

Book Announcements

Robert Englemore and Tony Morgan, eds., Blackboard Systems (Addison-Wesley, Reading, MA, 1988) 602 pages

Chapter 1: Introduction (R.S. Englemore, A.J. Morgan and H.P. Nii). PART I. *Chapter 2: Hearsay-II* (R.S. Englemore, A.J. Morgan and H.P. Nii). *Chapter 3: The Hearsay-II Speech-Understanding System: Integrating Knowledge to Resolve Uncertainty* (L.D. Erman, F. Hayes-Roth, V.R. Lesser and D.R. Reddy). *Chapter 4: A Retrospective View of the Hearsay-II Architecture* (V.R. Lesser and L.D. Erman). PART II. *Chapter 5: Early Applications (1975–1980)* (R.S. Englemore, A.J. Morgan and H.P. Nii). *Chapter 6: Signal-to-Symbol Transformation: HASP&SLAP Case Study* (H.P. Nii, E.A. Feigenbaum, J.J. Anton and A.J. Rockmore). *Chapter 7: Using Explicit Strategic Knowledge to Control Expert Systems* (A. Terry). *Chapter 8: Issues in the Development of a Blackboard-Based Schema System for Image Understanding* (B.A. Draper, R.T. Collins, J. Brolio, A.R. Hanson and E.M. Riseman). *Chapter 9: Structural Analysis of Complex Aerial Photographs* (M. Nagao, T. Matsuyama and H. Mori). *Chapter 10: Modeling Planning as an Incremental, Opportunistic Process* (B. Hayes-Roth, F. Hayes-Roth, S. Rosenschein and S. Cammarata). PART III. *Chapter 11: Generalizations (1977–1984)* (R.S. Englemore and A.J. Morgan). *Chapter 12: AGE (Attempt to GEneralize): A Knowledge-Based Program for Building Knowledge-Based Programs* (H.P. Nii and N. Aiello). *Chapter 13: The Design and an Example Use of Hearsay-III* (L.D. Erman, P.E. London and S.F. Fickas). *Chapter 14: BBI: An Implementation of the Blackboard Control Architecture* (B. Hayes-Roth and M. Hewett). *Chapter 15: MXA – A Blackboard Expert System Shell* (A. Taylor). *Chapter 16: BLOBS – An Object-Oriented Blackboard System Framework for Reasoning in Time* (R. Zanconato). PART IV. *Chapter 17: Recent Applications (1981–1985)* (R.S. Englemore and A.J. Morgan). *Chapter 18: The Distributed Vehicle Monitoring Testbed: A Tool for Investigating Distributed Problem Solving Networks* (V.R. Lesser and D.D. Corkill). *Chapter 19: Hierarchical Multi-expert Signal Understanding* (M.A. Williams). *Chapter 20: PROTEAN: Deriving Protein Structure from Constraints* (B. Hayes-Roth, B. Buchanan, O. Lichtarge, M. Hewett, R. Altman, J. Brinkley, C. Cornelius, B. Duncan and O. Jardetzky). *Chapter 21: Mission Planning within the Framework of the Blackboard Model* (G. Pearson). *Chapter 22: Intelligent Data Fusion for Naval Command and Control* (W.L. Lakin, J.A.H. Miles and C.D. Byrne). PART V. *Chapter 23: Current Directions (1985–1987)* (R.S. Englemore and A.J. Morgan). *Chapter 24: Transactional Blackboards* (J.R. Ensor and J.D. Gabbe). *Chapter 25: Frameworks for Concurrent Problem Solving: A Report on CAGE and POLYGON* (H.P. Nii, N. Aiello and J. Rice). *Chapter 26: GBB: A Generic Blackboard Development System* (D.D. Corkill, K.Q. Gallagher and K.E. Murray). *Chapter 27: MUSE: A Toolkit for Embedded, Real-time AI* (D. Reynolds). *Chapter 28: A Blackboard Shell in PROLOG* (J. Jones, M. Millington and P. Ross). *Chapter 29: Building Systems in the BB* Environment* (B. Hayes-Roth, M.V. Johnson, A. Carvey and M. Hewett). *Chapter 30: Conclusion* (R.S. Englemore and A.J. Morgan).

