**Report on Performance of Deep Learning Model for Alphabet Soup**

**Overview of the Analysis:**

The main purpose of the analysis is to develop a deep learning model that can predict whether applicants who received funding from Alphabet Soup, which is a venture capital firm, will be a success. This model aims to assist Alphabet Soup as the funding firm to determine the organizations worth their funding to optimize their investments decision and maximize their impact level.

**Results:**

**Data Preprocessing:**

**Target Variable(s):**

The target variable for this model is the “IS\_SUCCESSFUL” column. It indicates as to whether the organization receiving funding from Alphabet Soup was successful (1) or not successful (0).

**Feature Variable(s):**

The feature variables chosen for this model include but are not limited to the following characteristics of the organizations, that is, ”APPLICATION\_TYPE”, “CLASSIFICATION”, “AFFILIATION”, “SPECIAL\_CONSIDERATION”, “ORGANIZATION”, etc.

**Variables to Remove:**

Variables such as “EIN” and “NAME” were removed from the input data since they were neither a target nor a feature.

**Compiling, Training, and Evaluating the Model:**

**Neurons, Layers, and Activation Functions:**

The neural network model consists of two hidden layers and one output layer.

Seven (7) neurons were chosen for the first hidden layer, with fourteen (14) for the second hidden layer and the output layer was given one (1).

The “Relu” activation function was used for the hidden layers and the sigmoid activation function for the output layer.

The reason for selecting this architecture was to introduce non-linearity and also to capture complex patterns in the dataset.

**Target Model Performance:**

The final model achieved an accuracy of 72.85% on the test data approximately, which was below the set target of 75%. This therefore does not match the model’s performance by a slight difference of 2.15%.

**Steps to Increase Model Performance:**

The model performance could be optimized by experimenting with different activation functions, adjusting the number of neurons and layers, as well as fine-tuning the hyperparameters (batch size and number of epochs) during training.

Also, regularization methods such as dropout layers could be used to prevent overfitting and to improve generalized performance.

**Summary:**

The deep learning model developed for this organization, Alphabet Soup, achieved a target performance of 72.85% accuracy. The model predicts whether the organization will be successful or not based on various features. While the exact target performance achieved and accuracy of 72.85% it is still recommended, having demonstrated the effectiveness of making accurate predictions. This can still be beneficial to decision making.

One may therefore consider further optimizing this model by way of experimenting with different architectures, exploring additional feature engineering techniques, or fine-tuning hyperparameters of the model to reach the targeted performance of 75%.

Finally, to provide robust predictions, classification problems and potential interpretability for stakeholders in this industry, ensemble techniques such as gradient boosting or random forests might be relevant areas to explore as alternative models.