Tecnológico de Monterrey

TC3020 Machine Learning (Gpo 2)

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Team #04

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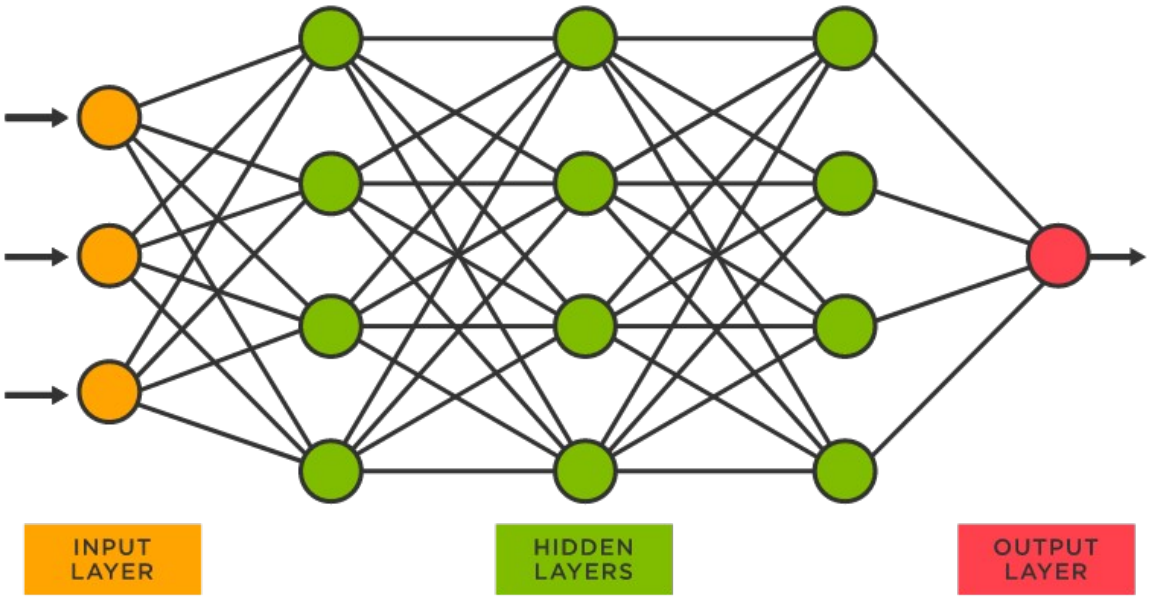
Description

Artificial Neural Networks are a series of algorithms that follow the behavior of a human brain, by recognizing patterns and relationships in data-sets. The objective of ANNs is to generate the best possible result without having the need to redesign output criteria. They consist of a node layer that contains an input layer, a different number of hidden layers, and the output layer. Each node is connected to another and has associated weight and threshold, where if the output of each node is higher than a determined threshold, the node is then activated.

An Artificial Neural Network can be visualized as:



Input Layer

The input layer is the “mouth” of the Neural Network, as it is the layer that receives the vector of values to be “digested” by the hidden layers within the ANN.

Hidden Layers

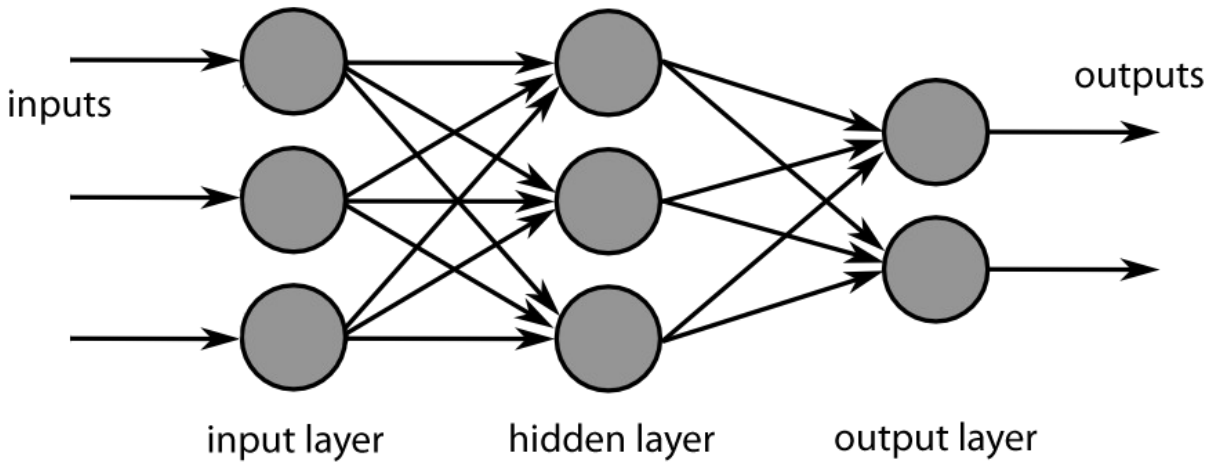
These are all the layers that do the actual learning process. These are located in-between the input & output layers of the ANN and these have the weights that allow the ANN to get better results with each epoch of the learning process.
In some particular cases this could also have data processing tools, such is the case of max-pooling or convolutional layers. Although the use of these layers change the conventional naming of the network, now called Convolutional Neural Networks (CNN).

Output Layer

This layer only job is returning the values of the processed data. It could be represented as a binary interpretation of Yes or No. It could be a probability distribution using Softmax function. It could also be a selection from different categories using techniques similar to One-hot-encoding.

