



AN EXTENSIVE AND CORRELATIVE EVOLUTION OF NEURAL NETWORK APPROACH

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Abstract

History of science has taken an incredible turn after the advancement of Man-made consciousness. Entire world is participated in computerized reasoning through various dialects like Python, Java, R, C++, C, JavaScript, Scala, Julia, and so on. AI is a piece of man-made consciousness that helps in preparing of machines for the connection with human. Man machine connection begins from a littlest degree of neural networks that is Perception. Perception is the single layer neural networks which is prepared utilizing AI. The interconnection of various layers shapes a neural network. There are various kinds of neural networks which are utilized for various purposes. The goal of the paper is to discover which neural network fits best for face acknowledgment or characteristic language handling or some other undertaking. Yield with the outline will settle on the choice all the more clear about the target.

1. Introduction

Human has the characteristic insight called the brain. Brain is an exceptionally perplexing, non-straight and equal PC. People normally have this knowledge that is the reason called the natural intelligence [1]. The intelligence given to machine or showed by machine is called Artificial or Machine intelligence. It is an extremely confused errand. Learning is one the objective of computer based intelligence. Learning is the capacity to improve conduct dependent on experience. People have this learning capacity and to show the machine how to learn is called AI. AI is one of the most significant uses of computerized reasoning. AI investigates calculations that gain from information or assemble model from information. This model is utilized for expectation, dynamic or fathoming task. There are different uses of AI, for example, Prescription, PC vision, Robot control, Regular Language Preparing, Money related stock ascent or fall, extortion location, comprehend purchaser opinions, and so forth. Artificial Neural networks [2][3][4] is one of the uses of AI.

In the paper we concentrated on the Artificial Neural networks. There are various sorts of artificial neural networks created for various purposes. For instance CNN neural networks [5] utilized for face acknowledgment, recurrent neural network utilized for NLP, and so forth. The paper shows the examination of various artificial neural networks with their individual outline and yield.

Neural network motivated by human mind, individuals are exceptionally canny and can carry out specific responsibilities amazingly well and this roused individuals to attempt to see how human brain functions. Human brain contains 10 billion of neurons which are Deeply associated and these individual neurons are straightforward leading units however together they perform extremely complex errand. There are sure attributes of neurons which have been consolidated while attempting to frame the design of neural network.

Along these lines, these attributes are:

1. Gigantic Parallelism
2. Connectionism
3. Conveyed Cooperative Memory

The fundamental unit in the neural networks is called Perception [6]. Straightforward Rosenblatt imagined perception in 1957 at the Cornell Aeronautical Laboratory [7]. To gain proficiency with the parallel classifier perception calculation is utilized. It is additionally named as single-layer perception. It is the basic feed forward neural networks [8]. Feedback neural networks are artificial neural networks where association between the units doesn't frame a cycle. It is the first and least difficult sort of Artificial Neural network inferred. It is a sort of direct classifier. Straight classifier settles on the grouping choice based on direct mix of highlights. Interestingly there is a classifier called non straight classifier. KNN is a case of non-straight classifier. Essentially there are two kinds of learning directed and unaided learning. Perception calculation is utilized for Supervised learning. In administered learning name implies yield dataset is given though in unaided adapting no mark or yield dataset is given; just info is given in Unsupervised learning. It is likewise called bunching.

2. Artificial Neural Network (ANN)

ANN depends on the human brain. Human has normally thinking power known as Characteristic Knowledge while when we applied the insight to the machine called Machine Knowledge.

Human brain comprises of numerous neurons. These neurons are interface together with connect and communicate with one another by transferring information/signal. So also, ANN is made out of various hubs. These hubs are associate with one another by connect. The hub takes input information, performs activity and passed yield to other hub. Right now the hubs are interfacing and cooperating with one another parallel. It makes ANN architecture Huge Parallelism, Connectionism, and Appropriated Cooperative Memory. The Initiation work is utilized at the yield of every hub. This capacity characterizes the hub yield based on the info or set of data sources. Also, the connection between every hub is related with weight. Because of this weight ANN is fit for learning. Learning occurs by adjusting weight.

