

```

#####
#UNIVERSITY : STEVENS INSTITUE OF TECHNOLOGY
#Project : HW_07_ANN
#Purpose : Use ANN methodology to develop a classification model
#First Name : Sarthak
#Last Name : Ahir
#CWID : 10479028
#Date : 11/15/2021
#####
rm(list=ls())
dev.off

#installing the required libraries
library(neuralnet)

#Load the "wisc_bc_ContinuousVar" from canvas into R and perform the analysis

newDataSet<-read.csv("~/Downloads/wisc_bc_ContinuousVar.csv")

set.seed(111)
#Summarizing each column
summary(newDataSet)
table(newDataSet$Class)

View(newDataSet)

#check if NAN
table(is.na(newDataSet))

newDataSet=newDataSet[,-1]

# Splitting the newDataSet Data to test and training 30 - 70
data<-sort(sample(nrow(newDataSet),as.integer(.70*nrow(newDataSet))))
training<-newDataSet[data,]
test<-newDataSet[-data,]

#performing ANN for 5 nodes
dataModel <- neuralnet(diagnosis~.,data=training,hidden=5, threshold=0.01)

#Plotting the neural network of the performed ANN
plot(dataModel)

# test with input column
ANN <-compute(dataModel,test)
ANN_diag<-c('B','M')[apply(ANN$net.result,1,which.max)]
dataModel$result.matrix

#displaying results of ANN
k=apply(ANN$net.result,1,which.max)
ANN$net.result
k

#accuracy of ANN
accuracy= (test$diagnosis==ANN_diag)
```

```
acccu<-sum(accuracy)/length(accuracy)
print(paste("the accuracy is",acccu*100))

#error rate
error<- (test$diagnosis!=ANN_diag)
errorRate<-sum(error)/length(error)
print(paste("the error rate is",errorRate*100))
```

