# Algorithm Design and Applications

**Michael T. Goodrich, Roberto Tamassia**

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## DESCRIPTION

Introducing a NEW addition to our growing library of computer science titles, *Algorithm Design and Applications*, by Michael T. Goodrich & Roberto Tamassia! Algorithms is a course required for all computer science majors, with a strong focus on theoretical topics. Students enter the course after gaining hands-on experience with computers, and are expected to learn how algorithms can be applied to a variety of contexts. This new book integrates application with theory.

Goodrich & Tamassia believe that the best way to teach algorithmic topics is to present them in a context that is motivated from applications to uses in society, computer games, computing industry, science, engineering, and the internet. The text teaches students about designing and using algorithms, illustrating connections between topics being taught and their potential applications, increasing engagement.

## ABOUT THE AUTHOR

**Michael T. Goodrich** received his B.A. in Mathematics and Computer Science from Calvin College in 1983 and his PhD in Computer Sciences from Purdue University in 1987. Dr. Goodrich's research is directed at the design of high performance algorithms and data structures for solving large-scale problems motivated from information assurance and security, the Internet, Bioinformatics, and geometric computing. He has pioneered and led research on efficient solutions to a number of fundamental
problems, including sorting, convex hull construction, linear programming, privacy-preserving data access, network traceback, and data authentication.

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FEATURES

• Extensive collection of topics provide coverage of both classic and emerging algorithmic methods such as:
  • *mathematics for asymptotic analysis*, including amortization and randomization,
  • *general algorithm design techniques*, including the greedy method, divide and-conquer, and dynamic programming,
  • *data structures*, including lists, trees, heaps, search trees, B-trees, hash tables, skip lists, union-find structures, and multi-dimensional trees,
  • *algorithmic frameworks*, such as NP-completeness, approximation algorithms, and external-memory algorithms, and
  • *fundamental algorithms*, including sorting, graph algorithms, computational geometry, numerical algorithms, cryptography, Fast Fourier Transform (FFT), and linear programming.

• Each chapter is relatively independent of other chapters, providing instructors and readers with greater flexibility with respect to which chapters to explore

• Emphasizing practical applications, each chapter is written to begin with a brief discussion of an application that motivates the topic of the chapter, highlighting real-world uses and how the topic of the chapter could be used in practice

• Included are detailed pseudo-code descriptions and complete mathematical analysis

• The chapters are designed so that they can be covered in 1-3 lectures, depending on the depth of the coverage

• The text can be used for a core algorithms course, classically known as CS7, as well as upper-division/graduate data structures or algorithms, or a two-course sequence of the two topics
• Contains over 800 exercises which are divided between the following categories:

  • *Reinforcement exercises*, which test comprehension of chapter topics

  • *Creativity exercises*, which test creative utilization of techniques from the chapter

  • *Application exercises*, which test uses of the topics of the chapter for real-world or contrived applications

• The exercises are distributed so that roughly 35% are reinforcement exercises, 40% are creativity exercises, and 25% are application exercises.

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