

Report on the Deep Learning Model for Alphabet Soup

Overview of the Analysis

The purpose of this analysis is to develop and optimize a deep learning model to predict the likelihood of success for applicants to Alphabet Soup, a non-profit organization. The goal is to use historical data to predict whether applicants will be funded, thereby assisting Alphabet Soup in making informed decisions about future applicants.

Results

Data Preprocessing

- **Target Variable:**
 - The target variable for this model is the **"IS_SUCCESSFUL"** column, which indicates whether the applicant received funding (1) or not (0).
- **Feature Variables:**
 - The feature variables include various applicant details such as **"Application Type"**, **"Affiliation"**, **"Class"**, **"Income Amount"**, and others that provide information about the applicant.
- **Removed Variables:**
 - Variables such as **"EIN"** and **"NAME"**, also tried with **"SPECIAL_CONSIDERATIONS"**, **"ORGANIZATION"** were removed from the input data as they are identifiers and do not contribute to predicting the outcome. They are neither target variables nor features.

Compiling, Training, and Evaluating the Model

- **Model Architecture:**
 - **First Attempt:**
 - Layers: 2 hidden layers
 - Neurons: 8 neurons in the first layer, 5 neurons in the second layer
 - Activation Functions: ReLU for the hidden layers, Sigmoid for the output layer
 - Performance: Accuracy of 72.40%, loss of 0.5508
 - **First Optimization:**
 - Layers: 2 hidden layers
 - Neurons: 5 neurons in the first layer, 7 neurons in the second layer
 - Activation Functions: ReLU in the first layer, Tanh in the second layer
 - Performance: Accuracy of 72.62%, loss of 0.5513
 - **Second Optimization:**

- Layers: 4 hidden layers
 - Neurons: 5, 7, 8, and 5 neurons in respective layers
 - Activation Functions: Tanh, ReLU, Tanh, ReLU
 - Performance: Accuracy of 72.52%, loss of 0.5529
 - **Third Optimization:**
 - Layers: 3 hidden layer
 - Neurons: 32,16,8 neurons
 - Activation Functions: tanh,tanh, ReLU,sigmoid
 - Performance: Accuracy of 72.49%, loss of 0.5525
 - **Model Performance:**
 - The highest accuracy achieved was **72.62%**, which did not meet the desired 75% threshold.
 - **Steps Taken to Improve Performance:**
 - I experimented with varying the number of neurons, adding and removing layers, and using different activation functions (ReLU, Tanh). I tried multiple optimizations but saw minimal improvements. The changes improved the structure and the handling of non-linear patterns but were not sufficient to achieve the target accuracy of 75%.
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Summary

The deep learning model successfully identified patterns in the data with an accuracy of **72.62%** but did not meet the target performance of 75%. Despite attempts to optimize the model with various configurations of layers and activation functions, the performance plateaued.