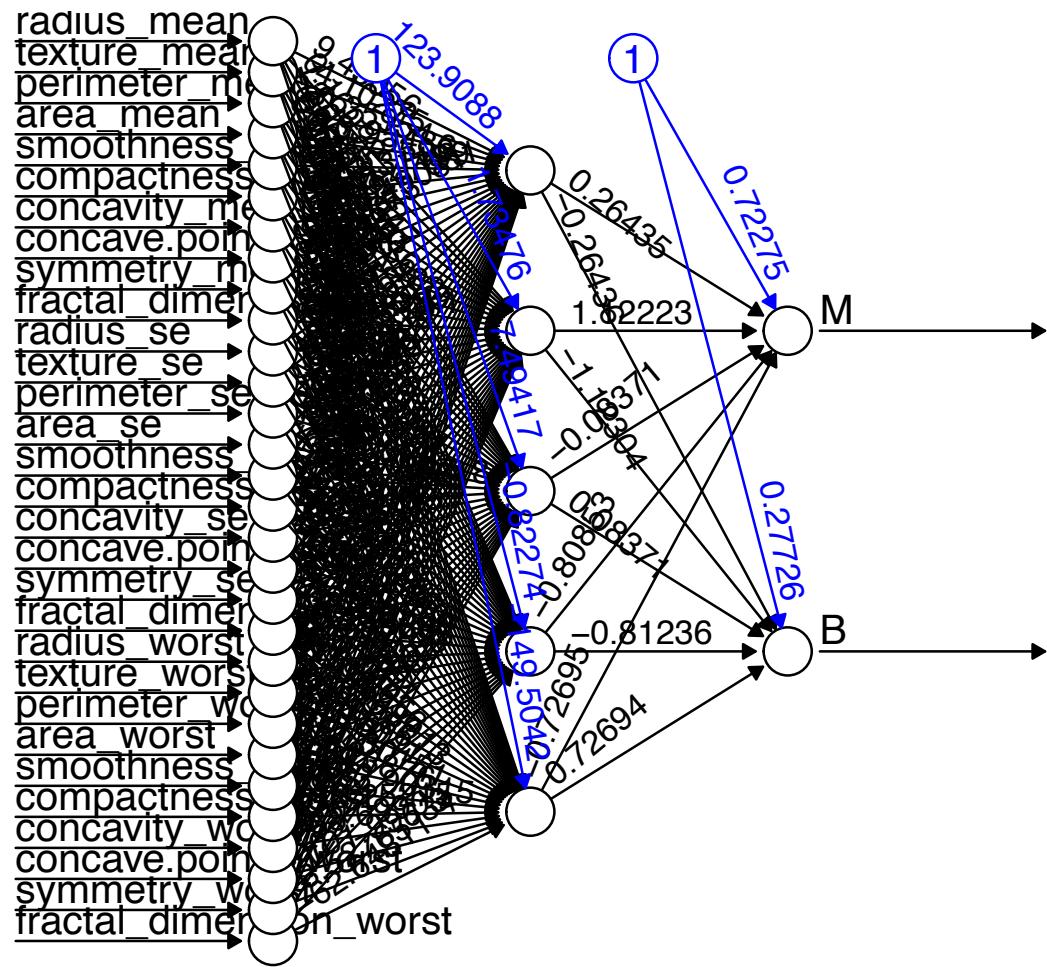
OUTPUT –

RStudio Source Editor

newDataSet x

Filter

	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mean	concave.points_mean	symm.
1	M	17.990	10.38	122.80	1001.0	0.11840	0.27760	0.300100	0.147100	
2	M	20.570	17.77	132.90	1326.0	0.08474	0.07864	0.086900	0.070170	
3	M	19.690	21.25	130.00	1203.0	0.10960	0.15990	0.197400	0.127900	
4	M	11.420	20.38	77.58	386.1	0.14250	0.28390	0.241400	0.105200	
5	M	20.290	14.34	135.10	1297.0	0.10030	0.13280	0.198000	0.104300	
6	M	12.450	15.70	82.57	477.1	0.12780	0.17000	0.157800	0.080890	
7	M	18.250	19.98	119.60	1040.0	0.09463	0.10900	0.112700	0.074000	
8	M	13.710	20.83	90.20	577.9	0.11890	0.16450	0.093660	0.059850	
9	M	13.000	21.82	87.50	519.8	0.12730	0.19320	0.185900	0.093530	
10	M	12.460	24.04	83.97	475.9	0.11860	0.23960	0.227300	0.085430	
11	M	16.020	23.24	102.70	797.8	0.08206	0.06669	0.032990	0.033230	
12	M	15.780	17.89	103.60	781.0	0.09710	0.12920	0.099540	0.066060	
13	M	19.170	24.80	132.40	1123.0	0.09740	0.24580	0.206500	0.111800	
14	M	15.850	23.95	103.70	782.7	0.08401	0.10020	0.099380	0.053640	
15	M	13.730	22.61	93.60	578.3	0.11310	0.22930	0.212800	0.080250	
16	M	14.540	27.54	96.73	658.8	0.11390	0.15950	0.163900	0.073640	
17	M	14.680	20.13	94.74	684.5	0.09867	0.07200	0.073950	0.052590	
18	M	16.130	20.68	108.10	798.8	0.11700	0.20220	0.172200	0.102800	
19	M	19.810	22.15	130.00	1260.0	0.09831	0.10270	0.147900	0.094980	
20	B	13.540	14.36	87.46	566.3	0.09779	0.08129	0.066640	0.047810	
21	B	13.080	15.71	85.63	520.0	0.10750	0.12700	0.045680	0.031100	
22	B	9.504	12.44	60.34	273.9	0.10240	0.06492	0.029560	0.020760	
23	M	15.340	14.26	102.50	704.4	0.10730	0.21350	0.207700	0.097560	
24	M	21.160	23.04	137.20	1404.0	0.09428	0.10220	0.109700	0.086320	
25	M	16.650	21.38	110.00	904.6	0.11210	0.14570	0.152500	0.091700	
26	M	17.140	16.40	116.00	912.7	0.11860	0.22760	0.222900	0.140100	
27	M	14.580	21.53	97.41	644.8	0.10540	0.18680	0.142500	0.087830	
28	M	18.610	20.25	122.10	1094.0	0.09440	0.10660	0.149000	0.077310	



RStudio

Source

Console Terminal Render Jobs

R 4.1.2 - ~/

```

> ---
Warning message:
In grid.Call(C_setDLon, FALSE) : reached elapsed time limit
+ output:
+ pdf_document: default
Error: object 'output' not found
> html_document: default
Error: object 'html_document' not found
> ---
+
+ #####
+ #UNIVERSITY : STEVENS INSTITUTE OF TECHNOLOGY
+ #Project : HW_07_ANN
+ #Purpose : Use ANN methodology to develop a classification model
+ #First Name : Sarthak
+ #Last Name : Aahir
+ #CWID : 10479028
+ #Date : 11/15/2021
+ #####
+ rm(list=ls())
Error in -rm(list = ls()) : invalid argument to unary operator
> dev.off()
function (which = dev.cur())
{
  if (which == 1)
    stop("cannot shut down device 1 (the null device)")
  .External(C_devoff, as.integer(which))
  dev.cur()
}

<environment: namespace:grDevices>
> #installing the required libraries
> library(neuralnet)
> #Load the "wisc_bc_ContinuousVar" from canvas into R and perform the analysis

```

Environment History Connections Tutorial

Import Dataset | 116 MiB | Project: (None)

Data

- ANN List of 2
- dataModel List of 14
- newDataSet 569 obs. of 31 variables
- test 171 obs. of 31 variables
- training 398 obs. of 31 variables

Values

accu	0.964912280701754
------	-------------------

Files Plots Packages Help Viewer

radius_mean texture_mean perimeter_mean area_mean smoothness_mean compactness_mean concavity_mean concave_points_mean symmetry_mean fractal_dimension_mean radius_se texture_se perimeter_se area_se smoothness_se compactness_se concavity_se concave_points_se symmetry_se fractal_dimension_se radius_worst texture_worst perimeter_worst area_worst smoothness_worst compactness_worst concavity_worst concave_points_worst symmetry_worst fractal_dimension_worst

