2
## 623	6	183	94	0	0	40.8
## 624	0	94	70	27	115	43.5
## 625	2	108	64	0	0	30.8
## 626	4	90	88	47	54	37.7
## 627	0	125	68	0	0	24.7
## 628	0	132	78	0	0	32.4
## 629	5	128	80	0	0	34.6
## 630	4	94	65	22	0	24.7
## 631	7	114	64	0	0	27.4
## 632	0	102	78	40	90	34.5
## 633	2	111	60	0	0	26.2
## 634	1	128	82	17	183	27.5
## 635	10	92	62	0	0	25.9
## 636	13	104	72	0	0	31.2
## 637	5	104	74	0	0	28.8
## 638	2	94	76	18	66	31.6
## 639	7	97	76	32	91	40.9
## 640	1	100	74	12	46	19.5
## 641	0	102	86	17	105	29.3
## 642	4	128	70	0	0	34.3
## 643	6	147	80	0	0	29.5
## 644	4	90	0	0	0	28.0
## 645	3	103	72	30	152	27.6
## 646	2	157	74	35	440	39.4
## 647	1	167	74	17	144	23.4
## 648	0	179	50	36	159	37.8
## 649	11	136	84	35	130	28.3
## 650	0	107	60	25	0	26.4
## 651	1	91	54	25	100	25.2
## 652	1	117	60	23	106	33.8
## 653	5	123	74	40	77	34.1
## 654	2	120	54	0	0	26.8
## 655	1	106	70	28	135	34.2
## 656	2	155	52	27	540	38.7
## 657	2	101	58	35	90	21.8
## 658	1	120	80	48	200	38.9
## 659	11	127	106	0	0	39.0
## 660	3	80	82	31	70	34.2
## 661	10	162	84	0	0	27.7

```
## 662    1   199   76   43     0 42.9
## 663    8   167  106   46   231 37.6
## 664    9   145   80   46   130 37.9
## 665    6   115   60   39     0 33.7
## 666    1   112   80   45   132 34.8
## 667    4   145   82   18     0 32.5
## 668   10   111   70   27     0 27.5
## 669    6    98   58   33   190 34.0
## 670    9   154   78   30   100 30.9
## 671    6   165   68   26   168 33.6
## 672    1    99   58   10     0 25.4
## 673   10    68  106   23    49 35.5
## 674    3   123  100   35   240 57.3
## 675    8    91   82    0     0 35.6
## 676    6   195   70    0     0 30.9
## 677    9   156   86    0     0 24.8
## 678    0    93   60    0     0 35.3
## 679    3   121   52    0     0 36.0
## 680    2   101   58   17   265 24.2
## 681    2    56   56   28    45 24.2
## 682    0   162   76   36     0 49.6
## 683    0    95   64   39   105 44.6
## 684    4   125   80    0     0 32.3
## 685    5   136   82    0     0  0.0
## 686    2   129   74   26   205 33.2
## 687    3   130   64    0     0 23.1
## 688    1   107   50   19     0 28.3
## 689    1   140   74   26   180 24.1
## 690    1   144   82   46   180 46.1
## 691    8   107   80    0     0 24.6
## 692   13   158  114    0     0 42.3
## 693    2   121   70   32    95 39.1
## 694    7   129   68   49   125 38.5
## 695    2    90   60    0     0 23.5
## 696    7   142   90   24   480 30.4
## 697    3   169   74   19   125 29.9
## 698    0    99    0    0     0 25.0
## 699    4   127   88   11   155 34.5
## 700    4   118   70    0     0 44.5
## 701    2   122   76   27   200 35.9
## 702    6   125   78   31     0 27.6
## 703    1   168   88   29     0 35.0
## 704    2   129    0    0     0 38.5
## 705    4   110   76   20   100 28.4
## 706    6    80   80   36     0 39.8
## 707   10   115    0    0     0  0.0
## 708    2   127   46   21   335 34.4
## 709    9   164   78    0     0 32.8
## 710    2    93   64   32   160 38.0
## 711    3   158   64   13   387 31.2
## 712    5   126   78   27    22 29.6
## 713   10   129   62   36     0 41.2
## 714    0   134   58   20   291 26.4
## 715    3   102   74    0     0 29.5
## 716    7   187   50   33   392 33.9
## 717    3   173   78   39   185 33.8
## 718   10    94   72   18     0 23.1
## 719    1   108   60   46   178 35.5
## 720    5    97   76   27     0 35.6
## 721    4    83   86   19     0 29.3
## 722    1   114   66   36   200 38.1
## 723    1   149   68   29   127 29.3
## 724    5   117   86   30   105 39.1
## 725    1   111   94    0     0 32.8
## 726    4   112   78   40     0 39.4
## 727    1   116   78   29   180 36.1
## 728    0   141   84   26     0 32.4
## 729    2   175   88    0     0 22.9
## 730    2    92   52    0     0 30.1
## 731    3   130   78   23    79 28.4
## 732    8   120   86    0     0 28.4
## 733    2   174   88   37   120 44.5
## 734    3   106   56   37   165 28.9
```

```
## 734                2    106              56              27    165 29.0
## 735                2    105              75               0      0 23.3
## 736                4     95              60              32      0 35.4
## 737                0    126              86              27    120 27.4
## 738                8     65              72              23      0 32.0
## 739                2     99              60              17    160 36.6
## 740                1    102              74               0      0 39.5
## 741               11    120              80              37    150 42.3
## 742                3    102              44              20     94 30.8
## 743                1    109              58              18    116 28.5
## 744                9    140              94               0      0 32.7
## 745               13    153              88              37    140 40.6
## 746               12    100              84              33    105 30.0
## 747                1    147              94              41      0 49.3
## 748                1     81              74              41     57 46.3
## 749                3    187              70              22    200 36.4
## 750                6    162              62               0      0 24.3
## 751                4    136              70               0      0 31.2
## 752                1    121              78              39     74 39.0
## 753                3    108              62              24      0 26.0
## 754                0    181              88              44    510 43.3
## 755                8    154              78              32      0 32.4
## 756                1    128              88              39    110 36.5
## 757                7    137              90              41      0 32.0
## 758                0    123              72               0      0 36.3
## 759                1    106              76               0      0 37.5
## 760                6    190              92               0      0 35.5
## 761                2     88              58              26     16 28.4
## 762                9    170              74              31      0 44.0
## 763                9     89              62               0      0 22.5
## 764               10    101              76              48    180 32.9
## 765                2    122              70              27      0 36.8
## 766                5    121              72              23    112 26.2
## 767                1    126              60               0      0 30.1
## 768                1     93              70              31      0 30.4
##     DiabetesPedigreeFunction Age Outcome
## 1                      0.627  50       1
## 2                      0.351  31       0
## 3                      0.672  32       1
## 4                      0.167  21       0
## 5                      2.288  33       1
## 6                      0.201  30       0
## 7                      0.248  26       1
## 8                      0.134  29       0
## 9                      0.158  53       1
## 10                     0.232  54       1
## 11                     0.191  30       0
## 12                     0.537  34       1
## 13                     1.441  57       0
## 14                     0.398  59       1
## 15                     0.587  51       1
## 16                     0.484  32       1
## 17                     0.551  31       1
## 18                     0.254  31       1
## 19                     0.183  33       0
## 20                     0.529  32       1
## 21                     0.704  27       0
## 22                     0.388  50       0
## 23                     0.451  41       1
## 24                     0.263  29       1
## 25                     0.254  51       1
## 26                     0.205  41       1
## 27                     0.257  43       1
## 28                     0.487  22       0
## 29                     0.245  57       0
## 30                     0.337  38       0
## 31                     0.546  60       0
## 32                     0.851  28       1
## 33                     0.267  22       0
## 34                     0.188  28       0
## 35                     0.512  45       0
## 36                     0.966  33       0
## 37                     0.420  35       0
```

