ECE 492: Artificial Intelligence Methods ----- Summer 2023

Project 1: Applying single Neuron Perceptron in image classification

Project Description:
In this project, you need to complete the following tasks:

1.) First, generating the double half-moon pattern following the example code shown during the computer experiment video. The radius of the moon is 10, width is 6, and distance between two half-moon is 0.5. Total sample number is 2500.
2.) Constructing your neural network: 2 inputs (coordinates), 1 extra input (bias), 1 neuron, 1 activation function, and 1 output (-1 or 1).
3.) Initializing weights vector using random number generator.
4.) Choosing training data (500) and testing data (2000).
5.) Training your neural network with **Gauss-Newton** method. Details could be found from slides P30 ~ P31.
6.) Comparing your results with **training** data use the *initial* weight vector and the *well-trained* weight vector.
7.) Comparing your results with **testing** data use the *initial* weight vector and the *well-trained* weight vector.
8.) Plotting the MSE respect to training iterations.

Source code:
You are welcome to use any software/language your preferred. However, no libs, toolboxs, functions related to machine learning are allowed to finish this project. Other mathmatic operation tools, such as matrix multiplication, matrix inverse, and etc. are welcome to use.

Delivery:
A report is needed for project I including: source code, plots, and simple discussion. Please put all these contents into a pdf file, and name your file as: LastName_FirstName.pdf.

Report Due: 05/26
Presentation: 05/24 ~ 05/25
Schedule: I will send a spreadsheet of the presentation schedule latter this week. Please check your time spot carefully and let me know if you have hard time to present on your time spot. I will find another time spot for you.

Format: I will send out a zoom before the presentation.
PPT: please prepare PowerPoint slides for your presentation, you need to share your screen during your presentation.

Basic requirements for this project:
1.) **Work independently.**
2.) **HAVE FUN!!**