Straightforward layer neural networks is comprises of Sources of info, Yields and a solitary Shrouded layer. In the event that a neural network has more than one Shrouded layer called multilayer neural networks.

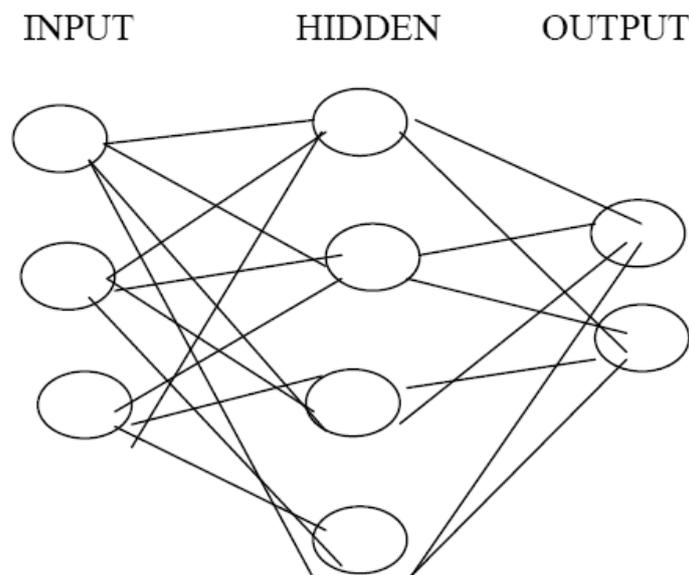


Figure 1: Single Layer Neural Network

A. Types of Neural network

Order of neural network is done on the fundamentals of Learning.

1. Supervised Learning
2. Unsupervised Learning
3. Deep Learning

1. Supervised Neural Network

a) Feed forward Neural Network

A feed forward neural network is a straightforward sort of artificial neural network where the units don't frame a cycle between the associations of the units [3]. It is not the same as repetitive neural networks [9]. Fundamentally a feed forward neural network was the first and most straightforward sort of artificial neural networks comes [10].

