

COMPSCI 240: Reasoning under Uncertainty

I. COURSE CATALOG

Development of mathematical reasoning skills for problems that involve uncertainty. Counting and probability: basic counting problems, probability definitions, mean, variance, binomial distribution, discrete random variables, continuous random variables, Markov and Chebyshev bounds, Laws of large number, and central limit theorem. Probabilistic reasoning: conditional probability and odds, Bayes' Law, Markov Chains, Bayesian Network, Markov Decision Processes.

II. COURSE DESCRIPTION

The goal of this course is to help students develop mathematical reasoning skills for problems that involve uncertainty. Each concept will be illustrated by real-world examples and demonstrated through in-class and homework exercises. Topics covered include counting and probability: basic counting problems, probability definitions, mean, variance, binomial distribution, discrete random variables, continuous random variables, Markov and Chebyshev bounds, laws of large numbers, and central limit theorem, as well as probabilistic reasoning: conditional probability and odds, Bayes' rule, game theory, Markov chains, and Bayesian networks. We will cover the basics of estimation theory and linear/binary regression if time permits.

III. COURSE DETAILS

Instructor: Andrew S. Lan, andrewlan@cs.umass.edu

Office hours: CS230, Wednesdays 5-6pm

TAs: TBD

Class meeting time: MWF 9:05-9:55am, Bartlett 65

Credits: 3 **Prerequisites:** COMPSCI 187 and MATH 132, with grade "C" or above

Textbooks (optional):

Introduction to Probability, 2nd Edition by Dimitri P. Bertsekas and John N. Tsitsiklis

Discussion sessions: Run by TAs, details TBD

Homework submission: Gradescope, details TBD. Late submissions will not be accepted. All homeworks due midnight on the due date.

IV. GRADING (TENTATIVE)

- Weekly quizzes, 10%
- 6 homework, 30%
- In-class midterm exam, 30%
- Final exam, 30%
- Grading scale: **tentative and subjective to change without prior notice:** A: 90-100%, A-: 85-90%, B+: 80-85%, B: 75-80%, B-: 70-75%, C+: 65-70%, C: 60-65%, C-: 55-60%, D+: 50-55%, D: 40-50%, F: 40% and below

V. ACCOMMODATION STATEMENT

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

VI. ACADEMIC HONESTY STATEMENT

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent. See <https://www.umass.edu/honesty/>.