Analog Circuit Sizing With RNN-LSTM Model

This Project is based on an article (https://doi.org/10.1145/3297156.3297160) which produced and compared an RNN-LSTM and a DNN model to determine an analog circuit sizing.

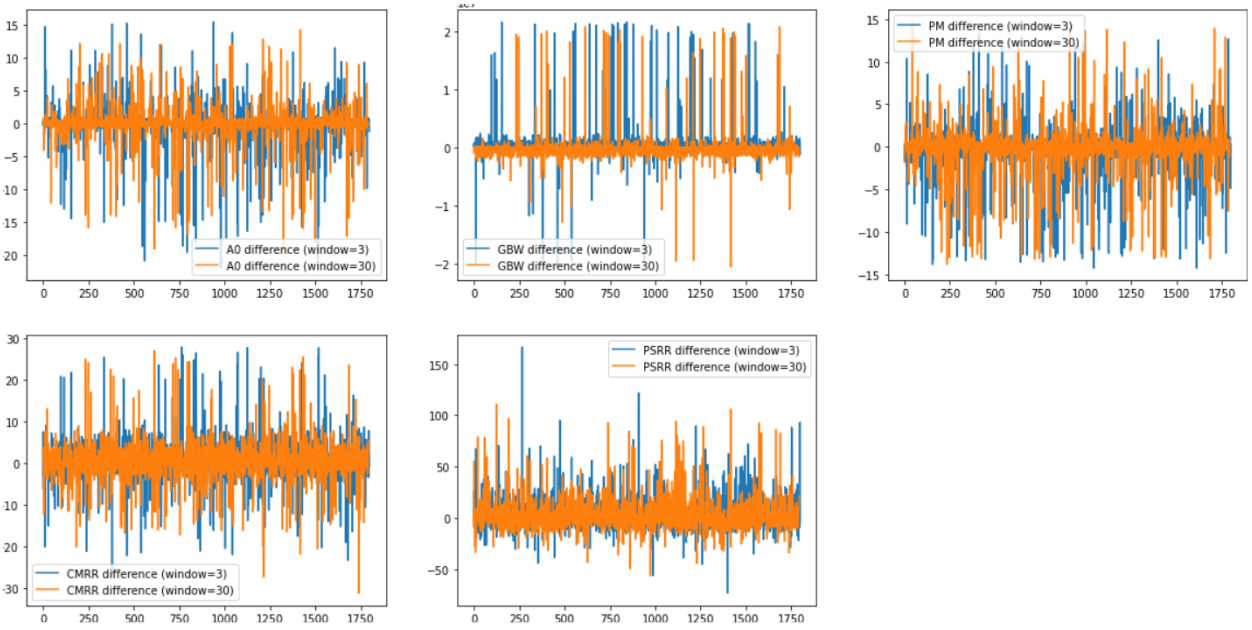
We implement the RNN-LSTM model and change some parameters and codes, due to improving performance, time consumption, and prediction of the model. Some settings which are modified, are dropout rate(because of overfitting problem), the number of units (there is no need to increase), etc.

