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Recent Algorithmic Developments for the Traveling Salesman Problem and the Vehicle Routing Problem - Gilbert Laporte 1993

Metaheuristics for Vehicle Routing Problems - Nacima Labadie 2016-02-10
This book is dedicated to metaheuristics as applied to vehicle routing problems. Several implementations are given as illustrative examples, along with applications to several typical vehicle routing problems. As a first step, a general presentation intends to make the reader more familiar with the related field of logistics and combinatorial optimization. This preamble is completed with a description of significant heuristic methods classically used to provide feasible solutions quickly, and local improvement moves widely used to search for enhanced solutions. The overview of these fundamentals allows appreciating the core of the work

devoted to an analysis of metaheuristic methods for vehicle routing problems. Those methods are exposed according to their feature of working either on a sequence of single solutions, or on a set of solutions, or even by hybridizing metaheuristic approaches with others kind of methods.

Vehicle Routing - Paolo Toth 2014-12-05
Vehicle routing problems, among the most studied in combinatorial optimization, arise in many practical contexts (freight distribution and collection, transportation, garbage collection, newspaper delivery, etc.). Operations researchers have made significant developments in the algorithms for their solution, and *Vehicle Routing: Problems, Methods, and Applications, Second Edition* reflects these advances. The text of the new edition is either completely new or significantly revised and provides extensive and complete

state-of-the-art coverage of vehicle routing by those who have done most of the innovative research in the area; it emphasizes methodology related to specific classes of vehicle routing problems and, since vehicle routing is used as a benchmark for all new solution techniques, contains a complete overview of current solutions to combinatorial optimization problems. It also includes several chapters on important and emerging applications, such as disaster relief and green vehicle routing.

Hybrid Artificial Intelligent Systems

- Enrique Onieva 2015-05-29

This volume constitutes the proceedings of the 10th International Conference on Hybrid Artificial Intelligent Systems, HAIS 2015, held Bilbao, Spain, June 2014. The 60 papers published in this volume were carefully reviewed and selected from 190 submissions. They are organized in topical sections such as data

mining and knowledge discovery; video and image analysis; bio-inspired models and evolutionary computation; learning algorithms; hybrid intelligent systems for data mining and applications; classification and cluster analysis, HAIS applications.

Computational Intelligence in Logistics and Supply Chain Management

- Thomas Hanne 2016-07-27

This book deals with complex problems in the fields of logistics and supply chain management and discusses advanced methods, especially from the field of computational intelligence (CI), for solving them. The first two chapters provide general introductions to logistics and supply chain management on the one hand, and to computational intelligence on the other hand. The subsequent chapters cover specific fields in logistics and supply chain management, work out the most relevant problems found in those fields, and discuss approaches for solving them. Chapter 3 discusses

problems in the field of production and inventory management. Chapter 4 considers planning activities on a finer level of granularity which is usually denoted as scheduling. In chapter 5 problems in transportation planning such as different types of vehicle routing problems are considered. While chapters 3 to 5 rather discuss planning problems which appear on an operative level, chapter 6 discusses the strategic problem of designing a supply chain or network. The final chapter provides an overview of academic and commercial software and information systems for the discussed applications. There appears to be a gap between general textbooks on logistics and supply chain management and more specialized literature dealing with methods for computational intelligence, operations research, etc., for solving the complex operational problems in these fields. For

readers, it is often difficult to proceed from introductory texts on logistics and supply chain management to the sophisticated literature which deals with the usage of advanced methods. This book fills this gap by providing state-of-the-art descriptions of the corresponding problems and suitable methods for solving them.

