Basic NeuralNet - Iris Data

```
library(nnet)
library(neuralnet)

head(iris)
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1          5.1         3.5          1.4         0.2  setosa
## 2          4.9         3.0          1.4         0.2  setosa
## 3          4.7         3.2          1.3         0.2  setosa
## 4          4.6         3.1          1.5         0.2  setosa
## 5          5.0         3.6          1.4         0.2  setosa
## 6          5.4         3.9          1.7         0.4  setosa
```

```
str(iris)
```

```
## 'data.frame':    150 obs. of  5 variables:
##  $ Sepal.Length: num  5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...
##  $ Sepal.Width : num  3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...
##  $ Petal.Length: num  1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...
##  $ Petal.Width : num  0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...
##  $ Species     : Factor w/ 3 levels "setosa","versicolor",..: 1 1 1 1 1 1 1 1 1 1 ...
```

```
# Start off with a Basic dataset - the good ol - IRIS

trainData <- cbind(iris[, 1:4], class.ind(iris$Species))

# Column Bind the 1 to 4 Columns Range
# Create a INDEX using the iris$Species Variable
#
```

```
# Create a SAMPLE Creation helper

samp<-c(sample(1:50,25), sample(51:100,25), sample(101:150,25))

## Code Source -- https://rweb.stat.umn.edu/R/library/nnet/html/predict.nnet.html
```

```
#Building ANN
library(neuralnet)

nn_iris<-neuralnet(setosa + versicolor + virginica ~ Sepal.Length + Sepal.Width + Petal.Length
+ Petal.Width,
trainData[samp,], hidden = c(5,5), threshold = 0.01,
stepmax = 1e+05, algorithm = "rprop+",
err.fct = "sse", act.fct = "logistic")

#Plotting the Model
#
plot(nn_iris)
nn_iris
```

```
## $call
## neuralnet(formula = setosa + versicolor + virginica ~ Sepal.Length +
##     Sepal.Width + Petal.Length + Petal.Width, data = trainData[samp,
```

```
##     ], hidden = c(5, 5), threshold = 0.01, stepmax = 100000,
##     algorithm = "rprop+", err.fct = "sse", act.fct = "logistic")
##
## $response
##     setosa versicolor virginica
## 13       1          0         0
## 27       1          0         0
## 28       1          0         0
## 18       1          0         0
## 29       1          0         0
## 17       1          0         0
## 19       1          0         0
## 47       1          0         0
## 48       1          0         0
## 43       1          0         0
## 40       1          0         0
## 20       1          0         0
## 24       1          0         0
## 35       1          0         0
## 39       1          0         0
## 4        1          0         0
## 33       1          0         0
## 16       1          0         0
## 22       1          0         0
## 25       1          0         0
## 5        1          0         0
## 32       1          0         0
## 12       1          0         0
## 2        1          0         0
## 41       1          0         0
## 69       0          1         0
## 56       0          1         0
## 77       0          1         0
## 99       0          1         0
## 74       0          1         0
## 80       0          1         0
## 66       0          1         0
## 100      0          1         0
## 57       0          1         0
## 86       0          1         0
## 88       0          1         0
## 73       0          1         0
## 89       0          1         0
## 81       0          1         0
## 95       0          1         0
## 78       0          1         0
## 54       0          1         0
## 75       0          1         0
## 91       0          1         0
## 55       0          1         0
## 92       0          1         0
## 72       0          1         0
## 84       0          1         0
## 53       0          1         0
```

```
## 96       0          1         0
## 116      0          0         1
## 113      0          0         1
## 108      0          0         1
## 107      0          0         1
## 146      0          0         1
## 144      0          0         1
## 101      0          0         1
## 119      0          0         1
## 129      0          0         1
## 128      0          0         1
## 130      0          0         1
## 150      0          0         1
## 126      0          0         1
## 143      0          0         1
## 121      0          0         1
## 105      0          0         1
## 149      0          0         1
## 141      0          0         1
## 112      0          0         1
## 148      0          0         1
## 110      0          0         1
## 109      0          0         1
## 102      0          0         1
## 135      0          0         1
## 125      0          0         1
##
## $covariate
##       [,1] [,2] [,3] [,4]
##  [1,]  4.8  3.0  1.4  0.1
##  [2,]  5.0  3.4  1.6  0.4
##  [3,]  5.2  3.5  1.5  0.2
##  [4,]  5.1  3.5  1.4  0.3
##  [5,]  5.2  3.4  1.4  0.2
##  [6,]  5.4  3.9  1.3  0.4
##  [7,]  5.7  3.8  1.7  0.3
##  [8,]  5.1  3.8  1.6  0.2
##  [9,]  4.6  3.2  1.4  0.2
## [10,]  4.4  3.2  1.3  0.2
## [11,]  5.1  3.4  1.5  0.2
## [12,]  5.1  3.8  1.5  0.3
## [13,]  5.1  3.3  1.7  0.5
## [14,]  4.9  3.1  1.5  0.2
## [15,]  4.4  3.0  1.3  0.2
## [16,]  4.6  3.1  1.5  0.2
## [17,]  5.2  4.1  1.5  0.1
## [18,]  5.7  4.4  1.5  0.4
## [19,]  5.1  3.7  1.5  0.4
## [20,]  4.8  3.4  1.9  0.2
## [21,]  5.0  3.6  1.4  0.2
## [22,]  5.4  3.4  1.5  0.4
## [23,]  4.8  3.4  1.6  0.2
## [24,]  4.9  3.0  1.4  0.2
## [25,]  5.0  3.5  1.3  0.3
```

```
## [26,]  6.2  2.2  4.5  1.5
## [27,]  5.7  2.8  4.5  1.3
## [28,]  6.8  2.8  4.8  1.4
## [29,]  5.1  2.5  3.0  1.1
## [30,]  6.1  2.8  4.7  1.2
## [31,]  5.7  2.6  3.5  1.0
## [32,]  6.7  3.1  4.4  1.4
## [33,]  5.7  2.8  4.1  1.3
## [34,]  6.3  3.3  4.7  1.6
## [35,]  6.0  3.4  4.5  1.6
## [36,]  6.3  2.3  4.4  1.3
## [37,]  6.3  2.5  4.9  1.5
## [38,]  5.6  3.0  4.1  1.3
## [39,]  5.5  2.4  3.8  1.1
## [40,]  5.6  2.7  4.2  1.3
## [41,]  6.7  3.0  5.0  1.7
## [42,]  5.5  2.3  4.0  1.3
## [43,]  6.4  2.9  4.3  1.3
## [44,]  5.5  2.6  4.4  1.2
## [45,]  6.5  2.8  4.6  1.5
## [46,]  6.1  3.0  4.6  1.4
## [47,]  6.1  2.8  4.0  1.3
## [48,]  6.0  2.7  5.1  1.6
## [49,]  6.9  3.1  4.9  1.5
## [50,]  5.7  3.0  4.2  1.2
## [51,]  6.4  3.2  5.3  2.3
## [52,]  6.8  3.0  5.5  2.1
## [53,]  7.3  2.9  6.3  1.8
## [54,]  4.9  2.5  4.5  1.7
## [55,]  6.7  3.0  5.2  2.3
## [56,]  6.8  3.2  5.9  2.3
## [57,]  6.3  3.3  6.0  2.5
## [58,]  7.7  2.6  6.9  2.3
## [59,]  6.4  2.8  5.6  2.1
## [60,]  6.1  3.0  4.9  1.8
## [61,]  7.2  3.0  5.8  1.6
## [62,]  5.9  3.0  5.1  1.8
## [63,]  7.2  3.2  6.0  1.8
## [64,]  5.8  2.7  5.1  1.9
## [65,]  6.9  3.2  5.7  2.3
## [66,]  6.5  3.0  5.8  2.2
## [67,]  6.2  3.4  5.4  2.3
## [68,]  6.7  3.1  5.6  2.4
## [69,]  6.4  2.7  5.3  1.9
## [70,]  6.5  3.0  5.2  2.0
## [71,]  7.2  3.6  6.1  2.5
## [72,]  6.7  2.5  5.8  1.8
## [73,]  5.8  2.7  5.1  1.9
## [74,]  6.1  2.6  5.6  1.4
## [75,]  6.7  3.3  5.7  2.1
##
## $model.list
## $model.list$response
## [1] "setosa"     "versicolor" "virginica"
```

```
##
## $model.list$variables
## [1] "Sepal.Length" "Sepal.Width"  "Petal.Length" "Petal.Width"
##
##
## $err.fct
## function (x, y)
## {
##     1/2 * (y - x)^2
## }
## <environment: 0x46d0018>
## attr(,"type")
## [1] "sse"
##
## $act.fct
## function (x)
## {
##     1/(1 + exp(-x))
## }
## <environment: 0x46d0018>
## attr(,"type")
## [1] "logistic"
##
## $linear.output
## [1] TRUE
##
## $data
##     Sepal.Length Sepal.Width Petal.Length Petal.Width setosa versicolor
## 13           4.8         3.0          1.4         0.1      1          0
## 27           5.0         3.4          1.6         0.4      1          0
## 28           5.2         3.5          1.5         0.2      1          0
## 18           5.1         3.5          1.4         0.3      1          0
## 29           5.2         3.4          1.4         0.2      1          0
## 17           5.4         3.9          1.3         0.4      1          0
## 19           5.7         3.8          1.7         0.3      1          0
## 47           5.1         3.8          1.6         0.2      1          0
## 48           4.6         3.2          1.4         0.2      1          0
## 43           4.4         3.2          1.3         0.2      1          0
## 40           5.1         3.4          1.5         0.2      1          0
## 20           5.1         3.8          1.5         0.3      1          0
## 24           5.1         3.3          1.7         0.5      1          0
## 35           4.9         3.1          1.5         0.2      1          0
## 39           4.4         3.0          1.3         0.2      1          0
## 4            4.6         3.1          1.5         0.2      1          0
## 33           5.2         4.1          1.5         0.1      1          0
## 16           5.7         4.4          1.5         0.4      1          0
## 22           5.1         3.7          1.5         0.4      1          0
## 25           4.8         3.4          1.9         0.2      1          0
## 5            5.0         3.6          1.4         0.2      1          0
## 32           5.4         3.4          1.5         0.4      1          0
## 12           4.8         3.4          1.6         0.2      1          0
## 2            4.9         3.0          1.4         0.2      1          0
## 41           5.0         3.5          1.3         0.3      1          0
## 69           6.2         2.2          4.5         1.5      0          1
```

```