```
## 38                     0.665  46       1
## 39                     0.503  27       1
## 40                     1.390  56       1
## 41                     0.271  26       0
## 42                     0.696  37       0
## 43                     0.235  48       0
## 44                     0.721  54       1
## 45                     0.294  40       0
## 46                     1.893  25       1
## 47                     0.564  29       0
## 48                     0.586  22       0
## 49                     0.344  31       1
## 50                     0.305  24       0
## 51                     0.491  22       0
## 52                     0.526  26       0
## 53                     0.342  30       0
## 54                     0.467  58       1
## 55                     0.718  42       0
## 56                     0.248  21       0
## 57                     0.254  41       1
## 58                     0.962  31       0
## 59                     1.781  44       0
## 60                     0.173  22       0
## 61                     0.304  21       0
## 62                     0.270  39       1
## 63                     0.587  36       0
## 64                     0.699  24       0
## 65                     0.258  42       1
## 66                     0.203  32       0
## 67                     0.855  38       1
## 68                     0.845  54       0
## 69                     0.334  25       0
## 70                     0.189  27       0
## 71                     0.867  28       1
## 72                     0.411  26       0
## 73                     0.583  42       1
## 74                     0.231  23       0
## 75                     0.396  22       0
## 76                     0.140  22       0
## 77                     0.391  41       0
## 78                     0.370  27       0
## 79                     0.270  26       1
## 80                     0.307  24       0
## 81                     0.140  22       0
## 82                     0.102  22       0
## 83                     0.767  36       0
## 84                     0.237  22       0
## 85                     0.227  37       1
## 86                     0.698  27       0
## 87                     0.178  45       0
## 88                     0.324  26       0
## 89                     0.153  43       1
## 90                     0.165  24       0
## 91                     0.258  21       0
## 92                     0.443  34       0
## 93                     0.261  42       0
## 94                     0.277  60       1
## 95                     0.761  21       0
## 96                     0.255  40       0
## 97                     0.130  24       0
## 98                     0.323  22       0
## 99                     0.356  23       0
## 100                    0.325  31       1
## 101                    1.222  33       1
## 102                    0.179  22       0
## 103                    0.262  21       0
## 104                    0.283  24       0
## 105                    0.930  27       0
## 106                    0.801  21       0
## 107                    0.207  27       0
## 108                    0.287  37       0
## 109                    0.336  25       0
## 110                    0.247  24       1
```

```
## 111                    0.199  24      1
## 112                    0.543  46      1
## 113                    0.192  23      0
## 114                    0.391  25      0
## 115                    0.588  39      1
## 116                    0.539  61      1
## 117                    0.220  38      1
## 118                    0.654  25      0
## 119                    0.443  22      0
## 120                    0.223  21      0
## 121                    0.759  25      1
## 122                    0.260  24      0
## 123                    0.404  23      0
## 124                    0.186  69      0
## 125                    0.278  23      1
## 126                    0.496  26      1
## 127                    0.452  30      0
## 128                    0.261  23      0
## 129                    0.403  40      1
## 130                    0.741  62      1
## 131                    0.361  33      1
## 132                    1.114  33      1
## 133                    0.356  30      1
## 134                    0.457  39      0
## 135                    0.647  26      0
## 136                    0.088  31      0
## 137                    0.597  21      0
## 138                    0.532  22      0
## 139                    0.703  29      0
## 140                    0.159  28      0
## 141                    0.268  55      0
## 142                    0.286  38      0
## 143                    0.318  22      0
## 144                    0.272  42      1
## 145                    0.237  23      0
## 146                    0.572  21      0
## 147                    0.096  41      0
## 148                    1.400  34      0
## 149                    0.218  65      0
## 150                    0.085  22      0
## 151                    0.399  24      0
## 152                    0.432  37      0
## 153                    1.189  42      1
## 154                    0.687  23      0
## 155                    0.137  43      1
## 156                    0.337  36      1
## 157                    0.637  21      0
## 158                    0.833  23      0
## 159                    0.229  22      0
## 160                    0.817  47      1
## 161                    0.294  36      0
## 162                    0.204  45      0
## 163                    0.167  27      0
## 164                    0.368  21      0
## 165                    0.743  32      1
## 166                    0.722  41      1
## 167                    0.256  22      0
## 168                    0.709  34      0
## 169                    0.471  29      0
## 170                    0.495  29      0
## 171                    0.180  36      1
## 172                    0.542  29      1
## 173                    0.773  25      0
## 174                    0.678  23      0
## 175                    0.370  33      0
## 176                    0.719  36      1
## 177                    0.382  42      0
## 178                    0.319  26      1
## 179                    0.190  47      0
## 180                    0.956  37      1
## 181                    0.084  32      0
## 182                    0.725  23      0
## 183                    0.399  21      0
```

```
## 183         0.299  21      0
## 184         0.268  27      0
## 185         0.244  40      0
## 186         0.745  41      1
## 187         0.615  60      1
## 188         1.321  33      1
## 189         0.640  31      1
## 190         0.361  25      1
## 191         0.142  21      0
## 192         0.374  40      0
## 193         0.383  36      1
## 194         0.578  40      1
## 195         0.136  42      0
## 196         0.395  29      1
## 197         0.187  21      0
## 198         0.678  23      1
## 199         0.905  26      1
## 200         0.150  29      1
## 201         0.874  21      0
## 202         0.236  28      0
## 203         0.787  32      0
## 204         0.235  27      0
## 205         0.324  55      0
## 206         0.407  27      0
## 207         0.605  57      1
## 208         0.151  52      1
## 209         0.289  21      0
## 210         0.355  41      1
## 211         0.290  25      0
## 212         0.375  24      0
## 213         0.164  60      0
## 214         0.431  24      1
## 215         0.260  36      1
## 216         0.742  38      1
## 217         0.514  25      1
## 218         0.464  32      0
## 219         1.224  32      1
## 220         0.261  41      1
## 221         1.072  21      1
## 222         0.805  66      1
## 223         0.209  37      0
## 224         0.687  61      0
## 225         0.666  26      0
## 226         0.101  22      0
## 227         0.198  26      0
## 228         0.652  24      1
## 229         2.329  31      0
## 230         0.089  24      0
## 231         0.645  22      1
## 232         0.238  46      1
## 233         0.583  22      0
## 234         0.394  29      0
## 235         0.293  23      0
## 236         0.479  26      1
## 237         0.586  51      1
## 238         0.686  23      1
## 239         0.831  32      1
## 240         0.582  27      0
## 241         0.192  21      0
## 242         0.446  22      0
## 243         0.402  22      1
## 244         1.318  33      1
## 245         0.329  29      0
## 246         1.213  49      1
## 247         0.258  41      0
## 248         0.427  23      0
## 249         0.282  34      0
## 250         0.143  23      0
## 251         0.380  42      0
## 252         0.284  27      0
## 253         0.249  24      0
## 254         0.238  25      0
## 255         0.926  44      1
```

