MC738 - Algoritmos Probabilísticos / Randomized Algorithms - 2018

Prof. Flávio Keidi Miyazawa

Informations about the course

- Topics
- Evaluation
- Office Hours
- Lists of Exercises
- Grades
- Slides [4 slides per page]
- Important dates
- Knuth talking about Randomized Algorithms (made available by Hsueh-I Lu)
- Theoretical Computer Science Cheat Sheet by Steve Seiden
- Bibliography

- **Links about randomized algorithms**
  - Wikipedia
- **Topics**
  - Basic concepts in probability.
  - Moments and Deviations.
  - Tail Inequalities.
  - Ball, Bins and Random Graphs.
  - The Probabilistic Method.
  - Markov Chains and Random Walks.

- Applications in graphs, data structures, optimization, game theory, etc.

Classes

Tuesday and Thursday, from 14:00 to 16:00.

Office Hours

Thursday: 13-14hs, room 30, building IC1.

Evaluation

- The final grade is calculated from grades *T*, *A* and *L*.
- The grade *T* is the average score of seven small tests (one for each given chapter).
- The grade *A* is obtained from two parts. One part, corresponding to 80% of the grade *A*, is obtained from the the oral presentation and short text detailing the contents of the presentation, about a paper using the techniques considered in the course. The second part, corresponding to 20% of the grade *A*; is obtained from the average grade of very simple one question tests for each presentation.
- The grade *L* is the average score of seven lists of exercises. To obtain the score of a list of exercises, the professor will correct the same exercise of the list (randomly selected) for all students.
- The final letter grade is obtained converting the numerical value *N*, where *N=(2T+A+L)/4*, using the following table conversion.

Value of N	Final grade
N>=8.5	A
7.0<=N<8.5	B
5.0<=N<7.0	C
N<5.0	D

List of Exercises

- List 1.
- List 2.
- List 3.
- List 4.
- List 5.

Important dates

- Tests: will occur in the next class after the deadline of the corresponding list of exercises.
- Lists of exercises: at least one week after the list is published.

- Presentations: Will occur in the last two weeks of the course.

Bibliography

- To learn about proof techniques and other aspects of discrete mathematics
  - Daniel J. Velleman . How to Prove it: A structured approach, Second edition, 2012.
  - G. Polya . How to Solve it: A New Aspect of Mathematical Method, Second Edition, 1973.
  - E. Lehman, F.T. Leighton, A. R. Meyer . Mathematics for Computer Science, 2012.
  - A. Gomide, J. Stolfi. Elementos de Matemática Discreta para Computação, 2014..
  - K. H. Rosen. Discrete Mathematics and its Applications.
  - S. Seiden.Theoretical Computer Science Cheat Sheet by Steve Seiden

- A good book to learn probability
  - Dimitri P. Bertsekas and John N. Tsitsiklis. Introduction to Probability, 2nd Edition, 2008.

- M. Mitzenmacher and E. Upfal. Probability and Computing : Randomized Algorithms and Probabilistic Analysis. Cambridge University Press, New York (NY), 2005. Errata of the first printing, second printing. This is the main book used in this course.

- R. Motwani and P. Raghavan. Randomized Algorithms, Cambridge, 1995.

- J. Michael Steele. Probability Theory and Combinatorial Optimization, SIAM, 1997.

- V. Vazirani. Approximation Algorithms. 2001. Springer-Verlag.

- D.S. Hochbaum (ed). Approximation Algorithms for NP-Hard Problems, PWS Publishing Company, 1997.

- Papers on the subject.