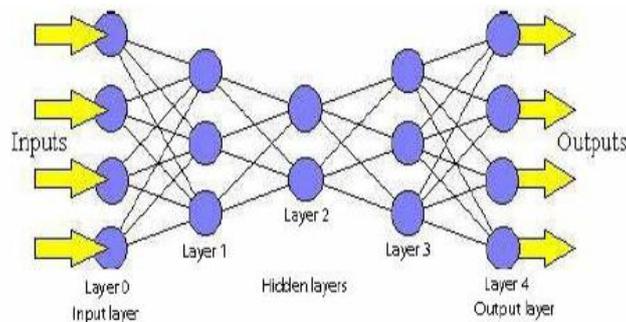


Figure 2: Feed forward Neural Network

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Python 3.6.3 Shell
File Edit Shell Debug Options Window Help
2 [1, 0] [0.8453921]
TRUE
3 [0, 0] [0.73825]
4 [1, 0] [0.83895067]
TRUE
5 [0, 0] [0.72918474]
6 [0, 1] [0.7733785]
7 [0, 0] [0.72111545]
8 [1, 0] [0.82628511]
TRUE
9 [0, 0] [0.71170185]
10 [0, 0] [0.69949933]
11 [1, 0] [0.81000047]
TRUE
12 [0, 0] [0.68979602]
13 [0, 0] [0.67675498]
14 [0, 0] [0.66326616]
15 [0, 0] [0.64935634]
16 [0, 0] [0.63505898]
17 [1, 0] [0.75967283]
18 [0, 1] [0.69309517]
19 [0, 0] [0.63245196]
20 [0, 0] [0.61774439]
21 [0, 1] [0.67321319]
22 [0, 0] [0.61064973]
23 [0, 1] [0.66729307]
24 [1, 0] [0.74731499]
25 [0, 1] [0.68048697]
26 [0, 0] [0.61709387]
27 [0, 0] [0.60207025]
28 [0, 1] [0.66071441]
29 [0, 1] [0.66899824]

```

Figure 3: Feed forward Neural Network Output

b) Radial Basis Neural Network

A Radial Basis Neural Network is a sort of artificial neural networks. Right now, Basis capacities are utilized as the initiation capacities [11]. The yield of the system is a direct mix of Radial Basis elements of the sources of info and neuron parameters [12]. Radial Basis work systems have numerous uses; including capacity estimation, time arrangement expectation, grouping, and framework control.

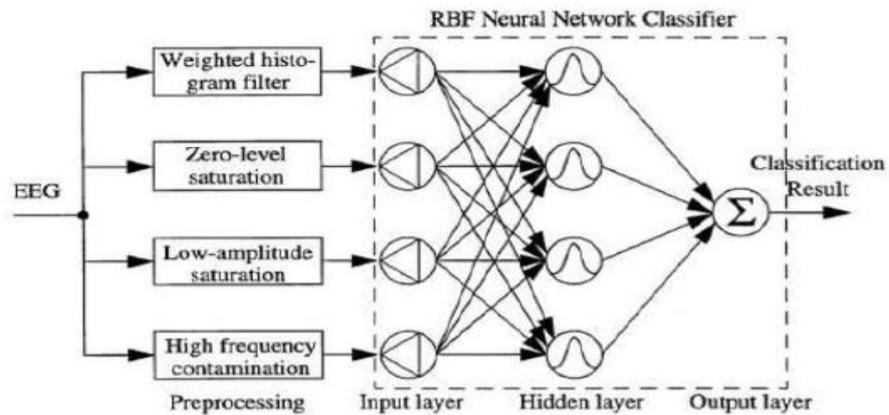


Figure 4: Radial Basis Neural Network

Above outline recognizes epileptiform artifacts in EEG recording utilizing Radial Basis Neural network.

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Python 3.6.3 Shell
File Edit Shell Debug Options Window Help
Performing k-fold cross validation using RBF network...
Cross validation complete.
Optimal beta and validation accuracy for optimal beta 140 93.9
training...
testing...
Comparing predicted labels to actual labels:
  label predicted
0      0.0      0.0
1      0.0      0.0
2      0.0      0.0
3      0.0      0.0
4      0.0      0.0
5      0.0      3.0
6      0.0      0.0
7      0.0      0.0
8      0.0      0.0
9      0.0      0.0
10     0.0      0.0
11     0.0      0.0
12     0.0      0.0
13     0.0      0.0
14     0.0      0.0
15     0.0      0.0
16     0.0      0.0
17     0.0      0.0
18     0.0      0.0
19     0.0      0.0
20     0.0      0.0
21     0.0      0.0
22     0.0      0.0
23     0.0      0.0
24     0.0      0.0
  
```

Figure 5: Radial Basis Neural Network output (part 1)

25	0.0	0.0
26	0.0	0.0
27	0.0	0.0
28	0.0	0.0
29	0.0	0.0
..
970	9.0	9.0
971	9.0	9.0
972	9.0	8.0
973	9.0	9.0
974	9.0	9.0
975	9.0	9.0
976	9.0	9.0
977	9.0	9.0
978	9.0	9.0
979	9.0	9.0
980	9.0	9.0
981	9.0	9.0
982	9.0	9.0
983	9.0	9.0
984	9.0	7.0
985	9.0	9.0
986	9.0	9.0
987	9.0	9.0
988	9.0	9.0
989	9.0	9.0
990	9.0	9.0
991	9.0	9.0
992	9.0	9.0
993	9.0	9.0
994	9.0	9.0
995	9.0	9.0
...

