EE 634/734 Intro to Neural Networks
Assignment #2: TensorFlow

Due Date: Wednesday, October 4, 2023

Objectives:

1. Preprocess and explore the UCI Glass Identification dataset.
2. Implement a Sequential model using TensorFlow's Keras API.
3. Train and evaluate a model with multiple dense layers for multi-class classification.

Steps:

1. Preprocess and explore the Dataset

   a) Load the dataset into a NumPy array.
   b) Define your X (features) and y (labels) matrices and show their dimensionality.
   c) Show the first 5 rows of X.
   d) Find the number of unique values in y.
   e) Calculate summary statistics: the mean, standard deviation, minimum, and maximum values for each feature.
   f) Plot a histogram for each of the features.
   g) Perform normalization/standardization.
   h) Calculate the correlation matrix between all the features
   i) If appropriate, use the One-Hot encoder.
   j) Perform train/test split.

2. Create the Neural Network Model

   a) Create a Sequential model with several dense layers. Use appropriate activation functions and initialization methods.
   b) Compile the Model: Choose an appropriate optimizer, loss function, and metrics.
   c) Print a summary of the model

3. Train and evaluate the Model

   a) Train the model using the training data. Choose appropriate values for the batch size and validation split.
   b) Evaluate the model's performance on the test data.
   c) Plot confusion matrix and the classification report.
   d) Visualize the model training history for the accuracy and loss metrics.
   e) Comment on whether the model is overfitting and why.
   f) Try a different architecture and compare results.