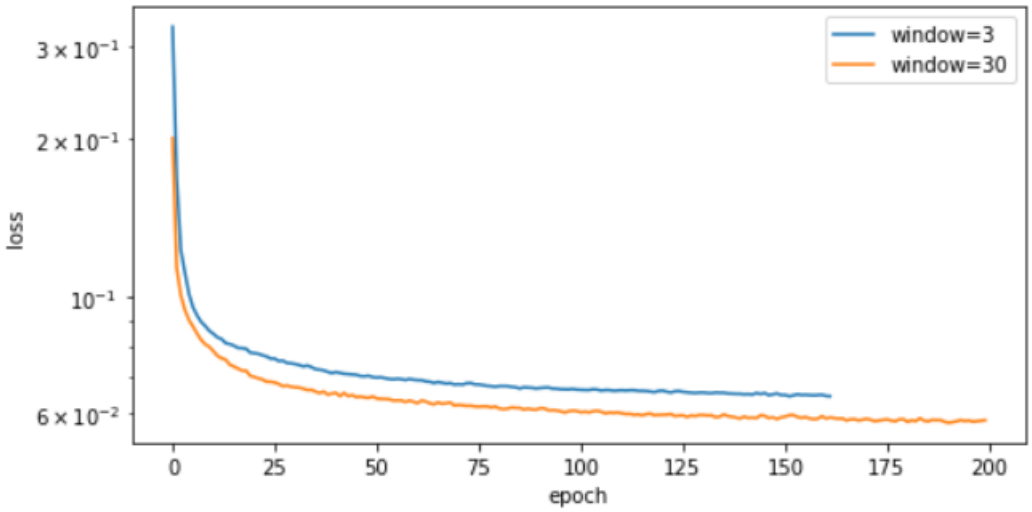
Besides, this paper was published at least three years ago and used old libraries. Owing to this reason we decided to write the code otherwise. Also, we implement seven models in five parts to compare time, accuracy, and loss with changing parameters. At last, we show these differences in some charts.

Part One: Comparison Between Window Sizes

In this part, we put two different window sizes. The first one was 3 and the second one was 30.

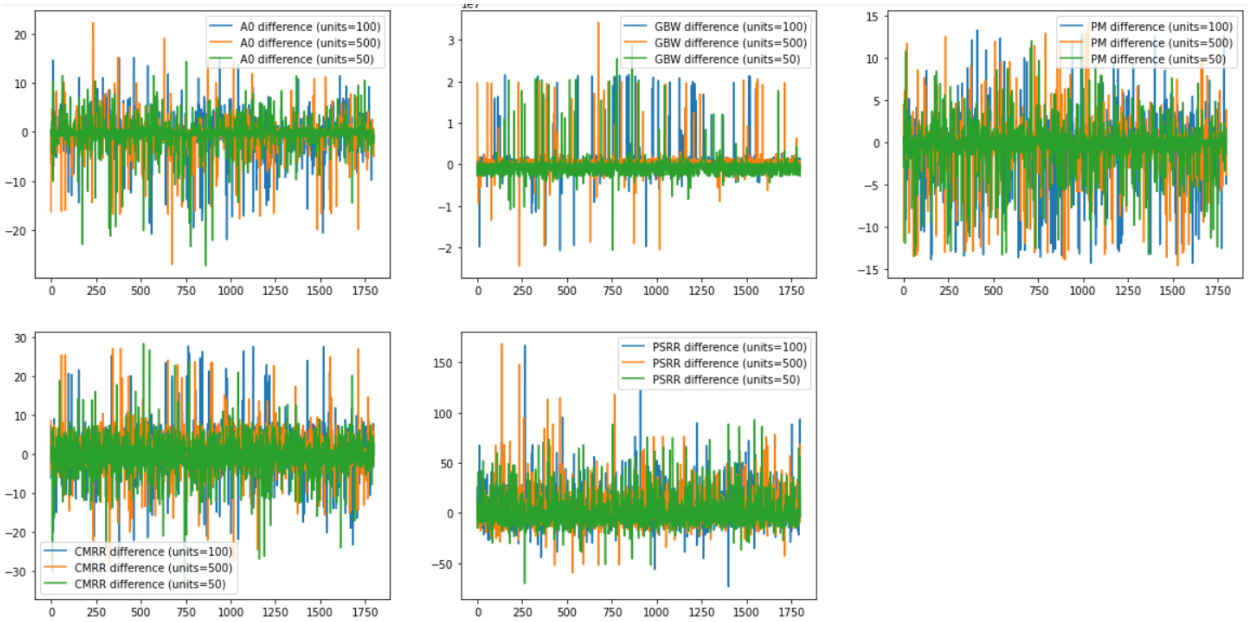
Although the model with window size 30 was a bit better in accuracy and loss, it was very time-consuming. Therefore, we choose the first model.