Figure 6: Radial Basis Neural Network output (part 2)

2. Unsupervised Network

a) Self-Organizing Neural Network

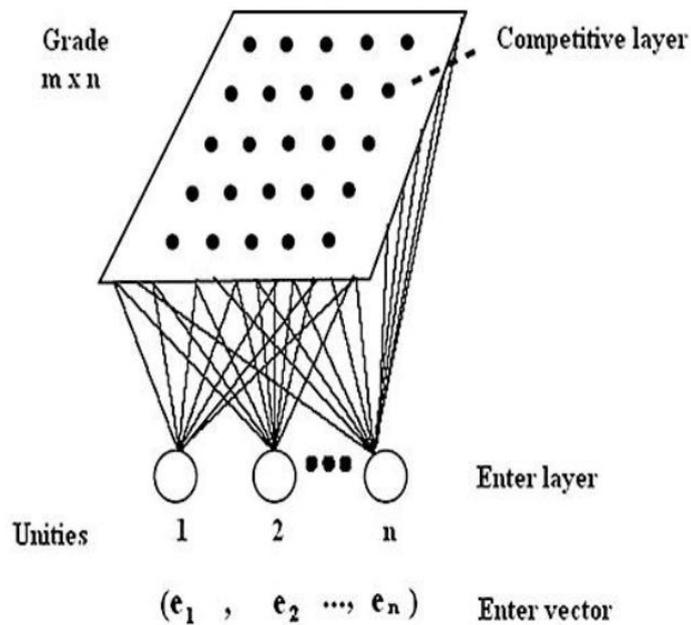


Figure 7: Self-Organizing Neural Network



It is utilized to deliver a low-dimensional (for the most part two-dimensional), discretized portrayal of info test space of the preparation samples [13] [14] and in this manner it is a strategy to do dimensionality decrease [15]. They applied on serious learning instead of blunder adjustment learning (back propagation with inclination plunge) to protect the topological properties of the information space[16].

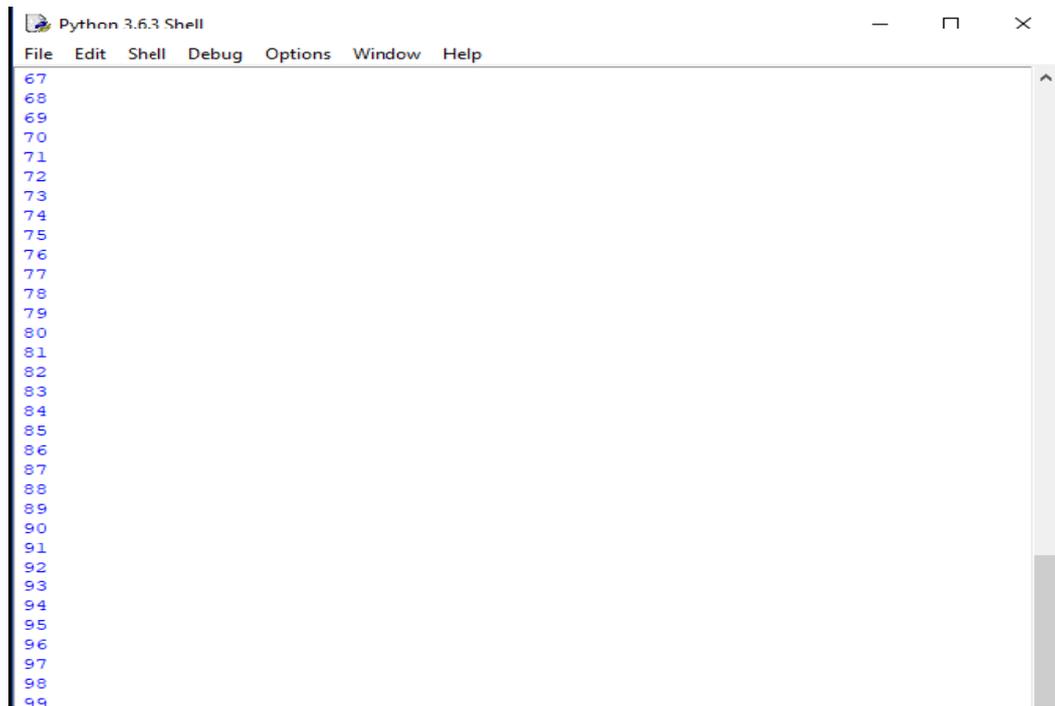


Figure 8: Self-Organizing Neural Network

3. Deep Learning

A) Recurrent neural network (RNN) or Long Short-Term Memory (LSTM)

