Approximation Algorithms For Np Hard Problems

Approximation Algorithms for NP-hard ProblemsFast Algorithms for NP-hard Problems which are Optimal Or Near-optimal with Probability OneProbabilistic Analysis of Algorithms for NP-Complete ProblemsPolynomial Time Algorithms for Np-hard Problems which are Optimal Or Near-optimal with Probability OneTechniques for Designing and Analyzing AlgorithmsAlgorithms for NP-hard Problems Related to Strings and for Approximate Pattern Matching and RepeatsAlgorithms for NP-hard Optimization Problems and Cluster AnalysisExact Algorithms for NP Hard Problems on NetworksDesign and Analysis of AlgorithmsApproximation Algorithms for NP-hard Routing ProblemsData Structures and Algorithms 2Super - Polynomial Approximation Algorithms for NP - Hard ProblemsApproximation Algorithms for Np-Hand ProblemsLinear-time Algorithms for NP-complete Problems Restricted to Partial K-treesAlgorithm and Design ComplexityFast Turing Reductions Between Problems in NP : Chapter 4 : Reductions Between NP-complete ProblemsComputers and IntractabilityStability in Multi-agent Environments and Approximation Algorithms for NP-hard Graph ProblemsAlgorithms in CGuide to Elliptic Curve Cryptography Dorit S. Hochbaum Routo Terada John Franco R. Terada Douglas R. Stinson Nira Shafrir Nan Li Jochen Alber Parag H. Dave Greg Norman Frederickson K. Mehlhorn Hadas Taubman Dorit S. Hochbaum Petra Scheffler Anli Sherine Dewdney, A. K. (Alexander Keewatin) Michael R. Garey Roee Engelberg Robert Sedgewick Darrel Hankerson Approximation Algorithms for NP-hard Problems Fast Algorithms for NP-hard Problems which are Optimal Or Near-optimal with Probability One Probabilistic Analysis of Algorithms for NP-Complete Problems Polynomial Time Algorithms for Np-hard Problems which are Optimal Or Near-optimal with Probability One Techniques for Designing and Analyzing Algorithms Algorithms for NP-hard Problems Related to Strings and for Approximate Pattern Matching and Repeats Algorithms for NP-hard Optimization Problems and Cluster Analysis Exact Algorithms for NP Hard Problems on Networks Design and Analysis of Algorithms Approximation Algorithms for NP-hard Routing Problems Data Structures and Algorithms 2 Super - Polynomial Approximation Algorithms for NP - Hard Problems Approximation Algorithms for Np-Hand Problems Linear-time Algorithms for NP-complete Problems Restricted to Partial K-trees Algorithm and Design Complexity Fast Turing Reductions Between Problems in NP : Chapter 4 : Reductions Between NP-complete Problems Computers and Intractability Stability in Multi-agent Environments and Approximation Algorithms for NP-hard Graph Problems Algorithms in C Guide to Elliptic Curve Cryptography *Dorit S. Hochbaum Routo Terada John Franco R. Terada Douglas R. Stinson Nira Shafrir Nan Li Jochen Alber Parag H. Dave Greg Norman Frederickson K. Mehlhorn Hadas Taubman Dorit S. Hochbaum Petra Scheffler Anli Sherine Dewdney, A. K. (Alexander Keewatin) Michael R. Garey Roee Engelberg Robert Sedgewick Darrel Hankerson*

this is the first book to fully address the study of approximation algorithms as a tool for coping with intractable problems with chapters contributed by leading researchers in the field this book introduces unifying techniques in the analysis of approximation algorithms approximation algorithms for np hard problems is intended for computer scientists and

operations researchers interested in specific algorithm implementations as well as design tools for algorithms among the techniques discussed the use of linear programming primal dual techniques in worst case analysis semidefinite programming computational geometry techniques randomized algorithms average case analysis probabilistically checkable proofs and inapproximability and the markov chain monte carlo method the text includes a variety of pedagogical features definitions exercises open problems glossary of problems index and notes on how best to use the book

the goal of this research is to develop and analyze algorithms which can in some practical sense solve certain np complete problems efficiently by solve we mean determine whether a solution to a given instance of an np complete problem exists where for the problems we have considered a solution is an assignment of values to a list of variables which cause some predicate to be true we do not consider actually finding solutions when they exist since doing so adds unnecessary complexity to the statement of the algorithms the algorithms we consider can all be modified to find solutions without significantly altering performance np complete problems are found in crytology operations research artificial intelligence computer system design and many other areas there is no known algorithm for an np complete problem which runs in time bounded by a polynomial on the length of the input polynomial time in the worst case nor is one likely to be found we seek algorithms which solve nearly every instance of specific np complete problems in polynomial time

techniques for designing and analyzing algorithms design and analysis of algorithms can be a difficult subject for students due to its sometimes abstract nature and its use of a wide variety of mathematical tools here the author an experienced and successful textbook writer makes the subject as straightforward as possible in an up to date textbook incorporating various new developments appropriate for an introductory course this text presents the main techniques of algorithm design namely divide and conquer algorithms greedy algorithms dynamic programming algorithms and backtracking graph algorithms are studied in detail and a careful treatment of the theory of np completeness is presented in addition the text includes useful introductory material on mathematical background including order notation algorithm analysis and reductions and basic data structures this will serve as a useful review and reference for students who have covered this material in a previous course features the first three chapters provide a mathematical review basic algorithm analysis and data structures detailed pseudocode descriptions of the algorithms along with illustrative algorithms are included proofs of correctness of algorithms are included when appropriate the book presents a suitable amount of mathematical rigor after reading and understanding the material in this book students will be able to apply the basic design principles to various real world problems that they may encounter in their future professional careers

