CS294-112 Deep Reinforcement Learning: Final Project

1 Final Project Requirements

The final project in this course requires implementing, evaluating, and documenting a new, research-style idea in the field of deep reinforcement learning. Students will be expected to prepare a proposal, peer feedback for the proposal, milestone report, peer feedback for the milestone report, and final report, with specific detailed below. Students will also have a short final presentation slot to present their work.

The project proposal is due **Sept 26**, the proposal feedback is due **Oct 8**, the milestone is due **Oct 31**, the milestone feedback is due **Nov 11**, and the final project report is due **Dec 12**. All due dates are 11:59 pm, and all reports should be submitted in pdf format to Gradescope.

2 Choosing a project

All projects should evaluate novel ideas that pertain to deep RL or its applications. The project must involve reinforcement learning algorithms, not just deep learning. Here are some examples of weak proposals and how to improve them.

1. Weak: re-implement a recent paper on deep RL.
   Strong: re-implement a recent paper and investigate an extension mentioned in the paper as potential future work.
2. Weak: run a deep RL algorithm out of the box on a new application.
   Strong: modify the algorithm to better suit the application.
3. Weak: sweep hyper-parameters, do architecture search of some algorithm.
   Strong: investigate the algorithm's robustness to more interesting tweaks (e.g. sparse rewards instead of dense), and pursue a solution.

It's a good idea to think early about the data (simulated or real) that you'll need to collect, and the computational resources you'll need. You are encouraged to use your ongoing research work as a project in this course, provided that this work relates to deep reinforcement learning. You are welcome to work on the project with students not enrolled in the class - in this case, we'd still like to know the size of the group. You may discuss the topic of your final project with course staff by email, private message in Piazza, or in office hours. If you are not sure about the topic, we encourage you to speak with us. If you are looking for ideas for your project, see the document posted on Piazza, which contains ideas we have collected since the first offering of this course in spring 2017, though we also encourage you to come up with your own.

3 Writing the proposal

The project proposal should be a **one page** single-spaced extended abstract motivating and outlining the project you plan to complete. You proposal should have the following structure (modeled after the structure used in academic grant applications):

1. **Objective** 1/4 page. Explain the objective of the project and why that objective is relevant and important.
2. **Related Work** 1/4 page. Briefly review the most relevant prior work, and highlight where those works fall short of meeting the objectives described above.
3. **Technical Outline** 1/2 page. Explain your approach at a high-level, making clear the novel technical contribution.

3.1 Submission

Submit one proposal per group. The proposal should be a one page PDF. Author names or any other personally identifying information should not appear anywhere in the document (for anonymized peer review purposes). You must submit the proposal on **both** gradescope (used for staff grading) and CMT (used for peer review). The deadline for both submissions is **11:59pm Wednesday Sept. 26th**. Submitting to gradescope follows the pattern of submitting homework. Submit a PDF of your proposal under the assignment "Project Proposal." CMT is the system we will use for the double-blind peer review process. Steps for submission to CMT:

1. Create a CMT account by going to `https://cmt3.research.microsoft.com` and selecting "Create Account." You will have to verify via email.
2. Navigate to `https://cmt3.research.microsoft.com/DeepRL2018/Submission/Index`, which is the Author Console for submission.

3. Select "Create New Submission." Enter a descriptive and succinct title for your proposal, and provide a few sentence summary of your proposal in the "Abstract" box. Add your collaborators as authors (do not forget to do this!). Upload the PDF of your proposal and hit "Submit."

4 Proposal Peer Feedback

The peer review process will model the process of how grant proposals are evaluated. Each proposal will be anonymized and assigned three peer reviewers. The peer reviews will evaluate novelty, the quality of the technical approach, and make suggestions about relevant prior work. Instructions and suggestions for writing a good review will be released closer to the reviews due date. After the peer review process, you will have an opportunity to revise your proposal given the comments from the reviews. The peer reviews will not affect your grade; they are meant to help you improve your project proposal.

4.1 Writing Reviews

You will be randomly assigned three proposals to review. The review process is double-blind - both authors and reviewers will remain anonymous to each other. You should have received an email from `email@msr-cmt.org` inviting you to be a reviewer. Accept by clicking the link in the email. If you have not received the email, please contact Kate by sending an email to `rakelly@eecs.berkeley.edu`. Once reviewers have been assigned (a Piazza announcement will be made), switch your role to "Reviewer" on the upper right of the CMT user console and you will see the papers you are assigned to review. After reading each proposal, complete the associated review form. The deadline for submitting the peer reviews is **Monday, October 8th, 11:59pm**. While the reviews you receive for your own proposal will not affect your grade, a small part of your project grade will be based on completion of the reviews assigned to you. The course staff will also provide feedback on your proposal via GradeScope.

5 Milestone Report

Your milestone report should be one page and answer the following questions:

1. What experiments have you conducted so far?
2. Are there any changes to the research hypothesis or problem statement from the proposal?

The milestone report must report on at least one experiment that you have done since the proposal. This experiment does not need to be successful, but you should have attempted something. If it did not work as expected, you should briefly discuss why. You are encouraged to include a plot or figure. Like the proposal, the milestone report will be graded by course staff, and you will also receive feedback from your peers in a peer review process. The reviews will not impact your grade, but are entirely there to provide more feedback for you.

5.1 Submission

Submit one milestone report per group, as a one page PDF. **Author names or any other personally identifying information should not appear anywhere in the document (for anonymized peer review purposes).** You must submit the proposal on **both** GradeScope (used for staff grading) and CMT (used for peer review). The deadline for both submissions is **Wednesday Oct. 31st 11:59pm**. Submitting to GradeScope follows the pattern of submitting homework - submit a PDF of your milestone report under the assignment "Milestone Report." You should already have a CMT account from submitting your project proposal. Switch your role to "Author", select the "Post Author Feedback" action in the righthand column, and upload the PDF.

6 Milestone Peer Feedback

Like the proposals, you will also peer review each others' anonymized milestone reports. You will review the same projects as you did for the proposal reviewing and we will again use CMT. If you didn't participate in proposal reviews, but would like to participate now, contact Kate at `rakelly@eecs.berkeley.edu` for a new reviewer invitation. After reading each milestone report, answer the additional questions added to the proposal review form. The deadline for submitting the reviews is **Sunday, November 11th 11:59pm**. While the reviews you receive for your own milestone report will not affect your grade, a small part of your project grade will be based on completion of the reviews assigned to you. The course staff will also provide feedback on your milestone report via GradeScope.

7 Final Report

The final report should be in the style of a research paper, preceded by a one-page extended abstract. One report is required per group. The one-page extended abstract should summarize the main findings and accomplishments of your final project, while the main paper should describe and motivate the method in detail, and discuss the results, including any relevant figures or plots. The extended abstract may be submitted as a separate pdf file, or attached as the first page of the full report.

Successful reports will have a main body that is about eight pages in length, but there is no hard length limit or requirement on the length or format, except the one-page extended abstract.

For group projects, we will also ask you to each individually submit a few sentences about what each member of the group contributed to the final project.

8 Groups

You may work in groups of up to three people. Each group will submit the report and give the presentations together. The expectations for the project scope will increase depending on the number of students in each group, and for groups of two or three, we will also expect a short paragraph to explain the role of each group member along with the final report. From past experience, groups of two tend to be the most effective, though you may work in a group of three or alone. Groups larger than three are not permitted without special permission from the course staff. Note that you should form your groups before Sept 26, though you are strongly encouraged to do this much sooner so that you can start on your project.