COMP-551 Applied Machine Learning, Winter 2018
Final Course Project

Introduction

In this final course project, there are three different tracks.

Track 1: Improve the baselines

When people propose new models, they often spend more time on fine-tuning their proposed model than fine-tuning the baselines. Simple baselines like Naive Bayes, Random Forests, k-NN, if properly tuned, can be sometimes too strong to beat. In this track, your goal will be to select a paper (from the list of given papers) and improve the baseline for the tasks considered in the paper. First implement the baselines mentioned in the paper and try to reproduce the baseline performance reported in the paper. Then try to finetune the baselines by doing extensive hyper-parameter tuning. Then, explore simple machine learning algorithms learnt in the class to improve the performance in the given task. Your job is to act like an adversary to the paper and try to beat their performance by using simple algorithms which has lesser computational complexity.

Track 2: Model ablation study

The goal of this track is to take a recently proposed model (from the given list of papers) which comes with code and try to explore the proposed model in depth. Specifically, you will first reproduce the results reported in the paper by running the code provided by the authors. Then you will try to tweak the model and try to understand the robustness of the model, importance of specific components of the algorithm or the model. You can also try to improve the model based on your ablation study. You should do a thorough analysis of the model by extensive set of experiments.

Track 3: Reproducibility Challenge

One of the challenges in machine learning research is to ensure that published results are reliable and reproducible. In support of this, the goal of this track is to investigate reproducibility of empirical results in most recent papers. You should select a paper from the given list, and aim to replicate the experiments described in the paper. The goal is to assess if the experiments are reproducible, and to determine if the conclusions of the paper are supported by your findings. You can implement algorithms from scratch, or use any existing toolbox or software, as long as you reference everything appropriately in your report. However, you should not use an already implemented version of the paper. The result of the reproducibility study should NOT be a simple Pass / Fail outcome. The goal should be to identify which parts of the contribution can be reproduced, and at what cost in terms of resources (computation, time, people, development effort, communication with the authors). Essentially, think of your role as an inspector verifying the validity of the experimental results and conclusions of the paper.

Instructions

1. This is a team project. You have to form a team of three students. We decided that you can team up with your Kaggle team members if you want.

2. You are allowed to participate in only one of the three tracks. Each track has different evaluation criteria which is listed below.

3. For each track, we have listed a set of papers here. Choose one of the papers from this list. You can see the selection of other teams here. Keep in mind if multiple teams choose the same paper then we will do relative grading of the teams with same paper. So try to avoid choosing a paper which is already chosen by many teams.

4. If you wish to work on a paper that is not listed, please email the TAs in-charge for your section (and cc your instructor) and get permission.

5. The list of paper will be made available from March 24, 8 pm.

6. Once you choose your track, team mates, and paper choice, fill this Google form on or before March 30, 8 pm.

7. If you want additional computational resources for your project, try to use Colab for all your prototyping. If you need more resources after prototyping (i.e. when your entire experimental setup is ready to be launched in a server), please contact Koustuv. We have some Google Cloud resources allocated for this project. The resources are limited so please make efficient use of it!

8. We encourage you to meet one of the TAs during the office hours and discuss your project plans to make sure it is feasible within the given timeline. For discussions about project feasibility, you can contact any of the 8 TAs.

Evaluation Criteria

1. For all the three tracks, we will follow the following evaluation criteria:
   (a) Spotlight Presentation: 10%
   (b) Project Report: 70%
   (c) Executive Summary: 20%

2. For spotlight presentation, prepare a 3 minutes presentation (5-6 slides max) describing your project.This should clearly outline the target question, describe the methodology, and preliminary results. More details will be announced later.

3. Written reports should clearly present the target questions, a clear and well motivated methodology, analysis and discussion on the findings. Concretely, for Track 1, the project should extensively cover the baseline models of the given paper and report on hyperparameter exploration; for Track 2, detailed analysis of ablation study on the provided model code and parameter tuning; and for Track 3, a thorough report on implementation goals, discussion and challenges. Submitted code will be evaluated according to the individual tracks.

4. Prepare and publish an executive summary (roughly 1 page) of your full report. Be as detailed as possible on key findings. You are encouraged to include a link to your full written report. Make sure to support any statement with as much evidence as you can. Include a copy of this executive summary as an appendix to your written report (in the same pdf file) when submitting on Mycourses.

Deadlines

- Fill the Google form about team info on or before March 30, 8 PM.
- Spotlight presentations on April 11 and 12 for section 1 and April 11 and 16 for section 2.
- Report and executive summary submission on April 20th 11:59 PM.

Questions and clarifications

For questions, please use the following channels:

- The course discussion forum.
- For more detailed questions, please go to the office hours of the following TAs: Chris, Koustuv (Section 1); Harsh, Sanjay (Section 2).