Reinforcement Learning

REL301m

Prerequisites

□ **Completed:**

- ◆ AIL303m

- ◆ DPL302m

Course Objectives

- ☐ Understand The K-Armed Bandit Problem

- ☐ Understand Estimating Action Values

- ☐ Understand Exploration vs. Exploitation Tradeoff

- ☐ Introduction to Markov Decision Processes

- ☐ Understand Goal of Reinforcement Learning

Course Objectives

- Understand Continuing Tasks

- Understand Policies and Value Functions

- Understand Bellman Equations

- Understand Optimality (Optimal Policies & Value Functions)

- Understand Policy Evaluation

Course Objectives

- Understand Policy Iteration (Control) Understand

- Understand Generalized Policy Iteration

- Introduction to Monte-Carlo Methods

- Understand Monte-Carlo for Control

- Understand Exploration Methods for Monte-Carlo

Course Objectives

- Off-policy learning for prediction

- Introduction to Temporal Difference Learning

- Advantages of Temporal Difference

- Temporal Difference for Control

- Off-policy Temporal Difference Control: Q-learning

Course Objectives

- Define model in Reinforcement Learning

- Define Planning in Reinforcement Learning

- Dyna as a formalism for planning

- Dealing with inaccurate models

- Estimating Value Functions as Supervised Learning

Course Objectives

- The Objective for On-policy Prediction

- The Objective for Temporal Difference

- Linear Temporal Difference

- Feature Construction for Linear Methods
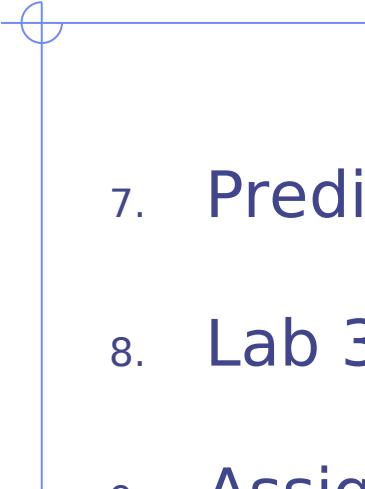
- Episodic Sarsa with Function Approximation

Course Objectives

- Exploration under Function Approximation

- Understand Average Reward

- Learning Parameterized Policies

- Policy Gradient for Continuing Tasks

- Actor-Critic for Continuing Tasks

- Policy Parameterizations

Course Plan

1. Fundamentals of Reinforcement Learning

2. Lab 1

3. Assignment introduction 1

4. Sample-based Learning Methods

5. Lab 2

6. Assignment Introduction 2

Course Plan

7. Prediction and Control with Function Approximation

8. Lab 3

9. Assignment Introduction

10. Guided Project Create a Tic-Tac-Toe game in Python

11. Quiz

Course Plan

10. Assignment grading

11. Review course

Materials/ References

- Fundamentals of Reinforcement Learning

- Sample-based Learning Methods

- Prediction and Control with Function Approximation

- A Complete Reinforcement Learning System

- Guided Project: Create a Tic-Tac-Toe game in Python

Learning Environments

- □ GitHub, Jupyter Notebooks, and Google colab

- □ Coursera lab

Course Rules

How to conduct

- Prepare contents of the next session/ topic at home

- Following lessons in classrooms

- Completing chapter assessments in time and Quizzes

Communication

- Class/Interchange by FU-HCM CMS, Forum

- Discussing actively in your teams and in classrooms

Evaluation Strategy

❑ Must attend more than 80% of contact hours (if not, not allow to take exam).

❑ Evaluating
  - 1 Progress Test (Q)   10 %
  - 3 Labs   30 %
  - Assignment   30%
  - Final Exam (FE)   30 %

❑ Total score
  - 10% (Qiz)+ 30%(lab) + 30% (Assignment) + 30% (FE)

❑ Pass
  - Total score ≥ 5 and Final Examination ≥ 4 (of 10)
  - Every components > 0

How to study

- This course is **complex knowledge** (**however**, it's **attractive and exciting**), so you need to keep tight grip on it
  - **Read**
    - On the books to get the general concept
    - Reference, study, collection from anywhere else (internet, your classmates, forum …)
  - **Attend lectures**
    - Listens, understand, then make your own notes
    - Give your explanation about some topic in lectures/ Ask questions
    - Give some examples that are not existed in your book
    - Practice all the exercises, demo to make your sense

How to study

- **After classes**

  - Discuss with your classmate in directly, on forum

  - Do the lab, assignments to submit via CMS, and do more exercises

  - Build your teams in yourselves to support together in studying

How to exam/test

□ This course is **required following rules**, so you **need to focus and practice** your exercises and homework in try your best everyday

- Progress Tests
  - ◆ **No** books
  - ◆ **No** conversations
- Workshop/Assignment
  - ◆ **Not** copy (copy code, contents, style)
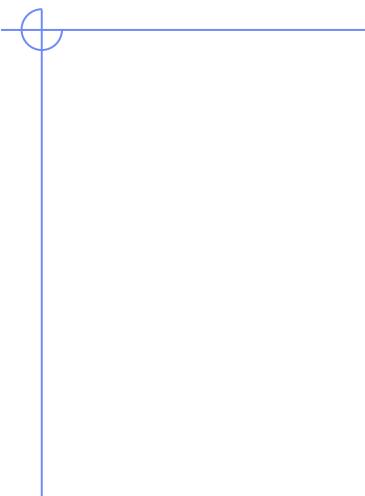
Academic policy

- ☐ Cheating, plagiarism and breach of copyright are serious offenses under this Policy.
  - ▪ Cheating
    - ◆ Cheating during a test or exam is construed as talking, peeking at another student's paper or any other clandestine method of transmitting information.
    - ◆ Cheating during in making lab and assignment as copy source code, copy style, same meaning in progress, …

Academic policy

- Cheating, plagiarism and breach of copyright are serious offenses under this Policy.

  - Plagiarism

    - Plagiarism is using the work of others without citing it; that is, holding the work of others out as your own work.

  - Breach of Copyright

    - If you photocopy a textbook without the copyright holder's permission, you violate copyright law.

Enjoy the Course

- Be enthusiastic about the material because it is interesting, useful and an important part of your training.

- Our job is to help you learn and enjoy the experience.

- We will do our best but we need your help.

- So, let's all have fun together with DAP391m!!!

Q & A