공학수학 2

C. Kim
2018

Basics

- Professor: Chong-kwon Kim (김종권), BIdg 302 Room 331
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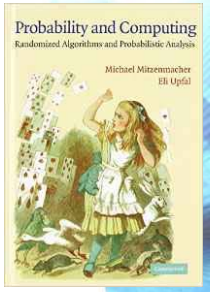
- TAs
  - 강온유 (onyukang@popeye.snu.ac.kr)
  - 최지호 (jihochoi@popeye.snu.ac.kr)
- Office Hours (면담시간)
  - mon/Wed: 10:00 ~ 10:50, 13:30 ~ 14:30
- Homepage: http://popeye.snu.ac.kr
- Text book
  - M. Mitzenmacher and E. Upfal, "Probability and Computing: Randomized Algorithms and Probabilistic Analysis", 2005, Cambridge Univ. Press.
- References
  - S. Ross, "A First Course in Probability", 2014, 9th Ed. Pearson
  - S. Ross, "Introduction to Probability Models", 2014, 11th ed. Academic Press



Class Organization

- Probability is one of most important tools that forms the foundation of Computer Science. Its importance is ever increasing as many big data analyses and machine learning algorithms are rooted in probability and statistics. In this class, we will learn several key concepts of probability that are important in Computer Science. Because many students already have basic knowledge on probability, this class addresses advanced topics after quick review of basic concepts. The topics include 1) Events & probability, 2) Discrete random variables and expectation, 3) MGF, 4) Markov/Chebyshev/Chernoff bounds, 5) Poisson distribution and Poisson approximation, 6) The probabilistic methods, 7) Discrete/Continuous Markov chain, 8) Poisson process, 9) Monte Carlo method. Along with the fundamental concepts, you will learn several examples that show how probability is applied to solve important CS problems such as hashing, sorting, graph problems, 2-/3-SAT, Random walk, PageRank, Queueing theory, DNF, and etc.

Grading

- Grading
  - Midterm – 30%
  - Final – 40%
  - Quiz - 20%
  - Attendance – 10%
- Grade Distribution (Expected)
  - A - 35%
  - B - 35%
  - C & D - 30%
- Important dates (tentative)
  - Midterm Exam.: April 18
  - Final Exam: June 11
  - Quiz: 3/19, April 4, May 3, May 23

Fine Prints

- A student will get an F if s/he
  - Misses midterm or final exam without acceptable reasons
  - Misses two or more Quizs
  - Misses more than 10% of classes
    - Three late attendances = 1 absence
  - Any types of plagiarism or trust break

- Supplementary classes (보강)
  - Mondays at 19:00

Original Dates	Supp. Class Dates
May 7	April 30
June 6	May 14
June 13	May 28

Topics & Schedule (Will revise)

- Wee1: Random variables, mean, variance
- Week 2: Discrete random variables and expectation
- Week 3/4: Tail bounds: Markov, Chebyshev
- Week 5: MGF, Chernoff
- Week 6/7: Balls & Bins Model, Poisson distribution
- Week 8/9: Poisson approximation, Random graphs, Hashing, Bloom filter
- Week 10/11: The probabilistic method (?)
- Week 12: The Lovasz local lemma (?)
- Week 13/14: Markov chains
- Week 15: Monte Carlo

Reading Assignments

- [3/05] Section 1.1, 1.2
- [3/07] Section 1.3
- [3/12] Section 2.1, 2.2
- [3/14] Section 2.3, 2.4, 2.5
- [3/19] Section 3.1, 3.2, 3.3
- [3/21] Section 3.3, 3.4
- [3/26] Section 4.1, 4.2
- [3/28] Section 4.2, 4.3
- [4/02] Section 4.3, 4.4
- [4/04] Section 5.1, 5.2, 5.3
- [4/09] Section 5.3
- [4/11] Section 5.4, 5.5
- [4/16] Reserved
- [4/18] Midterm

Reading Assignments

- [4/23] Section 6.1, 6.2
- [4/25] Section 6.3, 6.4
- [4/30] Section 6.5, 6.6
- [4/30, Supp.] Section 6.6, 6.7
- [5/02] Reserved
- [5/09] Section 6.7
- [5/14] Section 7.1, 7.2
- [5/14 Supp.] Section 7.3
- [5/16] Section 7.4
- [5/21] Section 8.1, 8.2
- [5/23] Section 8.3, 8.4
- [5/28] Section 8.5
- [5/28 Supp.] Section 8.6
- [5/30] Section 10.1, 10.2
- [6/04] Section 10.3, 10.4
- [6/11] Final

Some references

- http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041-probabilistic-systems-analysis-and-applied-probability-fall-2010/lecture-notes/
- http://www.cs.ox.ac.uk/people/varun.kanade/cs174/note_mincut.pdf
- http://www.cs.ox.ac.uk/people/varun.kanade/cs174/fa12.html