

# Breast Cancer Classification using Neural Network Approach

Name: Muhammad Waleed Iqbal

UOB: 14031207

Instructor Name: Dr. Junaid Akhtar

Contents

Introduction: ..... 4

Background: .....	4
Neuron: .....	4
Neural Network:.....	4
Feed Forward Neural Network: .....	4
Recurrent Neural Network:.....	5
Main Part: .....	6
Data Gathering:.....	6
Pre processing:.....	6
Post Processing: .....	6
Experimental Results and Analysis: .....	7
Hypothesis 1:.....	7
Hypothesis 2:.....	7
Hypothesis 3:.....	7
Hypothesis 4:.....	8
Conclusion:.....	8
Bibliography: .....	8

## Introduction:

“Breast cancer is caused when abnormal tissue in the breast begins to multiply uncontrollably. These cancerous cells can travel to other locations in the body and cause further damage.

Breast cancer is the most common type of cancer in women and the second leading cause of cancer related deaths, next to lung cancer.

If eight women live to the age of 85, at least one of them will develop breast cancer in her lifetime”. [1]

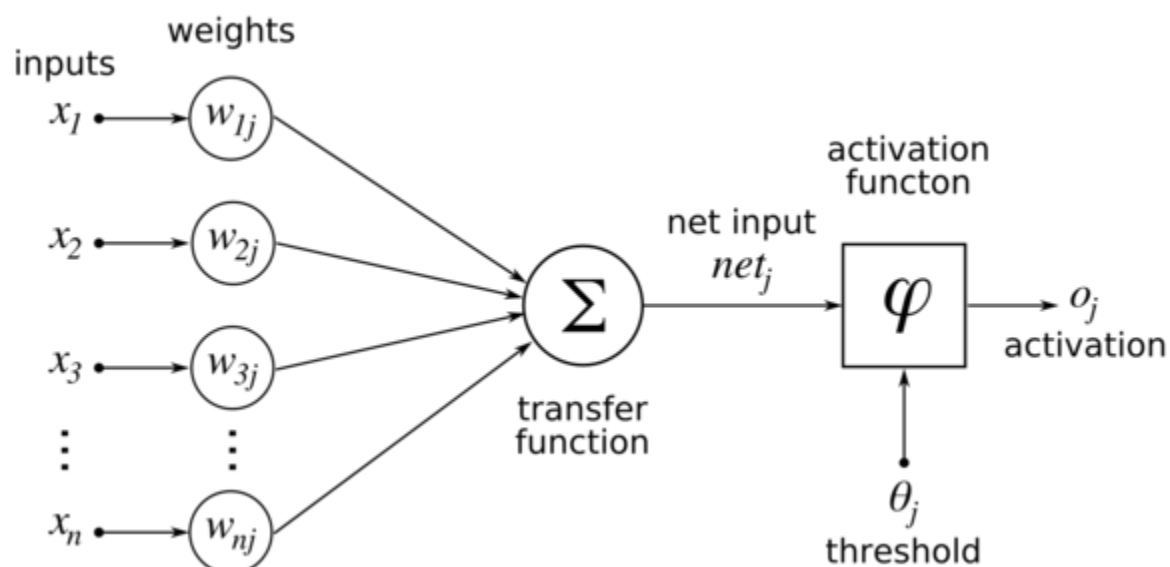
There are different methods to detect this disease. In this scenario I have to apply neural networks for the detection of this disease and sample data is given to train and test my neural network.

## Background:

Neural Networks are figuring frameworks motivated by the natural neural systems that constitute creature brains. These systems learn from given scenarios and give results on the basis of their learning. A neural network consists of different interconnected neurons.

### Neuron:

Neurons are building blocks in an Neural Network. It receives single or multiple inputs and based on given environment and learning it produces results. There is output unit and between input and output units there are hidden units which together form majority of artificial brain. Usually each hidden unit and output unit is connected to each other. Connection between units is represented by a number that is called weight. That can be positive or negative. One unit will have more influence on other if it has higher weight.



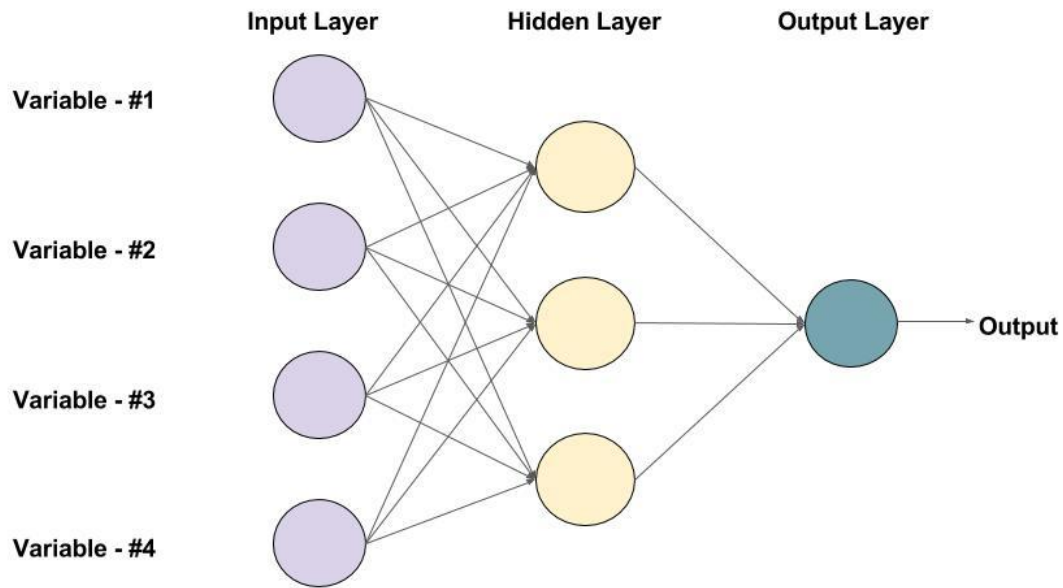
[4]

