CIS 5590. Special Topics Course. Spring 2024

Artificial General Intelligence

Syllabus

Instructor

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Course description

In recent years, an emerging field of "artificial general intelligence (AGI)" has has been formed by researchers who believe the necessity and possibility of treating AI as one problem, rather than as a collection of loosely related problems. This CIS Special Topic Course on AGI will cover the major topics in this field, such as

- Objectives and definitions
- Theoretical restrictions
- Strategies and techniques
- Safety and ethics issues

Given the current diversity in opinion and practice in the field, the course will be organized around the instructor's own AGI project, NARS (Non-Axiomatic Reasoning System). While the aspects of NARS are introduced, the related AGI problems will be analyzed, as well as the alternative solutions proposed by other researchers. The lectures will be accompanied by reading, discussion, and projects. With the help of the instructor, each student will select a topic for a course project, which can be

- Implementation of a subset of a particular AGI model
- Evaluation of the cognitive capabilities of an AGI system
- Theoretical analysis of an important problem in AGI from a new perspective

This will be a graduate-level course, and undergraduate students need the permission of the instructor to enroll.

Prerequisites

- CIS 1166 and 2166 (Mathematical Concepts in Computing)
- CIS 2033 (Computational Probability and Statistics)
- CIS 1068 and 2168 and 3223 (Programming, Data Structure, and Algorithms)
- CIS 2229 or 3207 (Operating System)
- CIS 3203 or 4526 (Artificial Intelligence or Machines Learning)

Students who do not fully satisfy the above requirements need the permission of the instructor to enroll.

Course Objective

- To give students a broad understanding of the basic problems and the proposed solutions in AGI.
- To give students a detailed understanding of NARS and the related AGI problems.
- To give students research experience in AGI by exploring selected topics in depth.

Lecture Schedule (tentative)

1. Objective and Strategy
2. Reasoning System and Logic
3. Rationality and Validity
4. Measurements of Uncertainty
5. Syntax and Semantics
6. Inference Rules
7. Memory and Control
8. Concept and Learning
9. Implication and Derivation
10. Symbol and Formal Model
11. Prediction and Explanation
12. Problem Solving and Decision Making
13. Self-monitor and Self-control
14. Scope and Boundary

Teaching Materials

- Main textbook: *Non-Axiomatic Logic: A Model of Intelligent Reasoning*, Pei Wang, World Scientific Publishing, 2013. [The draft of a revised edition of the book will be made accessible to the students.]
- There will be additional papers to read and/or open-source software to experiment.

Grade

- weekly assignments: 40%
- course project: 40%
- participation: 20%