Silvano Martello and Paolo Toth, Knapsack Problems: Algorithms and Computer Implementations (Wiley, Chichester, 1990) 296 pages

Chapter 1: Introduction. What are knapsack problems?. Terminology. Computational complexity. Lower and upper bounds. *Chapter 2: 0-1 Knapsack Problem.* Introduction. Relaxations and upper bounds (Linear programming relaxation and Dantzig's bound. Finding the critical item in $O(n)$ time. Lagrangian relaxation). Improved bounds (Bounds from additional constraints. Bounds from Lagrangian relaxations. Bounds from partial enumeration). The greedy algorithm. Branch-and-bound algorithms (The Horowitz-Sahni algorithm. The Martello-Toth algorithm). Dynamic programming algorithms (Elimination of dominated states. The Horowitz-Sahni algorithm. The Toth algorithm). Reduction algorithms. Approximate algorithms (Polynomial-time approximation schemes. Fully polynomial-time approximation schemes. Probabilistic analysis). Exact algorithms for large-size problems (The Balas-Zemel algorithm. The Fayard-Plateau algorithm. The Martello-Toth algorithm). Computational experiments (Exact algorithms. Approximate algorithms). Facets of the knapsack polytope. The multiple-choice knapsack problem. *Chapter 3: Bounded Knapsack Problem.* Introduction. Transformation into a 0-1 knapsack problem. Upper bounds and approximate algorithms (Upper bounds. Approximate algorithms). Exact algorithms (Dynamic programming. Branch-and-bound). Computational experiments. A special case: the unbounded knapsack problem (Upper bounds and approximate algorithms. Exact algorithms. An exact algorithm for large-size problems. Computational experiments). *Chapter 4: Subset-Sum Problem.* Introduction. Exact algorithms (Dynamic programming. A hybrid algorithm. An algorithm for large-size problems). Approximate algorithms (Greedy algorithms. Polynomial-time approximation schemes. Fully polynomial-time approximation schemes. Probabilistic analysis). Computational experiments (Exact algorithms. Approximate algorithms). *Chapter 5: Change-Making Problem.* Introduction. Lower bounds. Greedy algorithms. When the greedy algorithm solves classes of knapsack problems. Exact algorithms (Dynamic programming. Branch-and-bound). An exact algorithm for large-size problems. Computational experiments. The bounded change-making problem. *Chapter 6: 0-1 Multiple Knapsack Problem.* Introduction. Relaxations and upper bounds (Surrogate relaxation. Lagrangian relaxation. Worst-case performance of the upper bounds). Greedy algorithms. Exact algorithms (Branch-and-bound algorithms. The "bound-and-bound" method. A bound-and-bound algorithm). Reduction algorithms. Approximate algorithms (On the existence of approximation schemes. Polynomial-time approximation algorithms). Computational experiments. *Chapter 7: Generalized Assignment Problem.* Introduction. Relaxations and upper bounds (Relaxation of the capacity constraints. Relaxation of the semi-assignment constraints. The multiplier adjustment method. The variable splitting method). Exact algorithms. Approximate algorithms. Reduction algorithms. Computational experiments. *Chapter 8: Bin-Packing Problem.* Introduction. A brief outline of approximate algorithms. Lower bounds (Relaxations based lower bounds. A stronger lower bound). Reduction algorithms. Exact algorithms. Computational experiments.

T.H. Cormen, C.E. Leiserson and R.L. Rivest, Introduction to Algorithms (MIT, Cambridge, MA, 1990) 996 pages

Chapter 1: Introduction. Algorithms. Analyzing algorithms. Designing algorithms. Summary. PART I: MATHEMATICAL FOUNDATIONS. *Introduction.* *Chapter 2: Growth of Functions.* Asymptotic notation. Standard notations and common functions. *Chapter 3: Summations.* Summation formulas and properties. Bounding summations. *Chapter 4: Recurrences.* The substitution method. The iteration method. The master method. Proof of the master theorem. *Chapter 5: Sets, Etc..* Sets. Relations. Functions. Graphs. Trees. *Chapter 6: Counting and Probability.* Counting. Probability. Discrete random variables. The geometric and binomial distributions. The tails of the binomial distribution. Probabilistic analysis.