They are designed to capture information from sequence/ time series data $S_t = F(S_{t-1}, X_t)$

Where

X_t = input at time step t

S_t = state at time step t

F_w = recursive function

It uses the above equation [5][6] [16] to solve the problem

The LSTM cell is an explicitly planned unit of rationale that will help lessen the disappearing inclination issue adequately to make intermittent neural networks increasingly valuable for long haul memory errands for example content grouping predictions[5][16]. The manner in which it does so is by making an inner memory state which is essentially added to the prepared information, which incredibly lessens the multiplicative impact of little gradients [16]. It is utilized to Normal Language handling.

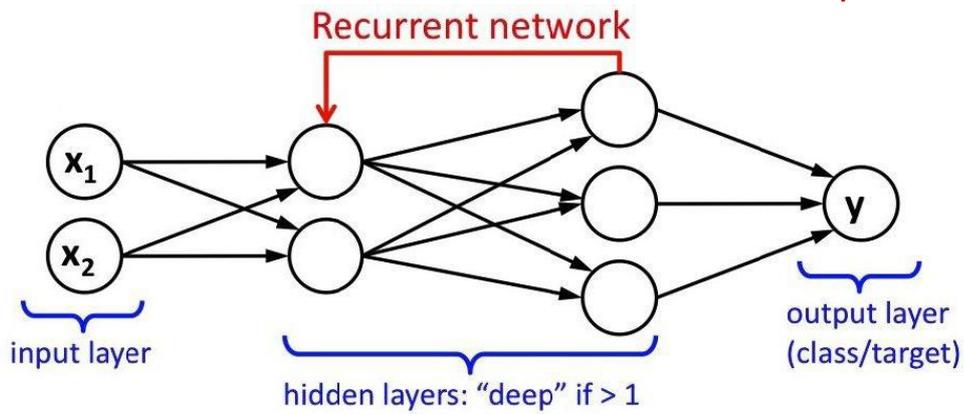


Figure 9: Recurrent Neural Network (RNN) or Long Short Term Memory(LSTM)

