



# Resource Allocation Problems: Algorithmic Approaches (Foundations of Computing)

*Toshihide Ibaraki, Naoki Katoh*

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This book addresses a theoretical problem encountered in a variety of areas in operations research and management science, including load distribution, production planning, computer scheduling, portfolio selection, and apportionment. It is a timely and comprehensive summary of the past thirty years of research on algorithmic aspects of the resource allocation problem and its variants, covering Lagrangean multiplier method, dynamic programming, greedy algorithms, and their generalizations. Modern data structures are used to analyze the computational complexity of each algorithm.

The resource allocation problem the authors take up is an optimization problem with a single simple constraint: it determines the allocation of a fixed amount of resources to a given number of activities in order to achieve the most effective results. It may be viewed as a special case of the nonlinear programming or nonlinear integer programming problem.

## Contents:

Introduction. Resource Allocation with Continuous Variables. Resource Allocation with Integer Variables. Minimizing a Convex Separable Function. Minimax and Maximin Resource Allocation Problems. Fair Resource Allocation Problem. Apportionment Problem. Fundamentals of Submodular Systems. Resource Allocation Problems under Submodular Constraints. Further Topics on Resource Allocation Problems. Appendixes: Algorithms and Complexity. NP-completeness and NP-hardness.

Toshihide Ibaraki is Professor in the Department of Applied Mathematics and Physics at Kyoto University and Naoki Katoh is Associate Professor in the Department of Management Science at Kobe University of Commerce. *Resource Allocation Problems* is included in the Foundations of Computing Series edited by Michael Garey and Albert Meyer.

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