CS89/189, Deep Learning, Spring 2015
Term Project

March 30, 2015

1 Important Dates

- April 21, 2015: project proposal (write-up and presentation)
- May 14, 2015: milestone (write-up and presentation)
- June 1, 2015: final presentation
- June 7, 2015: final write-up

2 General Guidelines

The goal of the term project is to allow you to investigate a topic of deep learning. The project can be done individually or in pairs. A group project should have roughly twice the contribution of an individual project.

- **Application project**: in this type of project you apply an existing deep learning technique to a problem of your choosing. The method that you plan to implement should be described in an article published in one of the top journals or conference proceedings of machine learning, such as JMLR, Neural Computation, NIPS, ICML. Don't simply reproduce the results presented in the paper but make an effort to use the algorithm in a novel way, e.g, by applying it to a different task or by training the model using a different kind of data (say, images instead of speech data). It is important that you make sure since the beginning that you will be able to have access to an adequately-large dataset of examples to train the deep learning model.
- **Algorithm project**: in this type of project you propose and evaluate a novel variant of an existing deep learning algorithm. A good starting point for this kind of project is the set of papers in the reading list: pick one that interests you, review it thoroughly, identify some shortcomings and propose a strategy to overcome these limitations. Your work will be graded primarily on the basis of how well you motivate your proposed solution: run experiments illustrating the shortcomings of the existing method and suggesting the benefits of your proposed modification. You won't be penalized if your proposed method does not yield the results that you expected as long as you analyze and describe clearly the reasons of the failure.

You are allowed to use external software for *parts* of your work. The project grade will be based on the novelty of your solution/application but also on the amount of new code written by you to implement the idea. Thus, using code written entirely by someone else would not be acceptable. If you use external software, please report clearly which code is your own and which one was taken from external sources.

You can either define your own project or you can talk to me and I'll be happy to brainstorm with you about some project ideas.

Please note that the list above provides only high-level descriptions of these projects. If you are interested in any of these projects, please talk to me and I will be happy to give you additional details.

3 Project components

The project involves three distinct components: proposal, milestone, and final.

- **Proposal**: the proposal is a written document describing your intended work. This document should address the following questions:

  1. What problem do you want to solve? Describe at a high level the application and the machine learning problem involved.
  2. What is a suitable method for this problem? Research the literature and find a technique that may be applied to solve this task. Include references to the method in your proposal.
  3. What data sets do you plan to use? Include pointers to databases that you will use in your project. If you plan to acquire the data yourself, describe in detail the collection procedure and the expected size and features of your dataset.
  4. What do you expect to accomplish by the milestone due date?

  Note that items 2. and 3. above are not binding: if after submitting the proposal you find new algorithms or databases that are more suitable to your task, you are free to use them without penalty. However, I want to see from your proposal that you have thought carefully about what you want to accomplish and how to do it.

  Proposal presentation: the same day when the proposal is due, you will give a brief in-class presentation: you will have a few minutes to present a couple of slides describing your project plan. Make sure to discuss the four points above during your presentation. Upload your project proposal slides to Blackboard on April 21st (the day before the proposal due date). *Proposal write-up and presentation will count equally, and contribute in total to 20% of your project grade.*

- **Milestone**: the milestone submission is a web document providing an account of the accomplishments you have achieved so far. The purpose of the milestone submission is to encourage you to start working early toward your project goals. It is crucial that you make good progress early on in order to complete a successful project. We expect that by the milestone you should have completed most of the coding and already obtained some preliminary results. You should comment honestly on whether you are on-track and if you have reached the milestone goals that you had set in the proposal. Please provide a brief description of the

algorithms you have implemented and include visualizations of the results already obtained. It is not necessary to submit code.
Milestone presentation: you will have 10 minutes to present an overview of what you have accomplished up to this date. You should view the milestone presentation as an opportunity to gather feedback that may help you resolve issues that have impeded the progress of your project. For this purpose, please prepare a few slides describing in detail what you have implemented, the experiments that you have run, what has worked and what has not. Discuss also what you still need to do in order to complete the project.
The milestone presentation will count for 30% of your project grade.

- **Final**: the final write-up is a document describing your project and the results you have obtained in a conference-paper style. Your submission should include an introduction section to motivate your problem and algorithm, a section describing your approach and how it compares to previous work, a section outlining the experiments you ran and the results you obtained, and a short conclusions section to sum up what you discovered. You should write your paper for a technical audience. Therefore, do not write lengthy descriptions of basic methods. However, you do need to cite the articles related to all the algorithms that you have implemented. Furthermore, if you have made modifications to the methods, please discuss your variations in detail and provide a justification for them. The most important part of the final project report is the discussion of the results: include a thorough description of your experiments and use well captioned figures and plots to summarize your results.
Final presentation: you will give a slide presentation of your project. You will have about 10 minutes to provide an overview of your work and to illustrate the results that you have obtained.
Final write-up and presentation will count equally and, together, they will be worth 50% of your project grade.

I am looking forward to seeing your project. Have fun and good luck!