COL 341: Assignment 3

Notes:

- This assignment has two parts - Image Classification using ConvNet and TGS Salt Identification Challenge.

- You should submit all your code (including any pre-processing scripts written by you) and any graphs that you might plot.

- You are advised to use vector/tensor operations and GPUs for best performance.

- Include a report of maximum 5 pages which should be a brief description explaining what you did. Include any observations and/or plots required by the question in the report.

- You should use Python/R for all your programming solutions. You are free to use any deep learning library (available on HPC) such as PyTorch, Tensorflow, Keras etc. Please find the details of specific versions in 'README'.

- Your assignments will be auto-graded, make sure you test your programs before submitting. We will use your code to train the model on training data and predict on test set.

- Input/output format, submission format and other details are included on 'README.md'. Your programs should be modular enough to accept specified parameters.

- You should submit work of your own. You should cite the source, if you choose to use any external resource. You will be awarded F grade or DISCO in case of plagiarism.

- You can use total of 7 buffer days across all assignments. Note that you can not use any buffer day for the competition.

1. **Image Classification (5 points, Release date: Sep. 9, 2018, Due date: Sep. 24, 2018)**
   In this problem, we will use Convolution Neural Network to classify given images of 'devanagari' characters. Try out different architectures and submit code for your best model. Submission, input, output format are available in 'README'. Marking will be relative and based on accuracy on test set. You are provided train and public test data to experiment and figure out best model. We'll setup a leader-board to track your progress like A2. Note that you don't need to write code for back-propagation, gradient descent etc. as these are already provided by deep learning libraries. Here are few pointers which can be helpful:

   (a) LeNet5 is a well known architecture for digit recognition, it can be a starting point for your experiments.

   (b) Use 'ReLU' instead of 'tanh' in your network and observe your results. How does it affect your accuracy on test set?

   (c) Experiment with number of neurons in fully connected network and observe how does it affect your performance. You can experiment with dropout in fully connected layers to regularize your network.

   Note: Your code should be able to train and make predictions within 3 hrs on HPC.

2. **TGS Salt Identification Challenge (20 points, Release date: Sep. 9, 2018, Due date: Oct. 19, 2018))**
   In this problem, we will be solving problem of segmenting salt with sediments. Read more about the problem statement at <u>this link</u>.

   Instructions/Rules:

   - Follow kaggle rules strictly.
   - You can use any open source library or tool.
   - You can discuss on moodle, piazza or kaggle but do not share your code.
   - You should submit your code with bash file to run at HPC. We'll autograde your code, so please follow the format specified in 'README'. Please note that you will need to load respective packages on HPC.
   - Your code should train and predict within 8 hrs.
   - Kaggle ID to be used for the competition must not be offensive or abusive.
   - If you are in top 25 teams of the final global ranking you will get full marks in all the assignment. Please note that this is subjected to following terms: i) Need to pass demo and code check ii) No cheating/target leakage iii) Submission needs to be a machine learning approach iv) You need to have developed a good understanding ot ML topics and your approach (determined using demos) v) Your submission can not be a already existing approach/code.

   Scoring plan

   - Your score will be the combination of private and public leader board results. Score will be based on average percentile at kaggle public leader board. This percentile score will be downloaded 2 times per week. i.e. Friday(10:00 p.m. and Monday 10:00 p.m.) in the duration of assignment.
   - Please note if your rank improves then only you have to submit your code. For the start of the assignment assume your rank is last. The link will be up soon.
   - Final scoring strategy will be updated soon.

Extra Readings:

1. Deep Learning with PyTorch: A 60 Minute Blitz

2. Getting started with the Keras Sequential model

3. Machine learning crash course with Tensorflow

4. Dropout

5. Introduction to conditional random fields

6. DeepLab: Semantic Image Segmentation with Deep Convolutional Nets, Atrous Convolution, and Fully Connected CRFs