

CS 542 Class Challenge: Image Classification of COVID-19 X-rays

Total Points: 100

In this class challenge, we will classify X-ray images. The data we will use has been collected by Adrian Xu, combining the Kaggle Chest X-ray dataset with the COVID-19 Chest X-ray dataset collected by Dr. Joseph Paul Cohen of the University of Montreal. The data can be downloaded [here](#). When you extract the data you will have two folders: **two** that will be used for a binary classification task (Task1), and **a11** that will be used for multi-class classification (Task2). An ipython notebook template is provided for each task.

- **[30 points] Task1** Train a deep neural network model to classify normal vs. COVID-19 X-rays using the data in the folder **two**. Starting from **a pre-trained model** typically helps performance on a new task, e.g. starting with weights obtained by training on **ImageNet**. After training is complete, visualize features of training data by **reducing their dimensionality to 2** using **t-SNE**. If your extracted features are good, data points representing a specific class should appear within a compact cluster.
- **[30 points] Task2** Train a deep neural network model to classify an X-ray image into one of the following classes: normal, COVID-19, Pneumonia-Bacterial, and Pneumonia-Viral, using the folder **a11**. **Explore at least two different model architectures for this task, eg. AlexNet vs. VGG16**. After training is complete, visualize features of training data by reducing their dimensionality to 2 using t-SNE. If your extracted features are good, data points representing a specific class should appear within a compact cluster.

Deliverables:

- **Code**
Two ipython notebooks corresponding to tasks 1 and 2
- **[40 points] Report**
 - o **[5 points]** Describe the architectures used in detail: layers, layer dimensions, dropout layers, etc. for both tasks
 - o **[5 points]** List the optimizer, loss function, parameters, and any regularization used in both tasks
 - o **[20 points]** Comparison of different architectures for the second task
 - o **[5 points]** Plot and comment on the accuracy and the loss for both tasks
 - o **[5 points]** Plot and comment on the t-SNE visualizations
 - o **[Bonus: 10 points]** Run the training on a GPU on the SCC cluster and include a CPU vs. GPU training time comparison by taking snapshots from your terminal

Submission:

Please complete the class challenge and submit a ZIP file containing a pdf of your report and two ipython notebooks. The deadline for this class challenge is: Apr 24, 2020. You can use [this link](#) to submit your zip file.