Deep Learning Challenge Report

1. **Overview** of the analysis: Explain the purpose of this analysis.

The purpose of this analysis is to create a tool that can help the nonprofit organization, Alphabet Soup, select applicants with the highest chance of success and receive funding for their projects. By using machine learning and neural network background knowledge, we are able to create a binary classifier to determine whether applicants will be successful if funded by Alphabet Soup.

1. **Results**: Using bulleted lists and images to support your answers, address the following questions:

* Data Preprocessing
  + What variable(s) are the target(s) for your model?
    - The target variable that was evaluated was [‘IS\_SUCCESSFUL] which represented the binary classifier values 0 and 1 were considered where 0 was ‘no’ and 1 was ‘yes’.
  + What variable(s) are the features for your model?
    - All the columns were features for the model especially ‘APPLICATION’ and ‘CLASSIFICATION’ which were used for binning and had certain cut offs in the preprocessing and optimization files.
    - The categories were checked for success after the preprocessing and optimization.
  + What variable(s) should be removed from the input data because they are neither targets nor features?
    - For preprocessing, variables such as ‘EIN’ and ‘NAME’ were dropped to remove identification of applicants.

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* Compiling, Training, and Evaluating the Model
  + How many neurons, layers, and activation functions did you select for your neural network model, and why?
    - For both the preprocessing and optimization of the Alphabet Soup analysis, three layers were selected and the hidden nodes were dictated based on the number of features.

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* + Were you able to achieve the target model performance?
    - In the first attempt through preprocessing, there were 6221 total parameters which resulted in a 72.70% accuracy which was under the recommended 75%.

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* + What steps did you take in your attempts to increase model performance?
    - To optimize the data, only the ‘EIN’ category was dropped and the ‘NAME’ category was added back in and the cutoff value was narrowed to <25 which helped narrow the analysis. The resulting parameters were then 1331 and the accuracy became 76.51% which is above the required 75% threshold.

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1. **Summary**: Summarize the overall results of the deep learning model. Include a recommendation for how a different model could solve this classification problem, and then explain your recommendation.

* To summarize, adding multiple layers to a deep learning model help optimize the data and allows the model to filter and predict the data better. This was proven by the optimization of the layers that were added after the preprocessing as well as the narrowing of the filter to less than 25 names. The deep learning, machine learning model is a good model to use for classification and prediction of various datasets.
* If one were to look for other methods of solving this problem, other alternatives could be to use simulation modeling to mimic the behavior of the desired system over time or rule-based systems as there are specific rules and logic to follow which would result in defined patterns.