

The background of the cover features a series of overlapping, wireframe-like mountain ranges or peaks. These shapes are composed of many thin, white lines that create a sense of depth and complexity. The lines are more densely packed in some areas, creating a textured effect. The overall color scheme is a gradient of blue, from a lighter blue at the top to a darker blue at the bottom.

AN INTRODUCTION  
TO THE

# ANALYSIS OF ALGORITHMS

SECOND EDITION

**ROBERT SEDGEWICK  
PHILIPPE FLAJOLET**

AN INTRODUCTION  
TO THE  
ANALYSIS OF ALGORITHMS  
*Second Edition*

# Introduction to the Analysis of Algorithms, An

## Table of Contents

### Table of Contents

#### CHAPTER ONE: ANALYSIS OF ALGORITHMS

- 1.1 Why Analyze an Algorithm?
- 1.2 Theory of Algorithms
- 1.3 Analysis of Algorithms
- 1.4 Average-Case Analysis
- 1.5 Example: Analysis of Quicksort
- 1.6 Asymptotic Approximations
- 1.7 Distributions
- 1.8 Randomized Algorithms

#### CHAPTER TWO: RECURRENCE RELATIONS

- 2.1 Basic Properties
- 2.2 First-Order Recurrences
- 2.3 Nonlinear First-Order Recurrences
- 2.4 Higher-Order Recurrences
- 2.5 Methods for Solving Recurrences
- 2.6 Binary Divide-and-Conquer Recurrences and Binary Numbers

# **Table of Contents**

2.7 General Divide-and-Conquer Recurrences

## **CHAPTER THREE: GENERATING FUNCTIONS**

3.1 Ordinary Generating Functions

3.2 Exponential Generating Functions

3.3 Generating Function Solution of Recurrences

3.4 Expanding Generating Functions

3.5 Transformations with Generating Functions

3.6 Functional Equations on Generating Functions

3.7 Solving the Quicksort Median-of-Three Recurrence with  
OGFs

3.8 Counting with Generating Functions

3.9 Probability Generating Functions

3.10 Bivariate Generating Functions

3.11 Special Functions

## **CHAPTER FOUR: ASYMPTOTIC APPROXIMATIONS**

4.1 Notation for Asymptotic Approximations

4.2 Asymptotic Expansions

4.3 Manipulating Asymptotic Expansions

4.4 Asymptotic Approximations of Finite Sums

4.5 Euler-Maclaurin Summation

4.6 Bivariate Asymptotics

4.7 Laplace Method

4.8 Normal Examples from the Analysis of Algorithms

4.9 Poisson Examples from the Analysis of Algorithms

# **Table of Contents**

## **CHAPTER FIVE: ANALYTIC COMBINATORICS**

- 5.1 Formal Basis
- 5.2 Symbolic Method for Unlabelled Classes
- 5.3 Symbolic Method for Labelled Classes
- 5.4 Symbolic Method for Parameters
- 5.5 Generating Function Coefficient Asymptotics

## **CHAPTER SIX: TREES**

- 6.1 Binary Trees
- 6.2 Forests and Trees
- 6.3 Combinatorial Equivalences to Trees and Binary Trees
- 6.4 Properties of Trees
- 6.5 Examples of Tree Algorithms
- 6.6 Binary Search Trees
- 6.7 Average Path Length in Catalan Trees
- 6.8 Path Length in Binary Search Trees
- 6.9 Additive Parameters of Random Trees
- 6.10 Height
- 6.11 Summary of Average-Case Results on Properties of  
Trees
- 6.12 Lagrange Inversion
- 6.13 Rooted Unordered Trees
- 6.14 Labelled Trees
- 6.15 Other Types of Trees

## **CHAPTER SEVEN: PERMUTATIONS**

# **Table of Contents**

- 7.1 Basic Properties of Permutations
- 7.2 Algorithms on Permutations
- 7.3 Representations of Permutations
- 7.4 Enumeration Problems
- 7.5 Analyzing Properties of Permutations with CGFs
- 7.6 Inversions and Insertion Sorts
- 7.7 Left-to-Right Minima and Selection Sort
- 7.8 Cycles and In Situ Permutation
- 7.9 Extremal Parameters

## **CHAPTER EIGHT: STRINGS AND TRIES**

- 8.1 String Searching
- 8.2 Combinatorial Properties of Bitstrings
- 8.3 Regular Expressions
- 8.4 Finite-State Automata and the Knuth-Morris-Pratt Algorithm
- 8.5 Context-Free Grammars
- 8.6 Tries
- 8.7 Trie Algorithms
- 8.8 Combinatorial Properties of Tries
- 8.9 Larger Alphabets

## **CHAPTER NINE: WORDS AND MAPPINGS**

- 9.1 Hashing with Separate Chaining
- 9.2 The Balls-and-Urns Model and Properties of Words
- 9.3 Birthday Paradox and Coupon Collector Problem
- 9.4 Occupancy Restrictions and Extremal Parameters

# **Table of Contents**

9.5 Occupancy Distributions

9.6 Open Addressing Hashing

9.7 Mappings

9.8 Integer Factorization and Mappings

List of Theorems

List of Tables

List of Figures

Index