## 56          5.7         2.8          4.5         1.3      0          1
## 77          6.8         2.8          4.8         1.4      0          1
## 99          5.1         2.5          3.0         1.1      0          1
## 74          6.1         2.8          4.7         1.2      0          1
## 80          5.7         2.6          3.5         1.0      0          1
## 66          6.7         3.1          4.4         1.4      0          1
## 100         5.7         2.8          4.1         1.3      0          1
## 57          6.3         3.3          4.7         1.6      0          1
## 86          6.0         3.4          4.5         1.6      0          1
## 88          6.3         2.3          4.4         1.3      0          1
## 73          6.3         2.5          4.9         1.5      0          1
## 89          5.6         3.0          4.1         1.3      0          1
## 81          5.5         2.4          3.8         1.1      0          1
## 95          5.6         2.7          4.2         1.3      0          1
## 78          6.7         3.0          5.0         1.7      0          1
## 54          5.5         2.3          4.0         1.3      0          1
## 75          6.4         2.9          4.3         1.3      0          1
## 91          5.5         2.6          4.4         1.2      0          1
## 55          6.5         2.8          4.6         1.5      0          1
## 92          6.1         3.0          4.6         1.4      0          1
## 72          6.1         2.8          4.0         1.3      0          1
## 84          6.0         2.7          5.1         1.6      0          1
## 53          6.9         3.1          4.9         1.5      0          1
## 96          5.7         3.0          4.2         1.2      0          1
## 116         6.4         3.2          5.3         2.3      0          0
## 113         6.8         3.0          5.5         2.1      0          0
## 108         7.3         2.9          6.3         1.8      0          0
## 107         4.9         2.5          4.5         1.7      0          0
## 146         6.7         3.0          5.2         2.3      0          0
## 144         6.8         3.2          5.9         2.3      0          0
## 101         6.3         3.3          6.0         2.5      0          0
## 119         7.7         2.6          6.9         2.3      0          0
## 129         6.4         2.8          5.6         2.1      0          0
## 128         6.1         3.0          4.9         1.8      0          0
## 130         7.2         3.0          5.8         1.6      0          0
## 150         5.9         3.0          5.1         1.8      0          0
## 126         7.2         3.2          6.0         1.8      0          0
## 143         5.8         2.7          5.1         1.9      0          0
## 121         6.9         3.2          5.7         2.3      0          0
## 105         6.5         3.0          5.8         2.2      0          0
## 149         6.2         3.4          5.4         2.3      0          0
## 141         6.7         3.1          5.6         2.4      0          0
## 112         6.4         2.7          5.3         1.9      0          0
## 148         6.5         3.0          5.2         2.0      0          0
## 110         7.2         3.6          6.1         2.5      0          0
## 109         6.7         2.5          5.8         1.8      0          0
## 102         5.8         2.7          5.1         1.9      0          0
## 135         6.1         2.6          5.6         1.4      0          0
## 125         6.7         3.3          5.7         2.1      0          0
##     virginica
## 13          0
## 27          0
## 28          0
## 18          0
```

```
## 29          0
## 17          0
## 19          0
## 47          0
## 48          0
## 43          0
## 40          0
## 20          0
## 24          0
## 35          0
## 39          0
## 4           0
## 33          0
## 16          0
## 22          0
## 25          0
## 5           0
## 32          0
## 12          0
## 2           0
## 41          0
## 69          0
## 56          0
## 77          0
## 99          0
## 74          0
## 80          0
## 66          0
## 100         0
## 57          0
## 86          0
## 88          0
## 73          0
## 89          0
## 81          0
## 95          0
## 78          0
## 54          0
## 75          0
## 91          0
## 55          0
## 92          0
## 72          0
## 84          0
## 53          0
## 96          0
## 116         1
## 113         1
## 108         1
## 107         1
## 146         1
## 144         1
## 101         1
## 119         1
```

```
## 129         1
## 128         1
## 130         1
## 150         1
## 126         1
## 143         1
## 121         1
## 105         1
## 149         1
## 141         1
## 112         1
## 148         1
## 110         1
## 109         1
## 102         1
## 135         1
## 125         1
##
## $net.result
## $net.result[[1]]
##                   [,1]              [,2]               [,3]
## 13   1.00153660732681  0.0004091046907  0.00456068661800
## 27   0.99772015723012  0.0011102360352 -0.00291195761696
## 28   1.00287504810438 -0.0013912347079  0.00346462100148
## 18   1.00335447807872 -0.0016032333456  0.00410344477157
## 29   1.00522039733759 -0.0021300373827  0.00732065971885
## 17   1.00872663212865 -0.0042496128298  0.01064238718242
## 19   1.00596982779617 -0.0028905976048  0.00729462892253
## 47   0.99797842395128  0.0001465104840 -0.00460851305041
## 48   0.99579172790211  0.0018920938095 -0.00566019075238
## 43   0.99478192125928  0.0021061013619 -0.00757170871260
## 40   1.00205198685934 -0.0008794051230  0.00271690767260
## 20   1.00127526384099 -0.0011912669063  0.00009298306710
## 24   0.99340214180763  0.0038544957790 -0.00670125607675
## 35   0.99971919254035  0.0010517844349  0.00174196580873
## 39   0.99359640081191  0.0033860038781 -0.00734931626222
## 4    0.99337048870664  0.0033752051594 -0.00791422185169
## 33   0.99520110500503  0.0011101250094 -0.00897556834498
## 16   1.00662893689314 -0.0036150962895  0.00711521933143
## 22   1.00297041006207 -0.0017388972596  0.00284991941281
## 25   0.99011542978621  0.0040055324655 -0.01420601888838
## 5    1.00038821020688 -0.0006572290812 -0.00074777901300
## 32   1.00684679157618 -0.0024004923973  0.01056890748487
## 12   0.99547394012384  0.0016660090880 -0.00696388664084
## 2    1.00194860729988  0.0006277114208  0.00606553204109
## 41   1.00362983223383 -0.0017925913382  0.00430867181867
## 69   0.00914498592631  0.9964227417791 -0.00999002725812
## 56  -0.00115220274556  1.0081037693216  0.00216181682619
## 77  -0.00267572560365  0.9998399804258 -0.00288026002797
## 99  -0.00017020376103  0.9994470818487  0.00325091602793
## 74  -0.00237095259994  1.0078615716127  0.00940203199343
## 80   0.00620591978667  0.9958918621251  0.00800392344201
## 66  -0.00213666398106  0.9937539043862 -0.00843494136046
## 100 -0.00369779901872  1.0023510546967  0.00368400274148
```

```
## 57  -0.00095073301305  1.0041626616332 -0.00730551894211
## 86   0.00459364947147  0.9979867824591 -0.00576326475338
## 88   0.00323096949157  0.9940261008951  0.00009433435454
## 73   0.00309150403656  1.0139131154143 -0.01427664804173
## 89   0.00000524045647  0.9994668452721  0.00307261584531
## 81  -0.00448294694135  1.0022055864069  0.00841217684873
## 95  -0.00236101072134  1.0047284416622  0.00472672023747
## 78  -0.00133792272211  1.0110720053163 -0.01695936416483
## 54   0.00427907232194  0.9969160758986  0.00311977148365
## 75  -0.00431104818724  0.9983818919352 -0.00229427769059
## 91  -0.00027096522863  1.0085038941356  0.00630874997893
## 55  -0.00111571951481  0.9992040070179 -0.00564481246432
## 92  -0.00188833178343  1.0049185785172  0.00034862300228
## 72  -0.00523210498625  0.9985728886181 -0.00286170180957
## 84   0.00267536636501  0.9621689267040  0.02737490338792
## 53  -0.00263145415140  0.9999724432575 -0.00536122983694
## 96   0.00291375954706  0.9970243998235  0.00537124670819
## 116 -0.00549920267393  0.0043221464981  1.00869146723909
## 113 -0.00076141363991 -0.0108644907931  1.00989237407621
## 108  0.00237233721039 -0.0061516513200  1.00784945749154
## 107 -0.00230911483395 -0.0017011762572  0.99891322202631
## 146 -0.00614075194269 -0.0052418567837  1.01707861096384
## 144 -0.00106937447356  0.0027289869336  0.99166504393412
## 101  0.00359124381878  0.0074867370717  0.99105866703890
## 119  0.00337428846969  0.0108982946452  0.99670494968381
## 129  0.00110277907935  0.0003016865858  0.99286464330700
## 128 -0.00252102480610  0.0165411737666  0.98859666507648
## 130  0.00011884235099  0.0121385603178  1.00045342891670
## 150 -0.00107601062426 -0.0157828982196  1.00962739825434
## 126  0.00194664686648 -0.0183276752541  1.01612957158928
## 143  0.00034556452324 -0.0052588009596  0.99884211524075
## 121 -0.00264142718927 -0.0007171402934  1.00156797685207
## 105 -0.00038146976797  0.0035794608847  0.98767229666329
## 149  0.00216747298849 -0.0022269706992  1.00280260208440
## 141 -0.00422812940551  0.0074889086966  1.00186276587527
## 112  0.00257380252958  0.0101752785406  0.98774469699439
## 148 -0.00202389962635 -0.0153224464334  1.01717087699799
## 110  0.00192618771440 -0.0001686572903  0.99735771454636
## 109  0.00454444059031 -0.0055395612491  1.00728566396709
## 102  0.00034556452324 -0.0052588009596  0.99884211524075
## 135  0.00508171803731  0.0258764265341  0.97240705638238
## 125 -0.00028810488601 -0.0086328379682  0.99835859177269
##
##
## $weights
## $weights[[1]]
## $weights[[1]][[1]]
##                [,1]            [,2]          [,3]          [,4]
## [1,]  0.08947382614  2.30777107798 -1.0215422902 -0.3249965584
## [2,] -0.43184769209 -0.26345415767  0.5540208493 -1.9053988436
## [3,]  0.56188239096 -0.06032883044  1.0270796485  0.8805743047
## [4,] -0.06572165144 -0.24124395160 -1.1750503209  2.0575886086
## [5,] -0.01720258322  0.05540110309 -2.0722734942  0.4505213943
##               [,5]
```

```
## [1,] -1.0893566605
## [2,] -1.4197313152
## [3,]  2.0138693641
## [4,] -0.5551647517
## [5,]  2.7396715479
##
## $weights[[1]][[2]]
##               [,1]          [,2]          [,3]          [,4]
## [1,] -0.02143918124 -3.4892596279 -0.7163884361  4.2644341521
## [2,] -2.12457301123 12.0149621968  3.9536757868  1.2264693205
## [3,]  0.48414275013 -9.1667473891  0.4301998104 -1.2122482568
## [4,]  2.08145917336 10.6122742043 -8.1524810571 40.0040474717
## [5,]  0.53338778789 -0.2256880235 -1.3004937606 -1.7849523046
## [6,]  0.46067507796  0.9006316377 -1.8915790500  0.1512031424
##                [,5]
## [1,]  -0.07420523578
## [2,]  29.90867965460
## [3,] 136.42305120237
## [4,] 322.97885732157
## [5,] -59.39907776446
## [6,] -86.13881655450
##
## $weights[[1]][[3]]
##                  [,1]          [,2]          [,3]
## [1,] -0.5445004973650  0.7683740852 -1.4016238734
## [2,]  0.8892503426587 -0.3686369832  1.2525059271
## [3,]  0.9199908804291 -1.0511567463 -0.2929215670
## [4,]  0.5067402392828 -0.4743189446  0.2215404802
## [5,] -0.0904051678393 -0.4737225820  1.7480680146
## [6,] -0.0007978090957  1.0523248346 -1.0639250525
##
##
##
## $startweights
## $startweights[[1]]
## $startweights[[1]][[1]]
##               [,1]          [,2]          [,3]          [,4]          [,5]
## [1,] -1.5836957672 -0.1450792146  0.5295346939  0.6051872882 -1.1353589758
## [2,] -1.4834663501 -0.4772054967  0.3489245120 -2.3115749799 -1.4604965604
## [3,] -1.3294626132 -0.1626835682  0.1796449652  0.5979815556  1.5349307473
## [4,]  0.1838899474  0.5699289130 -1.8542823346  1.3564482703 -0.6081531758
## [5,]  0.1832964110 -0.9673330208  0.3644450744 -0.7512110389 -1.9319548975
##
## $startweights[[1]][[2]]
##               [,1]          [,2]          [,3]          [,4]
## [1,] -0.3973138904 -1.7217688643 -0.09471439383  0.7824278332
## [2,]  0.1859351085  1.5103168985  0.78612574527  0.9761840082
## [3,] -0.3608391109 -0.4136926066  0.08727158695  0.5386065001
## [4,]  0.4469670622  0.5722901625  2.50263762369 -0.5296430892
## [5,] -0.0724723263 -0.8647038482 -0.07591371311  0.2385191672
## [6,] -0.6293404750  0.1468847968 -0.28664916813 -1.3709112947
##               [,5]
## [1,]  0.5108018813
## [2,]  1.0268239445
```

```
