

Seminar in Randomized Algorithms

Credits: 3, 3 lecture hours

Prerequisites: 11069 Applied English
61760 Probability for Software Engineering

Course Description

Randomized algorithms are algorithms which use randomness for making certain decisions. Randomized algorithms are in use in all fields of computer science and software engineering, and they often allow us to solve certain problems simply and efficiently.

The course consists of two main parts: In the first part, the lecturer will give several introductory lectures on the subject. In the second part, the students will be given relevant literature and, under the guidance of the supervisor, will present it to the class.

Course subjects:

1. The role of randomized algorithms
2. Tools in probabilistic analysis.
3. Las Vegas vs Monte Carlo algorithms
4. Analysis of exemplary algorithms of each type
5. Randomized approximation algorithms
6. Additional topics from the supplied reading material.

Literature

1. Cormen, T. H., Leiserson, C. E., Rivest, R. L., and Stein, C., *Introduction to Algorithms*, 3rd edition, 2009, MIT Press and McGraw-Hill.
2. Mitzenmacher, M. and Upfal, E., *Probability and Computing: Randomized Algorithms and Probabilistic Analysis*, 2005, Cambridge University Press.
3. Hromkovic, J., *Design and Analysis of Randomized Algorithms*, 2005, Springer.
4. Motwani, R. and Raghavan, P., *Randomized Algorithms*, 1995, Cambridge University Press
5. Vazirani, V. V., *Approximation Algorithms*, 2004, Springer-Verlag.

Course grade

In order to pass the course, students must attend all but at most two lectures.

The final grade will be computed as follows:

- Active participation in class 10%
- Short assignment on the subjects taught by the lecturer 15%
- Presentation of material learned independently 75%

Learning outcomes:

Upon successful completion of this course, students will be able to:

1. Perform probabilistic analysis of fundamental problems in computer science, as well as real life problems involving discrete random variables.

2. Analyze the success probability as well as the expected time complexity of randomized algorithms.
3. Integrate and apply knowledge from previous courses in new contexts, combined with newly learned techniques.
4. Understand the main advantages and disadvantages of randomized algorithms and data structures, and evaluate the situations in which they are most appropriate to use.
5. Improve their experience and skills in reading advanced technical material in English.
6. Improve their skills in in preparing professional presentations and in expressing themselves publically in English.