Overview

This assignment will help you familiarize yourself with the Virtual Lab (Apporto) environment and Jupyter Notebook. You will also gain some hands-on experience using the Keras library. Additionally, you will learn how to modify neural network parameters in Keras and how to understand the results.

Prompt

Access the Virtual Lab (Apporto) by using the link in the **Virtual Lab Access** module. We recommend that you use the Chrome browser to access the Virtual Lab. If prompted to allow the Virtual Lab access to your clipboard, click "Yes", as this will allow you to copy text from your desktop into applications in the Virtual Lab environment.

1. Once in the Apporto environment, create a new Jupyter Notebook and **configure it using the following naming convention:**

   <YourLastName>_<YourFirstName>_Assignment1.ipynb

   Thus, if your name is Jane Doe, please name the submission file "Doe_Jane_Assignment1.ipynb".

   For information on how to navigate the Jupyter environment, review the Jupyter Notebook in Apporto (Virtual Lab) Tutorial.
2. Read through the MNIST handwritten digits example on pages 16-24 of *Deep Learning with Keras*. Copy the code from pages 22-23 into your Jupyter Notebook.

   Note: More information about the training and test data sets can be found in The MNIST Database of Handwritten Digits.
3. Run the code in your Jupyter Notebook. Follow the examples in the book to **establish an accuracy rate for the training, validation, and test data sets with two hidden layers.**
4. The remainder of the chapter provides examples of how to modify different parameters within the code (number of hidden layers, hidden neurons, BATCH_SIZE, number of epochs, and so on). Pick one parameter and run two or three different experiments, modifying the parameter values to **establish accuracy scores with different parameter values**. Make sure that the experiments result in significant changes in accuracy rates. Be sure to place each experiment in a different code block so that your instructor can view all of your changes.

   Note: You may have to do some research beyond the information provided in the book to implement these changes.
5. Create a Markdown cell in your Jupyter Notebook after your code and its outputs. In this cell, **explain the changes in accuracy rates** by comparing and contrasting your results from Steps 3 and 4. What happens to the accuracy rates for the training, validation, and test data sets as you change the parameters? Why?

Specifically, you must address the following rubric criteria:

- Configure the notebook correctly and use the proper naming convention.
- Establish an accuracy rate for the training, validation, and test data sets with two hidden layers with the code working correctly.
- Establish accuracy scores with different parameter values with the code working correctly.
- Explain the changes in accuracy rates when the parameters are modified.

Guidelines for Submission

Please submit your completed IPYNB file. Make sure that your file is named as specified above, and that you have addressed all of the rubric criteria in your response.

Module Two Assignment Rubric

Criteria	Exemplary (100%)	Proficient (85%)	Needs Improvement (55%)	Not Evident (0%)	Value

Notebook Configuration and Naming Convention	Exceeds proficiency in an exceptionally clear, insightful, sophisticated, or creative manner	Configures the notebook correctly and uses the proper naming convention	Shows progress toward proficiency, but with errors or omissions	Does not attempt criterion	10
Establishes Accuracy Scores with Two Hidden Layers	Exceeds proficiency in an exceptionally clear, insightful, sophisticated, or creative manner	Establishes accuracy rates for the training, validation, and test data sets with hidden layers with the code working correctly	Shows progress toward proficiency, but with errors or omissions	Does not attempt criterion	20
Establishes Accuracy Scores by Varying Parameters	Exceeds proficiency in an exceptionally clear, insightful, sophisticated, or creative manner	Establishes accuracy scores with different parameter values with the code working correctly	Shows progress toward proficiency, but with errors or omissions	Does not attempt criterion	20
Explains Changes in Accuracy Rates	Exceeds proficiency in an exceptionally clear, insightful, sophisticated, or creative manner	Explains the changes in accuracy rates when the parameters are modified	Shows progress toward proficiency, but with errors or omissions	Does not attempt criterion	40
Articulation of Response	Exceeds proficiency in an exceptionally clear, insightful, sophisticated, or creative manner	Clearly conveys meaning with correct grammar, sentence structure, and spelling, demonstrating an understanding of audience and purpose	Shows progress toward proficiency, but with errors in grammar, sentence structure, and spelling, negatively impacting readability	Submission has critical errors in grammar, sentence structure, and spelling, preventing understanding of ideas	10
				Total:	100%