## [3,]  1.1276468200
## [4,] -0.1583901033
## [5,] -0.4308236271
## [6,]  0.7714308904
##
## $startweights[[1]][[3]]
##               [,1]           [,2]          [,3]
## [1,] -0.3875941550  0.58279142578 -2.0937655530
## [2,]  1.1040885276 -0.02302897127  0.9808982533
## [3,]  0.3937509734 -0.54231380842 -1.0926511436
## [4,] -0.1014112381  0.02428347611 -0.5052120659
## [5,]  0.4222954722 -0.52554279051  0.9552748486
## [6,]  0.1397750902  0.17412252335 -1.3421042774
##
##
##
## $generalized.weights
## $generalized.weights[[1]]
##                  [,1]             [,2]            [,3]              [,4]
## 13   -14.83269619241    4.43816412177   10.9747969095    11.01071266674
## 27     6.98282729535    4.06836787568  -11.0001910688    -3.33669962372
## 28    -5.91715524769    3.52411013140    4.4543426481    -1.25485648269
## 18    -4.16321612571    0.95101484786    4.7478567584    -2.47012213362
## 29    -3.45306183526    2.09727393160    2.4400670047    -0.24593104835
## 17    -0.87479483221    0.26791003914    1.5351447995    -3.05961293460
## 19    -2.66585524258    1.88328657083    1.9997966532    -1.19512848937
## 47     4.79077980648   -2.32717804515   -5.6769319350     9.30957783294
## 48     3.91719602660    0.44896996238   -4.6200564390    -1.09324200109
## 43     2.50978220666    1.04489125413   -3.7312161331     0.37430417021
## 40    -8.77345488810    4.08343589957    6.9855702705     0.39213094465
## 20    -6.37513352166    0.41034132839   10.8809459981   -16.86997205933
## 24     3.13227704596    3.09628577084   -5.3757245816    -4.27695153213
## 35    79.34709272680   -6.99956845914  -72.1471227985   -66.06245534767
## 39     2.90424215342    1.07769951340   -3.7006601924    -2.13590226518
## 4      2.99396674088    0.73942308804   -3.4588241218    -2.64291048150
## 33     1.33837127154   -1.59959466721   -1.6667961832     6.67471322934
## 16    -0.71697158485    0.56206428306    1.6117166379    -5.31256597813
## 22    -3.11990278330   -1.36678530930    6.0324809127    -5.18024830778
## 25     1.57881744195    0.63874798349   -1.9299924878    -1.57911177258
## 5    -31.35971320476   15.59676686552   32.6400330366   -39.04740455677
## 32    -2.64343900849    0.24382567098    2.8071491994     0.86431632685
## 12     3.32130956708   -0.04559283873   -3.7299099343    -0.26880856382
## 2    -11.79527108073    0.90476125259   10.4903624492    10.64359163618
## 41    -3.37087418402    0.54587188779    4.3404658915    -3.55606589081
## 69     0.08911197571   -2.01190587080   -0.6809891494     1.47271807586
## 56     3.12190784437    2.63510782452   -5.9878674637    -0.69701306051
## 77     1.20230078725    2.99639899741   -1.0314488595    -6.02599982670
## 99   -56.48031424706 -578.89181352221  252.8821239977   626.74293565893
## 74     2.41694639409   -0.73456419991   -2.2016934989    -2.91311875219
## 80     3.28638882073   19.70370811851   -9.7375274009   -23.19241460139
## 66     0.53464607346  -13.12552267833    1.8558367956     8.98205212232
## 100    0.49336119383   -0.26732894764   -1.5145748754     0.97093858328
## 57     2.81272730519  -22.83978349326   -3.8621811057    23.01429560341
## 86    -2.06410520014   14.23613766369   -1.0352541627    -8.73506125313
```

```
## 88    -1.38865410717   -6.19638263226    0.7703106534     8.53636055663
## 73    -0.69454933405   -3.85459984894   -0.1252118562     2.86309665113
## 89  -444.01854425403 7434.50070257115 -775.7830622191 -6717.27448595745
## 81     1.56641873601    3.23528591126   -2.5427660239    -5.41289037142
## 95     0.75115892376    4.02431728574   -3.0388576881    -1.43032251214
## 78    -0.09426511862    5.60392224665   -2.0226260027     0.46612688089
## 54    -0.10952727480   -6.07053801321    0.9222597679     4.34452451218
## 75     0.80202797676   -2.93628800053   -0.4518348912     0.60299829231
## 91    17.00312745023   34.60804378025  -26.9906187598   -33.06557633515
## 55     0.63099614061   11.03780896287   -2.0680523659   -10.13771684265
## 92     1.53841081966   -2.59333978597   -2.5950805263     2.51386130572
## 72     0.67339237832   -1.53246762137   -0.8298553839     0.17581388517
## 84    -0.98318055276   -3.30908573607    2.1741873940    -0.20815009641
## 53     0.83926353594   -0.95705488841   -0.7470083399    -1.36350112781
## 96    -0.85514963706   17.89934258599   -3.3896187233   -14.75474568184
## 116    0.90352470801   -1.48441291198   -1.7896148867     0.58713544520
## 113   -0.75475427354   10.27879763655   -8.2263825089    13.50836382484
## 108   -2.00534298195    0.09967939148    1.6049189180     0.86985212216
## 107   -3.61645104798    9.72287669042   -3.8319128970     9.92507465220
## 146   -0.41869406070    1.90632687711   -1.6073667946     2.67630905515
## 144   -0.10498207109    0.26666964407   -6.7021463885     9.16030367469
## 101   -3.84802213280    9.49140595416    1.4073698245     4.33555375157
## 119   -0.99728692304   -0.36328360163    0.8222503549     0.13480116984
## 129    1.88486580440   -9.06688806385    4.5164263002   -10.26008322620
## 128   -0.50232789766    3.23540288635   -3.7245808473     5.23291628554
## 130  -49.78183843283    5.28601968669   43.5536430912    45.33930769044
## 150   -1.45485549410    4.97269340144   -8.0779217746    14.62794676891
## 126   -2.52823455212    1.57811455522    2.6799309384    -0.09057699446
## 143   13.03065495496  -44.64729143944   18.5107629111   -46.77511871891
## 121    0.03025855351    0.98881036795   -3.2401020520     4.15816916232
## 105   -5.78097423593   14.87021092917  -15.7530407270    31.44458009237
## 149   -7.89822842788   18.96316628827    3.6258384037     5.68442698401
## 141    0.08982985074    0.63322708523   -2.0750042633     2.06012595108
## 112   -0.19340164402   -3.91768102349    1.5590596970    -2.22244902556
## 148   -1.00162217303    4.94644037289   -3.6878319248     6.60872369130
## 110   -5.39552093299   11.99892868946    4.0614897810     2.10232760846
## 109   -0.94030396591   -1.02996957913    0.3976310097     0.38450500978
## 102   13.03065495496  -44.64729143944   18.5107629111   -46.77511871891
## 135   -1.06684954681   -0.73886857101    0.7569051651     1.01929224687
## 125    4.39285145809  -11.36331546373  -28.4080002554    39.82868350483
##                [,5]             [,6]           [,7]            [,8]
## 13   -20.23230654235   -6.223934672841  18.7416346991   22.8177352073
## 27    -5.26814831654   -6.696072064734   9.9236971072    4.2615636280
## 28     4.61033673014   -1.467182857180  -3.8739000976    0.6394119332
## 18     3.21422735486    0.541066837343  -4.2082926081    1.7544528866
## 29     3.15109234280   -0.878250651012  -2.5331986372   -0.1055182469
## 17     0.66709902843   -0.002485711679  -1.3072822261    2.5665134810
## 19     2.12271657624   -1.081239478781  -1.7171250614    0.8880562428
## 47   -25.16720649411    6.846112695791  32.3550101349  -51.2190848241
## 48    -3.15757427820   -2.222484145106   4.5044227854    1.7094242105
## 43    -2.21016210845   -2.442508507879   4.0150613595    0.1251783772
## 40     7.66083523089   -0.945677339342  -6.9535868648   -1.3362057562
## 20     2.55584759697    0.640934172608  -4.8340929253    7.2428767715
## 24    -1.98558017229   -3.981543590797   4.2791623271    4.0581763312
```

```
## 35    -7.76742943357   -4.312512437589   8.7699986187    9.6568118809
## 39    -1.93864650709   -2.390589297435   3.1899775704    2.3682750143
## 4     -2.13961909667   -2.060240844911   3.0833597256    2.8374900970
## 33    -2.24225412132    2.477073097239   2.9301389395  -11.7450119167
## 16     0.51346480299   -0.342317341961  -2.2164638888    4.0105093014
## 22     1.96933405055    1.793294799157  -4.3318219047    3.4138347826
## 25    -1.46352824514   -1.391182637448   2.1004470947    1.9650177086
## 5      6.94328625776   -1.621415597571  -8.0213058953    8.9962162316
## 32     2.77318506605    1.316672315082  -3.5130258289   -1.6332680713
## 12    -3.35876938305   -1.390337905814   4.3501113000    0.8394662910
## 2    -13.20677880438   -9.212601067882  15.1432481542   18.6256480917
## 41     2.49077322711    0.649347197467  -3.7090075266    2.6967154872
## 69    -8.12136631703    3.301155157972  12.6245389299    1.6276690945
## 56     1.11250232180    1.371809737636  -2.0619661304   -2.1169610443
## 77   -91.40379050212   32.660954979427 141.2182583126  -85.4488989987
## 99    -6.64698531974 -168.558176291801  58.0046087979  139.0451291597
## 74     0.87903733470    1.335931984763  -2.2208679797    0.3147494624
## 80    -2.97583530859  -29.396627205885  12.1357333006   25.7456161219
## 66    -0.92529272293   -4.292175341647   2.0028716234    0.6670474940
## 100    4.60474973894    0.873841713389  -4.8197752255   -1.7293449400
## 57     3.50752818465    7.598762895552  -4.7797624338  -11.5112782007
## 86     5.52709027883  -42.263690228550   3.3329094375   19.7071970514
## 88    -2.01776626810    2.755511863790   3.5560036024   -4.1790237679
## 73     1.95463746033   -0.035879589118  -3.1097712918   -1.2855248688
## 89   -13.61240166898  -77.588553131506  29.4779468458   71.6768385300
## 81     0.07284041548   -8.026322704508   0.5201049655   18.8709668562
## 95     2.73573835641   -0.657158840217  -3.2309025843   -1.4229543121
## 78     2.49226678795    0.228813346143  -3.2870769274   -2.5678099214
## 54    -6.25699380336    6.581241932407   8.2142598121   -2.3395393565
## 75    -2.62522204723   -6.589475020441   4.9982072942   -8.1188875987
## 91     0.91474960889    0.578640874087  -2.0094332211   -0.7634940774
## 55   -25.09174196921    9.734069249290  33.7903400051   -1.2296220360
## 92     2.42166184305    2.907037678545  -3.8197820446   -3.7474432205
## 72    -1.62492084293   -3.330610612030   1.5529806599  -11.3631424778
## 84    22.59724998106  -20.555352797566 -42.0166714383  -43.7815782025
## 53  -587.62918775535 -237.420959819822 890.2807866231   77.2120742590
## 96    -1.27446857881  -18.674438298989   6.6407527255   12.3235865699
## 116   -3.53161813899   -4.140958002799   2.0146406548   11.6666062891
## 113    2.39938637083    0.226545233283  -2.4222718985   -3.9882845360
## 108    1.80315686755    2.670271140888  -3.7845335494   -3.0576272600
## 107  -58.27931134829  106.201757889567  25.9364541185  127.4594116590
## 146    7.24783967865   -2.161856877457  -4.9843857587  -11.1853556270
## 144   -4.29587941067   -4.696269263983   2.0083698499   15.9012350524
## 101    1.71615132800   -6.881143566786  -0.9629246117    2.7992163295
## 119   -0.80624155213   -0.685719928030   1.2777176511    0.8548148347
## 129  -52.88721989316  -16.413515230550  45.5589026595  134.1078901284
## 128   61.58272582911  -63.575948947515 -56.4477907750 -111.5959240958
## 130   47.04136083507  -19.030079878192 -97.5362154707  -52.6808517496
## 150    0.93617205151    1.112736707753  -0.8139365712   -3.8271036385
## 126    0.61976626502    1.258303325263  -1.3529956702   -1.5420178835
## 143    3.52067770102    0.851040742590  -2.6605468214   -9.9789834551
## 121   28.30644900382    9.068041440280 -18.8472705300  -66.4811337148
## 105   -3.18974731022   -2.731422536288   1.4992164980   12.0469468833
## 149   -4.31846873703   27.618638139668  -0.3521453062  -14.8063381035
```

