About this course

Knowledge representation and reasoning (KRR) is one of the fundamental areas in Artificial Intelligence. It is concerned with how knowledge can be represented in formal languages and manipulated in an automated way so that computers can make intelligent decisions based on the encoded knowledge. KRR techniques are key drivers of innovation in computer science, and they have led to significant advances in practical applications in a wide range of areas from Artificial Intelligence to Software Engineering. In recent years, KRR has also derived challenges from new and emerging fields including the semantic web, computational biology, and the development of software agents. This is a graduate-level course that introduces fundamental concepts as well as surveys recent research and developments in the field of knowledge representation and reasoning.

Specific topics covered include:
- Classical logic and knowledge representation
- Answer set programming
- Reasoning about actions and planning
- Ontology, Semantic Web languages, and knowledge graph
- Combining logic and probability

Required prior knowledge and skills

- Programming
- Classical logic
- Statistics
- Algebra

Learning Outcomes

Learners completing this course will be able to:
- Discuss the foundations of KRR
- Explain different categories of representation and reasoning tasks
- Assess the tradeoff between representation and reasoning
- Identify which knowledge-based techniques are appropriate for which tasks
- Apply KRR systems to challenging real-world problems

Estimated Workload/Time Commitment Per Week

15 - 20 hours per week

Technology Requirements

Hardware - Standard
Software and Other (programs, platforms, services, etc.) - Clingo, protégé
Joohyung Lee
Joohyung Lee is a tenured associate professor in the School of Computing, Informatics and Decision Systems Engineering at ASU, where he has led the Automated Reasoning Group since 2005. He is interested in designing and building intelligent systems, which can perform automated reasoning based on the knowledge represented in a formal language, thereby intelligently handling open-ended tasks by "thinking." He has been working on knowledge representation, logic programming, commonsense reasoning, reasoning under uncertainty, cognitive robotics, computational logics, security, and question answering. His research has been supported by the National Science Foundation, Department of Defense, IARPA, Siemens, Bosch, and ETRI. He is a recipient of Outstanding Paper Honorable Mention Award from AAAI 2004. He received his Ph.D from the University of Texas at Austin.