PART II: SORTING AND ORDER STATISTICS. *Introduction*. *Chapter 7: Heapsort*. Heaps. Maintaining the heap properly. Building a heap. The heapsort algorithm. Priority queues. *Chapter 8: Quicksort*. Description of quicksort. Performance of quicksort. Randomized versions of quicksort. Analysis of quicksort. *Chapter 9: Sorting in Linear Time*. Lower bounds for sorting. Counting sort. Radix sort. Bucket sort. *Chapter 10: Medians and Order Statistics*. Minimum and maximum. Selection in expected linear time. Selection in worst-case linear time. PART III: DATA STRUCTURES. *Introduction*. *Chapter 11: Elementary Data Structures*. Stacks and queues. Linked lists. Implementing pointers and objects. Representing rooted trees. *Chapter 12: Hash Tables*. Direct-address tables. Hash tables. Hash functions. Open addressing. *Chapter 13: Binary Search Trees*. What is a binary search tree?. Querying a binary search tree. Insertion and deletion. Randomly built binary search trees. *Chapter 14: Red-Black Trees*. Properties of red-black trees. Rotations. Insertion. Deletion. *Chapter 15: Augmenting Data Structures*. Dynamic order statistics. How to augment a data structure. Interval trees. PART IV: ADVANCED DESIGN AND ANALYSIS TECHNIQUES. *Introduction*. *Chapter 16: Dynamic Programming*. Matrix-chain multiplication. Elements of dynamic programming. Longest common subsequence. Optimal polygon triangulation. *Chapter 17: Greedy Algorithms*. An activity-selection problem. Elements of the greedy strategy. Huffman codes. Theoretical foundations for greedy methods. A task-scheduling problem. *Chapter 18: Amortized Analysis*. The aggregate method. The accounting method. The potential method. Dynamic tables. PART V: ADVANCED DATA STRUCTURES. *Introduction*. *Chapter 19: B-Trees*. Definition of B-trees. Basic operations on B-trees. Deleting a key from a B-tree. *Chapter 20: Binomial Heaps*. Binomial trees and binomial heaps. Operations on binomial heaps. *Chapter 21: Fibonacci Heaps*. Structure of Fibonacci heaps. Mergeable-heap operations. Decreasing a key and deleting a node. Bounding the maximum degree. *Chapter 22: Data Structures for Disjoint Sets*. Disjoint-set operations. Linked-list representation of disjoint sets. Disjoint-set forests. Analysis of union by rank with path compression. PART VI: GRAPH ALGORITHMS. *Introduction*. *Chapter 23: Elementary Graph Algorithms*. Representations of graphs. Breadth-first search. Depth-first search. Topological sort. Strongly connected components. *Chapter 24: Minimum Spanning Trees*. Growing a minimum spanning tree. The algorithms of Kruskal and Prim. *Chapter 25: Single-Source Shortest Paths*. Shortest paths and relaxation. Dijkstra's algorithm. The Bellman-Ford algorithm. Single-source shortest paths in directed acyclic graphs 536. Difference constraints and shortest paths. *Chapter 26: All-Pairs Shortest Paths*. Shortest paths and matrix multiplication. The Floyd-Warshall algorithm. Johnson's algorithm for sparse graphs. A general framework for solving path problem in directed graphs. *Chapter 27: Maximum Flow*. Flow networks. The Ford-Fulkerson method. Maximum bipartite matching. Preflow-push algorithms. The lift-to-front algorithm. PART VII: SELECTED TOPICS. *Introduction*. *Chapter 28: Sorting Networks*. Comparison networks. The zero-one principle. A bitonic sorting network. A merging network. A sorting network. *Chapter 29: Arithmetic Circuits*. Combinational circuits. Addition circuits. Multiplication circuits. Clocked circuits. *Chapter 30: Algorithms for Parallel Computers*. Pointer jumping. CRCW algorithms versus EREW algorithms. Brent's theorem and work efficiency. Work-efficient parallel prefix computation. Deterministic symmetry breaking. *Chapter 31: Matrix Operations*. Properties of matrices. Strassen's algorithm for matrix multiplication. Algebraic number systems and boolean matrix multiplication. Solving systems of linear equations. Inverting matrices. Symmetric positive-definite matrices and least-squares approximation. *Chapter 32: Polynomials and the FFT*. Representation of polynomials. the DFT and FFT. Efficient FFT implementations. *Chapter 33: Number-Theoretic Algorithms*. Elementary number-theoretic notions. Greatest common divisor. Modular arithmetic. Solving modular linear equations. The Chinese remainder theorem. Powers of an element. The RSA public-key cryptosystem. Primality testing. Integer factorization. *Chapter 34: String Matching*. The naive string-matching algorithm. The Rabin-Karp algorithm. String matching with finite automata. The Knuth-Morris-Pratt algorithm. The Boyer-Moore algorithm. *Chapter 35: Computational Geometry*. Line-segment properties. Determining whether any pair of segments intersects. Finding the convex hull. Finding the closest pair of points. *Chapter 36: NP-Completeness*. Polynomial time. Polynomial-time verification. NP-completeness and reducibility. NP-completeness proofs. NP-complete problems. *Chapter 37: Approximation Algorithms*. The vertex-cover problem. The traveling-salesman problem. The set-covering problem. The subset-sum problem.

