Introduction to AI – Probabilistic Reasoning and Decision Making

Department: Fudan International Summer Session

Course Code	ECON170026		
Course Title	Introduction to AI – Probabilistic Reasoning and Decision Making		
Credit	2	**Credit Hours**	36+3 tutorial hours (one credit hour is 45 minutes)
Course Nature	□Specific General Education Courses □Core Courses ☑General Education Elective Courses □Basic Courses in General Discipline □Professional Compulsory Courses □Professional Elective Courses □Others		
Course Objectives	• Describe and use different probabilistic models including Bayes Nets and EM algorithm • Apply probabilistic models to solve real-world problems • Design specific models for AI tasks • Perform inference using probabilistic models • Prove relationships between probabilities under different models • Implement core algorithms of different models • Describe how agents learn from data using maximum likelihood learning • Identify ethical concerns related to AI		
Course Description	This course will introduce students to the probabilistic and statistical models at the heart of modern artificial intelligence. Possible topics to be covered include: probabilistic methods for reasoning and decision-making under uncertainty; inference and learning in Bayesian networks		

Course Requirements:

Prerequisites are elementary probability, statistics, linear algebra, and calculus, as well as basic programming ability in some high-level language such as C, Java, Matlab, R, or Python. Programming assignments are completed in the language of the student's choice. Students should satisfy the pre-requisites before enrolling this class as AI classes are math heavy.

Teaching Methods:

Lectures

Instructor's Academic Background:

Dr. Cao Yingjun received his Ph.D. in Computer Engineering from Duke University (Durham, NC, USA). His primary research interest is Computer Science Education with a focus on collaborative learning. He is also involved in more traditional research on network data analysis and distributed learning. Dr. Cao has been teaching in the Department of Computer Science & Engineering at the University of California, San Diego since 2015.

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Course Schedule (Tentative, subject to change):

Day 1: Course overview, Modeling uncertainty, review of probability.
Day 2: Examples of probabilistic reasoning.
Day 3: Belief networks: from probabilities to graphs.
Day 4: Conditional independence, d-separation.
Day 5: Inference in polytrees and loopy networks.
Day 6: Learning, maximum likelihood estimation.
Day 7: Naive Bayes and Markov models.
Day 8: Latent variable models, EM algorithm.
Day 9: Examples of EM algorithm.
Day 10: Estimating Noisy-OR parameters with EM
Day 11: Other AI topics (such as HMM or Q-learning)
Day 12: Final Exam

The design of class discussion or exercise, practice, experience and so on:

Exercise and practice

Grading & Evaluation:

Your final grade will be determined via the following percentages:
Lecture participation points: 5%
Homework: 40%
Final: 45%

Important grading policies:

- You must score at least 55% on the final exam to pass the course. If you score lower than 55% on the final, you will receive an F for the course, regardless of your overall average.
- You must score at least 55% overall for the homework assignments.
- All homework should be done individually.
- According to Fudan University's policy, there is a threshold on the percentage of students who may receive A or A- in a class. Please keep this policy in mind.
- There will be no make-up exam

Teaching Materials & References:

- Artificial Intelligence: Foundations of Computational Agents, 2nd ed. by Poole and Mackworth. An online version of this textbook can be found on the publisher's website: https://artint.info/2e/html/ArtInt2e.html
- Artificial Intelligence: A Modern Approach, 3rd ed by Russell and Norvig.