

Data Science & Reinforcement Learning (Spring 2023)

Syllabus and Course Logistics

Instructor: Min-hwan Oh

- Email: minoh@snu.ac.kr
- URL: <https://minoh.io>
- Office hours: Wednesday 1:30-2:30PM, GSDS (Building #942) Rm.419

Teaching Assistants

- Wooseong Cho (wooseong_cho@snu.ac.kr)
- Kyonghyun Min (samn0065@snu.ac.kr)
- Office hours: Right after the in-class sessions

In-Class Time & Location: Friday 9:30AM–12:20PM, Building #942 Rm.302

- The pre-recorded lecture videos are posted on eTL. The lectures are taught in English. Students are expected to watch weekly assigned videos before the in-class meet-ups on Friday.
- In-class time will be spent on exercises based the lectures and programming labs. Please bring your laptops/tablets and pen/pencil.

Course Topics: With a focus on the design of decision-making agents learning from experience to predict and control their environment, topics will include

- Multi-armed bandits
- Markov decision processes
- Planning by approximate dynamic programming
- Monte Carlo and Temporal Difference Learning for prediction
- Monte Carlo, Sarsa and Q-learning for control
- Planning with a learned model
- Prediction and control with function approximation
- Policy gradient methods
- More recent techniques

Prerequisites: This class is intended to be an introductory graduate-level course. Students are expected to have a good background in elementary probability and statistics, e.g., expectations and conditional probability should not sound foreign. It is also important that students are comfortable with vector and matrix notation and are comfortable with concepts from introductory linear algebra. Students should also be familiar with Python programming since we intend to use it for labs throughout the course. Although this class is classified as a graduate-level course, any undergraduate students without the prerequisite stated above can take this course.

Textbook: We use the following required textbook:

- Sutton, Richard S., and Andrew G. Barto. *Reinforcement learning: An introduction*. MIT press, 2018.
An electronic version is freely available at: <http://incompleteideas.net/book/RLbook2020.pdf>.

When we say the textbook throughout the course, we refer to Sutton & Barto's book.

In-Class Exercises and Programming Labs

There will be in-class exercises and programming labs throughout the course. Students can **drop the lowest score of the exercises and the lowest score of the programming labs** (can only drop 1 for each, cannot drop 2 from exercises or 2 from labs). Students are welcome to work together on the exercises and labs but each student **must** write up his or her own solution and write their own code. Any student that submits a copy (or partial copy) of another student's solution will receive zero for that assignment and may receive an F grade for the entire course. For programming labs, late submission beyond the grace period will **not** be accepted.

Midterm Exam

The course will have a midterm in person unless the COVID situation does not permit. The coverage of the exam will include all the lectures up to the week of the exam. The tentative exam schedule is as follows (subject to change):

- Midterm exam date: Friday, April 21st, 9:30AM–11:00AM

Things to bring to the exam:

- Student ID (or any government-issued ID)
- Hand-written cheat sheet (1 sheet if two-sided or 2 sheets if one-sided)
- Pen/pencil
- **No electronic devices** are allowed during the exam.

Final Project

The course will have a final project. This will be a team project. The instructions about the project will be announced later in the course.

Grading

- A *tentative* grading scheme is weighted as follows:
Exercises & Programming labs 30%, Midterm Exam 30%, Final project 40%.
- There will be **NO** make-up exam or make-up assignments (exercises or labs). If a student has any conflicting schedule, it is the student's responsibility to take care of the conflicts. Final grades in this course will not be curved.

Q&A Etiquette: We encourage students to actively use the Q&A forum on eTL for any course-related questions **instead of asking questions via emails**. It is highly likely that your fellow students may have similar questions as you do. Please use English for your questions. For more confidential issues, there is an option for private questions on the Q&A forum only visible to the teaching crew.

Another good tip for getting a quick response from the teaching crew is, when asking questions, you can articulate your question such that it can be simply answered with “yes” or “no”, or some short phrase if possible. Lastly, debugging code requests **will not** be addressed.