Course: DD2422 - Final Project

Subject: Deep Learning for a data science task

1 Goal of the project

The outcome of this project will be a scientific report. The goal of the work is multi-fold:

- Apply a deep learning model/network to a computer vision, speech, natural language language, multi-modal, ... task.

- Study the literature regarding the state-of-the-art for the sub-problem you have chosen and summarize it.

- Conduct scientific experiments and obtain concrete results.

- Familiarize yourself with the process of a scientific endeavor.

- Collaborate on experiments and co-author a scientific work.

- Practice scientific writing.

The experience you gain through this project will help you with your master's thesis. Also, it will be a good practice for future technical writing should you choose to pursue a PhD degree or join an industrial lab. A large portion of research is devoted to writing up and explaining your work. Finally, hands-on experience with deep learning will boost your skill set for a future career in industry.

2 Format of the final report

The final report should include the following sections:

- **Abstract**: Where you give an overview of the task and the findings of your work in a nutshell.

- **Introduction/Problem formulation**: Motivate the problem you are trying to solve, attempt to make an intuitive description of the problem and also formally define the problem. (1-2 pages including title, authors and abstract)

- **Background**: summarize a few notable approaches/papers tackling the same problem. The selection should cover different possible techniques that can be (have been) used for the same task with success. Also, it is good to mention other recognition/synthesis tasks that use the same deep learning technique as yours. (1-2 pages)

- **Approach**: Describe the final approach you are take for this problem. For instance, here you would describe the details of the network's architecture. What training parameters and techniques you have used. The computational complexity of your model. And similar questions. To help explain your approach please make figures to accompany your text description. (1-3 pages)

- **Experiments/Results/Conclusions**: In this section, you should present the results you achieved with various experiments. The results can be presented in tables, plots, etc. Explain what conclusions you can draw from these set of experiments? The set of experiments and results reported here should justify some of the design choices described in the previous sections. (3-6 pages)

- **References**: It is extremely important to make sure all the content from other sources and the ideas that you build on are properly cited.

Both positive and negative results should be reported. A discussion regarding why certain techniques worked better than the others is necessary. Students are also encouraged to take initiatives in trying out new techniques, beyond those discussed at the lectures.

The stated number of pages above is a guideline, one can go beyond that or slightly below. The whole report should be between 7-14 pages.

The template for the report is provided at the course web both for Tex (`template_tex.zip`) and MS Word (`template_word.zip`). It is the same template as used for ECCV conference.

3 Logistics of the project

3.1 Rules

The constraints on the project are as follows

1) Groups should consist of 3 students.

2) The final task should be related to applying a deep learning some sort of *recognition, synthesis, translation, segmentation* ... task.

3) The two deadlines for the project are

    i) Submission of your project proposal. **April 13, 2018**

    ii) Submission of your final report and project. **May 22, 2018**

If the final project report is submitted after the deadline, then we will need to schedule the oral exam in the late Summer.

3.2   What you must submit for the project proposal

The project proposal you submit should be brief and to the point. Its length should roughly be .5 - 1 page. You should submit one proposal per group. I just want to know that you are going to explore a feasible and in scope idea. It should contain the following information:

- The names of the people in the group.

- A working title for the project.

- A brief description of the problem that you will work on and how you will try to solve it. Reference to at least one paper (or webpage) that provided inspiration as regards the problem statement and/or proposed approach to tackling the problem. (It is completely fine if you just want to replicate results of some paper and explore the influence of parameter settings, training conditions, see if the method can be transferred to another dataset etc...)

- The training data that you will use for training, validation and testing. (In most cases this training data should be labelled.)

- The software package(s) you will use to build your deep learning network(s).

- The initial set of experiments you will run.

- How you will measure the success of your project.

3.3   What you must submit with the final report

Each group must submit the following items through Canvas:

  i) A final pdf report following the template provided above.

  ii) The code to generate the final results.

iii) Optional: Relative contribution of each member. There are three levels of contributions:

1 ≡ no contribution.

2 ≡ contributed significantly less than a sensible equal share.

3 ≡ contributed around or above a sensible equal share.

There is always differences in the amount of work made by different members. Still, it is expected that for most teams everybody gets a 3 for the level of contribution (despite these differences). An instance of a case where a 2 is justified is when a member had agreed to perform an important task, but did not do it. Even in those cases other team members are encouraged to assign a make-up task to her/him in order to re-balance the share. If you do not submit a number here all the members of group will get a 3.

4   Project Evaluation

The project will be evaluated based on the grading of the written report and oral presentation of the project. The exact details of the grading criteria and scoring are available in a separate document available for download on the project canvas page. Roughly 60% of the final grade will come from the scoring of the written report and ~40% from the scoring of the oral presentation and examination. Here are some details about the oral presentation and examination.

4.0.1   Report scored as a group but not the oral examination

Although the work load of the project is to be distributed among group members, everybody should be fully aware of what has been done/written and how it has been done and why. The group should discuss the experiments and the writing at various times during the project. The project will be initially graded at the group level. But then during the group's oral presentation/examination the grade will be individualized depending on each group member's ability to answer questions about the project and present the project.

4.1   Scoring of the Oral Presentation/Examination

At the oral presentation/examination the group will make a short presentation of their project. Please come with prepared slides. Then each group member will be asked conceptual and/or practical questions related to the

project. Conceptual questions mean that, although the student is not required to be able to derive concepts rigorously, he/she should be aware of the implications of those theories. There will be a separate score for each member of the group.

5   Project help sessions

The goal of the project is to get experience specifying, planning and completing a deep learning project within a team.

Fifteen minute time slots will be available for consultancy on the following subject before the project starts:

- On the problem you want to tackle.

- The available techniques to solve that problem.

- Feasibility of your possible project idea.

- Software package to use.

and once your project proposal has been accepted:

- Software implementation issues.

- Algorithm implementation issues.

- Advice on how to proceed given success/failure at prior stage.