**Deep Learning Challenge**

**OVERVIEW:**

Our client is a non-profit foundation, Alphabet Soup, that provides financing to ventures seeking investment. They have contracted us to create a tool to help predict applicants’ likelihood of (business) success. To this end, we are tasked with creating a binary classifier – based on our knowledge of machine learning and neural networks – that can predict applicants’ likelihood of success. This tool is to leverage historic data from >30,000 applicants.

**RESULTS:**

**Data Preprocessing**

* The column “IS\_SUCCESSFUL” is the target of this model
* The variables considered in my model were: APPLICATION\_TYPE, AFFILIATION, CLASSIFICATION, USE\_CASE, ORGANIZATION, STATUS, INCOME\_AMT, SPECIAL\_CONSIDERATIONS, ASK\_AMT, and IS\_SUCCESSFUL
* The variables “EIN” and “NAME” should be removed from the input data because they are neither targets nor features

**Compiling, Training and Evaluating the Model**

* *How many neurons, layers, and activation functions did you select for your neural network model, and why?*
  + The initial neural network contained:
    - Two hidden layers with 40 and 20 neurons each
    - The hidden layers used the “relu” activation function and the output layer used the “sigmoid” activation function
    - The number of epochs was 100
* *Were you able to achieve the target model performance?*
  + I was not able to achieve target performance. Accuracy during each optimization varied between 73 and 74%.
* *What steps did you take in your attempts to increase model performance?*
  + During the optimizations I varied several model parameters between optimization attempts:
    - The number of hidden layers varied between 3 and 4
    - The number of neurons varied from 3 to >80
    - The hidden layers used the “relu”, “sigmoid”, “linear”, and/or “tanh” activation functions
    - The number of epochs varied between 30 and 200

**Summary**

None of the optimization attempts achieved an improvement in accuracy sufficient enough to meet the 75% accuracy target. Improved accuracy could have been achieved by removing variables from the model that were / are less associated with “success”. In addition, because much of this data was categorical, it might make sense to try a decision tree or a random forest model.