```
## 256                    0.543  21       1
## 257                    0.557  30       0
## 258                    0.092  25       0
## 259                    0.655  24       0
## 260                    1.353  51       1
## 261                    0.299  34       0
## 262                    0.761  27       1
## 263                    0.612  24       0
## 264                    0.200  63       0
## 265                    0.226  35       1
## 266                    0.997  43       0
## 267                    0.933  25       1
## 268                    1.101  24       0
## 269                    0.078  21       0
## 270                    0.240  28       1
## 271                    1.136  38       1
## 272                    0.128  21       0
## 273                    0.254  40       0
## 274                    0.422  21       0
## 275                    0.251  52       0
## 276                    0.677  25       0
## 277                    0.296  29       1
## 278                    0.454  23       0
## 279                    0.744  57       0
## 280                    0.881  22       0
## 281                    0.334  28       1
## 282                    0.280  39       0
## 283                    0.262  37       0
## 284                    0.165  47       1
## 285                    0.259  52       1
## 286                    0.647  51       0
## 287                    0.619  34       0
## 288                    0.808  29       1
## 289                    0.340  26       0
## 290                    0.263  33       0
## 291                    0.434  21       0
## 292                    0.757  25       1
## 293                    1.224  31       1
## 294                    0.613  24       1
## 295                    0.254  65       0
## 296                    0.692  28       0
## 297                    0.337  29       1
## 298                    0.520  24       0
## 299                    0.412  46       1
## 300                    0.840  58       0
## 301                    0.839  30       1
## 302                    0.422  25       1
## 303                    0.156  35       0
## 304                    0.209  28       1
## 305                    0.207  37       0
## 306                    0.215  29       0
## 307                    0.326  47       1
## 308                    0.143  21       0
## 309                    1.391  25       1
## 310                    0.875  30       1
## 311                    0.313  41       0
## 312                    0.605  22       0
## 313                    0.433  27       1
## 314                    0.626  25       0
## 315                    1.127  43       1
## 316                    0.315  26       0
## 317                    0.284  30       0
## 318                    0.345  29       1
## 319                    0.150  28       0
## 320                    0.129  59       1
## 321                    0.527  31       0
## 322                    0.197  25       1
## 323                    0.254  36       1
## 324                    0.731  43       1
## 325                    0.148  21       0
## 326                    0.123  24       0
## 327                    0.692  30       1
## 328                    0.200  37       0
```

```
## 329                      0.127  23        1
## 330                      0.122  37        0
## 331                      1.476  46        0
## 332                      0.166  25        0
## 333                      0.282  41        1
## 334                      0.137  44        0
## 335                      0.260  22        0
## 336                      0.259  26        0
## 337                      0.932  44        0
## 338                      0.343  44        1
## 339                      0.893  33        1
## 340                      0.331  41        1
## 341                      0.472  22        0
## 342                      0.673  36        0
## 343                      0.389  22        0
## 344                      0.290  33        0
## 345                      0.485  57        0
## 346                      0.349  49        0
## 347                      0.654  22        0
## 348                      0.187  23        0
## 349                      0.279  26        0
## 350                      0.346  37        1
## 351                      0.237  29        0
## 352                      0.252  30        0
## 353                      0.243  46        0
## 354                      0.580  24        0
## 355                      0.559  21        0
## 356                      0.302  49        1
## 357                      0.962  28        1
## 358                      0.569  44        1
## 359                      0.378  48        0
## 360                      0.875  29        1
## 361                      0.583  29        1
## 362                      0.207  63        0
## 363                      0.305  65        0
## 364                      0.520  67        1
## 365                      0.385  30        0
## 366                      0.499  30        0
## 367                      0.368  29        1
## 368                      0.252  21        0
## 369                      0.306  22        0
## 370                      0.234  45        1
## 371                      2.137  25        1
## 372                      1.731  21        0
## 373                      0.545  21        0
## 374                      0.225  25        0
## 375                      0.816  28        0
## 376                      0.528  58        1
## 377                      0.299  22        0
## 378                      0.509  22        0
## 379                      0.238  32        1
## 380                      1.021  35        0
## 381                      0.821  24        0
## 382                      0.236  22        0
## 383                      0.947  21        0
## 384                      1.268  25        0
## 385                      0.221  25        0
## 386                      0.205  24        0
## 387                      0.660  35        1
## 388                      0.239  45        1
## 389                      0.452  58        1
## 390                      0.949  28        0
## 391                      0.444  42        0
## 392                      0.340  27        1
## 393                      0.389  21        0
## 394                      0.463  37        0
## 395                      0.803  31        1
## 396                      1.600  25        0
## 397                      0.944  39        0
## 398                      0.196  22        1
## 399                      0.389  25        0
## 400                      0.241  25        1
## 401                      0.161  31        1
```

```