the set cover problem weighted set cover problem minimum dominating set problem and minimum weighted dominating set problem are all classical np hard optimization problems of great importance in both theory and real applications since the exact algorithms which require exhaustive exploration of exponentially many options are infeasible in practice approximation algorithms and heuristic algorithms are widely used to find reasonably good solutions in polynomial time i propose novel algorithms for these problems my algorithms for the weighted set cover and minimum weighted dominating set problems are based on a three step strategy for the weighted set cover problem in the first step we reserve the sets indispensable for the optimal solution and reduce the problem size in the second step we build a robust solution with

a novel greedy heuristic sets are iteratively selected according to a measure which integrates the weight the coverage gain for the current iteration and the global coverage capacity of each set it favors the sets that have smaller weights and better extend or consolidate the coverage especially on the items that are contained in less sets since the obtained solution tends to have a robust coverage in the third step we further improve it by removing the redundant sets in an efficient way for the minimum weighted dominating set problem we first reserve the indispensable vertices for the optimal solution then we convert it into a weighted set cover problem to solve it these two algorithms can be used to solve the set cover problem and minimum dominating set problem by simply considering all the sets or vertices as having the same weights extensive experimental evaluations on a large number of synthetic and real world set cover instances and graphs from many domains demonstrate the superiority of my algorithms over state of the art cluster analysis is a fundamental problem in data analysis and has extensive applications in artificial intelligence statistics and even in social sciences the goal is to partition the data objects into a set of groups clusters such that objects in the same group are similar while objects in different groups are dissimilar most of the existing algorithms for clustering are designed to handle data with only one type of attributes e g continuous categorical or ordinal mixed data clustering has received relatively less attention despite the fact that data with mixed types of attributes are common in real applications i propose a novel affinity learning based framework for mixed data clustering which includes how to process data with mixed type attributes how to learn affinities between data points and how to exploit the learned affinities for clustering in the proposed framework each original data attribute is represented with several abstract objects defined according to the specific data type and values each attribute value is transformed into the initial affinities between the data point and the abstract objects of attribute i refine these affinities and infer the unknown affinities between data points by taking into account the interconnections among the attribute values of all data points the inferred affinities between data points can be exploited for clustering alternatively the refined affinities between data points and the abstract objects of attributes can be transformed into new data features for clustering experimental results on many real world data sets demonstrate that the proposed framework is effective for mixed data clustering this work was published in our ijcai 2017 paper li latecki 2017 clustering aggregation also known as consensus clustering or clustering ensemble aims to find a single superior clustering from a number of input clusterings obtained by different algorithms with different parameters i formulate clustering aggregation as a special instance of the maximum weight independent set mwis problem for a given data set an attributed graph is constructed from the union of the input clusterings the vertices which represent the distinct clusters are weighted by an internal index measuring both cohesion and separation the edges connect the vertices whose corresponding clusters overlap intuitively an optimal aggregated clustering can be obtained by selecting an optimal subset of non overlapping clusters partitioning the data set together i formalize this intuition as the mwis problem on the attributed graph i e finding the heaviest subset of mutually non adjacent vertices this mwis problem exhibits a special structure since the clusters of each input clustering form a partition of the dataset the vertices corresponding to each clustering form a maximal independent set mis in the attributed graph i propose a variant of simulated annealing method that takes advantage of this special structure my algorithm starts from each mis which is close to a distinct local optimum of the mwis problem and utilizes a local search heuristic to explore its neighborhood in order to find the mwis extensive experiments on many challenging data sets show that both my algorithm for the maximum weight independent set problem and my approach to the application of clustering aggregation achieve good performance this work was published in our nips 2012

paper li latecki 2012 some new results were published in our ijcai 2017 paper fan et al 2017

all aspects pertaining to algorithm design and algorithm analysis have been discussed over the chapters in this book design and analysis of algorithms resource description page

computational complexity is critical in analysis of algorithms and is important to be able to select algorithms for efficiency and solvability algorithm and design complexity initiates with discussion of algorithm analysis time space trade off symptotic notations and so forth it further includes algorithms that are definite and effective known as computational procedures further topics explored include divide and conquer dynamic programming and backtracking features includes complete coverage of basics and design of algorithms discusses algorithm analysis techniques like divide and conquer dynamic programming and greedy heuristics provides time and space complexity tutorials reviews combinatorial optimization of knapsack problem simplifies recurrence relation for time complexity this book is aimed at graduate students and researchers in computers science information technology and electrical engineering

shows how to recognize np complete problems and offers proactical suggestions for dealing with them effectively the book covers the basic theory of np completeness provides an overview of alternative directions for further research and contains and extensive list of np complete and np hard problems with more than 300 main entries and several times as many results in total this book is suitable as a supplement to courses in algorithm design computational complexity operations research or combinatorial mathematics and as a text for seminars on approximation algorithms or computational complexity it provides not only a valuable source of information for students but also an essential reference work for professionals in computer science back cover

text providing a comprehensive introduction to important algorithms in c concentrating on graph algorithms covers diagraphs and dags shortest paths minimum spanning trees network flows sample c code and detailed algorithm descriptions

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