JOHNS HOPKINS
CAREY BUSINESS SCHOOL

Data Science: Artificial Intelligence (BU.920.624)

Group Assignment #1

Due on November 6th via Canvas

Group Members: _____

1. **AI Model Development Using No-Code Tools for Image Classification**

In this exercise, you will develop an AI model for image classification using a no-code AI development tool such as Google Teachable Machine, Roboflow, or a Generative AI tool. The purpose of this task is to give you hands-on experience with AI tools and to demonstrate how AI can be leveraged for practical business applications:

- **Step 1:** Choose a problem that can be solved through image classification. For example, you could classify objects (fruits, office supplies, etc.) or detect facial expressions (happy, sad, neutral). Briefly explain the problem you selected and why it's relevant in a business context.

- **Step 2:** Collect or download a small image dataset to train your AI model. You can gather images manually via image search or by taking photos with your phone, or use a publicly available dataset from platforms like Roboflow, Kaggle, or Github. Briefly describe your dataset, specifying the classes (labels) and the number of images per class.

- **Step 3:** Train the model using your chosen tool and provide a screenshot of the model and the training process. Report on the model's prediction accuracy and how it performed on the test data.

- **Step 4:** Reflect on the results. How well did the model perform? Were there any challenges in training or obtaining accurate predictions? How could this model be applied in a real-world business scenario?

2. **Understanding Linearly Classifiable vs. Non-Linearly Classifiable Datasets.**

What is a linearly classifiable dataset? What is a non-linearly-classifiable dataset? Provide an example dataset that is not linearly classifiable. You may plot your dataset without listing each data point.

3. **Building and Describing a Neural Network for Non-Linear Classification.**

   Consider the following training dataset from TensorFlow Playground (https://bit.ly/annga1):
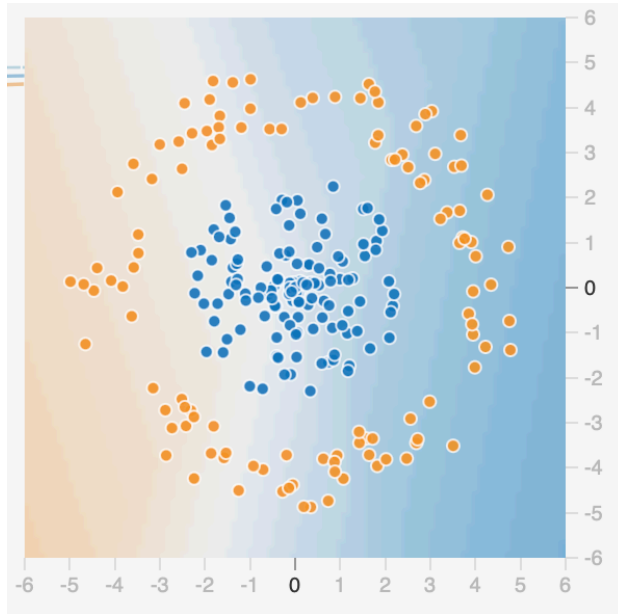
   The orange points are labeled with class label 0, and the blue points are labeled with class label 1. Using the TensorFlow Playground tool (see the link above), train a feedforward neuron network model. Write a mathematical expression using linear layers and ReLU activations that represents the structure of your model.

4. **Convolutional Filter Application.**

A two-dimensional, 3×3 convolutional filter, that is,

1	0	1
0	1	0
0	0	1

is applied to the following two-dimensional 5×5 input feature map

0	1	1	1	0
0	1	0	0.5	1
0	0	1	0	1
0	0	0.5	1	1
0	0	0	0	0

What is the shape of the output feature map? Represent the output feature map.