## 401        0.161  31   1
## 402        0.151  55   0
## 403        0.286  35   1
## 404        0.280  38   0
## 405        0.135  41   1
## 406        0.520  26   0
## 407        0.376  46   1
## 408        0.336  25   0
## 409        1.191  39   1
## 410        0.702  28   1
## 411        0.674  28   0
## 412        0.528  25   0
## 413        1.076  22   0
## 414        0.256  21   0
## 415        0.534  21   1
## 416        0.258  22   1
## 417        1.095  22   0
## 418        0.554  37   1
## 419        0.624  27   0
## 420        0.219  28   1
## 421        0.507  26   0
## 422        0.561  21   0
## 423        0.496  21   0
## 424        0.421  21   0
## 425        0.516  36   1
## 426        0.264  31   1
## 427        0.256  25   0
## 428        0.328  38   1
## 429        0.284  26   0
## 430        0.233  43   1
## 431        0.108  23   0
## 432        0.551  38   0
## 433        0.527  22   0
## 434        0.167  29   0
## 435        1.138  36   0
## 436        0.205  29   1
## 437        0.244  41   0
## 438        0.434  28   0
## 439        0.147  21   0
## 440        0.727  31   0
## 441        0.435  41   1
## 442        0.497  22   0
## 443        0.230  24   0
## 444        0.955  33   1
## 445        0.380  30   1
## 446        2.420  25   1
## 447        0.658  28   0
## 448        0.330  26   0
## 449        0.510  22   1
## 450        0.285  26   0
## 451        0.415  23   0
## 452        0.542  23   1
## 453        0.381  25   0
## 454        0.832  72   0
## 455        0.498  24   0
## 456        0.212  38   1
## 457        0.687  62   0
## 458        0.364  24   0
## 459        1.001  51   1
## 460        0.460  81   0
## 461        0.733  48   0
## 462        0.416  26   0
## 463        0.705  39   0
## 464        0.258  37   0
## 465        1.022  34   0
## 466        0.452  21   0
## 467        0.269  22   0
## 468        0.600  25   0
## 469        0.183  38   1
## 470        0.571  27   0
## 471        0.607  28   0
## 472        0.170  22   0
## 473        0.259  22   0
```

```
## 474                      0.210  50      0
## 475                      0.126  24      0
## 476                      0.231  59      0
## 477                      0.711  29      1
## 478                      0.466  31      0
## 479                      0.162  39      0
## 480                      0.419  63      0
## 481                      0.344  35      1
## 482                      0.197  29      0
## 483                      0.306  28      0
## 484                      0.233  23      0
## 485                      0.630  31      1
## 486                      0.365  24      1
## 487                      0.536  21      0
## 488                      1.159  58      0
## 489                      0.294  28      0
## 490                      0.551  67      0
## 491                      0.629  24      0
## 492                      0.292  42      0
## 493                      0.145  33      0
## 494                      1.144  45      1
## 495                      0.174  22      0
## 496                      0.304  66      0
## 497                      0.292  30      0
## 498                      0.547  25      0
## 499                      0.163  55      1
## 500                      0.839  39      0
## 501                      0.313  21      0
## 502                      0.267  28      0
## 503                      0.727  41      1
## 504                      0.738  41      0
## 505                      0.238  40      0
## 506                      0.263  38      0
## 507                      0.314  35      1
## 508                      0.692  21      0
## 509                      0.968  21      0
## 510                      0.409  64      0
## 511                      0.297  46      1
## 512                      0.207  21      0
## 513                      0.200  58      0
## 514                      0.525  22      0
## 515                      0.154  24      0
## 516                      0.268  28      1
## 517                      0.771  53      1
## 518                      0.304  51      0
## 519                      0.180  41      0
## 520                      0.582  60      0
## 521                      0.187  25      0
## 522                      0.305  26      0
## 523                      0.189  26      0
## 524                      0.652  45      1
## 525                      0.151  24      0
## 526                      0.444  21      0
## 527                      0.299  21      0
## 528                      0.107  24      0
## 529                      0.493  22      0
## 530                      0.660  31      0
## 531                      0.717  22      0
## 532                      0.686  24      0
## 533                      0.917  29      0
## 534                      0.501  31      0
## 535                      1.251  24      0
## 536                      0.302  23      1
## 537                      0.197  46      0
## 538                      0.735  67      0
## 539                      0.804  23      0
## 540                      0.968  32      1
## 541                      0.661  43      1
## 542                      0.549  27      1
## 543                      0.825  56      1
## 544                      0.159  25      0
## 545                      0.365  29      0
## 546                      0.423  37      1
```

```
## 547                    1.034  53      1
## 548                    0.160  28      0
## 549                    0.341  50      0
## 550                    0.680  37      0
## 551                    0.204  21      0
## 552                    0.591  25      0
## 553                    0.247  66      0
## 554                    0.422  23      0
## 555                    0.471  28      0
## 556                    0.161  37      0
## 557                    0.218  30      0
## 558                    0.237  58      0
## 559                    0.126  42      0
## 560                    0.300  35      0
## 561                    0.121  54      1
## 562                    0.502  28      1
## 563                    0.401  24      0
## 564                    0.497  32      0
## 565                    0.601  27      0
## 566                    0.748  22      0
## 567                    0.412  21      0
## 568                    0.085  46      0
## 569                    0.338  37      0
## 570                    0.203  33      1
## 571                    0.270  39      0
## 572                    0.268  21      0
## 573                    0.430  22      0
## 574                    0.198  22      0
## 575                    0.892  23      0
## 576                    0.280  25      0
## 577                    0.813  35      0
## 578                    0.693  21      1
## 579                    0.245  36      0
## 580                    0.575  62      1
## 581                    0.371  21      1
## 582                    0.206  27      0
## 583                    0.259  62      0
## 584                    0.190  42      0
## 585                    0.687  52      1
## 586                    0.417  22      0
## 587                    0.129  41      1
## 588                    0.249  29      0
## 589                    1.154  52      1
## 590                    0.342  25      0
## 591                    0.925  45      1
## 592                    0.175  24      0
## 593                    0.402  44      1
## 594                    1.699  25      0
## 595                    0.733  34      0
## 596                    0.682  22      1
## 597                    0.194  46      0
## 598                    0.559  21      0
## 599                    0.088  38      1
## 600                    0.407  26      0
## 601                    0.400  24      0
## 602                    0.190  28      0
## 603                    0.100  30      0
## 604                    0.692  54      1
## 605                    0.212  36      1
## 606                    0.514  21      0
## 607                    1.258  22      1
## 608                    0.482  25      0
## 609                    0.270  27      0
## 610                    0.138  23      0
## 611                    0.292  24      0
## 612                    0.593  36      1
## 613                    0.787  40      1
## 614                    0.878  26      0
## 615                    0.557  50      1
## 616                    0.207  27      0
## 617                    0.157  30      0
## 618                    0.257  23      0
## 619                    1.282  50      1
```

```
