

Dynamic Programming

What is dynamic programming and how does it work at a high level?

Dynamic programming is simply an optimization over plain recursion. Whenever we see a recursive solution for the same inputs, we can optimize it using Dynamic programming. The main idea is to simply store the results of the sub-problems so that we don't need to recompute them when they are needed later.

At a high level, you are looking at all the possible first choices, recursively solving them and then picking the best one.

What is the weighted activity selection problem and how would you solve it with dynamic programming? Explain the following:

- What is $P(i)$?

- What is the recurrence relation?

In the weighted activity selection problem, you have n events e_1, e_2, \dots, e_n . For each event, you have the start time s_i , finish time f_i , and the reward which is r_i . What we want to do is find a non-conflicting subset of events with the highest reward.

- The way we approach it with dynamic programming is by considering what you want to schedule last. But since we don't have a greedy strategy, we consider every possible choice for that last position.

- If you have an event e_j that you are considering for the last position, you are removing everything after e_j and you are removing anything that is conflicting with e_j . $P(i) = j$ means that there has to be some event e_1 to e_j that are left in the subproblem

- Define $M(j)$ as the best reward we can get from the first j events and we ultimately want to compute $M(n)$

- The recurrence relation is $M(n) = \max(r_i) + M(p(i))$. r_i is the reward from event e_i

Dynamic Programming Exam Questions And Solutions

Irvin N. Gleim



Dynamic Programming Exam Questions And Solutions:

Elements of Competitive Programming : Dynamic Programming: 88 Problems with Solutions (A Functional Approach)

Chandra Shekhar Kumar, 2022-11-04 This book was planned as an aid to students preparing for competitive programming. Written in a problem solution format, this is exceptionally convenient for analyzing common errors made by the coder in competitive coding sports, for reviewing different methods of solving the same problems, and for discussing difficult questions of fundamentals of algorithms with focus on dynamic programming. Attention can be drawn to various aspects of the problem; certain fine points can be made, and a more thorough understanding of the fundamentals can be reached. The art of formulating and solving problems using dynamic programming can be learned only through active participation by the student. Infused with the wisdom of Richard Bellman, the father of Dynamic Programming, this tiny book distills the inherent concepts and techniques in a problem solution format with focus on to convey the art of formulating the solution of problems in terms of dynamic programming recurrence relations, how to define and characterize the optimal value function, evaluation of the feasibility and computational magnitude of the solution based on the recurrence relation, to show how dynamic programming can be used analytically to establish the structure of the optimal solution or conditions necessarily satisfied by the optimal solution, both for their own interest and as means of reducing computation. The student must first discover by experience that proper formulation is not quite as trivial as it appears when reading a solution. Then by considerable practice with solving problems on his own, he will acquire the feel for the subject that ultimately renders proper formulation easy and natural. For this reason, this book contains a large number, 88, of instructional problems in a graded way, carefully chosen to allow the student to acquire the art that I seek to convey. The student must do these problems on his own. Solutions are given next to the problem because the reader needs feedback on the correctness of his procedures in order to learn, but any student who reads the solution before seriously attempting the problem does so at his own peril. This book provides a functional approach to solving problems using dynamic programming. Written in an extremely lively form of problems and solutions, including code in modern C and pseudo style, this leads to extreme simplification of optimal coding with great emphasis on unconventional and integrated science of dynamic programming. Though aimed primarily at serious programmers, it imparts the knowledge of deep internals of underlying concepts and beyond to computer scientists alike.

Multi-disciplinary Trends in Artificial Intelligence Raghava Morusupalli, Teja Santosh Dandibhotla, Vani Vathsala

Atluri, David Windridge, Pawan Lingras, Venkateswara Rao Komati, 2023-06-23 The 47 full papers and 24 short papers included in this book were carefully reviewed and selected from 245 submissions. These articles cater to the most contemporary and happening topics in the fields of AI that range from Intelligent Recommendation Systems, Game Theory, Computer Vision, Reinforcement Learning, Social Networks, and Generative AI to Conversational and Large Language Models. They are organized into four areas of research: Theoretical contributions, Cognitive Computing models, Computational Intelligence,