Fundamentals of Supply Chain Theory - Lawrence V. Snyder 2019-07-01

Comprehensively teaches the fundamentals of supply chain theory This book presents the methodology and foundations of supply chain management and also demonstrates how recent developments build upon classic models. The authors focus on strategic, tactical, and operational aspects of supply chain management and cover a broad range of topics from forecasting, inventory management, and facility location to transportation, process flexibility, and auctions. Key mathematical models

for optimizing the design, operation, and evaluation of supply chains are presented as well as models currently emerging from the research frontier. *Fundamentals of Supply Chain Theory, Second Edition* contains new chapters on transportation (traveling salesman and vehicle routing problems), integrated supply chain models, and applications of supply chain theory. New sections have also been added throughout, on topics including machine learning models for forecasting, conic optimization for facility location, a multi-supplier model for supply uncertainty, and a game-theoretic analysis of auctions. The second edition also contains case studies for each chapter that illustrate the real-world implementation of the models presented. This edition also contains nearly 200 new homework problems, over 60 new worked examples, and over 140 new illustrative figures. Plentiful teaching supplements are

available, including an Instructor's Manual and PowerPoint slides, as well as MATLAB programming assignments that require students to code algorithms in an effort to provide a deeper understanding of the material. Ideal as a textbook for upper-undergraduate and graduate-level courses in supply chain management in engineering and business schools, *Fundamentals of Supply Chain Theory, Second Edition* will also appeal to anyone interested in quantitative approaches for studying supply chains.

The Vehicle Routing Problem - Paolo Toth 2002

Green Transportation and New Advances in Vehicle Routing Problems - Houda Derbel 2020-12-08

This book presents recent work that analyzes general issues of green transportation. The contributed chapters consider environmental objectives in transportation,

including topics such as battery swap stations for electric vehicles, efficient home healthcare routing, waste collection, and various vehicle routing problems. The content will be valuable for researchers and postgraduate students in computer science, operations research, and urban planning.

Fleet Management and Logistics -

Teodor G. Crainic 2012-12-06
TEODOR GABRIEL CRAINIC, DIRECTOR The Centre for Research on Transportation (C.R.T.) was founded in 1971 by the Universite de Montreal. From 1988 on, it is jointly managed by the Universite de Montreal and its affiliated schools, the Ecole des Hautes Etudes Commerciales and Ecole Poly technique. Professors, students and researchers from many institutions in the Montreal area join forces at the C.R.T. to analyze transportation, logistics and telecommunication systems from a multidisciplinary perspective. The

C.R.T. pursues three major, complementary objectives: training of high-level specialists; the advancement of knowledge and technology; the transfer of technology towards industry and the public sector. Its main field of expertise is the development of quantitative and computer-based models and methods for the analysis of urban, regional and intercity transportation networks, as well as telecommunication systems. This applies to the study of passenger and commodity flows, as well as to the socioeconomic aspects of transportation: policy, regulation, economics. The twenty-fifth anniversary of the C.R.T. offered the opportunity to evaluate past accomplishments and to identify future trends and challenges. Five colloquia were thus organized on major research and application themes that also reflected our main research areas. They gathered together

internationally renowned researchers who linked recent scientific and technological advances to modeling and methodological challenges waiting to be tackled, particularly concerning new problems and applications, and the increasingly widespread use of new technologies.

Nature-Inspired Computation in Navigation and Routing Problems - Xin-She Yang 2020-02-19

This book discusses all the major nature-inspired algorithms with a focus on their application in the context of solving navigation and routing problems. It also reviews the approximation methods and recent nature-inspired approaches for practical navigation, and compares these methods with traditional algorithms to validate the approach for the case studies discussed. Further, it examines the design of alternative solutions using nature-inspired techniques, and explores the challenges of navigation and routing

problems and nature-inspired metaheuristic approaches.

Optimization Methods in Logistics -

Kaveh Sheibani 2014-06-30

Operations Research and Logistics are strongly connected: most of the theoretical developments of the former have been motivated by applications in the latter. The spirit of this special issue on Optimization Methods in Logistics moves along the same line, with methodological approaches presented to respond to the needs of practitioners. Applications emerging in different branches of the wide field of logistics have been addressed by authors from Belgium, Brazil, Singapore, Spain, Switzerland, Thailand and the USA.