## 619              1.282  50    1
## 620              0.141  24    1
## 621              0.246  28    0
## 622              1.698  28    0
## 623              1.461  45    0
## 624              0.347  21    0
## 625              0.158  21    0
## 626              0.362  29    0
## 627              0.206  21    0
## 628              0.393  21    0
## 629              0.144  45    0
## 630              0.148  21    0
## 631              0.732  34    1
## 632              0.238  24    0
## 633              0.343  23    0
## 634              0.115  22    0
## 635              0.167  31    0
## 636              0.465  38    1
## 637              0.153  48    0
## 638              0.649  23    0
## 639              0.871  32    1
## 640              0.149  28    0
## 641              0.695  27    0
## 642              0.303  24    0
## 643              0.178  50    1
## 644              0.610  31    0
## 645              0.730  27    0
## 646              0.134  30    0
## 647              0.447  33    1
## 648              0.455  22    1
## 649              0.260  42    1
## 650              0.133  23    0
## 651              0.234  23    0
## 652              0.466  27    0
## 653              0.269  28    0
## 654              0.455  27    0
## 655              0.142  22    0
## 656              0.240  25    1
## 657              0.155  22    0
## 658              1.162  41    0
## 659              0.190  51    0
## 660              1.292  27    1
## 661              0.182  54    0
## 662              1.394  22    1
## 663              0.165  43    1
## 664              0.637  40    1
## 665              0.245  40    1
## 666              0.217  24    0
## 667              0.235  70    1
## 668              0.141  40    1
## 669              0.430  43    0
## 670              0.164  45    0
## 671              0.631  49    0
## 672              0.551  21    0
## 673              0.285  47    0
## 674              0.880  22    0
## 675              0.587  68    0
## 676              0.328  31    1
## 677              0.230  53    1
## 678              0.263  25    0
## 679              0.127  25    1
## 680              0.614  23    0
## 681              0.332  22    0
## 682              0.364  26    1
## 683              0.366  22    0
## 684              0.536  27    1
## 685              0.640  69    0
## 686              0.591  25    0
## 687              0.314  22    0
## 688              0.181  29    0
## 689              0.828  23    0
## 690              0.335  46    1
## 691              0.856  34    0
```

```
## 692                    0.257  44      1
## 693                    0.886  23      0
## 694                    0.439  43      1
## 695                    0.191  25      0
## 696                    0.128  43      1
## 697                    0.268  31      1
## 698                    0.253  22      0
## 699                    0.598  28      0
## 700                    0.904  26      0
## 701                    0.483  26      0
## 702                    0.565  49      1
## 703                    0.905  52      1
## 704                    0.304  41      0
## 705                    0.118  27      0
## 706                    0.177  28      0
## 707                    0.261  30      1
## 708                    0.176  22      0
## 709                    0.148  45      1
## 710                    0.674  23      1
## 711                    0.295  24      0
## 712                    0.439  40      0
## 713                    0.441  38      1
## 714                    0.352  21      0
## 715                    0.121  32      0
## 716                    0.826  34      1
## 717                    0.970  31      1
## 718                    0.595  56      0
## 719                    0.415  24      0
## 720                    0.378  52      1
## 721                    0.317  34      0
## 722                    0.289  21      0
## 723                    0.349  42      1
## 724                    0.251  42      0
## 725                    0.265  45      0
## 726                    0.236  38      0
## 727                    0.496  25      0
## 728                    0.433  22      0
## 729                    0.326  22      0
## 730                    0.141  22      0
## 731                    0.323  34      1
## 732                    0.259  22      1
## 733                    0.646  24      1
## 734                    0.426  22      0
## 735                    0.560  53      0
## 736                    0.284  28      0
## 737                    0.515  21      0
## 738                    0.600  42      0
## 739                    0.453  21      0
## 740                    0.293  42      1
## 741                    0.785  48      1
## 742                    0.400  26      0
## 743                    0.219  22      0
## 744                    0.734  45      1
## 745                    1.174  39      0
## 746                    0.488  46      0
## 747                    0.358  27      1
## 748                    1.096  32      0
## 749                    0.408  36      1
## 750                    0.178  50      1
## 751                    1.182  22      1
## 752                    0.261  28      0
## 753                    0.223  25      0
## 754                    0.222  26      1
## 755                    0.443  45      1
## 756                    1.057  37      1
## 757                    0.391  39      0
## 758                    0.258  52      1
## 759                    0.197  26      0
## 760                    0.278  66      1
## 761                    0.766  22      0
## 762                    0.403  43      1
## 763                    0.142  33      0
## 764                    0.171  63      0
```

```
## 765                  0.340  27      0
## 766                  0.245  30      0
## 767                  0.349  47      1
## 768                  0.315  23      0
```

```r
library(Amelia) #This library is used to plot missmap
```

```
## Warning: package 'Amelia' was built under R version 3.5.2
```

```
## Loading required package: Rcpp
```

```
## ##
## ## Amelia II: Multiple Imputation
## ## (Version 1.7.5, built: 2018-05-07)
## ## Copyright (C) 2005-2019 James Honaker, Gary King and Matthew Blackwell
## ## Refer to http://gking.harvard.edu/amelia/ for more information
## ##
```

```r
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.5.2
```

```r
library(ggcorrplot)
```

```
## Warning: package 'ggcorrplot' was built under R version 3.5.2
```

```r
library(GGally)
```

```
## Warning: package 'GGally' was built under R version 3.5.2
```

```r
library(PerformanceAnalytics)
```

```
## Warning: package 'PerformanceAnalytics' was built under R version 3.5.2
```

```
## Loading required package: xts
```

```
## Warning: package 'xts' was built under R version 3.5.2
```

```
## Loading required package: zoo
```

```
## Warning: package 'zoo' was built under R version 3.5.2
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric
```

```
##
## Attaching package: 'PerformanceAnalytics'
```

```
## The following object is masked from 'package:graphics':
##
##      legend
```

```r
library(gridExtra)
```

```
## Warning: package 'gridExtra' was built under R version 3.5.2
```

```
chooseCRANmirror(graphics=FALSE, ind=1)


#t-test


attach(diabetes)

with(data=diabetes,t.test(Pregnancies[Outcome==1],Pregnancies[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  Pregnancies[Outcome == 1] and Pregnancies[Outcome == 0]
## t = 6.2984, df = 766, p-value = 5.065e-10
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.079067 2.056276
## sample estimates:
## mean of x mean of y
##  4.865672  3.298000
```

```
with(data=diabetes,t.test(Glucose[Outcome==1],Glucose[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  Glucose[Outcome == 1] and Glucose[Outcome == 0]
## t = 14.6, df = 766, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  27.07202 35.48291
## sample estimates:
## mean of x mean of y
##  141.2575  109.9800
```

```
with(data=diabetes,t.test(Insulin[Outcome==1],Insulin[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  Insulin[Outcome == 1] and Insulin[Outcome == 0]
## t = 3.6443, df = 766, p-value = 0.0002862
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  14.55231 48.53533
## sample estimates:
## mean of x mean of y
##  100.3358   68.7920
```

```
with(data=diabetes,t.test(SkinThickness[Outcome==1],SkinThickness[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  SkinThickness[Outcome == 1] and SkinThickness[Outcome == 0]