based algorithms and AI Applications **Principles of Sequencing and Scheduling** Kenneth R. Baker, Dan Trietsch, 2018-10-08 An updated edition of the text that explores the core topics in scheduling theory The second edition of Principles of Sequencing and Scheduling has been revised and updated to provide comprehensive coverage of sequencing and scheduling topics as well as emerging developments in the field The text offers balanced coverage of deterministic models and stochastic models and includes new developments in safe scheduling and project scheduling including coverage of project analytics These new topics help bridge the gap between classical scheduling and actual practice The authors noted experts in the field present a coherent and detailed introduction to the basic models problems and methods of scheduling theory This book offers an introduction and overview of sequencing and scheduling and covers such topics as single machine and multi machine models deterministic and stochastic problem formulations optimization and heuristic solution approaches and generic and specialized software methods This new edition adds coverage on topics of recent interest in shop scheduling and project scheduling This important resource Offers comprehensive coverage of deterministic models as well as recent approaches and developments for stochastic models Emphasizes the application of generic optimization software to basic sequencing problems and the use of spreadsheet based optimization methods Includes updated coverage on safe scheduling lognormal modeling and job selection Provides basic coverage of robust scheduling as contrasted with safe scheduling Adds a new chapter on project analytics which supports the PERT21 framework for project scheduling in a stochastic environment Extends the coverage of PERT 21 to include hierarchical scheduling Provides end of chapter references and access to advanced Research Notes to aid readers in the further exploration of advanced topics Written for upper undergraduate and graduate level courses covering such topics as scheduling theory and applications project scheduling and operations scheduling the second edition of Principles of Sequencing and Scheduling is a resource that covers scheduling techniques and contains the most current research and emerging topics **Computer Mathematics, Series II** Geoffrey Knight, 1969 General numerical and symbolic analysis Elementary algebra Calculus Difference differential and integral equations Abstracts mathematics Probability and statistics Optimization mathematical programming operations research Mathematical communication theory information theory Mathematical systems and control theory Mathematical logic and switching theory automata How to Think about Algorithms Jeff Edmonds, 2024-03-07 Exceptionally student friendly now with over 150 new exercises key concept summaries and a new chapter on machine learning algorithms Handbook of Approximation Algorithms and Metaheuristics Teofilo F. Gonzalez, 2018-05-15 Handbook of Approximation Algorithms and Metaheuristics Second Edition reflects the tremendous growth in the field over the past two decades Through contributions from leading experts this handbook provides a comprehensive introduction to the underlying theory and methodologies as well as the various applications of approximation algorithms and metaheuristics Volume 1 of this two volume set deals primarily with methodologies and traditional applications It includes restriction relaxation local ratio approximation schemes randomization

tabu search evolutionary computation local search neural networks and other metaheuristics It also explores multi objective optimization reoptimization sensitivity analysis and stability Traditional applications covered include bin packing multi dimensional packing Steiner trees traveling salesperson scheduling and related problems Volume 2 focuses on the contemporary and emerging applications of methodologies to problems in combinatorial optimization computational geometry and graphs problems as well as in large scale and emerging application areas It includes approximation algorithms and heuristics for clustering networks sensor and wireless communication bioinformatics search streams virtual communities and more About the Editor Teofilo F Gonzalez is a professor emeritus of computer science at the University of California Santa Barbara He completed his Ph D in 1975 from the University of Minnesota He taught at the University of Oklahoma the Pennsylvania State University and the University of Texas at Dallas before joining the UCSB computer science faculty in 1984 He spent sabbatical leaves at the Monterrey Institute of Technology and Higher Education and Utrecht University He is known for his highly cited pioneering research in the hardness of approximation for his sublinear and best possible approximation algorithm for k tMM clustering for introducing the open shop scheduling problem as well as algorithms for its solution that have found applications in numerous research areas as well as for his research on problems in the areas of job scheduling graph algorithms computational geometry message communication wire routing etc *U.S. Government Research & Development Reports* ,1967 United States Air Force Academy United States Air Force Academy,1984

Annual Catalogue United States Air Force Academy,1984 **Introduction to Management Science** Bernard W. Taylor,1996 This introduction to the often mathematically rigorous techniques and applications of management science is designed to make the subject accessible for students with no mathematical background or skills It focuses on management science not only as a collection of techniques and processes but as a philosophy and method for approaching problems in a logical manner as skill that is applicable across disciplines and endeavours in all types of jobs and organizations The author s perspective is contemporary his approach hands on and his pedagogy abundant supportive and user friendly for students and instructors alike *CMA Examination Review* Irvin N. Gleim,1981 CIA Examination Review Irvin N. Gleim,1984

Papers and Discussions Presented ,1959 **Papers and Discussions Presented** Joint Computer Conference,1955

Transactions of the American Society of Civil Engineers American Society of Civil Engineers,1969 Vols 29 30 contain papers of the International Engineering Congress Chicago 1893 v 54 pts A F papers of the International Engineering Congress St Louis 1904 **Government Reports Announcements & Index** ,1981 **CPA Examination Review:**

Outlines and study guides Irvin N. Gleim,1979 *Technical Section Proceedings* Canadian Pulp and Paper Association. Technical Section, Annual meeting held after the end of the calendar year covered by the proceedings Mathematical Reviews ,2008 Information Processing Journal ,1962

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