Recent Developments in Metaheuristics

- Lionel Amodeo 2017-09-18

This book highlights state-of-the-art developments in metaheuristic research. It examines all aspects of metaheuristic research including new

algorithmic developments, applications, new research challenges, theoretical developments, implementation issues, in-depth experimental studies. The book is divided into two sections. Part I is focused on new optimization and modeling techniques based on metaheuristics. The chapters in this section cover topics from multi-objective problems with fuzzy data with triangular-valued objective functions, to hyper-heuristics optimization methodology, designing genetic algorithms, and also the cuckoo search algorithm. The techniques described help to enhance the usability and increase the potential of metaheuristic algorithms. Part II showcases advanced metaheuristic approaches to solve real-life applications issues. This includes an examination of scheduling, the vehicle routing problem, multimedia sensor network, supplier selection, bin packing,

objects tracking, and radio frequency identification. In the fields covered in the chapters are of high-impact applications of metaheuristics. The chapters offer innovative applications of metaheuristics that have a potential of widening research frontiers. Altogether, this book offers a comprehensive look at how researchers are currently using metaheuristics in different domains of design and application.

Supply Chain Optimization, Design, and Management: Advances and Intelligent Methods - Minis, Ioannis
2010-12-31

Computational Intelligence (CI) is a term corresponding to a new generation of algorithmic methodologies in artificial intelligence, which combines elements of learning, adaptation, evolution and approximate (fuzzy) reasoning to create programs that can be considered intelligent. Supply Chain Optimization, Design, and Management:

Advances and Intelligent Methods presents computational intelligence methods for addressing supply chain issues. Emphasis is given to techniques that provide effective solutions to complex supply chain problems and exhibit superior performance to other methods of operations research.

City Logistics 1 - Eiichi Taniguchi
2018-05-24

This volume of three books presents recent advances in modelling, planning and evaluating city logistics for sustainable and liveable cities based on the application of ICT (Information and Communication Technology) and ITS (Intelligent Transport Systems). It highlights modelling the behaviour of stakeholders who are involved in city logistics as well as planning and managing policy measures of city logistics including cooperative freight transport systems in public-private partnerships. Case studies of

implementing and evaluating city logistics measures in terms of economic, social and environmental benefits from major cities around the world are also given.

Operational Research in the Digital Era - ICT Challenges - Angelo Sifaleras
2018-09-27

This proceedings volume highlights the role and importance of Operational Research (OR) in the digital era and the underlying ICT challenges. The selected papers cover recent advances in all branches of operational research, mathematical modeling and decision making. It covers a wide range of key areas from digital economy, to supply chain management, and also finance. The book adopts an applied perspective that covers the contributions of OR in the broad field of business and economics linked with the discipline of computer science. The chapters are based on papers presented at the 6th International Symposium & 28th

National Conference on Operational Research. Although the conference is organized by the Hellenic Operational Research Society (HELORS), the contributions in this book promotes international co-operation among researchers and practitioners working in the field.

Vehicle Routing - Paolo Toth

2014-12-05

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Models, Algorithms, and Technologies for Network Analysis - Boris I.

Goldengorin 2013-09-21

This volume contains two types of papers—a selection of contributions from the “Second International Conference in Network Analysis” held in Nizhny Novgorod on May 7–9, 2012, and papers submitted to an "open call for papers" reflecting the activities of LATNA at the Higher School for Economics. This volume contains many

new results in modeling and powerful algorithmic solutions applied to problems in • vehicle routing • single machine scheduling • modern financial markets • cell formation in group technology • brain activities of left- and right-handers • speeding up algorithms for the maximum clique problem • analysis and applications of different measures in clustering

The broad range of applications that can be described and analyzed by means of a network brings together researchers, practitioners, and other scientific communities from numerous fields such as Operations Research, Computer Science, Transportation, Energy, Social Sciences, and more. The contributions not only come from different fields, but also cover a broad range of topics relevant to the theory and practice of network analysis. Researchers, students, and engineers from various disciplines will benefit from the state-of-the-art in models, algorithms,

technologies, and techniques presented.

