Fall 2019

IT 485-005: Deep Learning for Games

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New Jersey Institute of Technology
Ying Wu College of Computing
IT 485: Deep Learning for Games

Fall 2019

Instructor

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Grader

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Course Pre-requisites

Basic Python programming: Variables, Objects, Arrays, Loops, Flow of a Program, etc.

Required Textbook

“Niko 5 Stars: I'm impressed by how close to the absolute cutting edge the author takes the reader from zero to RL researcher. I highly recommend to all who are interested in this topic”

Course Description

Games are a common way to illustrate the capabilities of particular algorithms. After beating the top human player of Go, focus has shifted to more complicated digital games like Starcraft II and DotA. Methods in reinforcement learning (RL) have shown impressive performance in these domains. In this course students will be introduced to RL through practical and hands-on applications of cutting edge algorithms that they will incrementally implement for playing games in the Arcade Learning Environment (ALE).

Course Structure

This course is cumulative in that material covered early on will be important for understanding the material covered later in the course. The course will have a midterm (15%) and final exam (15%) that together comprise 30% of the grade. The final project (15%) and its write-up (10%) and presentation(5%) worth 30% of the grade. Homework (20%), class participation (10%), and quizzes (10%) comprise the remaining 40% of the grade. Homework will be working toward combining state-of-the-art algorithms in RL with a new type of algorithm called a quality diversity (QD) algorithm to generate a variety of diverse solutions to playing games in the Arcade Learning Environment. Students will be expected to write up their approaches and present them in class. Students are expected to work individually.

Learning Objectives

- Demonstrate proficiency with python, PyTorch, and Google Colab
- Demonstrate how to structure problem in reinforcement learning
- Demonstrate applied knowledge of Q-Learning, Deep Q-Learning, Policy Gradients, the Actor-Critic Method, PPO, and the methods necessary for AlphaGo Zero
- Demonstrate aptitude in scientific writing in Overleaf

Important Dates

- Last Day of Add/Drop: Friday, September 13, 2019
- Midterm Date: Tuesday, October 15, 2019
- Withdrawal Deadline: Monday, November 11, 2019
- Final Presentations (1): Thursday, December 5, 2019
- Final Presentations (2): Tuesday, December 10, 2019
- Final Exams Begin: Saturday, December 14, 2019
- Out Final: TBD
- Final Exams End: Friday, December 20, 2019
- Grades Due: Sunday, December 22, 2019

**Course Grades**

A : [90, 100]
B+: [85,90)
B : [80,85)
C+: [75,80)
C : [70,75)
D : [60,70)
F : [0,60)

**Components of a Course Grade**

10% Quizzes
10% Participation
15% Midterm
15% Final
20% Homework
15% Final Project
15% Final Project Writeup and Presentation

Grading Explanation

- Quizzes (10%): Quizzes can be submitted and corrected an unlimited number of times until the deadline. The best score will be taken as the grade for the quiz.
- Participation (10%): Participation will be graded based on forum postings.
- Midterm and Final (30% = 15 * 2): The exams will cover all of the material presented in class and the assignments in addition to what is covered in the book.
- Homework (20%): Homework will be programming-based, introduced incrementally throughout the course.
- Final Project (30%): The final project will combine techniques implemented in homework assignments with an existing implementation of a quality diversity algorithm. Students will be expected to compare and contrast the performance of several different methods.

Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:


Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Office of Accessibility Resources & Services
If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director of the Office of Accessibility Resources & Services (OARS), Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the OARS authorizing your accommodations will be required.

Please note that the instructor reserves the right to alter the syllabus.