RStudio

Source

Console Terminal Render Jobs

R 4.1.2 - ~/

```

> newDataSet<-read.csv("~/Downloads/wisc_bc_ContinuousVar.csv")
> set.seed(111)
> #Summarizing each column
> summary(newDataSet)
      id diagnosis      radius_mean     texture_mean
Min. : 8670 Length:569 Min. : 6.981 Min. : 9.71
1st Qu.: 869218 Class :character 1st Qu.:11.700 1st Qu.:16.17
Median : 906024 Mode :character Median :13.370 Median :18.84
Mean : 30371831 Mean :14.127 Mean :19.29
3rd Qu.: 8813129 3rd Qu.:15.780 3rd Qu.:21.80
Max. :911320502 Max. :28.110 Max. :39.28
perimeter_mean area_mean smoothness_mean compactness_mean
Min. : 43.79 Min. : 143.5 Min. : 0.05263 Min. : 0.01938
1st Qu.: 75.17 1st Qu.: 420.3 1st Qu.: 0.08637 1st Qu.: 0.06492
Median : 86.24 Median : 551.1 Median : 0.09587 Median : 0.09263
Mean : 91.97 Mean : 654.9 Mean : 0.09636 Mean : 0.10434
3rd Qu.:104.10 3rd Qu.: 782.7 3rd Qu.: 0.10530 3rd Qu.: 0.13040
Max. :188.50 Max. : 2501.0 Max. : 0.16340 Max. : 0.34540
concavity_mean concave.points_mean symmetry_mean fractal_dimension_mean
Min. : 0.00000 Min. : 0.00000 Min. : 0.1060 Min. : 0.04996
1st Qu.: 0.02956 1st Qu.: 0.02031 1st Qu.: 0.1619 1st Qu.: 0.05770
Median : 0.06154 Median : 0.03350 Median : 0.1792 Median : 0.06154
Mean : 0.08880 Mean : 0.04892 Mean : 0.1812 Mean : 0.06280
3rd Qu.: 0.13070 3rd Qu.: 0.07400 3rd Qu.: 0.1957 3rd Qu.: 0.06612
Max. : 0.42680 Max. : 0.20120 Max. : 0.3040 Max. : 0.09744
      radius_se texture_se perimeter_se area_se
Min. : 0.1115 Min. : 0.3602 Min. : 0.757 Min. : 6.802
1st Qu.: 0.2324 1st Qu.: 0.8339 1st Qu.: 1.606 1st Qu.: 17.850
Median : 0.3242 Median : 1.1080 Median : 2.287 Median : 24.530
Mean : 0.4052 Mean : 1.2169 Mean : 2.866 Mean : 40.337
3rd Qu.: 0.4789 3rd Qu.: 1.4740 3rd Qu.: 3.357 3rd Qu.: 45.190
Max. : 2.8730 Max. : 4.8850 Max. : 21.980 Max. : 542.200
smoothness_se compactness_se concavity_se concave.points_se
Min. : 0.001713 Min. : 0.002252 Min. : 0.00000 Min. : 0.000000
1st Qu.: 0.005160 1st Qu.: 0.013080 1st Qu.: 0.015000 1st Qu.: 0.007628

```

Environment History Connections Tutorial

Import Dataset | 116 MiB | Project: (None)

Data

- ANN diag chr [1:171] "M" "M" "M" "M" "B" "B" "M" ...
- data int [1:398] 3 5 6 8 9 10 11 12 13 14 ...
- error logi [1:171] FALSE FALSE FALSE FALSE FALSE FALSE ...
- errorRate 0.0350877192982456
- k Named int [1:171] 2 2 2 2 1 1 2 2 2 ...

Values

accu	0.964912280701754
accuracy	logi [1:171] TRUE TRUE TRUE TRUE TRUE TRUE ...
ANN_diag	chr [1:171] "M" "M" "M" "M" "B" "B" "M" ...
data	int [1:398] 3 5 6 8 9 10 11 12 13 14 ...
error	logi [1:171] FALSE FALSE FALSE FALSE FALSE FALSE ...
errorRate	0.0350877192982456
k	Named int [1:171] 2 2 2 2 1 1 2 2 2 ...

Files Plots Packages Help Viewer

radius_mean texture_mean perimeter_mean area_mean smoothness_mean compactness_mean concavity_mean concave_points_mean symmetry_mean fractal_dimension_mean radius_se texture_se perimeter_se area_se smoothness_se compactness_se concavity_se concave_points_se symmetry_se fractal_dimension_se radius_worst texture_worst perimeter_worst area_worst smoothness_worst compactness_worst concavity_worst concave_points_worst symmetry_worst fractal_dimension_worst