Advances in Computational and Stochastic Optimization, Logic Programming, and Heuristic Search -

David L. Woodruff 2013-03-14

Computer Science and Operations Research continue to have a synergistic relationship and this book - as a part of the Operations Research and Computer Science Interface Series - sits squarely in the center of the confluence of these two technical research communities. The research presented in the volume is evidence of the expanding frontiers of these two intersecting disciplines and provides researchers and practitioners with new work in the areas of logic programming, stochastic optimization, heuristic search and post-solution analysis for integer programs. The chapter topics span the spectrum of application level. Some of the chapters are highly applied and others represent

work in which the application potential is only beginning. In addition, each chapter contains expository material and reviews of the literature designed to enhance the participation of the reader in this expanding interface.

The Vehicle Routing Problem: Latest Advances and New Challenges - Bruce L. Golden 2008-07-20

In a unified and carefully developed presentation, this book systematically examines recent developments in VRP. The book focuses on a portfolio of significant technical advances that have evolved over the past few years for modeling and solving vehicle routing problems and VRP variations. Reflecting the most recent scholarship, this book is written by one of the top research scholars in Vehicle Routing and is one of the most important books in VRP to be published in recent times.

Approximate Dynamic Programming for Dynamic Vehicle Routing - Marlin Wolf

Ulmer 2017-04-19

This book provides a straightforward overview for every researcher interested in stochastic dynamic vehicle routing problems (SDVRPs). The book is written for both the applied researcher looking for suitable solution approaches for particular problems as well as for the theoretical researcher looking for effective and efficient methods of stochastic dynamic optimization and approximate dynamic programming (ADP). To this end, the book contains two parts. In the first part, the general methodology required for modeling and approaching SDVRPs is presented. It presents adapted and new, general anticipatory methods of ADP tailored to the needs of dynamic vehicle routing. Since stochastic dynamic optimization is often complex and may not always be intuitive on first glance, the author accompanies the ADP-methodology with illustrative examples from the field of SDVRPs.

The second part of this book then depicts the application of the theory to a specific SDVRP. The process starts from the real-world application. The author describes a SDVRP with stochastic customer requests often addressed in the literature, and then shows in detail how this problem can be modeled as a Markov decision process and presents several anticipatory solution approaches based on ADP. In an extensive computational study, he shows the advantages of the presented approaches compared to conventional heuristics. To allow deep insights in the functionality of ADP, he presents a comprehensive analysis of the ADP approaches.

Operations Research Proceedings 2007

- Jörg Kalcsics 2008-03-20

The symposium Operations Research 2007 was held from September 5-7, 2007 at the Saarland University in Saarbrücken. This international conference is at the same time the

annual meeting of the German - erations Research Society (GOR). The transition in Germany (and many other countries in Europe) from a production orientation to a service society combined with a continuous demographic change generated a need for intensified Operations Research activities in this area. On that account this conference has been devoted to the role of Operations Research in the service industry. The links to Operations Research are manifold and include many different topics which are particularly emphasized in scientific sections of OR 2007. More than 420 participants from 30 countries made this event very international and successful. The program consisted of three plenary, eleven semi-plenary and more than 300 contributed presentations, which had been organized in 18 sections. During the conference, the GOR Dissertation and Diploma Prizes were awarded. We congratulate

all winners, especially Professor Wolfgang Domschke from the Da- stadt University of Technology, on receiving the GOR Scienti?c Prize Award.

Developments in Maritime Transportation and Exploitation of Sea Resources - Carlos Guedes Soares
2013-10-07

Developments in Maritime Transportation and Exploitation of Sea Resources covers recent developments in maritime transportation and exploitation of sea resources, encompassing ocean and coastal areas. The book brings together a selection of papers reflecting fundamental areas of recent research and development in the fields of:- Ship Hydrodynamics-

Metaheuristics for Logistics - Laurent Deroussi
2016-02-10

This book describes the main classical combinatorial problems that can be encountered when designing a logistics network or driving a supply

chain. It shows how these problems can be tackled by metaheuristics, both separately and using an integrated approach. A huge number of techniques, from the simplest to the most advanced ones, are given for helping the reader to implement efficient solutions that meet its needs. A lot of books have been written about metaheuristics (methods for solving hard optimization problems) and supply chain management (the field in which we find a huge number of combinatorial optimization problems) in the last decades. So, the main reason of this book is to describe how these methods can be implemented for this class of problems.

