ECE 4420/6420: Knowledge Engineering
Section 001
FALL 2020

MEETING TIME: Tue., Thu. 08:00 AM - 09:15 AM

MEETING LOCATION: Clemson Campus | Business Building | Room 225

INSTRUCTOR(s): Ao Ren, Office (TBD), aren@clemson.edu, 315-439-9652

OFFICE HOURS AND PROCEDURES: Wed. 08:00 AM - 09:30 AM, Online (Tentative)

COURSE MODALITY: HYBRID

COURSE DESCRIPTION: Introduction to the theoretical and practical aspects of knowledge engineering or applied artificial intelligence (AI). Topics include symbolic representation manipulation, knowledge structures and ontologies, unification, constraint satisfaction, production systems and structures, rule-based and expert systems, planning, machine learning, and biomimetic approaches.

COURSE PREREQUISITES: ECE 3170 or MATH 4000 or STAT 3090

STUDENT LEARNING OUTCOMES:

At the completion of the course, students should be able to:

- gain knowledge about the evolution of Artificial Intelligence (AI) and Intelligent Systems (IS)
- gain knowledge about techniques used to represent symbolic knowledge
- gain knowledge about logical reasoning and uncertainty reasoning
- gain knowledge about machine learning and deep neural networks
- understand core AI research as reflected in ECAI, IJCAI, AAAI

REQUIRED MATERIALS:

Recommended Textbooks:

- Brachman & Levesque, *Knowledge Representation & Reasoning* (optional, available online)
- Schalkoff, R.J., *Intelligent Systems: Principles, Paradigms and Pragmatics* (optional)

All students are required to have a laptop computer, internet connectivity capable of transmitting and receiving video, a video camera, a microphone, and a cell phone.

TOPICAL OUTLINE:

Tentative syllabus:

- Introduction
- Artificial Intelligence and Knowledge Engineering
- Propositional logic and inference
- First order logic and inference
- Ontologies and representation of Domain Knowledge
- Model-based reasoning
- Modeling uncertainty and uncertainty reasoning
- Planning and decision making
- Machine learning
- Artificial neural networks
- Advanced topics in AI
- Presentation I: advanced topics in knowledge representation and machine learning
- Presentation II: advanced topics in knowledge representation and machine learning
- Presentation III: advanced topics in knowledge representation and machine learning
- Presentation IV: advanced topics in knowledge representation and machine learning

CLASS CANCELLATION POLICY: Class is cancelled if the instructor is more than 15 minutes late to class

GRADING POLICY:

Grades:

- Four assignments (40%)
- Final project: report (20%) and presentation (20%)
- Final take-home test: 20%

Grade scale is 90-100 A, 80-89.9 B, 70-79.9 C, 60-69.9 D, 50-59.9 F. The final scores of undergraduates and graduates will be weighted separately.

ATTENDANCE POLICY:

1. The university will assign students a day of the week they are to come this class; on other days, they must attend online.
2. The attendance is optional on days students are to come physically.
3. Online attendance is optional.
4. I will notice you before if there will be a class cancellation due to a COVID-19 test day.
   Refer to: https://newsstand.clemson.edu/covid-19-testing-plans-finalized-for-students/?_ga=2.136835129.823683436.1597069365-222093310.1585771250
5. Please use the Notification of Absence module in Canvas or email to inform the instructor of student absences.
6. To maintain physical distancing, individuals arriving first to the classroom should sit farthest from the door. Similarly, at the conclusion of class, students closest to the door should leave first.
7. While on campus, face coverings are required in all buildings and classrooms. Face coverings are also required in outdoor spaces where physical distance cannot be guaranteed. If a student does

not have a face covering or refuses to wear an approved face covering without valid documented accommodation, the instructor will ask the student to leave the academic space and may report the student's actions to the Office of Community & Ethical Standards as a violation of the Student Code of Conduct. If the student's actions disrupt the class to the extent that an immediate response is needed, the instructor may call the Clemson University Police Department at 656-2222.

8. Please note that the University may convert to a purely online mode at any time. University classes are initially in a purely online mode and will remain so until Sept. 21.

ACCESSIBILITY STATEMENT: Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to a class should let the instructor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848 or by emailing studentaccess@lists.clemson.edu. Students who receive Academic Access Letters are strongly encouraged to request, obtain, and present these to their instructors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information here: http://www.clemson.edu/campus-life/campus-services/sds/.

TITLE IX STATEMENT: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972.

USE OF ANIMALS/HUMAN SUBJECTS: See http://www.clemson.edu/research/compliance/iacuc or http://www.clemson.edu/research/compliance/irb/

SAFE CAMPUS: Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

a. Ensure you are signed up for emergency alerts (https://www.getrave.com/login/clemson)
b. Download the Rave Guardian app to your phone (https://www.clemson.edu/cusafety/cupd/rave-guardian/)
c. Learn what you can do to prepare yourself in the event of an active threat (http://www.clemson.edu/cusafety/EmergencyManagement/)

ACADEMIC INTEGRITY: As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a

Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity. Further information on Academic Integrity can be found in the *Undergraduate Announcements* and in the *Graduate School Policy Handbook*.

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MODIFICATION STATEMENT: The instructor reserves the right to modify any aspect of the syllabus at any time during the semester for reasons including but not limited to COVID-related situations. (08/10/2020)