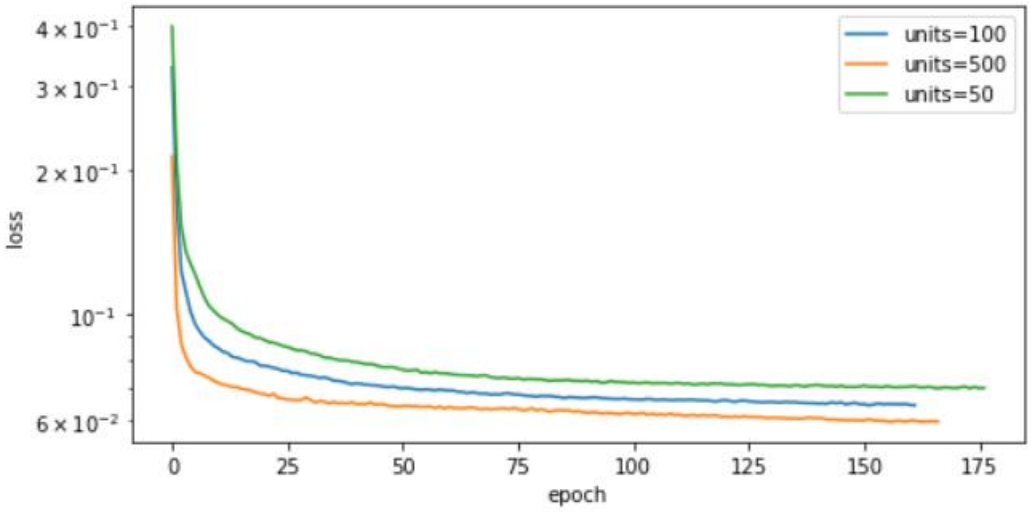




Part Two: Comparison Between numbers of units

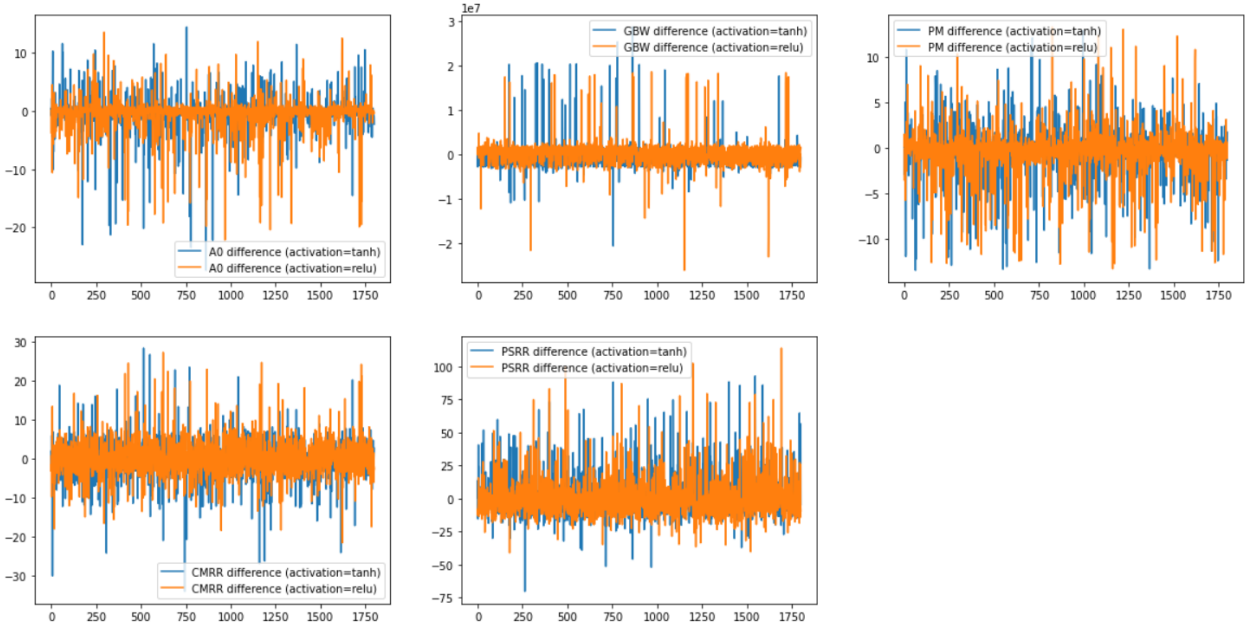
Altering numbers of units revealed to us that not only it did not have a significant impact on loss reduction and increasing accuracy but also it could grow runtime. Rising runtime became more apparent in the third model with 500 units (number of units: 50, 100, 500).