Bernard Cornet and Henry Tulkens, eds., Contributions to Operations Research and Economics: The Twentieth Anniversary of Core (MIT, Cambridge, MA, 1989) 561 pages

PART I: GAME THEORY AND MATHEMATICAL ECONOMICS. *Introduction to Part I. Chapter 1: CORE as a Macrococosm of Game-Theoretic Research, 1967-1987* (R.J. Aumann). Comments: What is Bob Aumann trying to accomplish? (C. d'Aupremont). Comments (J.-F. Mertens). *Chapter 2: Information, Incentives, and General Equilibrium* (P. Champsaur). Comments (R. Boadway). Comments (P.J. Hammond). *Chapter 3: CORE and Equilibria of a Large Economy* (W. Hildenbrand). *Chapter 4: Existence of Equilibria in Economies with Increasing Returns* (B. Cornet). *Chapter 5: First-Best Allocation of Resources with Nonconvexities in Production* (K. Guesnerie). *Chapter 6: Equilibrium without Market Clearing* (J. Roberts). **PART II: OPERATIONS RESEARCH.** *Introduction to Part II. Chapter 7: Twenty Years of Mathematical Programming* (T.L. Magnanti). Comments (E. Loute). Comments: Mathematical Programming in the Next Twenty Years (A.H.G. Rinnooy Kan). *Chapter 8: On the Relationship between the Search Directions in the Affine and Projective Variants of Karmarkar's Linear Programming Algorithm* (J.E. Mitchell and M.J. Todd). *Chapter 9: Two-Terminal Steiner Tree Polyhedra* (M.O. Ball, W.-G. Liu and W.R. Pulleyblank). *Chapter 10: Solving Arborescent Linear Programs with Nested Decomposition* (O. Janssens de Bisthoven and E. Loute). **PART III: ECONOMETRICS.** *Introduction to Part III. Chapter 11: Twenty Years After: Econometrics, 1966-1986* (A. Pagan). Comments (M. Mouchart). Comments (J. Waelbroeck). *Chapter 12: Recent Developments in the Theory of Encompassing* (D.F. Hendry and J.-F. Richard). *Chapter 13: Toward a Levels Version of the Rotterdam and Related Demand Systems* (A.P. Barten). *Chapter 14: Bayesian Specification Tests* (J.-P. Florens and M. Mouchart). *Chapter 15: Estimating Average Excess Supply on Goods and Labor Markets from a Cross Section of Business Survey Reports* (P. Kooiman). *Chapter 16: The Structure of Dynamic Macroeconometric Models* (P. Malgrange).