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Python 3.6.3 Shell
File Edit Shell Debug Options Window Help
Error: [3.45638663]
Pred: [0 0 0 0 0 0 1]
True: [0 1 0 0 0 1 0 1]
9 + 60 = 1
-----
Error: [3.63389116]
Pred: [1 1 1 1 1 1 1 1]
True: [0 0 1 1 1 1 1 1]
28 + 35 = 255
-----
Error: [3.91366595]
Pred: [0 1 0 0 1 0 0 0]
True: [1 0 1 0 0 0 0 0]
116 + 44 = 72
-----
Error: [3.72191702]
Pred: [1 1 0 1 1 1 1 1]
True: [0 1 0 0 1 1 0 1]
4 + 73 = 223
-----
Error: [3.5852713]
Pred: [0 0 0 0 1 0 0 0]
True: [0 1 0 1 0 0 1 0]
71 + 11 = 8
-----
Error: [2.53352328]
Pred: [1 0 1 0 0 0 1 0]
True: [1 1 0 0 0 0 1 0]
81 + 113 = 162
-----
Error: [0.57691441]
Pred: [0 1 0 1 0 0 0 1]

```

Figure 10: Recurrent Neural Network (RNN) or Long Short Term Memory(LSTM) output)



B. Usefulness and Capacities of Neural network

1. Non linearity
Neural network is the interconnection of non-direct neurons. Non linearity is conveyed all through the machine/mind.
2. Info Yield Mapping
Learning with an educator.
3. Adaptively
It can adjust the free parameters to the adjustments in the general condition.
4. Evidential Reaction
Choice with a proportion of confidence.
5. Adaptation to non-critical failure
Effortless degradation.
6. Neurobiological similarity

C. Utilizations of Neural network

By and large Machines are quicker than People. For instance Silicon IC's processes in certain nanoseconds and Human neuron Artificial Neural networks calculation speed is in certain milliseconds. So we can say that machines are 5 to multiple times quicker than people. However, there are a few undertakings which are simpler for human yet troublesome for a machine. Right now of AI or ANN comes. Following are the some significant utilizations of ANN.

PC vision, Robot control, Characteristic Language Preparing, Money related stock ascent or fall, extortion identification, comprehend shopper opinions

1. Therapeutic
Ailments like malignant growth discovery, order, and examination. EEG and ECG investigation.
2. Discourse
Transformation content to discourse and the other way around, perceive and group the discourse, break down the discourse and judge the feelings.
3. Picture
Acknowledgment, classification of pictures. Picture to content, content to picture, picture to discourse, discourse to picture change. Likewise, investigation of slants.
4. Estimating
Forecasting or forecast broadly utilized in business choices, financial exchange, whether, and so on.

ANN has a great deal of different zones of uses additionally like in Transportation, Industry, Military, Gadgets, Money related, Media communications, Aviation, Time arrangement forecast, design acknowledgment, and so on.

D. Limitations of Neural Networks

1. Like with any information driven models, they can't be utilized if there is no or next to no information accessible.
2. There are many free parameters, for example, the quantity of concealed hubs, the learning rate, insignificant mistake, which may enormously impact the conclusive outcome.
3. Not useful for number juggling and exact counts.
4. Neural networks don't give clarifications. On the off chance that there are numerous hubs, at that point there are an excessive number of loads that are hard to interpret (in contrast to the inclines in direct models, which can be viewed as relationships). In certain undertakings, clarifications are significant (for example aviation authority, therapeutic finding).

Table 1: Analysis of Neural Networks

LEARNING	NEURAL NETWORK	ACTIVATION FUNCTION	APPLICATION
Supervised	FEEDFORWARD NEURAL NETWORK	$y = f(v)$ $f(v) = a + v = a + \sum w_i x_i$	Computer Vision
	RADIAL BASIC NEURAL NETWORK	$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	Used in multilayer perceptron
Unsupervised	SELF ORGANIZING NEURAL NETWORK	$d_j(x) = \sum_{i=1}^D (x_i - w_{ij}) - w_{ij}$	Topology data analysis
Deep Learning	CONVOLUTION NEURAL NETWORK	$\sigma(x) = \frac{1}{1+e^{-x}}$ $\sigma(x) = \frac{1}{1+e^{-x}}$	analyzing visual imagery
	RECURRENT NEURAL NETWORK	$h_{t+1} = \sigma_h(W h_t + U h_{t-1} + b_h)$ $y_t = \sigma_y(W y_t + b_y)$	Speech Recognition, language processing

3. Conclusion

The paper clarified the extensive investigation of neural networks and its sort with their suitable charts and yields. Neural networks applications and utilizations are additionally clarified in detail. It is an intricate, point by point theme that can be utilized in building up a machine simply like human. The machine that can think, have emotions, judgment force, forecast or forecasting capacity can be created utilizing this innovation. Neural networks is anything but an extremely basic theme that can be clarified in a solitary paper yet comprehensively the paper clarified most extreme zones of this field. Specialists working right now utilized the paper.

Later on another Neural networks can be created with the fitting Actuation work. Distinctive Neural networks utilize diverse Enactment functions which are utilized for various purposes. Ventures like Humanoid should be possible with the fitting effectively present neural networks or other neural networks with various actuation capacity and weight related with each connection. Humanoid only a robot looks like human

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