Introduction

I tried to compare the **Decision Tree(DT)** and **Neural network(NN)** for this problem.

First I created **hypothese1(h1)** for DT and **hypothese2(h2)** for NN. Then I tested both of them on 6 different test data. And tried to calculate **overalError** from errors that I got from 6 test data(**sampleError**).

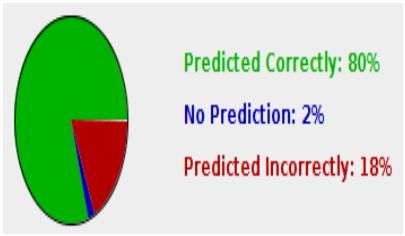
Acquire errors.

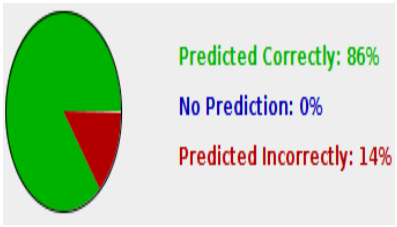
Test inputs(myinput1-6) can be found in **data** folder. They all have same training data because I want to get same hypothesis when I run them on AISpace applets.

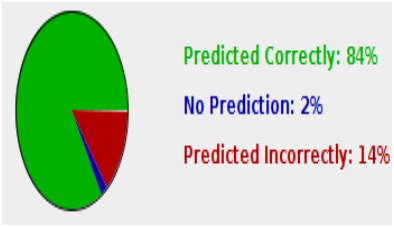
Initializations that were done when I run Decision-Tree applet:
Decision Tree Options ->Stopping Condition-> Minimum Information Gain->0.1
Decision Tree Options ->Splitting Function-> Information Gain

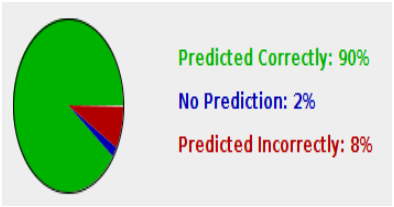
Initializations that were done when I run Neural-Network applet:
Neural Options ->Parameter Initialization Options-> Constant Parameter ->0
Neural Options ->Stopping Condition-> Number Of Iterations ->250

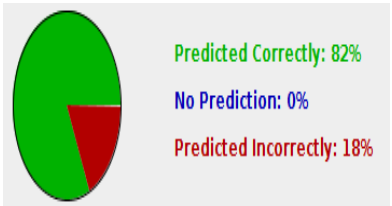
After running them all, I got these errors from DT:

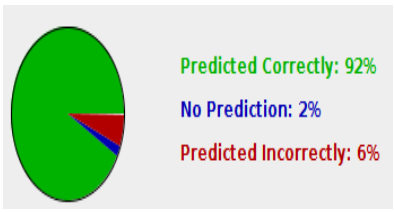




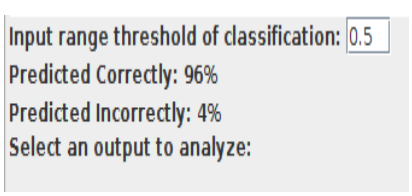


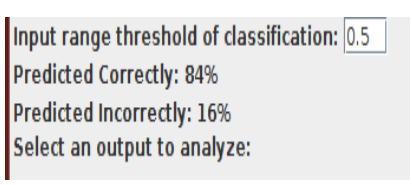


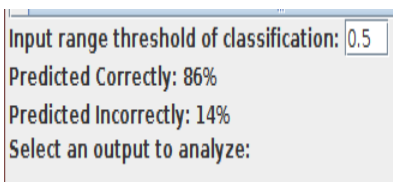


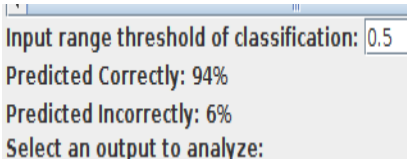


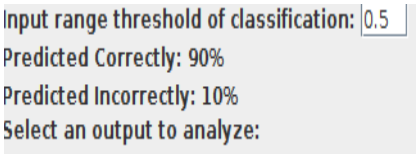
And these errors from NN:

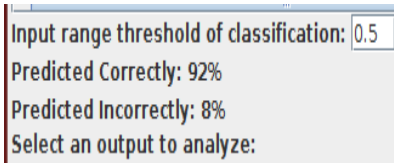












Finding Overal-Error

First I calculated **mean** for DT like summing all errors and dividing it to their number
(0.2+0.14+0.16+0.1+0.18+0.08)/6 = 0.14, so my **mean is 0.14**
then I calculated **standard deviation** subtracting each error from mean and adding them and dividing by number of experiments was done.
((0.14-0.2)+(0.14-0.14)+(0.14-0.1)+(0.14-0.18)+(0.14-0.08)+(0.14-0.16))/6 = 0.003 so my **standard deviation is 0.003**

now we have mean and standard deviation, according to **Central Limit theorem** if I continue to do experiments the distribution of them will be **Normal distribution** with means and standard deviation that we calculated.
Here I want to mention that we met two conditions :
1. sampling number must be greater than 30, our sampling number was 50, so we met the condition.
2. doing enough experiments we did 6 experiments.

Now we can calculate **Overal-Error** from error of single experiment(**Sample-Error**).
Lets take Sample-Error mean of our errors from six experiment which is **0,14. ($error_s(h)$)**

According to this formula, our Overal-Error with 95% probability will lie in this interval

$$error_S(h) \pm 1.96\sqrt{\frac{error_S(h)(1-error_S(h))}{n}}$$

[0.16 ... 0.44]

Calculating mean and standard deviation of Overal-Error
Mean of Overal-Error can directly be taken from mean of Sample-Error. Which is **0,14**
and Standar deviation of is equal to **(standard deviation of 1experiment)/number of samples** which gives us **0,00006**

So for DT, our Overal-Error with 95% probability will lie in this interval [0.16 ... 0.44] and it has mean 0.14 and standard deviation 0.00006.

If we do same calculations on the results of **NN** we will get:
Overal-Error with 95% probability will lie in this interval [0.042 ... 0.15] and it has mean 0.096 and standard deviation 0.00013.

Conclusion

As you can see from results that we obtained **Neural Network** seems to be better approach to solve this problem.