

CIVE 7397 – Fall 2020 Assignment 4 - Part 1

Due date: 11/18/2020 (23:59:59 PM)

Number of points: 16

This assignment has two parts. In the first part, you will use a generative adversarial network to train on the [CelebA Dataset](#) and learn to generate face images. This part is inspired by material from the [Stanford CS231n](#). The second part will be released soon in the coming week on the physics-informed neural network. Please manage your time wisely; the due date and points above are set for both parts.

1. Part one: face generation with a GAN

Download the starting package Startpkg_A4_P1 from blackboard. Download the CelebA_Dataset from [this link](#). Make a data folder with the name `celeba_data`, and put the unzipped `celeba_train_128res` folder under this data folder. You may also use the `download_celeba.sh` code to set this up. The CelebA_data provided to you is a preprocessed version which has been filtered using a simple face detector to obtain good images for generation. The images are also all cropped and resized to the same width and height.

Upload the entire package to google drive if using Colab. Give the CelebA_Dataset is very large, you might experience very slow uploading. The solution is to upload the zipped CelebA_Dataset folder and unzip within google drive via Colab. Refer to the notebook MP4_P1.ipynb for details on how to do this. If using uHPC or your own GPU, please skip these instructions in the notebook.

We provide a notebook `*/Startpkg_A4_P1/GAN_debugging.ipynb` to help you debug. This notebook provides a small network you can use to train on MNIST. The small network trains very quickly so you can use it to verify that your loss functions and training code are correct. Check your generated fake MNIST images to make sure your loss functions and training code work. You will train two different models, the original GAN and LSGAN, which have different loss functions.

The notebook `*/Startpkg_A4_P1/MP4_P1.ipynb` will guide you through the steps you need to train a GAN on the CelebA_Dataset. You will use the loss functions and train code you just debugged. The generator and discriminator network architectures you will implement are roughly based on [DCGAN](#).

Some references for GAN:

- Lectures on 10/06 and 10/08
- A nice [blog post series](#) including introductory posts along with posts on DCGAN and LSGAN
- [Generative Adversarial Nets paper](#)
- [LSGAN paper](#)
- [DCGAN paper](#)

Task: Training a GAN on the CelebA_Dataset, and report your results using the given template.

Some hints for training a GAN on the CelebA_Dataset:

- Starting with the notebook GAN_debugging.ipyn. As it's a light network trained on MNIST, Colab is the perfect platform to explore the setup.
- When you work on MP4_P1.ipynb using Colab, you might encounter runtime error because CelebA_dataset is too large to (1) be uploaded to Google Drive, and (2) too large to be loaded in Colab. The solution for (1) is to unzip the datafile directly on Google drive (instructions provided in the notebook). There is not an effective solution for (2) as it's limited by Colab service. For debug proposes, you can try only load part of the dataset for it to run on Colab; then run full scale on uHPC. Or you can work directly work on uHPC for MP4_P1.ipynb.
- The original GAN and LSGAN each take about 28 hours running on uHPC (50 epochs). We suggest you to train them separately and reserve 30 hours for each job.
- You can also train your GAN on AWS console, but we will not provide further instructions on it. You may find [instructions provided by AWS](#) useful.

2. Part two:

Coming soon...

3. Submission instructions

For part one, submit files to blackboard including:

- All of your code (python files and ipynb file) in a single ZIP file.
File name as Assignment4_P1_code_CougarNetID.zip
- Results of notebooks GAN_debugging.ipynb and MP4_P1.ipynb converted to PDF format. You may take a screenshot of result cells then convert to a PDF, or you may print your notebook with results as a PDF.
File name as Assignment4_P1_output_CougarNetID.pdf
- Report using Assignment4_P1_report_template.docx from blackboard. Convert and submit your report as a single PDF.
File name as Assignment4_P1_report_CougarNetID.pdf.

Please be aware that this assignment is set to allow **only one submission on blackboard**. However, you can always save your assignment as a draft without submitting and continue working on it later. Save as draft stores comments and the files on the page, but does not submit them. You may return later to modify or finish the assignment. Submit must be selected to send your final results.