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Step 4: Write a Report on the Neural Network Model

For this part of the assignment, you'll write a report on the performance of the deep learning model you created for Alphabet Soup.

The report should contain the following:

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

   a. Using machine learning, this analysis develops a binary classification model to predict whether an applicant will be successful if funded. By analyzing metadata from past applicants, we aim to provide a predictive framework to guide funding decisions effectively.

2. **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 IS_SUCCESSFUL column is my target variable using a binary indicator for success and failure
  - What variable(s) are the features for your model?
    - The remaining columns, excluding the EIN and NAME columns are my features for the model.
  - What variable(s) should be removed from the input data because they are neither targets nor features?

- The variables removed are the EIN and NAME variables. After using the get_dummies function to encode categorical variables, I removed the SPECIAL_CONSIDERATIONS_N column due to its collinear relationship to SPECIAL_CONSIDERATIONS_Y column.
- Compiling, Training, and Evaluating the Model
    - How many neurons, layers, and activation functions did you select for your neural network model, and why?
        - I added 2 more hidden layers to the neural model, reconfigured the amount of neurons in each layer, and kept the same activation function, RELU, for the new model. I went with these choices due to me finding a model that had the highest accuracy levels at the time which was 74% and I want to focus on optimizing the model with those restrictions in mind.
    - Were you able to achieve the target model performance?
        - Unfortunately no. After tweaking the the tuner.search function and the create_model function to restrict the
    - What steps did you take in your attempts to increase model performance?
        - Adding Hidden Layers, increasing Nodes used, using the keras tuner to search for a better model, deleting columns that had collinear relationships.

3. **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.

    a. The overall performance of the model did not reach its target goal of 75% or more in accuracy. Even after adding more hidden layers and nodes, it still was not enough. The next step was to have keras-tuner find a model. Which did show better results but it did not break the desired threshold. I could not keep the tuner.search function running for 40 minutes or longer due to the disconnection that would occur in Google Colab. I decided to constrain the create_model function to only use RELU and constrain the hidden layers and nodes to values that closely resembled the model that reached 74% accuracy. Regardless of all this, the tuner.search runtime timed out eventually.

    b. My recommendation would be to allow the create_model function to loosen the constraints and use other activation functions and give it more time to find a better model.