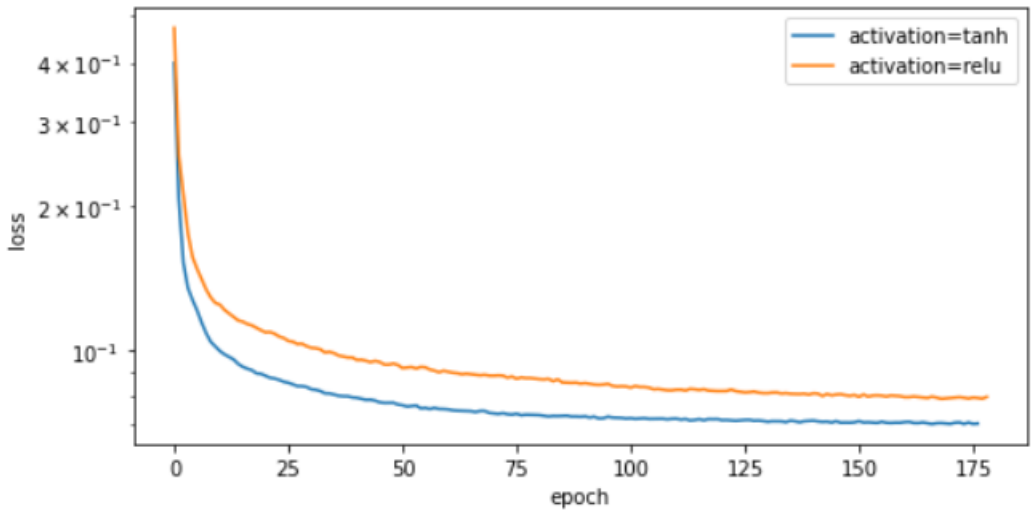




Part Three: Comparison Between Types of Activation Functions

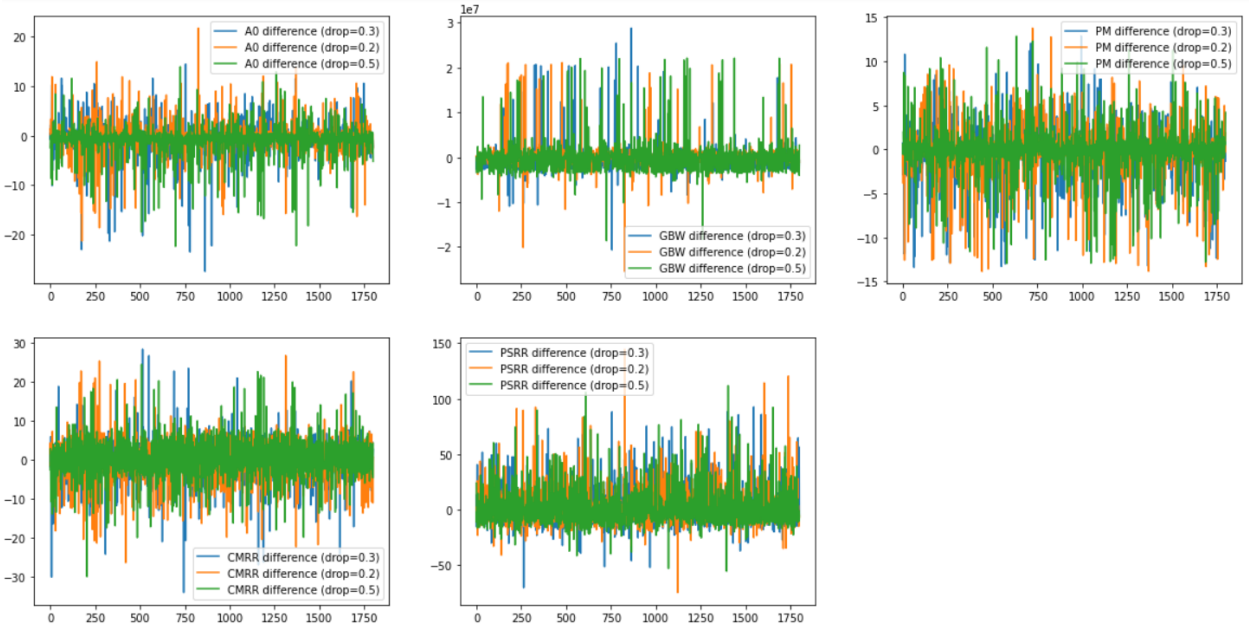
There are various activation functions and some of them are more common. Owing to this, we have chosen two of them which were “relu” and “tanh” and compared them. We realized that they do not have meaningful differences but, “relu” was better than “tanh” somehow.

