Project 2
Deep Learning

1 Introduction

The objective of this project is to help you gain a better understanding of deep neural networks for deep learning application. The best way to understand Deep Learning is by applying it into a project and learning thorugh experiencing the implementation of it. This project helps to develop your intuition for model-to-problem fit. You will be challenged to decide which models are good for a given problem set. This project will teach you the invaluable skill of prototyping models quickly and understanding how to follow a proper pipeline for your Deep Learning model.

Deep Learning models can solve a broad range of problem statements. Thereby, every individual working in the area of Deep Learning may have tendency towards a particular sets of problems and categories. Thus, this project is democratized in a way that every student would have the opportunity to choose a problem set of their interest. However, it is also understood that some students may have difficulty finding a problem statement to work on their own. Therefore, to accommodate with all groups of students, the following topics are provided for you to choose as your Project 2:

1. Traffic Sign Classifier
2. Translating English text to French
3. Open Topic

These topics will be explained in the following sections.

2 Project Format

This is an individual assessment requiring each student to submit their project (code+report) individually. Students are allowed to work in groups of maximum 3 students, however, the submission and assessment interview will be individual. Those who wish to work in groups must provide the names of their group members in their report.

3 Traffic Sign Classifier

In this project, you will implement a Convolutional Neural Network to identify traffic signs. The dataset has been prepared for you and can be downloaded from Blackboard (Learning Resources -> Datasets). The prepared datasets for you are:

1. Train dataset: train.p

2. Test dataset: test.p

3. Validation dataset: valid.p

A template is provided in Blackboard (Assessments -> Projects -> Project 2 - Deep Learning -> traffic-sign-template.ipynb) to help you get started! You can find solutions on the Internet as well!

4   English to French Translation

In this project, you will translate an English text into a French text.

- The dataset and a sample implementation of it can be found here:
  https://github.com/tommytracey/AIND-Capstone

- More information can be found here:
  https://towardsdatascience.com/language-translation-with-rnns-d84d43b40571

5   Open Topic

This is an open topic which enables you to choose any type problem statement that you would like to work on as you project. You are free to use your own dataset or any publicly available datasets. You could refer to Google (https://ai.google/tools/datasets/) or Kaggle (https://www.kaggle.com/datasets) datasets.

You could use Google Dataset search engine (https://toolbox.google.com/datasetsearch) to find your preferred dataset.

5.1   Amazon Echo

I have two Amazon devices:

- Echo Dot

- Echo Spot

You can use these devices for speech recognition projects. AWS provides SDKs for these devices and there are sample projects online. Contact me ASAP if you would like to borrow these devices!

5.2   Reinforcement Learning

If you are interested in Reinforcement Learning (RL) you can refer to the following links:

- University of Berkely AI course materials & projects:
  http://ai.berkeley.edu/reinforcement.html

- A tutorial for implementing RL with Keras:
  https://adventuresinmachinelearning.com/reinforcement-learning-tutorial-python-keras/

- A sample RL project: https://github.com/keras-rl/keras-rl

6   Submission

Submissions are online through the Project 1 submission link in BlackBoard. You must archive all your project materials into a zip file and name it as *AdmissionNumber_Project1*.

Your submission must include the following:

- **Code:** You must implement your project using Python written in Jupyter Notebook.
- **Report:** Your report file can be the same file as your Jupyter Notebook or you can submit your report separately as a PDF file.
- **Dataset:** Include the dataset in your submission or provide a link so it can be viewed/downloaded.

7   Tips

1. You can use available online solutions, but make sure to provide reference and make at least some changes to the code.
2. Your code must be well structured and clear with comments where necessary.
3. It is important that you provide details of your solution in your report. For example, you must explain whay you have chosen model XXX as a solution. What pre-processing methods and data exploratory methods have you used and why. You must discuss and analyze the performance of your model. Explain the method(s) that you have used for model evaluation and provided analysis of the evaluation results.

8   FAQ

Do I have to only use methods we discussed in lectures and/or labs?
No! You are free to use any Machine Learning method to solve the problem statement.

Can I use Deep Learning methods?
No! Deep Learning is for term 2. You are required to use Machine Learning methods only (e.g Linear Regression, Logistic Regression, K Nearest Neighbor, etc.)

Can I create my own dataset?
Yes! But be mindful of the time that you have to complete and submit the project.

What if my model is not performing well and I have no time to change it?
You should plan and manage your time when starting this project. Also, allocate some buffer for fixing unexpected problems. However, in the event where your model is not performing well and you have no time to implement a new model. Keep calm and submit your work with a good report analyzing the reasons why your model is not performing well and provide details for what you would have done if you had more time.

Can I get help from my lecturer if I encounter a problem?

Yes! However, you must first do your research to find a solution for your problem and/or error. If you really cannot find an answer or if you need some guideline to look for an answer, ask your lecturer for support.

What do I do if I am unable to submit the project on-time?
You can submit your project after the deadline. There will be points deducted for late-submission.