CSE 579 Knowledge Representation and Reasoning (Tentative)

Time and Place MW 12:15 – 1:30 pm, BYAC 110

Instructor Joohyung Lee (joolee@asu.edu)

Instructor's Office Hours TBD

Description 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 which will introduce basic and recent developments in the research in knowledge representation and reasoning.

Objectives Students who complete this course

- will understand the foundations of KRR and the tradeoff between representation and reasoning
- will understand which knowledge-based techniques are appropriate for which tasks;
- can apply KRR systems to their research and challenging problems;
- can write a research paper related to knowledge representation.

Reading Materials Handouts and reading materials will be distributed. In addition, we will read some chapters from:

- Knowledge representation and reasoning. Ronald Brachman and Hector Levesque. Morgan Kaufmann Publishers. (Online copy is available from the ASU Library)
- Handbook of knowledge representation. Edited by Frank van Harmelen, Vladimir Lifschitz, and Bruce Porter. Elsevier Science.

- Semantic Web Primer, **3rd edition**. Antoniou *et al.*. The MIT Press.

Topics

1. Classical logic and knowledge representation
2. Logic programming and answer set programming
3. Reasoning about actions and planning
4. Ontology, linked data and the Semantic Web
5. Probability: Bayesian networks, Markov networks
6. Combining logic and probability: Markov Logic, Probabilistic Soft Logic, LP^{MLN}
7. Applications of KRR

Grading The grade will be determined by class participation, two midterms, homework and one project.

Class participation	15%
Two midterms	15% + 15%
Homework	25%
Project	30%

Class Participation For problems announced for class discussion, you are expected to volunteer to present a solution to some problem at some times during the semester; in this way you get credit for class participation. This should be a solution that you found by yourself, without help from others.

Homework Several times during the semester you will receive e-mail messages with homework problems. When you work on these additional problems, you may consult the materials handed out in class and your notes, but not any books, and you should not accept any help.

Project The project is individual, or up to two people are allowed in a team. You may choose your own topic, or the instructor will assist you in selecting one. It is better to contact him early.

Initial proposal	10%
Survey, progress report	30%
Final report	60%

The syllabus is subject to change if necessary.