## Neural Network:

Each neural network consists of three components that is input unit, hidden unit and output unit. Neural network has two types on the basis of its functionality.

### Feed Forward Neural Network:

“A feedforward neural network is a neural network where in connections between the units do not form a cycle”. [2] That is a node sends output to another node and doesn't receive any information from it. It has fixed inputs and outputs.



An example of a Feed-forward Neural Network with one hidden layer ( with 3 neurons )

[3]

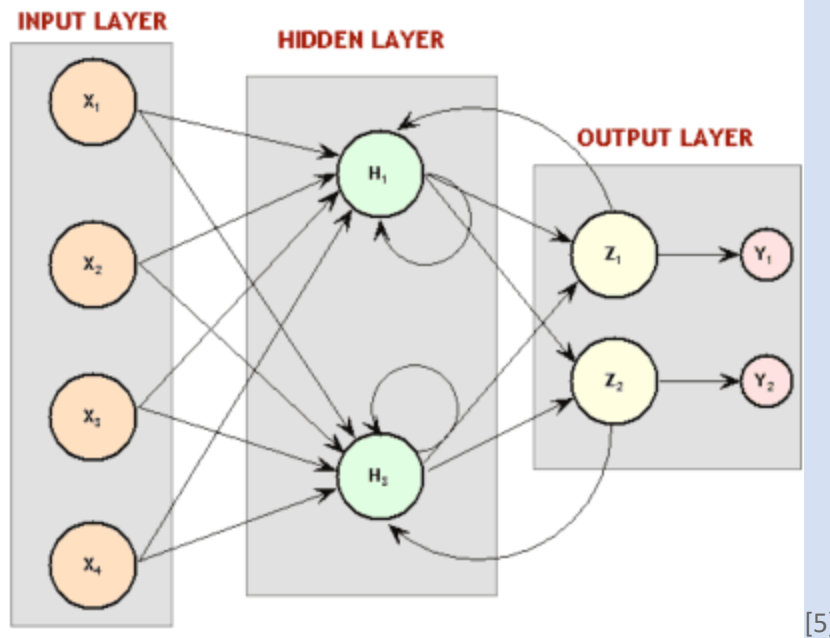
### Recurrent Neural Network:

“A recurrent neural network is a neural network where connections between units form a directed cycle”. That is a node sends output to another node and receive any data from that node.

Neural Networks have weights in it and when a weight changes it means network has learned something. We can calculate weights using this formula.

$W(t+1) = W(t) + (\text{learning rate}) * (\text{desired\_Output} - \text{actual\_OutPut}) * (\text{bias})$ .

If neural network has not learned anything then difference will be zero. That will show that neural network has not learned anything.



## Main Part:

In this section i will explain method or that i have followed to train and test my neural network.

### Data Gathering:

I have used data set that is available on UCI Machine Learning repository. There are 699 rows in this data and we have 11 columns that first column represents patients id. From 2-10 columns there are different values on the basis of different samples from patient and last column is the result column. If last column has the value of 2 then cancer will be benign and if column's value is 4 then cancer will be malignant.

### Pre processing:

Data was available to us in .txt format and we convert that file to the file having extension .m put square brackets around it. In this file data first column was patient id and we don't need this in our processing so we have neglected that column. There were also some entries that have missing values we have deleted that rows.

### Creating and Training Network:

After arranging data and handling rows that have missing values we have made a new neural network by using newff function and i have set values of different attributes like epochs, goals and set number of nodes etc. Then we have trained our neural network by giving it a little amount of data using train function after this i have tested my neural network using SIM function.

### Post Processing:

After Processing data that is training and testing i have measured the accuracy of my neural network by applying following formula.

$$\text{percentage} = (\text{counter} / \text{size}(\text{testDataOutput}, 1)) * 100.$$

## Experimental Results and Analysis:

After training and testing now i have made different hypothesis on the basis of some values. Now i am going to verify it on experimental basis.

