Autonomous Multi-Agent Systems (Spring 2020)[1]

Class Project

The class project for E6899 carries 60% of the final grade and consists of four components; i) project proposal, ii) midterm progress report, iii) final report, and iv) conference style presentation. Additionally you will need to keep a logbook to record your weekly activity. Details of each of these can be found below. The goal of this course is to encourage critical thinking and discussions about open problems in the area of multi-agent systems as well as to find novel areas of application, as such the project grade will reflect the effort put into the project and clarity of exposition, rather than progress towards a solution.

Projects should be done individually, however, groups of two will be permitted with the instructor's permission, and only if there is clear work divide. In such cases, both students will have to submit individual proposals and a progress report, but the presentation can be given jointly (and will be allocated a longer time-slot) as can the final report.

The goal of the class project is to explain, model, and analyze/control a multi-agent system. Projects may be theoretical, computational, or a mixture of both. The subject of the project may be chosen from those we discussed in class, or it could be something completely different. Applying methods we discussed in class to your own research is encouraged. Projects will likely fall into one (or more) of the following categories:

1. **Theoretical:** Developing new, or extending existing theory
2. **Computational:** Developing a software toolbox to implement existing methods
3. **Applied:** Using existing methodologies in new application areas

It is strongly encouraged that students discuss project ideas with the instructor **before** submitting the proposal.

Project structure

The proposal and two reports should all be written using LaTeX. Templates will be available on the course website.

Project proposal

The proposal should be a maximum of two pages, excluding references, in single column format and is due by **February 19**th. The proposal should include:

- Motivation for the choice of project
- Acknowledgement of prior work and relevant papers
- A clear problem statement
  - Be ambitious, but be somewhat realistic; solving the Riemann Hypothesis is probably not going to happen in this class. If possible, provide backup sub-problems that you think are achievable. Ideally, define incremental goals.

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- Deliverables
  - e.g. a software toolbox for..., an extension of a theorem to a new class of system, simulations that back up your hypothesis, constructing a network model for a new application etc.
- The approach to solving the problem

A well thought through proposal will make the project much easier and less daunting.

Midterm progress report

The progress report should be a maximum of 3 pages excluding references and is due **March 13th**. Items to include:

- Description of progress towards achieving goals set out in the proposal
  - This could include a reformulation of the problem statement or change of deliverables. State new refined or expanded goals.
- Preliminary results
  - e.g. Simulation results or observations, theoretical observations, new conjectures, solution to a restricted version of the problem, etc.
- State any difficulties you have encountered thus far
- Outline path to completion
  - List of tasks left to be completed with expected duration of each. Do you anticipate any difficulties (if so, how do you plan to handle these)?

Final report

The final report will be written in the style of a conference paper (8 pages max including references). The deadline for the final report is **May 7th**. Note this is after the presentations, this will allow you to incorporate any feedback. A conference paper is a document that stands on its own, i.e. your classmates should be able to follow it without having read the proposal and mid-term report. A conference paper format will include the following sections:

- Introduction
- Literature review
- Problem statement
- Results
- Numerical results/experiments (if applicable)
- Conclusion and future work

Presentation

Each individual project will be assigned a 20 minute presentation slot, paired projects will have 30 minutes. There will be an additional 5 minutes of questions from the audience. The presentations will take place during the last weeks of class, exact dates will depend on the number of projects. All presentation will take the form of slides, i.e. not chalk-talks.

Logbook

To encourage good research practice and to help with project management, each student should maintain a logbook with weekly entries. At a minimum, each week include the following entries:

- **Progress:** list what you have achieved this week
- **Reading:** list the papers/books/forums/etc. you read (if any)
- **Problems:** what in particular has caused you trouble? how can this be fixed?
- **Goals:** list goals for the next week
- **Impediments:** What do you foresee that may prevent you reaching the goals for next week?

Logbooks will be submitted at the same time as final project reports.