CSE 312 Foundations II

1. Introduction

Autumn 2013

W.L. Ruzzo

University of Washington
Computer Science & Engineering

CSE 312, Au '13: Foundations of Computing II

Lecture:	MGH 241 (schematic)	MWF	1:30-2:20	
Section A:	MGH 242 (schematic)	Th	1:30-2:20	Sonya Alexandrova
Section B:	MGH 228 (schematic)	Th	2:30-3:20	Scott Lundberg
Section C:	MEB 243 (schematic)	Th	12:30-1:20	Yanling He

		Office Hours		Location	Phone
Instructor:	Larry Ruzzo, ruzzo@cs	F	2:30-3:20	CSE 554	543-6298
TAs:	Sonya Alexandrova, sonyaa@cs	M	4:30-5:30	CSE 216	
	Scott Lundberg, slundl@cs	Tu	4:30-5:30	CSE 2xx	
	Yanling He, heyl@cs	M	3:30-4:30	CSE 2xx	

Course Email: cse312a_au13@uw.edu. Staff announcements and general interest student/staff Q&A about homework, lectures, etc. The instructor and TA are subscribed to this list. Enrolled students are as well, but probably should change their default subscription options. Messages are automatically archived.

Discussion Board: Also feel free to use Catalyst GoPost to discuss homework, etc.

Catalog Description: Examines fundamentals of enumeration and discrete probability; applications of randomness to computing; polynomial-time versus NP; and NP-co

Prerequisites: CSE 311; CSE 332, whic concurrently.

Credits: 4

Learning Obj intro basic expressing and properties of designing and analyzing (4) some basic methods of statistics and their use in a computer science & engineering context.

Grading: Homework, Midterm, Final. Possibly some quizes, small programming assignments. Overall weights 55%, 15%, 30%, roughly.

Late Policy: Assignments are due at the start of lecture on the due date, either on paper or electronically. Late papers/e-turnin will be accepted (but penalized 25%) up to the start of the next lecture; not accepted thereafter, barring major emergencies.

Extra Credit: Assignments may include "extra credit" sections. These will enrich your understanding of the material, but at a low points per hour ratio. Do them for the glory, not the points, and don't start extra credit until the basics are complete.

Collaboration: Homeworks are all individual, not group, exercises. Discussing them with others is fine, even encouraged, but *you must produce your own homework solutions*. Follow the "Gilligan's Island Rule": if you discuss the assignment with someone else, don't keep any notes (paper or electronic) from the discussion, then go watch 30+ minutes of TV (Gilligan's Island reruns especially recommended) before you continue work on the homework by yourself. You may *not* look at o people's written solutions to these problems, not in notes, not in the dorm files, not on the inte doubt about whether your activitie *tell us before*, not after, v the UW CSE Acad

Textbook

, Dimitri P. , Athena Scientific, ook Store, Amazon, etc.)

Empiricism:

1. Relying on observation and experiment, esp. in the natural sciences
2. A former school of medical practice founded on experience *without the aid of science or theory*

Synonym: Quackery, Charlatanry

merriam-webster.com

Study Probability!

"Life is uncertain. Eat dessert first."

-- Ernestine Ulmer

syllabus

Counting & Binomial Coeffs: (1wk)

- Sum and product rules, product trees, Permutations and Combinations, Inclusion-Exclusion, Binomial Theorem, Pigeonhole Principle

Probability (5 wks)

- Basics: Sample spaces, events, (e.g. coins, dice, cards, program bugs?)
- Conditional probability & Bayes theorem, ex: false positive/negative, spam detection
- Random variables: independence, expectation, linearity of expectation, variance
- Bernoulli trials, binomial, multinomial? distributions; Poisson approximation
- Tail bounds (Markov, Chebyshev, Chernoff)
- Continuous random variables; exponential and normal, central limit theorem
- Applications: average case vs random algs, hashing, fingerprinting, load balancing, entropy and data compression

Statistics (3 wks)

- Parameter estimation: confidence intervals, bias; maximum likelihood: binomial, normal, EM
- Hypothesis Testing: likelihood ratio, t-test, contingency tables & chi-squared test?
- Monte-Carlo simulation, polling and sampling?
- Bayesian estimation, Bayes classifier, machine learning
- How to lie with statistics

CSE applications (some examples)

- Performance analysis: "events" happen randomly, unpredictable failures, unpredictable arrival of data, varying workloads, ...
- "Knowledge discovery," data mining, AI, ...

  statistical descriptions of patterns in data
- Scientific data analysis: measurement errors and artifacts
- Uncertainty: navigation and control with noisy sensors, ...
- Algorithm design and analysis: sometimes a randomized approach is simpler or better than any known deterministic one.

Read the paper, listen to the news, surf the web. You'll be bombarded with statistics – most of it phrased so as to bias the conclusion they hope you will draw.

Defend yourself!