### Hypothesis 1:

First hypothesis is that with increase in training data accuracy should increase because neural network will learn more with more different data sets. I have taken different ratios of training data testing data and measured their accuracy. Result of this experiment is given below:

Train Data Entries	Test Data Entries	Accuracy
100	583	95.5403
200	483	96.8944
300	383	96.8668
400	283	95.4064
500	183	96.1749
600	83	95.1807

According to the results of experiment our hypothesis is wrong because accuracy is not increasing.

### Hypothesis 2:

Second hypothesis is that accuracy should increase as we place value of epochs near zero. Result of this experiment is given below:

Epochs Value	Accuracy
0.20	95.406360424028260
0.15	95.053003533568900
0.10	95.406360424028260
0.05	95.053003533568900
0.01	95.759717314487630

From these results accuracy is not increasing readily. So our hypothesis is wrong.

### Hypothesis 3:

I have made a hypothesis that accuracy will increase as we increase value of goal function so here is the result of our experiment.

Goal	Accuracy
100	95.759717314487630
1000	95.759717314487630
2000	95.759717314487630
3000	95.759717314487630
4000	95.759717314487630

Our hypothesis is wrong because accuracy is neither increasing nor decreasing.

#### Hypothesis 4:

Our hypothesis is that accuracy will increase with the increase in number of neurons.

Number of Neurons	Accuracy
20	96.113074204947000
30	95.759717314487630
40	96.113074204947000
50	95.406360424028260
60	96.113074204947000

This hypothesis is again wrong. Accuracy is not increasing or decreasing in any particular sequence.

#### Conclusion:

Study of Neural Networks is becoming very beneficial in solving many issues. As we can see from our experiments that the accuracy that this neural network giving about detection of breast cancer is good. By increasing training neural network don't give more accuracy. So, training data should not be big. By changing goal function value there is no change in accuracy. By changing number of neurons there is no such change in accuracy.

#### Bibliography:

- [1]2017. [Online]. Available: (<https://www.babymed.com/cancer/introduction-breast-cancer-causes-and-risk-factors>). [Accessed: 02- Dec- 2017].
- [2]2017. [Online]. Available: ([https://en.wikipedia.org/wiki/Feedforward\\_neural\\_network](https://en.wikipedia.org/wiki/Feedforward_neural_network)). [Accessed: 02- Dec- 2017].



[3]"feedforward neuron in neural network - Google Search", *Google.com.pk*, 2017. [Online]. Available: [https://www.google.com.pk/search?biw=1366&bih=613&tbm=isch&sa=1&ei=PVOiWo7TCYjUvgSkqJOGDw&q=feedforward+neuron+in+neural+network&oq=feedforward+neuron+in+neural+network&gs\\_l=psy-ab.3...98146.101456.0.105191.12.12.0.0.0.195.1738.0j11.11.0....0...1c.1.64.psy-ab..1.1.194...0i13k1.0.yGMSwSTDpic#imgsrc=v5MAA\\_bTljhqeM:](https://www.google.com.pk/search?biw=1366&bih=613&tbm=isch&sa=1&ei=PVOiWo7TCYjUvgSkqJOGDw&q=feedforward+neuron+in+neural+network&oq=feedforward+neuron+in+neural+network&gs_l=psy-ab.3...98146.101456.0.105191.12.12.0.0.0.195.1738.0j11.11.0....0...1c.1.64.psy-ab..1.1.194...0i13k1.0.yGMSwSTDpic#imgsrc=v5MAA_bTljhqeM:) [Accessed: 02- Dec- 2017].

[4]"Image: machine learning - Neural network: activation function vs transfer ...", *Google.com.pk*, 2017. [Online]. Available: <https://www.google.com.pk/imgres?imgurl=https%3A%2F%2Fstack.imgur.com%2FibYr3.png&imgrefurl=https%3A%2F%2Fstackoverflow.com%2Fquestions%2F26058022%2Fneural-network-activation-function-vs-transfer-function&docid=xYFFpjXZ0ppmZM&tbnid=eGvQ8UvJAcfjIM%3A&vet=10ahUKEwjO5dnZ7erXAhUIqo8KHSTUBPQQMwicASgBMAE..i&w=600&h=285&bih=662&biw=1366&q=neuron%20in%20neural%20network&ved=0ahUKEwjO5dnZ7erXAhUIqo8KHSTUBPQQMwicASgBMAE&iact=mrc&uact=8> [Accessed: 02- Dec- 2017].

[5]"Recurrent Neural Network - Google Search", *Google.com.pk*, 2017. [Online]. Available: [https://www.google.com.pk/search?q=Recurrent+Neural+Network&source=Inms&tbm=isch&sa=X&ved=0ahUKEwjeg4bB7urXAhXDu48KHQYtBDEQ\\_AUICigB&biw=1366&bih=613#imgsrc=34oQDPHpFtwpsM:](https://www.google.com.pk/search?q=Recurrent+Neural+Network&source=Inms&tbm=isch&sa=X&ved=0ahUKEwjeg4bB7urXAhXDu48KHQYtBDEQ_AUICigB&biw=1366&bih=613#imgsrc=34oQDPHpFtwpsM:) [Accessed: 02- Dec- 2017].