```
## 141   -2.69662443627   -0.481748877768   1.2607661526    6.4085947238
## 112   34.56947373723  -38.665353340242 -52.3830539949  -52.1995575883
## 148    1.64091433421    0.340941385604  -1.5132148887   -3.0814749671
## 110    8.62602498554  201.882222729233 -12.2888036974 -208.5637979902
## 109    2.56613628163    2.019796808532  -4.0492885961   -3.0445729753
## 102    3.52067770102    0.851040742590  -2.6605468214   -9.9789834551
## 135    4.30400977542   -5.624181461342 -29.7508552633  -19.5635534828
## 125    1.34281877049    2.424682415607  -1.1471167868   -5.7717895615
##                 [,9]            [,10]            [,11]             [,12]
## 13     7.6892794449   -4.93584265954    -4.8790131193    -4.03722000742
## 27    -8.2538727929   -1.50814122451    11.5192030261     2.36876850434
## 28     7.3984525066   -5.64507217311    -5.1767549880     1.89062042851
## 18     5.2017399054   -2.39239386729    -5.4172782892     3.22300715632
## 29     3.7640737406   -3.01427785169    -2.4435655529     0.49754612242
## 17     1.1087216933   -0.53832441506    -1.8097156301     3.64366741573
## 19     3.2693624747   -2.71296587253    -2.3313282051     1.52417545841
## 47    -3.1048088429    1.92460951082     3.4801996270    -5.84538467261
## 48    -4.4072085362    0.97435020411     4.5756311816     0.57697564288
## 43    -2.6383280423   -0.09032756641     3.4375821118    -0.68936234465
## 40    10.0093558686   -6.69829669958    -7.3023795419     0.31869244094
## 20   131.7207047559  -33.71162937314  -209.8692090221   333.03560988437
## 24    -4.5897031053   -1.79500537230     6.6912090295     4.44294514182
## 35    19.4702787074   -8.91707032745   -15.2407537961   -11.62556657079
## 39    -3.8677170268    0.38460396696     4.1431448497     1.82253275155
## 4     -3.7651319900    0.61375667028     3.7322721232     2.37110619176
## 33    -1.0384354019    1.30361443861     1.2487509361    -4.99711612721
## 16     0.9962706301   -0.85892427353    -2.1561679776     7.10521615124
## 22     4.9608444084    0.79118070543    -8.8082638909     8.00796281307
## 25    -1.6012754810   -0.11570865967     1.7493087021     1.26995290440
## 5    -24.4433182262   16.05211290474    23.7368867031   -29.64342162933
## 32     2.6510893484   -1.10842586550    -2.5024637104    -0.46966309145
## 12    -3.2110530530    0.86410813492     3.2745084047    -0.05974410536
## 2      5.8657824477   -2.98294149088    -4.3744932531    -3.63386194505
## 41     4.3716855580   -1.76832680247    -5.1209415228     4.53414885125
## 69    -0.5091758463   -0.79667732688     1.1895696920     4.86109777862
## 56     8.0617340214    1.85945637355   -10.6793395180   -28.03755659802
## 77     3.6566890993   -1.84027160890    -3.2663401949    13.25531659073
## 99     2.3362193694   -4.67784399271    -1.8473762926   -10.41390100580
## 74     0.3531647165    0.15977503063    -0.3310866364    -5.53384685769
## 80     1.2142332040   -2.41454495430    -0.7815894310    -5.90020694191
## 66     1.4581254903    1.28237028965    -2.0733226822     2.42746157079
## 100   -2.5127991169   -0.96232206006     3.2566434659    -7.16291167043
## 57    -0.9640851056   -0.47356385569     2.0914196607     5.13432561301
## 86     1.5470650325   -0.86797851640     0.3646465593    -2.31876594916
## 88   -72.2610859294   57.63725067016    34.8847626570  -422.72392075919
## 73    -1.5734689593   -0.72208060899     2.2312255745     4.71553154601
## 89    -2.0852230035   -3.75705809717     3.1902945819    -5.02546809921
## 81    -1.2663343692   -0.50579141785     1.8849508979    -3.66751368404
## 95     0.2391073045    0.44209308557    -0.5666014662    -8.94215104497
## 78    -0.8450647365   -0.63698604680     1.3976899094     3.36586641128
## 54    -0.4325544908    2.13145225345    -0.4773913990   -14.83966979926
## 75     5.5750627282    3.24687890173    -7.7002591505    10.89931787974
## 91     2.8455505965    0.79016399700    -3.6274277237   -10.36417004503
## 55     1.0975305099   -1.08764506484    -0.6243168032     7.18708196179
```

```
## 92    14.5362573908    4.56575091135   -21.9711701308  -131.59141809037
## 72     3.6513182152    2.99493426230    -5.1206029900     8.25364991181
## 84   -30.1192764437   28.22550345711    56.9218388528    59.09944966869
## 53     1.8074750166   -0.61633658085    -1.8649677691     6.84165388885
## 96    -1.0898986245   -3.18161829341     2.6104769831    -3.52567087991
## 116   -2.1029769083   -1.67581763162     5.3171102322    -1.80170771503
## 113   -3.3850640609    0.02789210076     4.4725593988     2.85196126830
## 108   -4.9358550145    0.91984859543     5.0238633453     5.88505626827
## 107  -78.9842766853  188.60163106792    -6.9670931778   237.74595583000
## 146   -1.2828568078   -0.42587045678     2.4634831713     0.10304040929
## 144    2.4791017286    0.29795425674    -4.2430090590     1.15575957651
## 101    0.6451856863    0.36753486264    -2.9356215200     6.10874107347
## 119    7.9983760254   -5.59149305281    -5.8555762728    -2.62911975839
## 129    4.3027064555   -0.46304544042    -5.3691668724    -1.67943516138
## 128  -89.0546428826   93.51581956291    79.4933656800   163.19306006966
## 130 1225.8066224108 -492.20105207197 -2590.7131242044 -1294.55450991699
## 150   -3.9629686538   -1.51837251520     6.1941836202     4.85610070701
## 126   -2.5454612758   -0.07964298396     2.9609105934     3.89068763730
## 143   29.3375334479    7.52276647617   -42.9654326440   -21.47410049592
## 121  -15.5046486370   -2.46853896149    26.1532008588    -0.22787285758
## 105    1.8536435165    0.01317972563    -2.7607950248     0.37551050025
## 149   -7.2598050950   -2.18217549704    15.7172841420    -7.48473954344
## 141   -9.2592226902   -4.28274422931    20.8559987186   -10.98666541582
## 112  -27.8181571146   32.10872146883    42.6744805642    43.45859435357
## 148   -1.7133767733   -0.65713802055     2.6777061420     1.81965998838
## 110    4.8044759158    3.05319283614   -13.5124892076    11.26366112684
## 109   -5.2740528836    1.08706728545     4.7136346337     5.21069325592
## 102   29.3375334479    7.52276647617   -42.9654326440   -21.47410049592
## 135   -2.3767745130    4.59077110639    26.9429364408    16.47658864030
## 125   18.2971326449    3.54963651404   -28.3904092667   -11.04829744237
##
##
## $result.matrix
##                                        1
## error                     0.0058872398643
## reached.threshold         0.0095614786530
## steps                  8600.0000000000000
## Intercept.to.1layhid1     0.0894738261438
## Sepal.Length.to.1layhid1 -0.4318476920876
## Sepal.Width.to.1layhid1   0.5618823909609
## Petal.Length.to.1layhid1 -0.0657216514440
## Petal.Width.to.1layhid1  -0.0172025832250
## Intercept.to.1layhid2     2.3077710779826
## Sepal.Length.to.1layhid2 -0.2634541576671
## Sepal.Width.to.1layhid2  -0.0603288304413
## Petal.Length.to.1layhid2 -0.2412439515979
## Petal.Width.to.1layhid2   0.0554011030892
## Intercept.to.1layhid3    -1.0215422901507
## Sepal.Length.to.1layhid3  0.5540208492815
## Sepal.Width.to.1layhid3   1.0270796484786
## Petal.Length.to.1layhid3 -1.1750503208815
## Petal.Width.to.1layhid3  -2.0722734941802
## Intercept.to.1layhid4    -0.3249965584342
## Sepal.Length.to.1layhid4 -1.9053988435533
```

```
## Sepal.Width.to.1layhid4     0.8805743046935
## Petal.Length.to.1layhid4    2.0575886085793
## Petal.Width.to.1layhid4     0.4505213942727
## Intercept.to.1layhid5      -1.0893566604666
## Sepal.Length.to.1layhid5   -1.4197313152171
## Sepal.Width.to.1layhid5     2.0138693640674
## Petal.Length.to.1layhid5   -0.5551647516904
## Petal.Width.to.1layhid5     2.7396715479436
## Intercept.to.2layhid1      -0.0214391812364
## 1layhid.1.to.2layhid1      -2.1245730112298
## 1layhid.2.to.2layhid1       0.4841427501335
## 1layhid.3.to.2layhid1       2.0814591733572
## 1layhid.4.to.2layhid1       0.5333877878886
## 1layhid.5.to.2layhid1       0.4606750779605
## Intercept.to.2layhid2      -3.4892596279066
## 1layhid.1.to.2layhid2      12.0149621967580
## 1layhid.2.to.2layhid2      -9.1667473890705
## 1layhid.3.to.2layhid2      10.6122742043344
## 1layhid.4.to.2layhid2      -0.2256880234765
## 1layhid.5.to.2layhid2       0.9006316376672
## Intercept.to.2layhid3      -0.7163884360581
## 1layhid.1.to.2layhid3       3.9536757868168
## 1layhid.2.to.2layhid3       0.4301998103730
## 1layhid.3.to.2layhid3      -8.1524810571078
## 1layhid.4.to.2layhid3      -1.3004937606104
## 1layhid.5.to.2layhid3      -1.8915790499811
## Intercept.to.2layhid4       4.2644341520994
## 1layhid.1.to.2layhid4       1.2264693205253
## 1layhid.2.to.2layhid4      -1.2122482567976
## 1layhid.3.to.2layhid4      40.0040474716802
## 1layhid.4.to.2layhid4      -1.7849523046152
## 1layhid.5.to.2layhid4       0.1512031424113
## Intercept.to.2layhid5      -0.0742052357754
## 1layhid.1.to.2layhid5      29.9086796546007
## 1layhid.2.to.2layhid5     136.4230512023724
## 1layhid.3.to.2layhid5     322.9788573215714
## 1layhid.4.to.2layhid5     -59.3990777644588
## 1layhid.5.to.2layhid5     -86.1388165544975
## Intercept.to.setosa        -0.5445004973650
## 2layhid.1.to.setosa         0.8892503426587
## 2layhid.2.to.setosa         0.9199908804291
## 2layhid.3.to.setosa         0.5067402392828
## 2layhid.4.to.setosa        -0.0904051678393
## 2layhid.5.to.setosa        -0.0007978090957
## Intercept.to.versicolor     0.7683740852044
## 2layhid.1.to.versicolor    -0.3686369832222
## 2layhid.2.to.versicolor    -1.0511567463351
## 2layhid.3.to.versicolor    -0.4743189446363
## 2layhid.4.to.versicolor    -0.4737225819868
## 2layhid.5.to.versicolor     1.0523248346329
## Intercept.to.virginica     -1.4016238733762
## 2layhid.1.to.virginica      1.2525059271428
## 2layhid.2.to.virginica     -0.2929215669898
## 2layhid.3.to.virginica      0.2215404802148
```

```
## 2layhid.4.to.virginica      1.7480680145856
## 2layhid.5.to.virginica     -1.0639250524869
##
## attr(,"class")
## [1] "nn"
```

```
# Another simpler code chunk ... Basic Classifier NN

iris$Species.Class <- 0
iris$Species.Class[iris$Species == "versicolor"] <- 1
iris$Species.Class[iris$Species == "virginica"] <- 2
nn.1 <- neuralnet(Species.Class ~ Sepal.Width + Sepal.Length + Petal.Width + Petal.Length,
                  data = iris, hidden = 2)
plot(nn.1)
nn.1
```

```
