CS 542 Stat RL: Project Guideline

Project themes:

1. **Reproduce the proofs of existing paper(s).** You must fully understand the proofs and rewrite them in your own words. Sometimes a paper considers a relatively general setting and the analysis can be quite complicated. In this case you should aim at scrutinizing the results and presenting them in the cleanest possible way. Ask yourself: What's the most essential part of the analysis? Can you introduce simplification assumptions to simplify the proofs significantly without trivializing the results?

2. **Novel research.** Pick a new research topic and work on it. Be sure to discuss with me before you settle on the topic. The project must contain a significant theoretical component. It is fine to include heuristic development of algorithmic ideas and empirical validations for the sake of completeness, but your project will be mainly evaluated based on its theoretical analyses.

3. **Something between 1 & 2.** I would encourage most of you to start in this category. The idea is to reproduce the proofs of existing results and see if you can extend the analysis to a more challenging and/or interesting setting. This way, even if you do not get the new results before the end of the semester, your project will just fall back to category 1.

Group:

- You will work **individually**. Exceptions may be granted for special circumstances in a case-by-case manner.

Choice of Topic and References:

1. You can find the link of the potential topics through http://nanjiang.cs.illinois.edu/cs598project.

2. The references are to help you choose the course project topic, not to put constraints on you. Feel free to choose paper(s) not listed here as long as they are related to RL and have significant theoretical components.

3. The references are roughly organized into categories. You can choose 1 or more papers from the same category, or even across categories—as long as you see a strong connection and can write a coherent report based on the selected papers. Also note that **you don't need to reproduce all the results from the paper(s).** Feel free to choose a subset of the results as long as they form a coherent story.

4. The lists can be incomplete and not representative. You should use them as seed papers and track the citations to read more. You can ask me about the quality of the papers you find, but keep in mind that **literature search is part of your work in the project**.

5. **We will do some of the topics in class.** I will mark them with ($*$). Your report needs to be significantly different from what's done in class. If you are unsure which parts/aspects of the papers will be covered, talk to me.

6. **Some papers have been popular choices in past semesters.** I will mark them with (-): You are encouraged to choose other papers. If you have to choose one of them, you will be held to a higher standard than usual—your report must include a novel extension.

Submissions:

1. You are expected to submit a short project proposal in the middle of the semester and a final report at the end of the semester.

2. The submission of the proposal and the final report will be through **Canvas**.

3. Proposals are for me to sanity-check your project. If it is submitted late, I will still try to provide feedback but this is not guaranteed. If it is submitted too late or not submitted, your final grade may be affected.

Proposal:

1. The purpose of the proposal is to give me (and yourself) a rough idea of what your final report would look like.

2. Describe briefly the background and the setting you are interested in. List the paper(s) you plan to work on. Briefly explain the main theoretical results that you want to prove.

3. A few short paragraphs are enough, and it is fine if there is still some uncertainty. For example, e.g., you do not know if Theorems A,B,C are exactly what you want to prove in the final report—that is fine. I will only need to know that you want to prove something along those lines.

Final report:

1. The report has to be compiled by **LaTeX** but there is no fixed template. If you need one, feel free to use the style files from NeurIPS (https://nips.cc/Conferences/2018/PaperInformation/StyleFiles) or similar files from any conference.

2. There is no hard limits on the number of pages. Always make things shorter and cleaner as long as it conveys the same message. For those who have long proofs in their report, you can include the full proofs at the end (like an appendix), and only highlight the proof sketch and the most interesting and insightful steps in the "main text".

3. One possible format: Briefly describe background and motivate the topic. Concisely and clearly define the setup mathematically. State and describe the main theoretical result(s). Describe major implication of the result(s): What should we care about the results and ever put in effort in proving them? Why are they significant and interesting? Include a short literature review and bibliographical remark section. Then the rest of the report is the proof, perhaps starting with some high-level ideas and proof sketch. Feel free to re-arrange the parts as appropriate.

4. You can also ignore this format if you know how to (1) write a short research paper, or (2) write a course note as if you were going to teach on the topic you choose. Follow your own judgement of what makes a good research paper / course note.

Academic Integrity:

- Even if you reproduce the results of an existing papers, **reusing large amounts of text from the cited paper is still plagiarism**. You must understand the paper and reproduce it on your own, adding your own understanding, interpretation, etc. **Paraphrasing sentences from the original paper without adding your own stuffs is not acceptable either.** As this is a PhD-level seminar course, I expect you to be aware of standard academic integrity disciplines and exercise them when you write your final report.