DS-GA 3001.001
Reinforcement Learning Project

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Project

Students are asked to work in a group of 2 (min) to 4 (max), propose a reinforcement learning problem (see list of RL problems on page 2) and develop a solution. Projects will be graded by a panel of instructors who will assess several dimensions (listed below), based on both the code and a presentation in person of the problem, method(s) tested, and results.

Grading:

The project will be graded based on:

- **20**%: Demonstrated understanding of RL concepts learned in the class
- **20**%: RL agent functionality and quality of implementation (e.g., clarity of code, definition of state-action space, reward function, data or simulator chosen for the environment, program efficiency, documentation)
- **20**%: Method used to evaluate RL results, including quantitative performance analysis and graphical visualizations
- **20**%: Innovation and originality of the reinforcement learning problem addressed and the solution developed for this problem
- **20**%: Effectiveness of the presentation: Clarity of the exposition, quality of slides and report, respect of time allocation, validity of answers given to questions from the panel

Forming Groups

- You are requested to work in a group of 2 (minimum) to 4 (maximum), and responsible for forming/joining a group
- The instructional team will create a Slack channel mid-February with instructions to form groups (in short: If you don't have a group yet, just post a brief introduction of yourself or your project interests; then reply in thread to other people's posts or DM them)
- Groups need be formed and final by early March (exact date TBD): the instructional team will release an online form early-March where each group will indicate a name for their group and the names of its group members

Project Proposal

- **Due March 31st, 2025 by 8pmET**
- **Build your own proposal**: See list of recommended topics in section below. You can propose any original idea that involves implementing a reinforcement learning solution, and can focus more on the originality of the problem to solve, of the solution (for a well-known problem), of the source of data used to train the agent (simulation data), or of course you can come up with original ideas for both the problem and the solution
- **Not graded**: The proposal itself is not graded directly, but can be taken into account during the final presentation when grading *innovation and originality*
- **Proposal format**: 2 to 4 slides. There is no requirement on who in the group present(s) the proposal. Presentation of the proposal itself is optional
- **Optional in-person presentation**: Each group is invited to present 5 min in front of a panel (DS-GA 3001 RL instructional team) on [**exact date TBD**]. This presentation is informal, not graded, and optional. The goal is to benefit you = to receive feedback and advices from us, in particular on whether your proposal appears overly or insufficiently complex. You can also ask us questions about your project (total 10-15 min including Q&A)

Final Project

- **Due April 29th, 2025 by 8pmET**
- **Code**: Complete (final) code must be submitted, together with a presentation (draft), by April 29th
- **In-person presentation**: May 2nd and May 5th. In addition to your group's assigned time slot, you can also attend presentations from other groups
- **In-person presentation**: Every group will present in front of a panel (3001 RL instructional team). This presentation is formal, graded, and mandatory
- **Presentation format**: Slides, or Jupyter notebook markdown cells instead of slides. No limit on number of slides (annexes welcomed too). Length of the presentation is limited based on group size: up to 10 min for groups of two, up to 15 min for groups of three, up to 20 min for groups of four. Everyone in the group must present (at least 3 min per person). The panel may ask questions to the group for up to 10 min after the presentation

Recommended RL Problems

- Playing video games or board games
- Tuning language or vision models, reasoning (e.g., HuggingFace environment)
- Robotic application in a simulator (e.g., MuJoCo environment)
- Autonomous driving in a simulator (e.g., Carla environment)
- Financial stock trading and portfolio optimization
- Resource allocation* e.g., product placement, vaccine deployment during a pandemic, rental bike station load rebalancing, corporate workforce planning
- Web navigation and browser automation
- Cross application of existing algorithms (e.g., AlphaGo applied to NLP)
- Any problem that can be solved by reinforcement learning and that lets you demonstrate your understanding of key RL concepts learned in the class

* Fictitious datasets and simulators are accepted