## $call
## neuralnet(formula = Species.Class ~ Sepal.Width + Sepal.Length +
##     Petal.Width + Petal.Length, data = iris, hidden = 2)
##
## $response
##     Species.Class
## 1               0
## 2               0
## 3               0
## 4               0
## 5               0
## 6               0
## 7               0
## 8               0
## 9               0
## 10              0
## 11              0
## 12              0
## 13              0
## 14              0
## 15              0
## 16              0
## 17              0
## 18              0
## 19              0
## 20              0
## 21              0
## 22              0
## 23              0
## 24              0
## 25              0
## 26              0
## 27              0
## 28              0
## 29              0
## 30              0
## 31              0
## 32              0
## 33              0
```

```
## 34              0
## 35              0
## 36              0
## 37              0
## 38              0
## 39              0
## 40              0
## 41              0
## 42              0
## 43              0
## 44              0
## 45              0
## 46              0
## 47              0
## 48              0
## 49              0
## 50              0
## 51              1
## 52              1
## 53              1
## 54              1
## 55              1
## 56              1
## 57              1
## 58              1
## 59              1
## 60              1
## 61              1
## 62              1
## 63              1
## 64              1
## 65              1
## 66              1
## 67              1
## 68              1
## 69              1
## 70              1
## 71              1
## 72              1
## 73              1
## 74              1
## 75              1
## 76              1
## 77              1
## 78              1
## 79              1
## 80              1
## 81              1
## 82              1
## 83              1
## 84              1
## 85              1
## 86              1
## 87              1
```

```
## 88              1
## 89              1
## 90              1
## 91              1
## 92              1
## 93              1
## 94              1
## 95              1
## 96              1
## 97              1
## 98              1
## 99              1
## 100             1
## 101             2
## 102             2
## 103             2
## 104             2
## 105             2
## 106             2
## 107             2
## 108             2
## 109             2
## 110             2
## 111             2
## 112             2
## 113             2
## 114             2
## 115             2
## 116             2
## 117             2
## 118             2
## 119             2
## 120             2
## 121             2
## 122             2
## 123             2
## 124             2
## 125             2
## 126             2
## 127             2
## 128             2
## 129             2
## 130             2
## 131             2
## 132             2
## 133             2
## 134             2
## 135             2
## 136             2
## 137             2
## 138             2
## 139             2
## 140             2
## 141             2
```

```
## 142             2
## 143             2
## 144             2
## 145             2
## 146             2
## 147             2
## 148             2
## 149             2
## 150             2
##
## $covariate
##        [,1] [,2] [,3] [,4]
##   [1,]  3.5  5.1  0.2  1.4
##   [2,]  3.0  4.9  0.2  1.4
##   [3,]  3.2  4.7  0.2  1.3
##   [4,]  3.1  4.6  0.2  1.5
##   [5,]  3.6  5.0  0.2  1.4
##   [6,]  3.9  5.4  0.4  1.7
##   [7,]  3.4  4.6  0.3  1.4
##   [8,]  3.4  5.0  0.2  1.5
##   [9,]  2.9  4.4  0.2  1.4
##  [10,]  3.1  4.9  0.1  1.5
##  [11,]  3.7  5.4  0.2  1.5
##  [12,]  3.4  4.8  0.2  1.6
##  [13,]  3.0  4.8  0.1  1.4
##  [14,]  3.0  4.3  0.1  1.1
##  [15,]  4.0  5.8  0.2  1.2
##  [16,]  4.4  5.7  0.4  1.5
##  [17,]  3.9  5.4  0.4  1.3
##  [18,]  3.5  5.1  0.3  1.4
##  [19,]  3.8  5.7  0.3  1.7
##  [20,]  3.8  5.1  0.3  1.5
##  [21,]  3.4  5.4  0.2  1.7
##  [22,]  3.7  5.1  0.4  1.5
##  [23,]  3.6  4.6  0.2  1.0
##  [24,]  3.3  5.1  0.5  1.7
##  [25,]  3.4  4.8  0.2  1.9
##  [26,]  3.0  5.0  0.2  1.6
##  [27,]  3.4  5.0  0.4  1.6
##  [28,]  3.5  5.2  0.2  1.5
##  [29,]  3.4  5.2  0.2  1.4
##  [30,]  3.2  4.7  0.2  1.6
##  [31,]  3.1  4.8  0.2  1.6
##  [32,]  3.4  5.4  0.4  1.5
##  [33,]  4.1  5.2  0.1  1.5
##  [34,]  4.2  5.5  0.2  1.4
##  [35,]  3.1  4.9  0.2  1.5
##  [36,]  3.2  5.0  0.2  1.2
##  [37,]  3.5  5.5  0.2  1.3
##  [38,]  3.6  4.9  0.1  1.4
##  [39,]  3.0  4.4  0.2  1.3
##  [40,]  3.4  5.1  0.2  1.5
##  [41,]  3.5  5.0  0.3  1.3
##  [42,]  2.3  4.5  0.3  1.3
```

```
##  [43,]  3.2  4.4  0.2  1.3
##  [44,]  3.5  5.0  0.6  1.6
##  [45,]  3.8  5.1  0.4  1.9
##  [46,]  3.0  4.8  0.3  1.4
##  [47,]  3.8  5.1  0.2  1.6
##  [48,]  3.2  4.6  0.2  1.4
##  [49,]  3.7  5.3  0.2  1.5
##  [50,]  3.3  5.0  0.2  1.4
##  [51,]  3.2  7.0  1.4  4.7
##  [52,]  3.2  6.4  1.5  4.5
##  [53,]  3.1  6.9  1.5  4.9
##  [54,]  2.3  5.5  1.3  4.0
##  [55,]  2.8  6.5  1.5  4.6
##  [56,]  2.8  5.7  1.3  4.5
##  [57,]  3.3  6.3  1.6  4.7
##  [58,]  2.4  4.9  1.0  3.3
##  [59,]  2.9  6.6  1.3  4.6
##  [60,]  2.7  5.2  1.4  3.9
##  [61,]  2.0  5.0  1.0  3.5
##  [62,]  3.0  5.9  1.5  4.2
##  [63,]  2.2  6.0  1.0  4.0
##  [64,]  2.9  6.1  1.4  4.7
##  [65,]  2.9  5.6  1.3  3.6
##  [66,]  3.1  6.7  1.4  4.4
##  [67,]  3.0  5.6  1.5  4.5
##  [68,]  2.7  5.8  1.0  4.1
##  [69,]  2.2  6.2  1.5  4.5
##  [70,]  2.5  5.6  1.1  3.9
##  [71,]  3.2  5.9  1.8  4.8
##  [72,]  2.8  6.1  1.3  4.0
##  [73,]  2.5  6.3  1.5  4.9
##  [74,]  2.8  6.1  1.2  4.7
##  [75,]  2.9  6.4  1.3  4.3
##  [76,]  3.0  6.6  1.4  4.4
##  [77,]  2.8  6.8  1.4  4.8
##  [78,]  3.0  6.7  1.7  5.0
##  [79,]  2.9  6.0  1.5  4.5
##  [80,]  2.6  5.7  1.0  3.5
##  [81,]  2.4  5.5  1.1  3.8
##  [82,]  2.4  5.5  1.0  3.7
##  [83,]  2.7  5.8  1.2  3.9
##  [84,]  2.7  6.0  1.6  5.1
##  [85,]  3.0  5.4  1.5  4.5
##  [86,]  3.4  6.0  1.6  4.5
##  [87,]  3.1  6.7  1.5  4.7
##  [88,]  2.3  6.3  1.3  4.4
##  [89,]  3.0  5.6  1.3  4.1
##  [90,]  2.5  5.5  1.3  4.0
##  [91,]  2.6  5.5  1.2  4.4
##  [92,]  3.0  6.1  1.4  4.6
##  [93,]  2.6  5.8  1.2  4.0
##  [94,]  2.3  5.0  1.0  3.3
##  [95,]  2.7  5.6  1.3  4.2
##  [96,]  3.0  5.7  1.2  4.2
```

```
##  [97,]  2.9  5.7  1.3  4.2
##  [98,]  2.9  6.2  1.3  4.3
##  [99,]  2.5  5.1  1.1  3.0
## [100,]  2.8  5.7  1.3  4.1
## [101,]  3.3  6.3  2.5  6.0
## [102,]  2.7  5.8  1.9  5.1
## [103,]  3.0  7.1  2.1  5.9
## [104,]  2.9  6.3  1.8  5.6
## [105,]  3.0  6.5  2.2  5.8
## [106,]  3.0  7.6  2.1  6.6
## [107,]  2.5  4.9  1.7  4.5
## [108,]  2.9  7.3  1.8  6.3
## [109,]  2.5  6.7  1.8  5.8
## [110,]  3.6  7.2  2.5  6.1
## [111,]  3.2  6.5  2.0  5.1
## [112,]  2.7  6.4  1.9  5.3
## [113,]  3.0  6.8  2.1  5.5
## [114,]  2.5  5.7  2.0  5.0
## [115,]  2.8  5.8  2.4  5.1
## [116,]  3.2  6.4  2.3  5.3
## [117,]  3.0  6.5  1.8  5.5
## [118,]  3.8  7.7  2.2  6.7
## [119,]  2.6  7.7  2.3  6.9
## [120,]  2.2  6.0  1.5  5.0
## [121,]  3.2  6.9  2.3  5.7
## [122,]  2.8  5.6  2.0  4.9
## [123,]  2.8  7.7  2.0  6.7
## [124,]  2.7  6.3  1.8  4.9
## [125,]  3.3  6.7  2.1  5.7
## [126,]  3.2  7.2  1.8  6.0
## [127,]  2.8  6.2  1.8  4.8
## [128,]  3.0  6.1  1.8  4.9
## [129,]  2.8  6.4  2.1  5.6
## [130,]  3.0  7.2  1.6  5.8
## [131,]  2.8  7.4  1.9  6.1
## [132,]  3.8  7.9  2.0  6.4
## [133,]  2.8  6.4  2.2  5.6
## [134,]  2.8  6.3  1.5  5.1
## [135,]  2.6  6.1  1.4  5.6
## [136,]  3.0  7.7  2.3  6.1
## [137,]  3.4  6.3  2.4  5.6
## [138,]  3.1  6.4  1.8  5.5
## [139,]  3.0  6.0  1.8  4.8
## [140,]  3.1  6.9  2.1  5.4
## [141,]  3.1  6.7  2.4  5.6
## [142,]  3.1  6.9  2.3  5.1
## [143,]  2.7  5.8  1.9  5.1
## [144,]  3.2  6.8  2.3  5.9
## [145,]  3.3  6.7  2.5  5.7
## [146,]  3.0  6.7  2.3  5.2
## [147,]  2.5  6.3  1.9  5.0
## [148,]  3.0  6.5  2.0  5.2
## [149,]  3.4  6.2  2.3  5.4
## [150,]  3.0  5.9  1.8  5.1
```

```
##
## $model.list
## $model.list$response
## [1] "Species.Class"
##
## $model.list$variables
## [1] "Sepal.Width"  "Sepal.Length" "Petal.Width"  "Petal.Length"
##
##
## $err.fct
## function (x, y)
## {
##     1/2 * (y - x)^2
## }
## <bytecode: 0x4377a88>
## <environment: 0x56a8388>
## attr(,"type")
## [1] "sse"
##
## $act.fct
## function (x)
## {
##     1/(1 + exp(-x))
## }
## <bytecode: 0x4d04958>
## <environment: 0x56a8388>
## attr(,"type")
## [1] "logistic"
##
## $linear.output
## [1] TRUE
##
## $data
##     Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
## 1            5.1         3.5          1.4         0.2     setosa
## 2            4.9         3.0          1.4         0.2     setosa
## 3            4.7         3.2          1.3         0.2     setosa
## 4            4.6         3.1          1.5         0.2     setosa
## 5            5.0         3.6          1.4         0.2     setosa
## 6            5.4         3.9          1.7         0.4     setosa
## 7            4.6         3.4          1.4         0.3     setosa
## 8            5.0         3.4          1.5         0.2     setosa
## 9            4.4         2.9          1.4         0.2     setosa
## 10           4.9         3.1          1.5         0.1     setosa
## 11           5.4         3.7          1.5         0.2     setosa
## 12           4.8         3.4          1.6         0.2     setosa
## 13           4.8         3.0          1.4         0.1     setosa
## 14           4.3         3.0          1.1         0.1     setosa
## 15           5.8         4.0          1.2         0.2     setosa
## 16           5.7         4.4          1.5         0.4     setosa
## 17           5.4         3.9          1.3         0.4     setosa
## 18           5.1         3.5          1.4         0.3     setosa
## 19           5.7         3.8          1.7         0.3     setosa
## 20           5.1         3.8          1.5         0.3     setosa
```

```