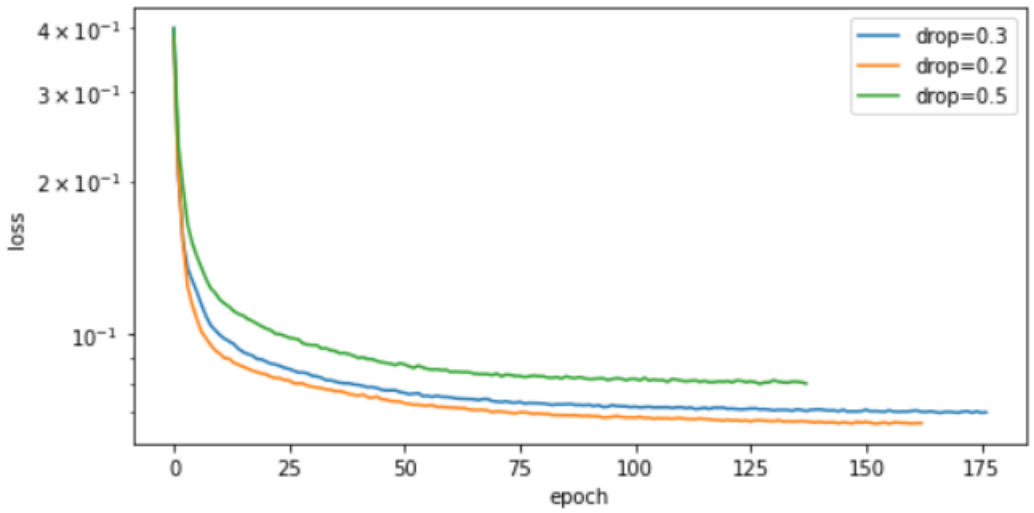




Part Four: Comparison Between Amount of Dropout

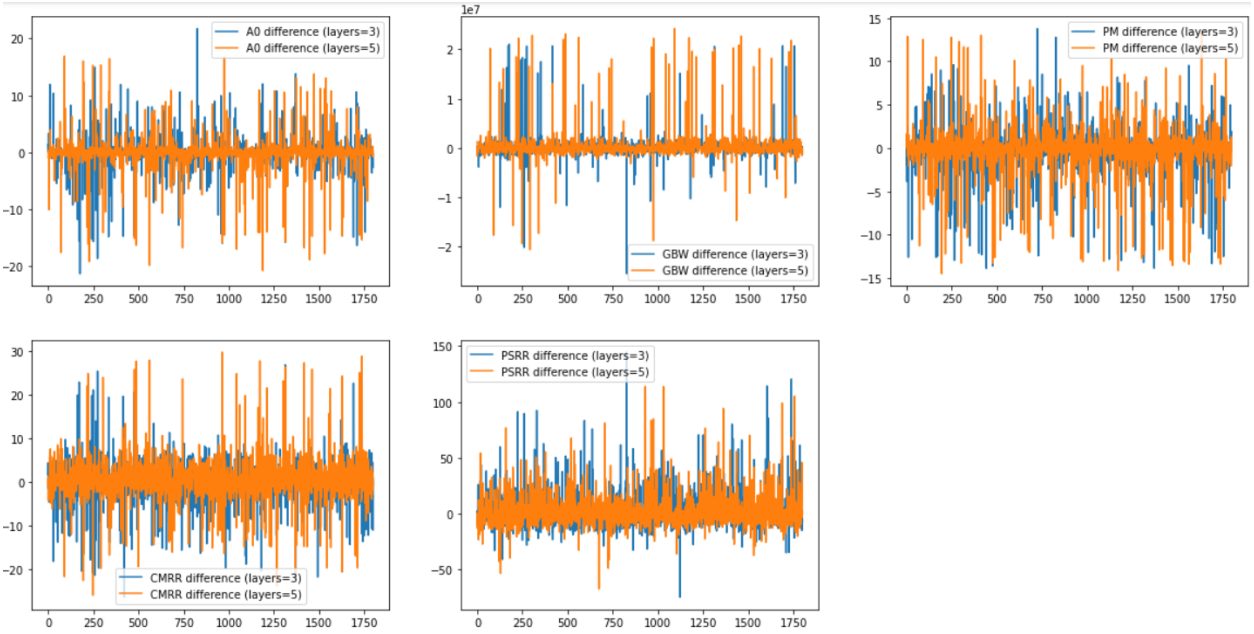
Dropout uses for reducing overfitting and improving the generalization of deep neural networks. In this case, three amounts 0.2, 0.3, and 0.5 were settled and all of them were suitable.

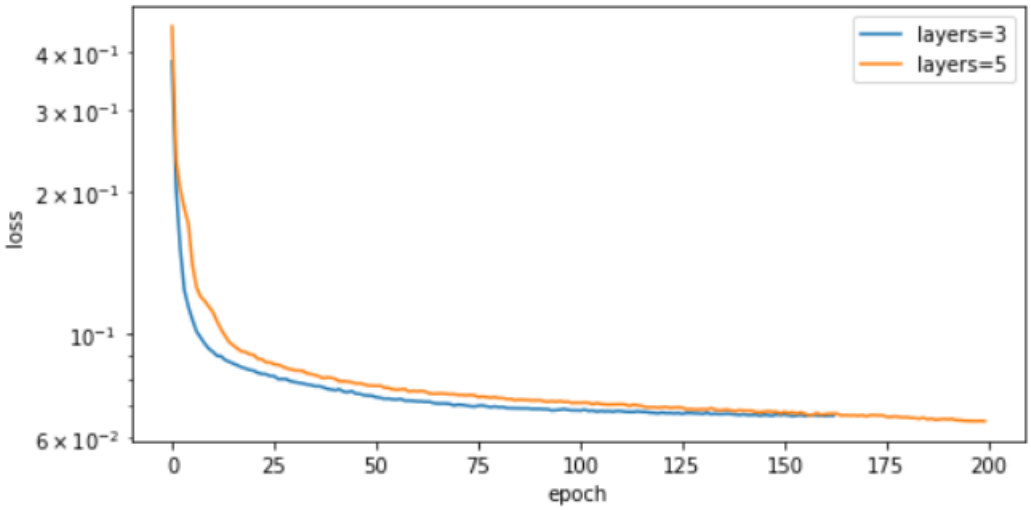




Part Five: Comparison Between Number of Layers

Two values for dense layers were selected but almost they did not have a difference in both accuracy and loss.





Result

As mentioned above, codes and libraries were written in this project differently and the results such as accuracy and loss become better than the article. Also, I should say parameters in the charts such as A0, PSRR, and ... which we attached, are used for designing Analog circuits and pave the way for designers to compute the size of elements.