## t = 2.0747, df = 766, p-value = 0.03835
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  0.1345284 4.8658298
## sample estimates:
## mean of x mean of y
##  22.16418  19.66400
```

```r
with(data=diabetes,t.test(BMI[Outcome==1],BMI[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  BMI[Outcome == 1] and BMI[Outcome == 0]
## t = 8.4718, df = 766, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  3.717214 5.959460
## sample estimates:
## mean of x mean of y
##  35.14254  30.30420
```

```r
with(data=diabetes,t.test(DiabetesPedigreeFunction[Outcome==0],DiabetesPedigreeFunction[Outcome==1],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  DiabetesPedigreeFunction[Outcome == 0] and DiabetesPedigreeFunction[Outcome == 1]
## t = -4.8858, df = 766, p-value = 1.255e-06
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.16928831 -0.07224369
## sample estimates:
## mean of x mean of y
##  0.429734  0.550500
```

```r
with(data=diabetes,t.test(Age[Outcome==1],Age[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  Age[Outcome == 1] and Age[Outcome == 0]
## t = 6.7927, df = 766, p-value = 2.21e-11
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  4.178682 7.575646
## sample estimates:
## mean of x mean of y
##  37.06716  31.19000
```

```r
with(data=diabetes,t.test(BloodPressure[Outcome==1],BloodPressure[Outcome==0],var.equal=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  BloodPressure[Outcome == 1] and BloodPressure[Outcome == 0]
## t = 1.8047, df = 766, p-value = 0.07151
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2317162  5.5129700
## sample estimates:
## mean of x mean of y
##  70.82463  68.18400
```

```r
#Hotelling

install.packages("Hotelling")
```

```
## Installing package into 'C:/Users/siddh/OneDrive/Documents/R/win-library/3.5'
## (as 'lib' is unspecified)
```

```
## package 'Hotelling' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##   C:\Users\siddh\AppData\Local\Temp\RtmpoFYzmw\downloaded_packages
```

```r
library(Hotelling)
```

```
## Warning: package 'Hotelling' was built under R version 3.5.2
```

```
## Loading required package: corpcor
```

```
## Warning: package 'corpcor' was built under R version 3.5.2
```

```r
t2testsparr <- hotelling.test(Pregnancies + Glucose + Insulin + SkinThickness + BMI+ DiabetesPedigreeFunction + Age  ~ Outcome, data=diabetes)
cat("T2 statistic =",t2testsparr$stat[[1]],"\n")
```

```
## T2 statistic = 321.5672
```

```r
print(t2testsparr)
```

```
## Test stat:  45.578
## Numerator df:  7
## Denominator df:  760
## P-value:  0
```

```r
#F-test
attach(diabetes)
```

```
## The following objects are masked from diabetes (pos = 5):
##
##     Age, BloodPressure, BMI, DiabetesPedigreeFunction, Glucose,
##     Insulin, Outcome, Pregnancies, SkinThickness
```

```r
var.test(Pregnancies[Outcome==1],Pregnancies[Outcome==0])
```

```
##
##  F test to compare two variances
##
## data:  Pregnancies[Outcome == 1] and Pregnancies[Outcome == 0]
## F = 1.5375, num df = 267, denom df = 499, p-value = 4.246e-05
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.249880 1.904318
## sample estimates:
## ratio of variances
##           1.537543
```

```r
var.test(Glucose[Outcome==1],Glucose[Outcome==0])
```

```
##
##  F test to compare two variances
##
## data:  Glucose[Outcome == 1] and Glucose[Outcome == 0]
## F = 1.4928, num df = 267, denom df = 499, p-value = 0.0001392
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.213527 1.848931
## sample estimates:
## ratio of variances
##           1.492824
```

```
var.test(Insulin[Outcome==1],Insulin[Outcome==0])
```

```
##
##  F test to compare two variances
##
## data:  Insulin[Outcome == 1] and Insulin[Outcome == 0]
## F = 1.9679, num df = 267, denom df = 499, p-value = 9.062e-11
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.599699 2.437302
## sample estimates:
## ratio of variances
##           1.967873
```

```
var.test(SkinThickness[Outcome==1],SkinThickness[Outcome==0])
```

```
##
##  F test to compare two variances
##
## data:  SkinThickness[Outcome == 1] and SkinThickness[Outcome == 0]
## F = 1.4098, num df = 267, denom df = 499, p-value = 0.001112
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.146054 1.746129
## sample estimates:
## ratio of variances
##           1.409821
```

```
var.test(BMI[Outcome==1],BMI[Outcome==0])
```

```
##
##  F test to compare two variances
##
## data:  BMI[Outcome == 1] and BMI[Outcome == 0]
## F = 0.89206, num df = 267, denom df = 499, p-value = 0.295
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.7251585 1.1048520
## sample estimates:
## ratio of variances
##           0.8920555
```

```
var.test(DiabetesPedigreeFunction[Outcome==1],DiabetesPedigreeFunction[Outcome==0])
```

```
##
##  F test to compare two variances
##
## data:  DiabetesPedigreeFunction[Outcome == 1] and DiabetesPedigreeFunction[Outcome == 0]
## F = 1.55, num df = 267, denom df = 499, p-value = 3.03e-05
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.259981 1.919708
## sample estimates:
## ratio of variances
##           1.549969
```

```
var.test(Age[Outcome==1],Age[Outcome==0])
```

```
## 
##  F test to compare two variances
## 
## data:  Age[Outcome == 1] and Age[Outcome == 0]
## F = 0.88371, num df = 267, denom df = 499, p-value = 0.2569
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.7183712 1.0945108
## sample estimates:
## ratio of variances
##           0.8837061
```

```
var.test(BloodPressure[Outcome==1],BloodPressure[Outcome==0])
```

```
## 
##  F test to compare two variances
## 
## data:  BloodPressure[Outcome == 1] and BloodPressure[Outcome == 0]
## F = 1.4157, num df = 267, denom df = 499, p-value = 0.0009661
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.150810 1.753375
## sample estimates:
## ratio of variances
##           1.415672
```

```
#levene Test - To test equality of variables

install.packages("car")
```

```
## Installing package into 'C:/Users/siddh/OneDrive/Documents/R/win-library/3.5'
## (as 'lib' is unspecified)
```

```
## package 'car' successfully unpacked and MD5 sums checked
## 
## The downloaded binary packages are in
##   C:\Users\siddh\AppData\Local\Temp\RtmpoFYzmw\downloaded_packages
```

```
library(car)
```

```
## Warning: package 'car' was built under R version 3.5.2
```

```
## Loading required package: carData
```

```
## Warning: package 'carData' was built under R version 3.5.2
```

```
#diabetes$Outcome <- is.factor(diabetes$outcome)
#levels(diabetes$Outcome) <- c("Non-Diabetic","Diabetic")
#leveneTest(diabetes$Pregnancies, diabetes$Outcome,center=mean)

with(diabetes,leveneTest(Outcome,Pregnancies))
```

```
## Warning in leveneTest.default(Outcome, Pregnancies): Pregnancies coerced to
## factor.
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##        Df F value  Pr(>F)
## group  16  1.7726 0.03078 *
##       751
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
with(diabetes,leveneTest(Outcome,BMI))
```

```
## Warning in leveneTest.default(Outcome, BMI): BMI coerced to factor.
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##        Df F value Pr(>F)
## group 247   0.726 0.9978
##       520
```

```
with(diabetes,leveneTest(Outcome,Insulin))
```

```
## Warning in leveneTest.default(Outcome, Insulin): Insulin coerced to factor.
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##        Df F value Pr(>F)
## group 185  0.6804  0.999
##       582
```

```
with(diabetes,leveneTest(Outcome,BloodPressure))
```

```
## Warning in leveneTest.default(Outcome, BloodPressure): BloodPressure
## coerced to factor.
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##        Df F value Pr(>F)
## group  46  1.0258 0.4279
##       721
```

```
with(diabetes,leveneTest(Outcome,Age))
```

```
## Warning in leveneTest.default(Outcome, Age): Age coerced to factor.
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##        Df F value Pr(>F)
## group  51  1.2615 0.1094
##       716
```

```
# Correlation matrix
#This plot shows us correlation coeeficents of all the varaibles.