## 21          5.4         3.4          1.7         0.2     setosa
## 22          5.1         3.7          1.5         0.4     setosa
## 23          4.6         3.6          1.0         0.2     setosa
## 24          5.1         3.3          1.7         0.5     setosa
## 25          4.8         3.4          1.9         0.2     setosa
## 26          5.0         3.0          1.6         0.2     setosa
## 27          5.0         3.4          1.6         0.4     setosa
## 28          5.2         3.5          1.5         0.2     setosa
## 29          5.2         3.4          1.4         0.2     setosa
## 30          4.7         3.2          1.6         0.2     setosa
## 31          4.8         3.1          1.6         0.2     setosa
## 32          5.4         3.4          1.5         0.4     setosa
## 33          5.2         4.1          1.5         0.1     setosa
## 34          5.5         4.2          1.4         0.2     setosa
## 35          4.9         3.1          1.5         0.2     setosa
## 36          5.0         3.2          1.2         0.2     setosa
## 37          5.5         3.5          1.3         0.2     setosa
## 38          4.9         3.6          1.4         0.1     setosa
## 39          4.4         3.0          1.3         0.2     setosa
## 40          5.1         3.4          1.5         0.2     setosa
## 41          5.0         3.5          1.3         0.3     setosa
## 42          4.5         2.3          1.3         0.3     setosa
## 43          4.4         3.2          1.3         0.2     setosa
## 44          5.0         3.5          1.6         0.6     setosa
## 45          5.1         3.8          1.9         0.4     setosa
## 46          4.8         3.0          1.4         0.3     setosa
## 47          5.1         3.8          1.6         0.2     setosa
## 48          4.6         3.2          1.4         0.2     setosa
## 49          5.3         3.7          1.5         0.2     setosa
## 50          5.0         3.3          1.4         0.2     setosa
## 51          7.0         3.2          4.7         1.4 versicolor
## 52          6.4         3.2          4.5         1.5 versicolor
## 53          6.9         3.1          4.9         1.5 versicolor
## 54          5.5         2.3          4.0         1.3 versicolor
## 55          6.5         2.8          4.6         1.5 versicolor
## 56          5.7         2.8          4.5         1.3 versicolor
## 57          6.3         3.3          4.7         1.6 versicolor
## 58          4.9         2.4          3.3         1.0 versicolor
## 59          6.6         2.9          4.6         1.3 versicolor
## 60          5.2         2.7          3.9         1.4 versicolor
## 61          5.0         2.0          3.5         1.0 versicolor
## 62          5.9         3.0          4.2         1.5 versicolor
## 63          6.0         2.2          4.0         1.0 versicolor
## 64          6.1         2.9          4.7         1.4 versicolor
## 65          5.6         2.9          3.6         1.3 versicolor
## 66          6.7         3.1          4.4         1.4 versicolor
## 67          5.6         3.0          4.5         1.5 versicolor
## 68          5.8         2.7          4.1         1.0 versicolor
## 69          6.2         2.2          4.5         1.5 versicolor
## 70          5.6         2.5          3.9         1.1 versicolor
## 71          5.9         3.2          4.8         1.8 versicolor
## 72          6.1         2.8          4.0         1.3 versicolor
## 73          6.3         2.5          4.9         1.5 versicolor
## 74          6.1         2.8          4.7         1.2 versicolor
```

```
## 75          6.4         2.9          4.3         1.3 versicolor
## 76          6.6         3.0          4.4         1.4 versicolor
## 77          6.8         2.8          4.8         1.4 versicolor
## 78          6.7         3.0          5.0         1.7 versicolor
## 79          6.0         2.9          4.5         1.5 versicolor
## 80          5.7         2.6          3.5         1.0 versicolor
## 81          5.5         2.4          3.8         1.1 versicolor
## 82          5.5         2.4          3.7         1.0 versicolor
## 83          5.8         2.7          3.9         1.2 versicolor
## 84          6.0         2.7          5.1         1.6 versicolor
## 85          5.4         3.0          4.5         1.5 versicolor
## 86          6.0         3.4          4.5         1.6 versicolor
## 87          6.7         3.1          4.7         1.5 versicolor
## 88          6.3         2.3          4.4         1.3 versicolor
## 89          5.6         3.0          4.1         1.3 versicolor
## 90          5.5         2.5          4.0         1.3 versicolor
## 91          5.5         2.6          4.4         1.2 versicolor
## 92          6.1         3.0          4.6         1.4 versicolor
## 93          5.8         2.6          4.0         1.2 versicolor
## 94          5.0         2.3          3.3         1.0 versicolor
## 95          5.6         2.7          4.2         1.3 versicolor
## 96          5.7         3.0          4.2         1.2 versicolor
## 97          5.7         2.9          4.2         1.3 versicolor
## 98          6.2         2.9          4.3         1.3 versicolor
## 99          5.1         2.5          3.0         1.1 versicolor
## 100         5.7         2.8          4.1         1.3 versicolor
## 101         6.3         3.3          6.0         2.5  virginica
## 102         5.8         2.7          5.1         1.9  virginica
## 103         7.1         3.0          5.9         2.1  virginica
## 104         6.3         2.9          5.6         1.8  virginica
## 105         6.5         3.0          5.8         2.2  virginica
## 106         7.6         3.0          6.6         2.1  virginica
## 107         4.9         2.5          4.5         1.7  virginica
## 108         7.3         2.9          6.3         1.8  virginica
## 109         6.7         2.5          5.8         1.8  virginica
## 110         7.2         3.6          6.1         2.5  virginica
## 111         6.5         3.2          5.1         2.0  virginica
## 112         6.4         2.7          5.3         1.9  virginica
## 113         6.8         3.0          5.5         2.1  virginica
## 114         5.7         2.5          5.0         2.0  virginica
## 115         5.8         2.8          5.1         2.4  virginica
## 116         6.4         3.2          5.3         2.3  virginica
## 117         6.5         3.0          5.5         1.8  virginica
## 118         7.7         3.8          6.7         2.2  virginica
## 119         7.7         2.6          6.9         2.3  virginica
## 120         6.0         2.2          5.0         1.5  virginica
## 121         6.9         3.2          5.7         2.3  virginica
## 122         5.6         2.8          4.9         2.0  virginica
## 123         7.7         2.8          6.7         2.0  virginica
## 124         6.3         2.7          4.9         1.8  virginica
## 125         6.7         3.3          5.7         2.1  virginica
## 126         7.2         3.2          6.0         1.8  virginica
## 127         6.2         2.8          4.8         1.8  virginica
## 128         6.1         3.0          4.9         1.8  virginica
```

```
## 129          6.4         2.8          5.6         2.1  virginica
## 130          7.2         3.0          5.8         1.6  virginica
## 131          7.4         2.8          6.1         1.9  virginica
## 132          7.9         3.8          6.4         2.0  virginica
## 133          6.4         2.8          5.6         2.2  virginica
## 134          6.3         2.8          5.1         1.5  virginica
## 135          6.1         2.6          5.6         1.4  virginica
## 136          7.7         3.0          6.1         2.3  virginica
## 137          6.3         3.4          5.6         2.4  virginica
## 138          6.4         3.1          5.5         1.8  virginica
## 139          6.0         3.0          4.8         1.8  virginica
## 140          6.9         3.1          5.4         2.1  virginica
## 141          6.7         3.1          5.6         2.4  virginica
## 142          6.9         3.1          5.1         2.3  virginica
## 143          5.8         2.7          5.1         1.9  virginica
## 144          6.8         3.2          5.9         2.3  virginica
## 145          6.7         3.3          5.7         2.5  virginica
## 146          6.7         3.0          5.2         2.3  virginica
## 147          6.3         2.5          5.0         1.9  virginica
## 148          6.5         3.0          5.2         2.0  virginica
## 149          6.2         3.4          5.4         2.3  virginica
## 150          5.9         3.0          5.1         1.8  virginica
##     Species.Class
## 1               0
## 2               0
## 3               0
## 4               0
## 5               0
## 6               0
## 7               0
## 8               0
## 9               0
## 10              0
## 11              0
## 12              0
## 13              0
## 14              0
## 15              0
## 16              0
## 17              0
## 18              0
## 19              0
## 20              0
## 21              0
## 22              0
## 23              0
## 24              0
## 25              0
## 26              0
## 27              0
## 28              0
## 29              0
## 30              0
## 31              0
```

```
## 32              0
## 33              0
## 34              0
## 35              0
## 36              0
## 37              0
## 38              0
## 39              0
## 40              0
## 41              0
## 42              0
## 43              0
## 44              0
## 45              0
## 46              0
## 47              0
## 48              0
## 49              0
## 50              0
## 51              1
## 52              1
## 53              1
## 54              1
## 55              1
## 56              1
## 57              1
## 58              1
## 59              1
## 60              1
## 61              1
## 62              1
## 63              1
## 64              1
## 65              1
## 66              1
## 67              1
## 68              1
## 69              1
## 70              1
## 71              1
## 72              1
## 73              1
## 74              1
## 75              1
## 76              1
## 77              1
## 78              1
## 79              1
## 80              1
## 81              1
## 82              1
## 83              1
## 84              1
## 85              1
```

```
## 86              1
## 87              1
## 88              1
## 89              1
## 90              1
## 91              1
## 92              1
## 93              1
## 94              1
## 95              1
## 96              1
## 97              1
## 98              1
## 99              1
## 100             1
## 101             2
## 102             2
## 103             2
## 104             2
## 105             2
## 106             2
## 107             2
## 108             2
## 109             2
## 110             2
## 111             2
## 112             2
## 113             2
## 114             2
## 115             2
## 116             2
## 117             2
## 118             2
## 119             2
## 120             2
## 121             2
## 122             2
## 123             2
## 124             2
## 125             2
## 126             2
## 127             2
## 128             2
## 129             2
## 130             2
## 131             2
## 132             2
## 133             2
## 134             2
## 135             2
## 136             2
## 137             2
## 138             2
## 139             2
```

```
## 140             2
## 141             2
## 142             2
## 143             2
## 144             2
## 145             2
## 146             2
## 147             2
## 148             2
## 149             2
## 150             2
##
## $net.result
## $net.result[[1]]
##                 [,1]
## 1   0.00001299465609
## 2   0.00001299465647
## 3   0.00001299465610
## 4   0.00001299465632
## 5   0.00001299465608
## 6   0.00001299465628
## 7   0.00001299465623
## 8   0.00001299465609
## 9   0.00001299465738
## 10  0.00001299465609
## 11  0.00001299465608
## 12  0.00001299465610
## 13  0.00001299465609
## 14  0.00001299465609
## 15  0.00001299465608
## 16  0.00001299465608
## 17  0.00001299465609
## 18  0.00001299465613
## 19  0.00001299465610
## 20  0.00001299465609
## 21  0.00001299465611
## 22  0.00001299465655
## 23  0.00001299465608
## 24  0.00001301846842
## 25  0.00001299465623
## 26  0.00001299465810
## 27  0.00001299470317
## 28  0.00001299465609
## 29  0.00001299465609
## 30  0.00001299465624
## 31  0.00001299465664
## 32  0.00001299467778
## 33  0.00001299465608
## 34  0.00001299465608
## 35  0.00001299465633
## 36  0.00001299465609
## 37  0.00001299465608
## 38  0.00001299465608
## 39  0.00001299465624
```

