Project choice/instructions

New Attempt

Due Mar 29 by 11:59pm **Points** 10 **Submitting** a text entry box

Instructions

- You can choose to work in groups of 2 or individually on a project.
- You can either choose from one of the projects listed below or propose your own project. **You must make a submission on Canvas by 11:59 pm Wednesday, March 29** (10 out of 100 points for the project will be given for meeting this deadline) to identify which project you will work on. If you are proposing a project that is not listed below, describe it in sufficient detail in your submission (what is the problem, what models will be tried, what datasets will be used, what metrics will be used for validation). The instructor retains the right to ask you to modify your proposed project to fit within the expected scope or to instead choose one of the predefined projects. It is a good idea to check with the instructor before March 29 if the project is acceptable.
- Your project must use a non-trivial (more than 1 hidden layer) deep neural network model.
- You must build your code using PyTorch or TensorFlow. You are encouraged to try models from existing neural network architectures that are included in these packages. You should try various ideas on initialization/pre-training, regularization, augmentation, multi-task learning etc. we discussed in class. You will be judged not on the novelty of what you tried, but more on the extent of what you tried and your analysis.
- You are not expected to beat state-of-the-art models in the challenge you choose, but you should strive to obtain as good a score as possible with the computational resources available to the class.
- Your deliverable will be a project report in the form of a pdf file and a zip file with all code including either an executable script named Myproject.sh OR a notebook file named Myproject.ipynb which will run and generate the results in your pdf report. Your report should include:
  1. A short introduction (approximately ¼ - ½ page) discussing why this problem is significant. Why solve it? And what are the main challenges in solving it?
  2. Method: describe the models, training strategies, etc. you tried. You don't have to describe existing algorithms, e.g. details of a ResNet or Adam optimization, but you should list what you have used. If you implemented a custom data augmentation, or a custom architecture, describe it in a bit more detail. Don't include pseuo-code, describe using sentences and equations as necessary.
  3. Experiments: Describe datasets and metrics being used for evaluation. Describe training/validation/test splits and any other relevant information. Analyze various aspects of your method don't just present a single result. Use graphs, tables to summarize results. Use actual input/output images sparingly (don't fill your report with hundreds of images). This is most likely going to be the longest part of your report.

4. Conclusions: Brief (approximately ¼ - ½ page) What have you learned from this project? What could be future modifications to what you tried to improve performance?

Maximum length of report should not exceed 8 pages. The **deadline** for submission of the final report and code is **11:59 pm Wednesday, May 3**. You are allowed to use your remaining grace period up to a maximum of 5 days beyond the deadline.

List of project choices

Project 1: Pneumonia Detection

Predicting bounding boxes for the lung opacities and using mean average precision to evaluate your results. This is an object detection type of problem.

https://www.kaggle.com/c/rsna-pneumonia-detection-challenge (https://www.kaggle.com/c/rsna-pneumonia-detection-challenge)

Project 2: Road Object Detection

Predicting bounding boxes for road objects (car, traffic sign, pedestrian etc.) for the road object detection dataset from Berkley deep drive. This is an object detection problem. Warning: It is a large dataset; you might need to subsample images unless you have access to excellent computational resources.

https://bdd-data.berkeley.edu/index.html (https://bdd-data.berkeley.edu/index.html)

Project 3: Road Object Instance Segmentation

This project uses a similar dataset as Project 2 above to address a different task in computer vision. In this project, you are required to develop an instance segmentation model to mask out different objects appearing in a given image. Can be computational resource intensive.

Project 4: Lung segmentation

Develop a lung segmentation algorithm using deep convolutional neural networks. Train and test your algorithm on the following two datasets. Also analyze cross-dataset (train on one test on another) accuracy.

https://www.kaggle.com/yoctoman/shcxr-lung-mask (https://www.kaggle.com/yoctoman/shcxr-lung-mask)

http://db.jsrt.or.jp/eng.php (http://db.jsrt.or.jp/eng.php)

Project 5: Viral/Bacterial Infection Diagnosis using X-Ray Images

This project contains 2D X-Ray images of patients with various type of infections. You will develop a prediction model to determine the type of infection of a given patient.

https://github.com/ieee8023/covid-chestxray-dataset (https://github.com/ieee8023/covid-chestxray-dataset)

Project 7: Unconstrained Face Recognition

In this project, your task involves developing a face recognition model using images in the wild and are captured in unconstrained conditions. In other words, this dataset contains images of people under various conditions such as different lighting, background, facial expression, camera quality, etc. Your task is to develop a model to identify people in these unconstrained images.

http://vis-www.cs.umass.edu/lfw/index.html (http://vis-www.cs.umass.edu/lfw/index.html)

Project 8: Lymphocyte Assessment

This project contains histopathology images stained with CD3 and CD8 immunohistochemical markers of breast, colon, and prostate cancers. This challenge requires you to implement a deep learning method to estimate the number of lymphocyte presented in a given histopathological image.

https://lysto.grand-challenge.org/Data/ (https://lysto.grand-challenge.org/Data/)

Project 9: Estimating Gleason Score in Prostate Cancer

Gleason score is an indication of the severity of prostate cancer in a patient. In this project, you will develop an automatic Gleason grading model from haematoxylin and eosin stained histopathology images.

https://gleason2019.grand-challenge.org/Home/ (https://gleason2019.grand-challenge.org/Home/)

Project 10: Automated Measurement of Fetal Head Circumference

Head circumference is an important metric used to monitor the growth of the fetus. In this project, you will develop an automatic head circumference estimation from 2D Ultrasound images. This automatic pipeline needs to first segment the fetus' head and then compute the head circumference from the segmented mask.

https://hc18.grand-challenge.org/Home/ (https://hc18.grand-challenge.org/Home/)