corr <- round(cor(diabetes), 1)
# Plot
ggcorrplot(corr, hc.order = TRUE,
           type = "lower",
           lab = TRUE,
           lab_size = 3,
           method="circle",
           colors = c("tomato2", "white", "springgreen3"),
           title="Correlogram",
           ggtheme=theme_bw)
```

Correlogram
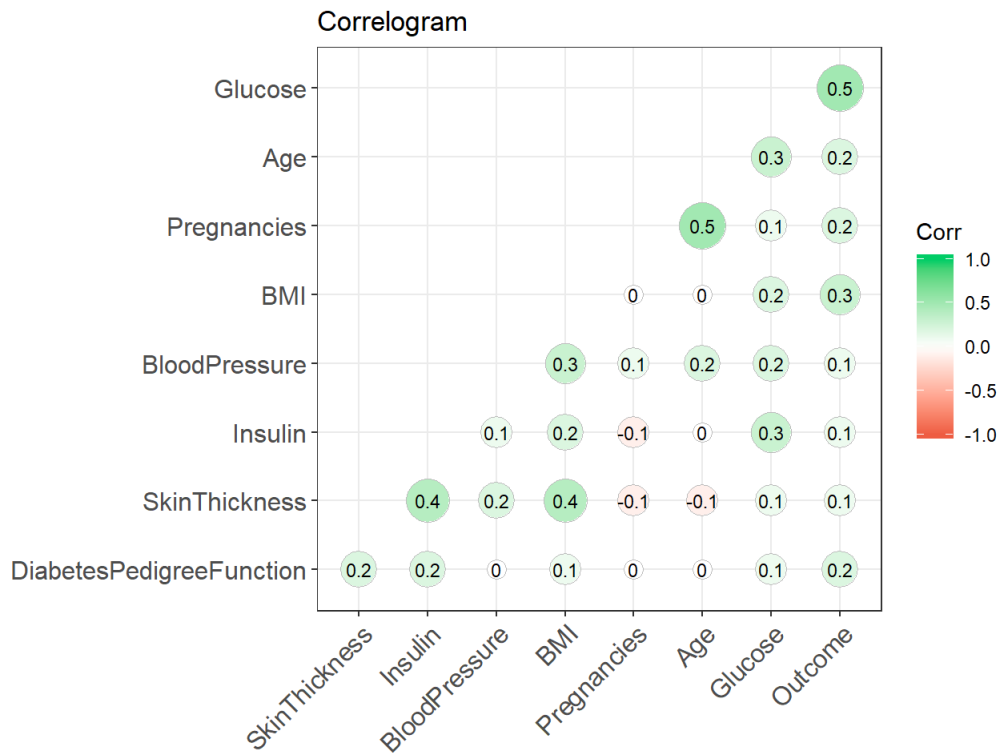

```
# From the plot, we can say that the variable Glucose has a higher impact on the Outcome variable. They are
highly Co-rrelated.
#Pregnancies and Age are strongly correlated with coeeficient value 0.54.
#SkinThickness , BMI and Skinthickness and Insulin are positively correlated with coeeficient values 0.4.


#Changing outcome from numerical to categorical varibale.
diabetes$Outcome<- is.factor(diabetes$Outome)
levels(diabetes$Outcome) <- c("No","Yes")


#correlation plot
#This plot shows the relationship between the variables.
ggpairs(diabetes, aes(color=Outcome, alpha=0.75), lower=list(continuous="smooth"))+ theme_bw()+
  labs(title="Correlation Plot of Variance(diabetes)")+
  theme(plot.title=element_text(face='bold',color='black',hjust=0.5,size=12))
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

Correlation Plot of Variance(diabetes)
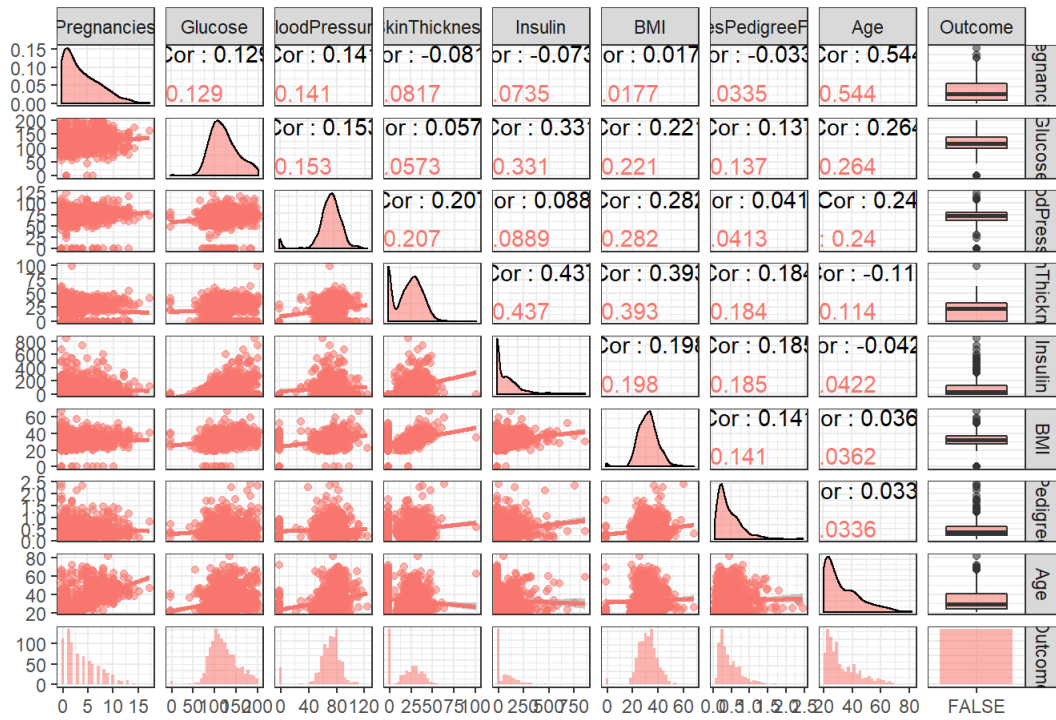

```
#From the box plots in the last segment, we see the variables Insulin, BloodPressure, and the DiabetesPedigr
eefunction
#contain many outliers.

#stripchart is like scatter plots (or dot plots) of the given data.