```
## 40  0.00001299465609
## 41  0.00001299465610
## 42  0.00001306754663
## 43  0.00001299465610
## 44  0.00001304464939
## 45  0.00001299465955
## 46  0.00001299467945
## 47  0.00001299465608
## 48  0.00001299465611
## 49  0.00001299465608
## 50  0.00001299465609
## 51  0.99284374555303
## 52  0.99430189053985
## 53  1.00559479565391
## 54  0.99497811643474
## 55  1.00897994155708
## 56  0.99692547267974
## 57  1.00932048961522
## 58  0.99208351658689
## 59  0.99311804041111
## 60  0.99373942348199
## 61  0.99212969217820
## 62  0.99431841833293
## 63  0.99214170865427
## 64  1.00658270829692
## 65  0.99209911755005
## 66  0.99242785419841
## 67  1.01501280820408
## 68  0.99210089615431
## 69  1.15874225556695
## 70  0.99214447567813
## 71  1.47889260533302
## 72  0.99219785039970
## 73  1.33185908424846
## 74  0.99452559706814
## 75  0.99233886356316
## 76  0.99271536113087
## 77  1.00245358054950
## 78  1.32560770277776
## 79  1.00826407603478
## 80  0.99208105096773
## 81  0.99214523961612
## 82  0.99209196655497
## 83  0.99213811635562
## 84  1.80137255243637
## 85  1.02537137471933
## 86  0.99837710455604
## 87  0.99820599727838
## 88  0.99870713144754
## 89  0.99232376284616
## 90  0.99335576425681
## 91  0.99506253327342
## 92  0.99745341017994
## 93  0.99223835333878
```

```
## 94  0.99208439278899
## 95  0.99358887385341
## 96  0.99220076855037
## 97  0.99262803240763
## 98  0.99245971030309
## 99  0.99208077099123
## 100 0.99253787370147
## 101 2.01329343683077
## 102 2.00664456783351
## 103 2.01302367949196
## 104 2.00710860657201
## 105 2.01324324059392
## 106 2.01328349623369
## 107 1.87160952185946
## 108 2.01261938306199
## 109 2.01250179695250
## 110 2.01328031249438
## 111 1.95093287731060
## 112 2.00685412493503
## 113 2.01167526184214
## 114 2.01183913664318
## 115 2.01325383928425
## 116 2.01267748682003
## 117 1.98902112060067
## 118 2.01322728673312
## 119 2.01329474586663
## 120 1.85592715596042
## 121 2.01314333621022
## 122 2.00589089822225
## 123 2.01328477261638
## 124 1.86674465651150
## 125 2.01188677090643
## 126 2.00214574580651
## 127 1.73383465321737
## 128 1.72571407215349
## 129 2.01311132646918
## 130 1.88540942019568
## 131 2.01270712661804
## 132 2.00804543932428
## 133 2.01323380742694
## 134 1.32030227652564
## 135 1.92113866592050
## 136 2.01326578714025
## 137 2.01322927452207
## 138 1.98323951667515
## 139 1.63663900391939
## 140 2.00797213426413
## 141 2.01325371276684
## 142 2.00982748696295
## 143 2.00664456783351
## 144 2.01325643055590
## 145 2.01327758781623
## 146 2.01242467733744
## 147 1.99963596326958
```

```
## 148 1.99737885053862
## 149 2.01276445107460
## 150 1.93592534988083
##
##
## $weights
## $weights[[1]]
## $weights[[1]][[1]]
##               [,1]           [,2]
## [1,]  23.824389720  10.7581259777
## [2,]   4.110419432  12.7195143127
## [3,]   1.915798305  -0.1191311057
## [4,] -11.014876652 -41.1988118357
## [5,]  -5.908519703  -8.2237943841
##
## $weights[[1]][[2]]
##               [,1]
## [1,]  2.0132947955
## [2,] -1.0212148493
## [3,] -0.9920669515
##
##
##
## $startweights
## $startweights[[1]]
## $startweights[[1]][[1]]
##               [,1]          [,2]
## [1,]  0.5090502483 -0.7988085061
## [2,]  0.3335579287  0.1222440455
## [3,] -0.7646259584 -0.3532262051
## [4,] -1.2790336081 -1.1228605908
## [5,] -0.5053730745  0.5413089785
##
## $startweights[[1]][[2]]
##               [,1]
## [1,]  1.1383047565
## [2,] -0.6668130786
## [3,] -0.5007398266
##
##
##
## $generalized.weights
## $generalized.weights[[1]]
##                         [,1]                        [,2]
## 1    -0.0000000006468652845  0.00000000006058547103
## 2    -0.0000003762595227861  0.00000003421742600707
## 3    -0.0000000127934111933  0.00000000085720532709
## 4    -0.0000002317925095343  0.00000001966354949907
## 5    -0.0000000002156217615  0.00000000002019515701
## 6    -0.0000001902501180933  0.00000001747781928651
## 7    -0.0000001379974859413  0.00000001190177839347
## 8    -0.0000000054622713121  0.00000000017056998950
## 9    -0.0000012646919129303  0.00000011504090959085
## 10   -0.0000000039529189826  0.00000000002920389049
```

```
## 11   -0.0000000002156217615  0.00000000002019515701
## 12   -0.0000000120026514251  0.00000000044211576379
## 13   -0.0000000061091365961  0.00000000023115546050
## 14   -0.0000000004312435230  0.00000000004039031402
## 15    0.0000000000000000000  0.00000000000000000000
## 16    0.0000000000000000000  0.00000000000000000000
## 17   -0.0000000071155181264  0.00000000066644018100
## 18   -0.0000000410398618332  0.00000000350277088508
## 19   -0.0000000114279533505  0.00000000107034332063
## 20   -0.0000000021562176149  0.00000000020195157008
## 21   -0.0000000291806650149  0.00000000239203725529
## 22   -0.0000004512241636441  0.00000004157964911987
## 23    0.0000000000000000000  0.00000000000000000000
## 24   -0.0232658021682385745  0.00021790490024194528
## 25   -0.0000001407992489679  0.00000000909494956989
## 26   -0.0000019715003072973  0.00000018226373942412
## 27   -0.0000460838078738244  0.00000431212201590199
## 28   -0.0000000015093523305  0.00000000014136609906
## 29   -0.0000000023718393763  0.00000000022214672708
## 30   -0.0000001498562426191  0.00000001198939005245
## 31   -0.0000005399877153033  0.00000004818811824251
## 32   -0.0000212365513957256  0.00000198799457287483
## 33    0.0000000000000000000  0.00000000000000000000
## 34    0.0000000000000000000  0.00000000000000000000
## 35   -0.0000002399865761091  0.00000002145408738384
## 36   -0.0000000058217875585  0.00000000054526923905
## 37   -0.0000000002156217615  0.00000000002019515701
## 38    0.0000000000000000000  0.00000000000000000000
## 39   -0.0000001559658190061  0.00000001324366745620
## 40   -0.0000000054622713121  0.00000000017056998950
## 41   -0.0000000178966061813  0.00000000167619802956
## 42   -0.0709501236297670895  0.00066451377820914088
## 43   -0.0000000124338949473  0.00000000048250607775
## 44   -0.0487478509403772506  0.00045657034075972971
## 45   -0.0000033938838606490  0.00000031377919973364
## 46   -0.0000228697357998289  0.00000213857161304364
## 47    0.0000000000000000000  0.00000000000000000000
## 48   -0.0000000286055270090  0.00000000199714284953
## 49   -0.0000000002156217615  0.00000000002019515701
## 50   -0.0000000084809759701  0.00000000045330218743
## 51   -0.4415438323528665943 -0.20579625505380876164
## 52   -1.6085120109955224343 -0.74970076306662913898
## 53    9.7432589448132294052  4.54117135324429543856
## 54   -2.3773635768591478978 -1.10804972264709778960
## 55    7.5399670542443262278  3.51425355523029887048
## 56   -6.4672625443402678158 -3.01428377985399142956
## 57    7.4058472787946358906  3.45174255343668257012
## 58   -0.0018686326388801017 -0.00087093791229903255
## 59   -0.6236892186636611157 -0.29069119779788699083
## 60   -1.0946223438557876051 -0.51018531465647254385
## 61   -0.0261856335482161910 -0.01220468937554470591
## 62   -1.6251374397427795770 -0.75744959958940683009
## 63   -0.0325598818985526339 -0.01517562078341476959
## 64    8.8689243370858061866  4.13365849781766847570
```

```
## 65   -0.0100531179904329859 -0.00468559151369027284 5
## 66   -0.1902324939773143986 -0.08866420948053306549 9
## 67    6.0470986459556694825  2.81845235734752996847 9
## 68   -0.0109882199762606231 -0.00512142699289533983 4
## 69    3.1164903910341084092  1.45254446859992558671 6
## 70   -0.0340303941256343487 -0.01586100213649229567 8
## 71    1.4785102609584861444  0.68910910410696568639 8
## 72   -0.0625969018449552828 -0.02917537746561355352 4
## 73    2.1085243992776625532  0.98274824202569777131 8
## 74   -1.8419870163457814360 -0.85851958970364150580 7
## 75   -0.1399535923278432403 -0.06523004755007165422 8
## 76   -0.3609445603061327001 -0.16823027147853228391 3
## 77   17.1600403875938063436  7.99801013911674374412 5
## 78    2.1388591450998344357  0.99688676379914686887 0
## 79    7.8572235922143711662  3.66212156477620043304 5
## 80   -0.0005780410419352215 -0.00026941364250033334 9
## 81   -0.0344365624053626085 -0.01605031043343488339 5
## 82   -0.0062976585058382960 -0.00293523412484284883 9
## 83   -0.0306523044384153787 -0.01428653057611468935 0
## 84    0.4782039168539722329  0.22288291222953873771 4
## 85    5.0886144041398821969  2.37171875351705407908 3
## 86  -15.8766658580782760168 -7.39985056212820335730 4
## 87  -13.9768851879518329895 -6.51439430919569595346 3
## 88  -20.9601886042615390693 -9.76919617834242259846 2
## 89   -0.1315358322189118245 -0.06130666921416141890 2
## 90   -0.7935643275220986004 -0.36986716780408906979 4
## 91   -2.4880233519047858515 -1.15962640794716587144 8
## 92   -8.6496323325868260667 -4.03145013258106299503 0
## 93   -0.0845325036704668853 -0.03939919756424260094 4
## 94   -0.0023274575448213966 -0.00108478913853581352 9
## 95   -0.9722352110511734979 -0.45314270246213222970 2
## 96   -0.0641698149967298154 -0.02990848619075177697 3
## 97   -0.3077031472540094348 -0.14341533213143944913 7
## 98   -0.2085151616888359927 -0.09718545759091402891 4
## 99   -0.0004315379187423269 -0.00020113215776723652 9
## 100  -0.2540261508724516171 -0.11839737462083810282 1
## 101   0.0000027374900984021  0.00000127589871982942 0
## 102   0.0134443137013780037  0.00626617157467920533 2
## 103   0.0005463330641628146  0.00025463677752576754 5
## 104   0.0125032617153301370  0.00582756285606055631 6
## 105   0.0001038781323709092  0.00004841587415701539 3
## 106   0.0000227664409500635  0.00001061106043094474 9
## 107   0.3074729877739871275  0.14330805861615425467 2
## 108   0.0013613191967249338  0.00063448829327067705 8
## 109   0.0015984132590336703  0.00074499390231578198 9
## 110   0.0000291812850146918  0.00001360091282702900 9
## 111   0.1297323525907517483  0.06046609727926136046 4
## 112   0.0130192855579323984  0.00606807300824776726 9
## 113   0.0032657867226181347  0.00152212901192100400 1
## 114   0.0029350906860097499  0.00136799707551415431 1
## 115   0.0000825223530877304  0.00003846229972608985 3
## 116   0.0012441724095704767  0.00057988811924639680 3
## 117   0.0495141265065651287  0.02307771292399309406 9
## 118   0.0001360247167664254  0.00006339886383104859 4
```

```
