IE643: Deep Learning : Theory and Practice **Jul-Nov 2019**

Assignment 4: Due On 8^{th} November 2019 (11:55 PM IST)

1 Instructions

Answer all questions. Write your answers clearly. Please make sure that all your answers are present in a single pdf document. Upload on moodle, the python code, plots, images and pdf document as a single zip file named as `IE643_YOURROLLNO_assignment4.zip`. All your files within the zip file should follow similar naming convention. There will be no extensions to the submission deadline.

You can score a maximum of 20 marks in this assignment.

2 Question

1. **[Use only Python]** Download the data set from the following link `https://drive.google.com/open?id=1YkKo5oI5M3DGctGcBG9YpK47p-zofzl9`. The data set contains images containing different objects belonging to 8 different categories (*e.g.* airplane, car, person, cat, etc.) Note that there are approximately 800 to 1000 images in each category. Choose a category C of your choice and construct a data set D containing 80% images from the category C of the data. Construct a validation set V using the remaining 20% images.

   (a) Use the attached GAN code and CNN code to construct a CNN-GAN.

   (b) Train the CNN-GAN on the data D.

   (c) Choose the best parameters for CNN-GAN (e.g. number of training iterations, learning rate, number of samples to train the discriminator and generator, etc.) using the validation set V.

   (d) If needed, use heuristics from the attached paper [1] to improve training.

   (e) Prepare a plot of the training objective value against the iterations.

   (f) Prepare a plot to depict the discriminator objective and the generator objective and check if they converge.

   (g) After training, display 50 images (in a 10×5 grid) generated using the generator of CNN-GAN. Display 50 original images from the training data D in a 10×5 grid. Comment on the quality of the generated images.

[1] `https://arxiv.org/pdf/1511.06434.pdf`