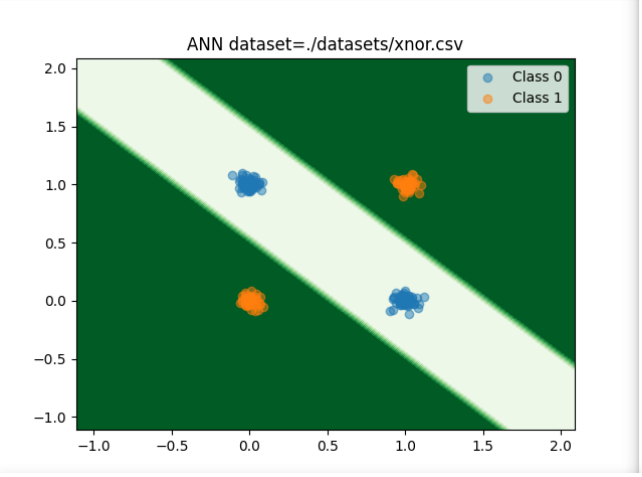
Feed-Forward

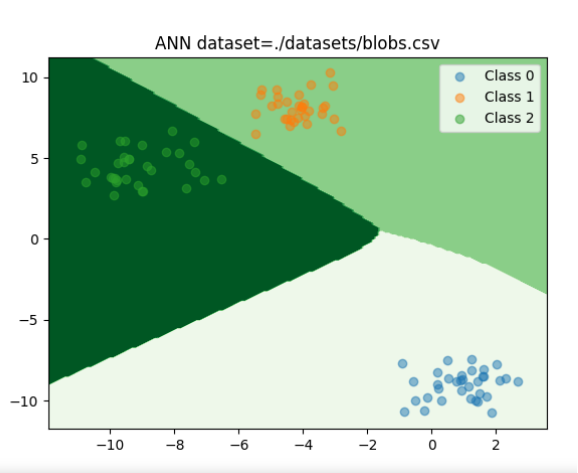
The process of training an ANN is a two fundamental steps process. The feed forward that consists of running the data through the network, sending the output of previous layer to the next using the according weights of each layer and their respective activation function.

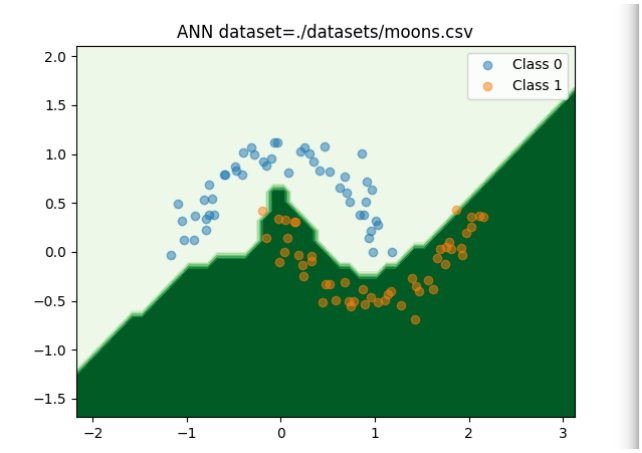


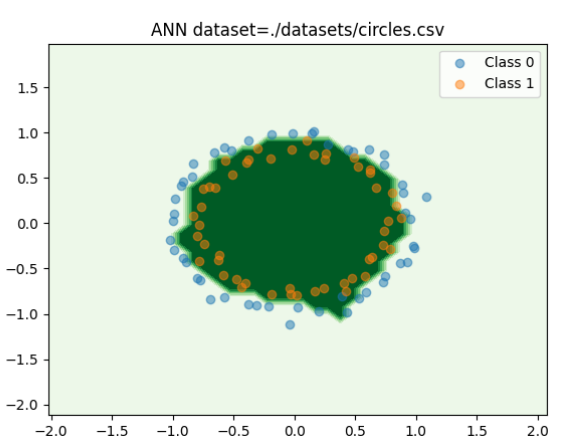
Figures

Using the code provided by the teacher in a correctly implemented feed forward algorithm and using the right architecture for the Neural Network. We get the following results.









As described in our “result.log” file:

++++++++++++++++++ XNOR DATASET ++++++++++++++++++

[[0 0]] predicted as [[0.99995456]]

[[0 1]] predicted as [[4.54803785e-05]]

[[1 0]] predicted as [[4.54803785e-05]]

[[1 1]] predicted as [[0.99995456]]

++++++++++++++++++ BLOBS DATASET ++++++++++++++++++

[[1 -9]] predicted as [[0.83300159 0.05169803 0.15890068]]

[[-4. 7.8]] predicted as [[0.06609078 0.83433916 0.12536189]]

[[-9. 4.5]] predicted as [[0.10053893 0.120974 0.78689376]]

++++++++++++++++++ MOONS DATASET ++++++++++++++++++

[[-0.5 0.5]] predicted as [[9.99988442e-01 1.27034345e-05]]

[[1. 0.5]] predicted as [[9.99993059e-01 8.19801099e-06]]

[[0 0]] predicted as [[5.77226613e-06 9.99993851e-01]]

[[1.5 -0.5]] predicted as [[6.36229133e-06 9.99993249e-01]]

+++++++++++++++++ CIRCLES DATASET +++++++++++++++++

[[-0.6 -0.85]] predicted as [[9.99996816e-01 2.99471367e-06]]

[[0.75 -0.06]] predicted as [[1.24458526e-05 9.99986260e-01]]

These results reflect the results of a previously trained Neural Network perfectly.