## 119   0.0000000999758844232  0.00000004659710112698
## 120   0.3444479880956908824  0.16054149284983082468
## 121   0.0003051912021608063  0.00014224455619673661
## 122   0.0149736678429685105  0.00697897816804738183
## 123   0.0000201946922225547  0.00009412411014434834
## 124   0.3188752178691375283  0.14862244890019382648
## 125   0.0028389759672070945  0.00132319959962605773
## 126   0.0225907141347610196  0.01052915707764495376
## 127   0.6557575669416274566  0.30563772291546964510
## 128   0.6780690637033258694  0.31603674140775395162
## 129   0.0003696969601510154  0.00017230961984367860
## 130   0.2754556934527327416  0.12838532890080861515
## 131   0.0011844163194190361  0.00055203679698198507
## 132   0.0106047484510756428  0.00494269731997866619
## 133   0.0001228856381478395  0.00005727495726460039
## 134   2.1648723434269485644  1.00901108397974081932
## 135   0.1947388870533266203  0.09076456453207765173
## 136   0.0000584483527606424  0.00002724180756195989
## 137   0.0001320193492766054  0.00006153202849319999
## 138   0.0614892034129668821  0.02865909760321259936
## 139   0.9378432241842705741  0.43711316794747434588
## 140   0.0107532379719026631  0.00501190582219091657
## 141   0.0000827772773660260  0.00003858111570300263
## 142   0.0069983490315409938  0.00326181438079885992
## 143   0.0134443137013780037  0.00626617157467920533
## 144   0.0000773011176723009  0.00003602876851939691
## 145   0.0000346711935391132  0.00001615966811252883
## 146   0.0017539282196851881  0.00081747684547799147
## 147   0.0277114326623628601  0.01291583903049933757
## 148   0.0323277928549899063  0.01506744793074058300
## 149   0.0010688509195852776  0.00049817368135262349
## 150   0.1622219254588608550  0.07560894819018194879
##                       [,3]                   [,4]
## 1     0.0000000020952121666  0.0000000004182303635
## 2     0.0000012185932692823  0.0000002434405570847
## 3     0.0000000413980500591  0.0000000083283014666
## 4     0.0000007505408028264  0.0000001502056832216
## 5     0.0000000006984040555  0.0000000001394101212
## 6     0.0000006161845786046  0.0000001230628293533
## 7     0.0000004468568191088  0.0000000893923794312
## 8     0.0000000176523122042  0.0000000035883573538
## 9     0.0000040959662742070  0.0000008182530920910
## 10    0.0000000127634838190  0.0000000026124865063
## 11    0.0000000006984040555  0.0000000001394101212
## 12    0.0000000387966446645  0.0000000078737653089
## 13    0.0000000197475243690  0.0000000040065877169
## 14    0.0000000013968081111  0.0000000002788202423
## 15    0.0000000000000000000  0.0000000000000000000
## 16    0.0000000000000000000  0.0000000000000000000
## 17    0.0000000230473338207  0.0000000046005339960
## 18    0.0000001328889809494  0.0000000265910272618
## 19    0.0000000370154149115  0.0000000073887364152
## 20    0.0000000069840405544  0.0000000013941012114
## 21    0.0000000944767581059  0.0000000189234706401
```

```
## 22    0.0000014614456540001   0.0000002918521717730
## 23    0.0000000000000000000   0.0000000000000000000
## 24    0.0753584877056941438   0.0150424952564924292
## 25    0.0000004555707568290   0.0000000917144195234
## 26    0.0000063854559574115   0.0000012750694501363
## 27    0.0001492660772742870   0.0000297961392110927
## 28    0.0000000048888283883   0.0000000009758708481
## 29    0.0000000076824446097   0.0000000015335113325
## 30    0.0000004851472696931   0.0000000972298387735
## 31    0.0000017487523484000   0.0000003495258385773
## 32    0.0000687855788150976   0.0000137306498116641
## 33    0.0000000000000000000   0.0000000000000000000
## 34    0.0000000000000000000   0.0000000000000000000
## 35    0.0000007772019275651   0.0000001553333647805
## 36    0.0000000188569094915   0.0000000037640732698
## 37    0.0000000006984040555   0.0000000001394101212
## 38    0.0000000000000000000   0.0000000000000000000
## 39    0.0000005050165651898   0.0000001010665235429
## 40    0.0000000176523122042   0.0000000035883573538
## 41    0.0000000579675365299   0.0000000115710400405
## 42    0.2298091448728452890   0.0458727696025532650
## 43    0.0000000401934527729   0.0000000081525855507
## 44    0.1578954550305216864   0.0315178981567454178
## 45    0.0000109923898137009   0.0000021949943326289
## 46    0.0000740752214507084   0.0000147869813159230
## 47    0.0000000000000000000   0.0000000000000000000
## 48    0.0000000925737567698   0.0000000186083446041
## 49    0.0000000006984040555   0.0000000001394101212
## 50    0.0000000274299689714   0.0000000055400990479
## 51    1.1832249555479428249   0.6346968907883977495
## 52    4.3104023049460513661   2.3121545300145172064
## 53  -26.1094511737072068058 -14.0054411483142402517
## 54    6.3707285810357463518   3.4173397066052100257
## 55  -20.2051903546043867266 -10.8383206724340492855
## 56   17.3306156169530503064   9.2963622817058269021
## 57  -19.8457835330915060013 -10.6455302896139638591
## 58    0.0050074601971930640   0.0026860634908475825
## 59    1.6713281761781821899   0.8965216562864776195
## 60    2.9333089474919500361   1.5734641666958080197
## 61    0.0701708252303009095   0.0376405216830976511
## 62    4.3549542174608619760   2.3360527416092278230
## 63    0.0872521865085400389   0.0468031807741592434
## 64  -23.7664572248402095056 -12.7486294427216630964
## 65    0.0269397944571868886   0.0144508478289631960
## 66    0.5097746084021840263   0.2734495730830021065
## 67  -16.2046834363588878603  -8.6923979629083270027
## 68    0.0294456295450942693   0.0157950094905878538
## 69   -8.3514000971255644146  -4.4797970584729984722
## 70    0.0911927845581510244   0.0489169676055329003
## 71   -3.9620307421749099142  -2.1252836001096087060
## 72    0.1677437458660859526   0.0899798752986038092
## 73   -5.6503080913001175745  -3.0308970079860704239
## 74    4.9360558246771208957   2.6477630225688613130
## 75    0.3750399641604514334   0.2011761990464411565
```

```
## 76    0.9672394449441413800   0.5188395203088390639
## 77  -45.9845354800136263407 -24.6666887447429452607
## 78   -5.7315974801377667092  -3.0745016683741299701
## 79  -21.0553570323644905216 -11.2943608738312182282
## 80    0.0015490046914263880   0.0008309018910987751
## 81    0.0922812120470176134   0.0495008139316907847
## 82    0.0168761200436929361   0.0090525650244318353
## 83    0.0821403650082745546   0.0440611348115726650
## 84   -1.2814646402086018462  -0.6873939050913778770
## 85  -13.6361899113274844808  -7.3146254212595396282
## 86   42.5454187731952160334  22.8219028731795390286
## 87   37.4544906834902135984  20.0910644010762062805
## 88   56.1679643386662874605  30.1292092940653155608
## 89    0.3524825121004270256   0.1890760953260978983
## 90    2.1265501799748380840   1.1407085195481649897
## 91    6.6672685795939905518   3.5764075273072775119
## 92   23.1788105332475069531  12.4334082953927893556
## 93    0.2265255690807951860   0.1215111916846377260
## 94    0.0062369933799771337   0.0033456019635491924
## 95    2.6053426185304098261   1.3975388633127519000
## 96    0.1719587522999706797   0.0922408582715095737
## 97    0.8245660250568875860   0.4423076862091640526
## 98    0.5587674990399932318   0.2997299817345862594
## 99    0.0011564122531133524   0.0006203130535923324
## 100   0.6807253528430370348   0.3651497231396945709
## 101  -0.0000073357758905491  -0.0000039350033376332
## 102  -0.0360273348104945199  -0.0193255198687253861
## 103  -0.0014640333941791065  -0.0007853261029856744
## 104  -0.0335055552887958963  -0.0179728053116403746
## 105  -0.0002783669243028765  -0.0001493195529091477
## 106  -0.0000610082603522723  -0.0000327256055380141
## 107  -0.8239492563001648007  -0.4419768436163089564
## 108  -0.0036479885529103434  -0.0019568273820692295
## 109  -0.0042833402230741825  -0.0022976380856631704
## 110  -0.0000781984078009880  -0.0000419466189106077
## 111  -0.3476496462635409457  -0.1864836847233105888
## 112  -0.0348883676926543401  -0.0187145634440710300
## 113  -0.0087514762217554901  -0.0046944029719053204
## 114  -0.0078652951123268488  -0.0042190441720486183
## 115  -0.0002211388777499874  -0.0001186217020544117
## 116  -0.0033340650149349701  -0.0017884348100870122
## 117  -0.1326852417404067730  -0.0711740485114631533
## 118  -0.0003645115788204494  -0.0001955286394602544
## 119  -0.0000002679098941823  -0.0000001437102691687
## 120  -0.9230328351124938990  -0.4951265334580428057
## 121  -0.0008178346523064028  -0.0004386968923905966
## 122  -0.0401256141966152280  -0.0215238889715376365
## 123  -0.0000541166291011415  -0.0000290288470247293
## 124  -0.8545043274141462808  -0.4583669717512260933
## 125  -0.0076077321580969963  -0.0040808841328561904
## 126  -0.0605373572663501294  -0.0324730071431814024
## 127  -1.7572631778370191302  -0.9426182823819789780
## 128  -1.8170523036943382333  -0.9746899286962872333
## 129  -0.0009906936462229011  -0.0005314206516970462
```

```
## 130  -0.7381510662356361996  -0.3959536049972331995
## 131  -0.0031739339205057037  -0.0017025384576848331
## 132  -0.0284180235238646051  -0.0152437886712723097
## 133  -0.0003293021962511715  -0.0001766418795601041
## 134  -5.8013062229147722704  -3.1118943231638054314
## 135  -0.5218505935170317800  -0.2799272848398941527
## 136  -0.0001566266914624079  -0.0000840165461517229
## 137  -0.0003537782146041692  -0.0001897711266020019
## 138  -0.1647753963344740225  -0.0883876149176428261
## 139  -2.5131808575678515894  -1.3481021244591242514
## 140  -0.0288159376012590215  -0.0154572348351137527
## 141  -0.0002218220098554615  -0.0001189881427902237
## 142  -0.0187537920700395939  -0.0100597722026865635
## 143  -0.0360273348104945199  -0.0193255198687253861
## 144  -0.0002071472973231776  -0.0001111164406478861
## 145  -0.0000929099636960313  -0.0000498380843005678
## 146  -0.0047000806889604292  -0.0025211829633497804
## 147  -0.0742595780477132428  -0.0398337806155510954
## 148  -0.0866302470130295432  -0.0464695645317403511
## 149  -0.0028642480975772534  -0.0015364190498644412
## 150  -0.4347134224865958352  -0.2331857998282778344
##
##
## $result.matrix
##                                        1
## error                          0.970976334725
## reached.threshold              0.009992551904
## steps                       6807.000000000000
## Intercept.to.1layhid1         23.824389720106
## Sepal.Width.to.1layhid1        4.110419431960
## Sepal.Length.to.1layhid1       1.915798305265
## Petal.Width.to.1layhid1      -11.014876651651
## Petal.Length.to.1layhid1      -5.908519703240
## Intercept.to.1layhid2         10.758125977694
## Sepal.Width.to.1layhid2       12.719514312666
## Sepal.Length.to.1layhid2      -0.119131105707
## Petal.Width.to.1layhid2      -41.198811835708
## Petal.Length.to.1layhid2      -8.223794384087
## Intercept.to.Species.Class     2.013294795486
## 1layhid.1.to.Species.Class    -1.021214849320
## 1layhid.2.to.Species.Class    -0.992066951510
##
## attr(,"class")
## [1] "nn"
```

```
# Related Posts -
# http://rpubs.com/rohitdhankaranalytics/RWeka_ADT_Classification_GermanCreditData
```