#It's like an alternative to boxplots when sample sizes are small and are also used to check outliers presen
t in each variables
stripchart(diabetes$BloodPressure,
           main="Blood pressure levels",
           xlab="Pressure levels",
           ylab="",
           method="jitter",
           col="orange",
           pch=1)
```
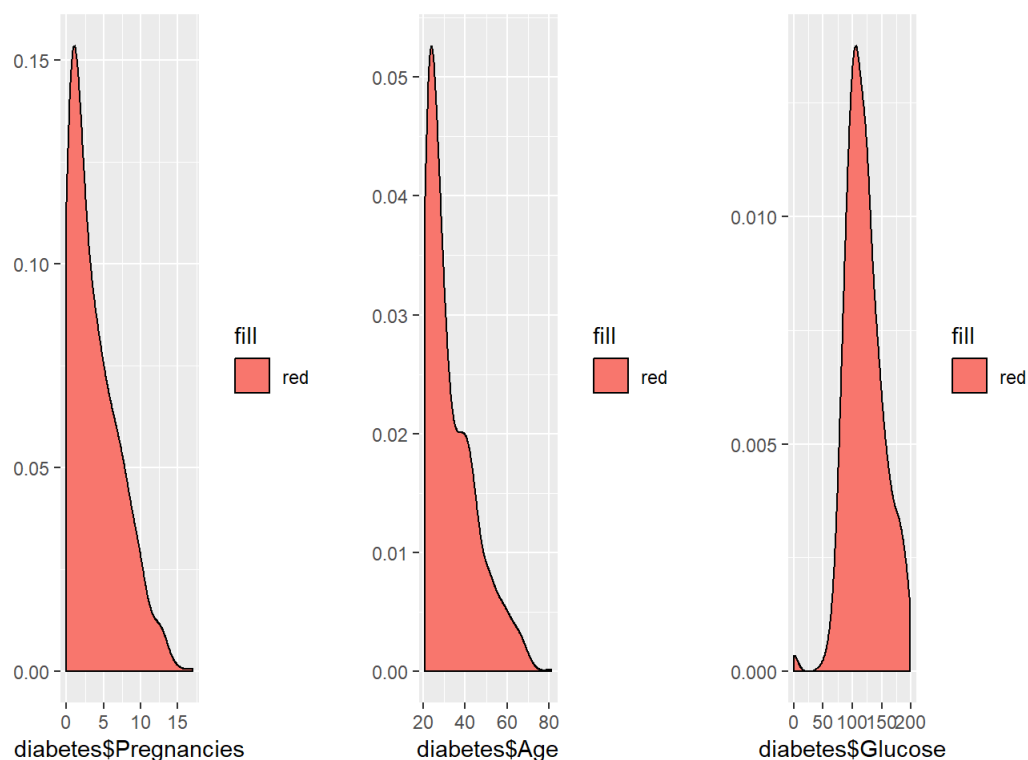
Blood pressure levels
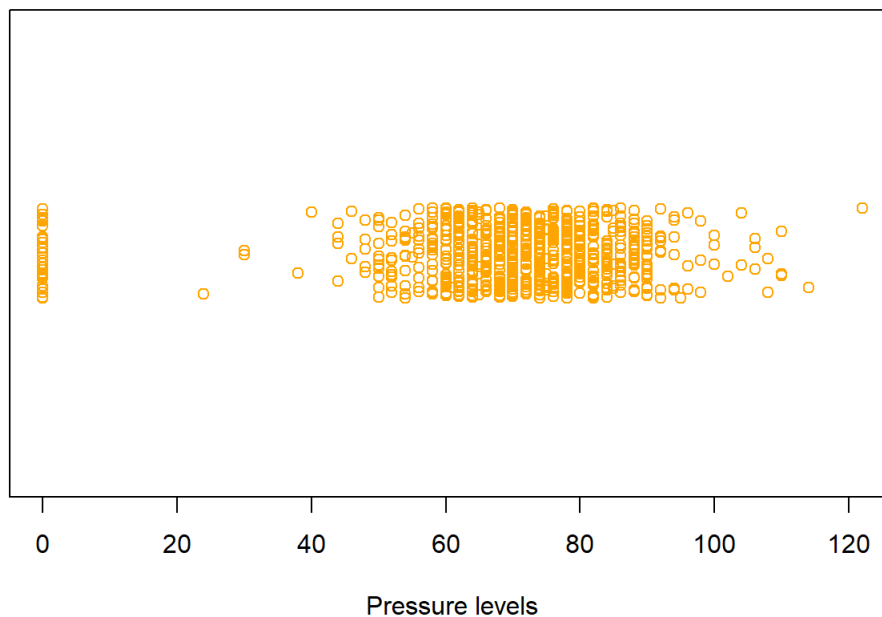
```
#Densityplots
plot1 = qplot(diabetes$Pregnancies, data = diabetes, geom = "density", fill = "red")
plot2 = qplot(diabetes$Age, data = diabetes, geom = "density", fill = "red")
plot3 = qplot(diabetes$Glucose, data = diabetes, geom = "density", fill = "red")
plot4 = qplot(diabetes$BloodPressure, data = diabetes, geom = "density", fill = "red")
grid.arrange(plot1, plot2, plot3, ncol = 3)
```
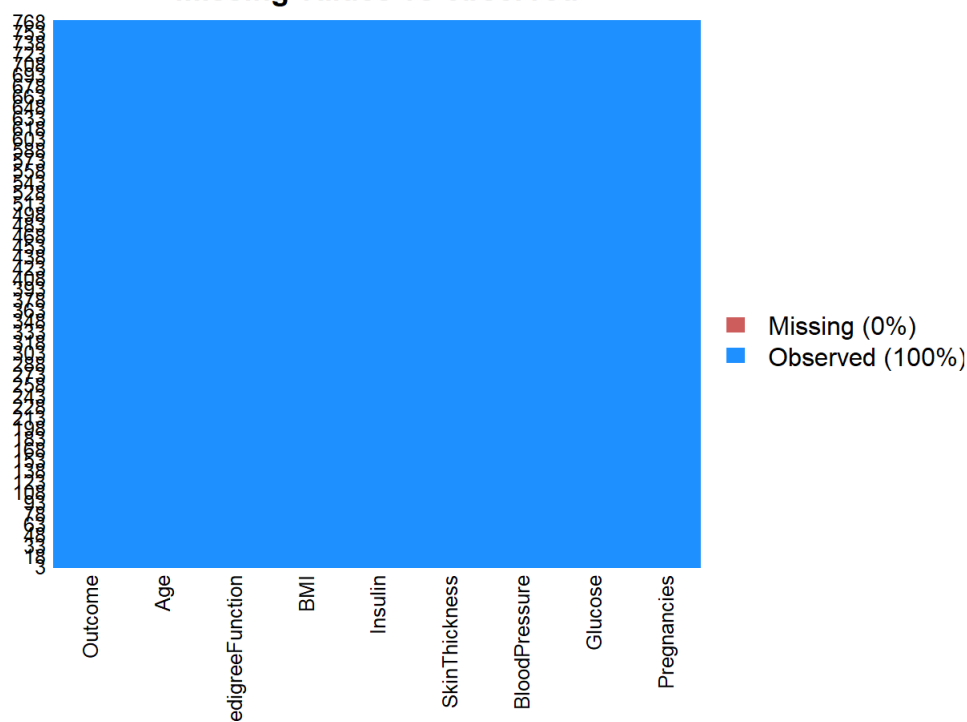


```
#The density plot here shows the distribution of the data and if they are positively or negatively skewed.

#Plots a missingness map showing where missingness occurs in the dataset

missmap(diabetes, main ="Missing values vs observed")
```



```
#No missing Values occured in our dataset.
```