How to Choose Hidden Layers and number of hidden neurons

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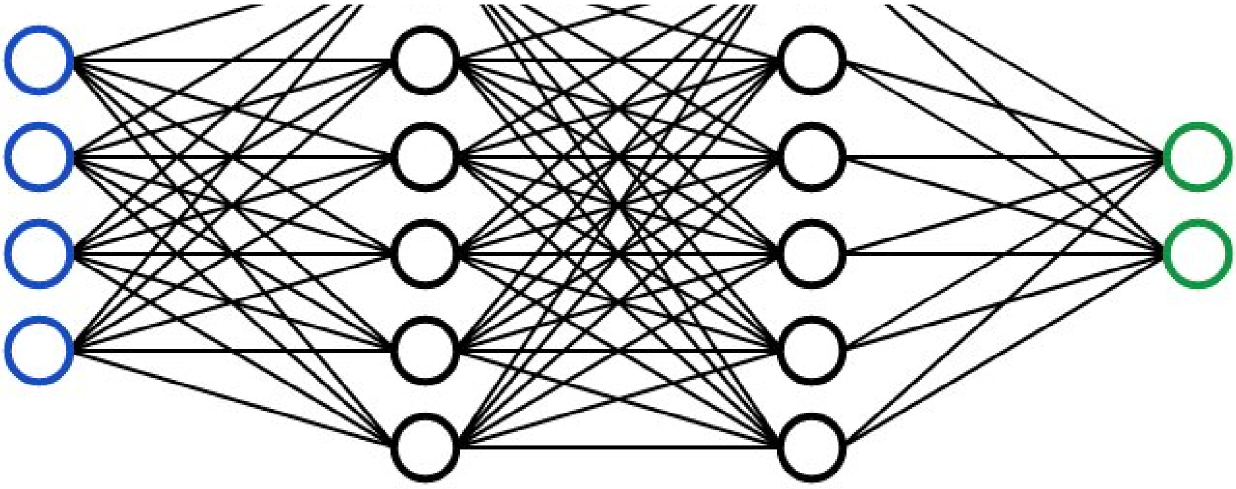

Choosing number of Hidden Layers and number of hidden neurons in Neural Networks

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The deep learning revolution has brought us self-driving cars, the greatly improved Google Assistant and Google Translate and fluent conversations with Siri and Alexa. Deep learning can be used to play games such as Go better than professional poker players and defeat a world champion.

But while developing a deep learning model or neural network it is sometimes very confusing and even a daunting task to choose number of hidden layers or number of nodes in hidden layers does neural network possess.

We all are familiar that neural networks take several hours or sometimes days to get trained and tuning hidden layers and its nodes, again and again, can even be exasperating and time-consuming.

By following a small set of clear rules, one can programmatically set a competent network architecture and can efficiently decide the number of hidden layers and nodes in a neural network.

Choosing Hidden Layers

1. Well if the data is linearly separable then you don't need any hidden layers at all.
2. If data is less complex and is having fewer dimensions or features then neural networks with 1 to 2 hidden layers would work.
3. If data is having large dimensions or features then to get an optimum solution, 3 to 5 hidden layers can be used.

It should be kept in mind that increasing hidden layers would also increase the complexity of the model and choosing hidden layers such as 8, 9, or in two digits may sometimes lead to overfitting.

Choosing Nodes in Hidden Layers

Once hidden layers have been decided the next task is to choose the number of nodes in each hidden layer.

1. The number of hidden neurons should be between the size of the input layer and the output layer.
2. The most appropriate number of hidden neurons is

sqrt(input layer nodes * output layer nodes)

1. The number of hidden neurons should keep on decreasing in subsequent layers to get more and more close to pattern and feature extraction and to identify the target class.

These above algorithms are only a general use case and they can be molded according to use case. Sometimes the number of nodes in hidden layers can increase also in subsequent layers and the number of hidden layers can also be more than the ideal case.

This whole depends upon the use case and problem statement that we are dealing with.

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Simple and good advice for newbies like me. Thanks a lot!

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Harpreet, Thank you very much for showing simple and effective rules for designing layers. Recently I was working on a home price estimation problem. Initially, I was so confused about choices and results. Your article fits so well with my problem. The task was relatively simple, and just 1 hidden layer was sufficient. I had 50 variables and 1 output. So I used 50 input nodes and 1 output node. As you said, I used one hidden layer with 8 nodes. (8 to 25 works similar, so 8 is fine as it will take less time and less complicated.) The combination was 50/8/1 with relu as a function. The loss function approximated within 3 epoch which is very fast. It approached near zero within 10 iterations. Usually, we expect to get these results in some 50 - 100 iterations. The final answer was very efficient. Your article rules are very simple to understand and follow. Keep it up.

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