National University of Singapore
School of Computing

Semester 1, AY202122

CS4246/CS5446 AI Planning and Decision Making

Issue: 27 Aug, 2021

Project Guidelines

Important Dates

Project proposal submission: **(Monday) 27 September 2021**
Project presentation: **Week of 8 November 2021**
Project report submission: **(Monday) 22 November 2021**

Project Team

You will work on the term project in **3-person teams**[*]. Each team member, however, will be responsible for the success or failure of the entire team. Please choose your team members carefully; make sure you can work well together.

Your team may consists of members in different CS4246/5446 Tutorial groups, but the team must be able to present the project outcomes in the Tutorial session of at least ONE of the team members.

Project Topic

The term project constitutes an important and interesting part of this module. The project aims to allow you to examine a particular aspect of AI Planning and Decision Making in more depth. We encourage you to choose a project topic from one of the following 3 themes. But if you want to work on a different topic, it should be related to one or more of the planning and decision making topics covered in the module.

- AI planning and decision making for social good
- AI planning and decision making in strategic and serious games
- AI planning and decision making in automated cars or vehicles

You can choose to work on ONE of the following project types:

1. A **survey** project on a particular theme. Read several related papers, absorb and understand the papers, and write a coherent survey of the topic. In a survey, it is often useful to group related ideas together, compare and contrast methods and try to look for interesting observations that may only come from collecting all the related results together. If time allows, replicate one or more of the applications in the papers to give you hands-on experience on the topic.

[*] Due to the large class size, we allow **two-person projects** this semester only under special circumstances. Please seek **approval** from your Tutor.

2. An **exposition** project on an application. Choose an application in a theme, e.g., the Dota 2 video game, the AlphaFold drug discovery program, the Perseverance Mars Rover, and study it in depth. Explain the AI planning and decision making methods deployed, how things work, the challenges involved, the novelty and significance of the application, and a small demonstration of its capabilities, if possible.

3. An **application** project. Define a planning problem in one of the themes, and apply/extend one of the existing AI planners (deterministic, HTN, or probabilistic) or decision systems (RL, Multi-agent systems) to demonstrate how AI planning and decision making can be applied to solve the problem.

4. A **competition** entry to solve a special planning or decision making task in a common domain. You do not have to actually enter the competition, but you can demonstrate how you can apply or extend a planning or decision making controller with the access to a common simulation environment and a set of tools to solve a challenge problem.

5. For the "brave souls": A methodological or theoretical **research** project. Develop a new algorithm or propose new AI planning or decision making technique with useful properties. Examples: Integrating hierarchical and probabilistic planning. Integrating learning and decision making. Improving online planning and learning. Study and prove properties about planning algorithms. *If you choose this type of projects, come talk to me about PhD research opportunities!

Project Requirements

The project constitutes **25%** of the total marks for the course. You will be graded on the project report and the presentation only, but must submit a project proposal in order to receive a grade for the project.

Project Proposal

The length of the proposal should be *at most* **ONE(1) single-spaced, SINGLE column page with 1-in margins**, it should explain clearly what you *plan* to do, not the specifics.[†]

The proposal should give enough background to allow the audience to understand the problem and the approach. You should carefully consider what can reasonably be done within the scope of a course project. If you are doing the project with a partner, explain the division of work. You should give some deadlines on certain tasks that need to be done and do a risk assessment on the possibility that you may not achieve your aims. Remember that things will almost always turn out harder than you expected, so your plan should include intermediate milestones that can also serve as finishing points if things do not work out.

Submission: Submit the proposal through the LumiNUS QUIZ channel. CLEARLY list ALL your team members' names, metric numbers, Tutorial groups, and EMAIL addresses.

Note: You will be asked to submit a draft proposal before the due date – instructions to be announced. This is to allow the teaching team to give you feedback on the feasibility and scope of your proposal.

[†]Feel free to start preliminary discussion on your topic in the forum before the proposal deadline

Project Presentation

The oral presentation will allow you to explain your project accomplishments to the class. Each presentation should be **10 minutes** in duration, with additional **2 minutes** for questions and answers.

Project Report

Your report should be *at most* **TEN(10) single-spaced, SINGLE column pages with 1-in margins**, including all discussions, figures, tables, and references; the actual printout(s) of the probabilistic graphics models or screenshots or planning graphs, etc., can be included in an appendix. Your writing should be concise and specific, and should meet the standard of an academic technical report.

Submission: Submit the proposal through the LumiNUS QUIZ channel by the due date. CLEARLY list ALL your team members' names, metric numbers, Tutorial Groups and EMAIL addresses.

Audience

The project proposal, report and presentation should be targeted at a technical audience who are generally knowledgeable in the area but may not be familiar with the particular topic you are working on, e.g. one of the other students taking the class.

Collaboration

You are encouraged to work in three-person teams. However, you should

- Explain the division of labour in the proposal and in the final report (it is okay if the actual work division is different from the proposed work)
- Be sure that all partners understand the entire work. The teaching staff will direct questions to each of you individually during the presentation to check your individual understanding.
- Please ensure that you cite all sources of information consulted during the project.
- **Do NOT cut-and-paste nor just rephrase from any printed or online descriptions or documentations!**

Grading

- *Project report:* your report will be graded according to its organization, degree of difficulty, level of achievement, soundness, innovativeness, and clarity of writing.
- *Presentation:* your presentation will be graded according to its organization, clarity, and the ability to answer questions.

Best Project Award

The best project in class will be awarded a mystery prize at the end of the term!

Information Resources

A list of relevant information repositories is available on the CS4246 Wiki
https://github.com/cs4246/meta/wiki/07-Project-resources