Student Evaluation

Student Name: Nengxin Mou

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Information:
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Overview

CIS (Center for Interdisciplinary Scholarship) is one of the most influential global programs for young scholars, focusing on selecting and nurturing scholars with interdisciplinary research and innovation capabilities. CIS proposes a teaching philosophy that transcends professional and academic boundaries, centering on a two-semester inquiry-based learning model aimed at solving real-world problems. Throughout the process, students receive in-depth guidance from a top-tier university professor. In the first phase, students are expected to master a multidisciplinary knowledge structure and develop interdisciplinary research skills, while in the second phase, they collaborate with their mentor to complete an original research project.

Course Description
(Optimal Control and Planning via Dynamic Programming and Reinforcement Learning)

This course introduces modeling frameworks and computational algorithms to address complex decision-making problems that arise in operations research and machine learning.

We cover linear, integer, nonlinear, and stochastic optimization methods. The technical discussions are motivated by a rich set of real world applications from transportation,matching, scheduling, and machine learning.

Roughly speaking, the first week consists of (1)The teaching of new technical topics (2)Critical analysis of assigned research papers, and (3)Narrowing down research plan. In the second week,

students will focus on their own research projects. A final presentation will happen on the last day of the course.

Student Learning Outcomes:

By the end of this course, students should have achieved these goals

1. Refined Python programming skills; application of mathematical concepts from basic linear algebra and calculus.

2. Understanding the mathematical foundations of popular analytical tools on the market today, e.g., optimization, deep learning.

3. A framework to formulate and analyze quantitative decision problems, which entails

(a) identifying components of decision problems that are (not) susceptible to analytical modeling, and selecting the appropriate tools (e.g., learning, simulation, optimization),

(b) translating decision problems to logical, mathematical formulations, and clearly identifying the input, output, main assumptions, and machinery used to map from input to output,

(c) translating these mathematical descriptions into efficient computational language

(d) making sense of the analysis, and applying findings back to the decision problem context in business and policy in human language.

4. Soft skills: Teamwork skills for analytical projects. Presentation skills.

Overall performance during program

Nengxin's performance during the program was commendable. He demonstrated a solid understanding of the research concepts and techniques taught and consistently applied them effectively in his project work.

TA's Evaluation

Nengxin made substantial contributions to the project through his excellent research synthesis and documentation abilities. In the project's initial phases, his comprehensive literature review of state-of-the-art reinforcement learning algorithms demonstrated both strong English language proficiency and analytical capabilities. His writing skills were particularly evident in the development of the paper's introduction and literature review sections, where he effectively contextualized complex technical concepts. Nengxin's visual communication abilities shone through in his creation of detailed architectural diagrams and workflow charts, which clearly illustrated the team's deep learning framework and methodology. His active participation in group discussions was

characterized by thoughtful insights and pertinent questions that enhanced the team's understanding and approach. Beyond his documentation responsibilities, his ability to synthesize and communicate technical information effectively made him a valuable bridge between technical implementation and project documentation. His combination of strong research capabilities, clear communication skills, and engaged participation significantly contributed to the project's academic quality and team dynamics.

Professor's Evaluation

Nengxin Mou worked on a 2D obstacle avoidance and path finding model, motivated by field search and rescue robots. The output of the model is a path to go from origin to destination, going around obstacles, with minimal cost. This is a model-based setup – agent knows the entire environment ahead of time. The authors evaluated Deep Q-Learning (DQL), Proximal Policy Optimization (PPO), Advantage Actor-Critic (A2C), and Deep Q-Network (DQN) methods. Numerical findings highlight DQL's superiority in success rate, average reward, and stability.

Throughout the program and project development, the group was able to come up with concrete problem statements, design computational environments, and implement various algorithms very quickly and independently. They take good initiative in completing the project.

Sincerely,

Peter Zhang

Regards

This project demonstrates your motivation, quick ability to study, and ability to formulate and solve a practical problem with your skills in optimization. Please do not hesitate to contact us if you need us in your future study.