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CE889– Neural Network and Deep Learning

Assignment 1

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GitHub: https://github.com/krnbhtt/CE-889

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Abstract

There are Plenty of distinctive neural network architectures developed nowadays. The ANN Represents *Artificial Neural Networks*. It is simply called as Neural Network. Basically, neural network is a combined system of hardware and software which is patterned on the bases of the operation of different neurons inside of the human brain. Which is based on anatomy and functions of biological neural networks. Although, the anatomy of the ANN is affected by a circulation/movement of information. This network checks the work of the human brain. Numerous applications are there which utilize this network like Medical, self-driving car, voice or text analysis/recognition, etc. In this project, workload is classified using the dataset generated by the EEG signal which is provided by the prof. junhua Li. It is identified using a simple logistic model and a deep learning model. Let's compare and talk over the outcome of both the models.

Background:

It is tough and burdensome to understand the working and/or measuring the activity of human brain, but if we use interconnected neural network that tough task can be done easily. There are three major/fundamental types or neural network, which are Artificial Neural Network (also known as ANN), Convolution Neural Network (also known as CNN), and Recurrent Neural Network (also known as RNN). Every type of Neural Network has their own individual uses and applications. Like ANN can be used for tabular data, which contains tables / rows columns. If you are working with sequence data like time series, text data, audio data etc. then you can use RNN. If your data contains images/visual data, then you can use CNN. There are plenty of signals which are used to calculate/measure mental load such as Neurophysiological, Electrocardiogram (ECG), Electroencephalogram, Electrooculogram. Among of all these signals EEG signals are the foremost for loading the assessment.

Method:

Here I am creating function for Logistic Regression model and a Deep Learning model, with the use of different functions like Sigmoid Function, standard deviation, Gradient Dissent, Freed Forward (Forward Propagation), weight and bias updating, loss function, function for the rounding off the output.

1. I imported Matlab and Scipy libraries to load and read data.
2. Now I saperated data and model in two classes from 180 sample each, Total of 360 samples.
3. Now I imported SKLearn library so that I can test and train my splitted the data. I have slit the data 46% train and 54% test
4. Then I have traversed my data to convert rows into columns.
5. I used three functions

   Sigmoid function = $F(x) = 1 / (1 + e^{-x})$

   Sigmoid Derative = $dy/dx = f(x)' = f(x) * (1 - f(x))$

   Rectified Linear Unit (ReLU)= $\max(0,z)$
6. I have created one class which includes feed forward, backward, accuracy counter
7. For logistic model accuracy I have used above class functionalities
8. To validate accuracy I used different model KNNclassifier and deeplearning .

Result:

I compared the accuracy between these models. I got a test accuracy of 73% in the Logistic Regression computed score, 43% in showing the KNeighborsClassifier, and 49% in showing the neural structure.

Conclusion:

By running all three models, I conclude that I should try with different other models and continually updating model by adding more features to the model to gain more accuracy and less data loss.

Reflections:

I would try to continually update the model and will perform more operations to get more accuracy than I get this time with this dataset.

References:

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