

## ASSIGNMENT -3

### Individual Assignment (100 points)

#### Instructions:

- Submit the paper review as a word or pdf file.
  - Submit code as a Python notebook (.ipynb) file along with the HTML version.
  - Write elegant code with substantial comments. If you have reused code from a website add the links as reference.
1. Article Review – Summarize the article on [bias in computer vision](#). Research other sources and provide two examples of the bias problem in computer vision and solutions being proposed (300-500 words). (20)
  2. Build a CNN model using Keras to classify the [IP 102 dataset](#) for an 80/20 train-test split (40).
    - a) Data Preprocessing (10)
      - Sub sample the dataset with enough representation from each class to suit your compute capacity.
      - Plot the class distribution.
      - Apply various image augmentation settings (e.g. flips, zoom, shear, and other effects)
    - b) Custom Model (20)
      - Summarize the model architecture.
      - Explain the hyperparameters used and the reason why they were used.
      - Provide an explanation (calculation) of the number of parameters in each layer.
      - Apply BatchNormalization and Dropouts as needed.
      - Apply kernel regularization L1 and L2 (kernel\_regularizer)
      - Plot the drop-in test loss and training loss over epochs
    - c) Transfer Learning (10)
      - Transfer learn from any three of the models (ResNet, DenseNet, EfficientNet, etc.)
      - Freeze most of the layers and train the last few layers on the dataset.
      - Compare transfer learning to your best custom model (above) in their accuracy and other metrics.
  3. Build two RNNs (an LSTM and GRU) models that can learn the Sine wave from assignment 2 (20)
    - Summarize the model architecture.
    - Explain the hyperparameters used and the reason why they were used.
    - Provide an explanation (calculation) of the number of parameters in each layer.
    - Compare your RNN model with the MLP used earlier.

#### 4. Identify and analyze bias and fairness in deep learning models (20)

- Download and prepare any one of the following datasets, or one of your choices. Provide a summary of what you would like to analyze.
  - [FairFace](#)
  - [UTKFace](#)
- Train a deep learning model to perform specific attribute classification. For example, such attributes can be race, gender or age for facial dataset. The model can be any architecture, but you must justify your choice of architecture and explain why it is suitable for this class.
- Evaluate the model's performance on the validation set using at least two metrics such as accuracy, F1 score, confusion matrix etc.
- Analyze the model's fairness and bias by analyzing its performance on the testing set. You can use one of the following metrics, or one of your choices.
  - Equal opportunity
  - Disparate impact