Open Problems in Optimization and Data Analysis - Panos M. Pardalos
2018-12-04

Computational and theoretical open problems in optimization, computational geometry, data science, logistics, statistics, supply chain

modeling, and data analysis are examined in this book. Each contribution provides the fundamentals needed to fully comprehend the impact of individual problems. Current theoretical, algorithmic, and practical methods used to circumvent each problem are provided to stimulate a new effort towards innovative and efficient solutions. Aimed towards graduate students and researchers in mathematics, optimization, operations research, quantitative logistics, data analysis, and statistics, this book provides a broad comprehensive approach to understanding the significance of specific challenging or open problems within each discipline. The contributions contained in this book are based on lectures focused on "Challenges and Open Problems in Optimization and Data Science" presented at the Deucalion Summer Institute for Advanced Studies in Optimization,

Mathematics, and Data Science in August 2016.

The State of the Art in the Routing and Scheduling of Vehicles and Crews
- 1981

Network Optimization - Julia Pahl
2011-06-03

This book constitutes the refereed proceedings of the 5th International Conference on Network Optimization, INOC 2011, held in Hamburg, Germany, in June 2011. The 65 revised full papers presented were carefully reviewed and selected from numerous submissions. The papers highlight recent developments in network optimization and are organized in the following topical sections: theoretical problems, uncertainty, graph theory and network design; network flows; routing and transportation; and further optimization problems and applications (energy oriented network design, telecom applications,

location, maritime shipping, and graph theory).

Advances in Simulation, Product Design and Development - M. S. Shunmugam 2019-11-06

This volume comprises select proceedings of the 7th International and 28th All India Manufacturing Technology, Design and Research conference 2018 (AIMTDR 2018). The papers in this volume discuss simulations based on techniques such as finite element method (FEM) as well as soft computing based techniques such as artificial neural network (ANN), their optimization and the development and design of mechanical products. This volume will be of interest to researchers, policy makers, and practicing engineers alike.

The Evolution of the Vehicle Routing Problem - Bruce Golden 2023-01-01

This book presents state-of-the-art research and practice in optimization routing, specifically the vehicle

routing problem (VRP). Since its introduction in the late 1950s, the VRP has been a very significant area of research and practice in operations research. Vehicles are used to make deliveries and for pickups every day and everywhere. Companies such as Amazon, UPS, FedEx, and DHL use route optimization to reduce mileage, fuel use, number of trucks on the road, and carbon dioxide emissions. The authors compile and analyze 135 survey and review articles on vehicle routing topics published between 2005 and 2022 in an effort to make key observations about publication and trend history, summarize the overall contributions in the field, and identify trends in VRP research and practice. The authors have compiled published research on models, algorithms, and applications for specific areas, including: alternative and multiple objectives; arc routing and general routing;

drones, last-mile delivery, and urban distribution; dynamic and stochastic routing; green routing; inventory routing; loading constraints; location-routing; multiple depots; pickup and delivery and dial-a-ride problems; rich and multi-attribute routing; routing over time; shipping; two-echelon, collaborative, and inter-terminal problems; specific variants, benchmark datasets, and software; and exact algorithms and heuristics. In addition, the book discusses how vehicle routing problems are among the most widely studied problems in combinatorial optimization due to the mathematical complexity and practical significance.

Metaheuristics - Patrick Siarry
2016-12-24

Metaheuristics exhibit desirable properties like simplicity, easy parallelizability, and ready applicability to different types of optimization problems. After a

comprehensive introduction to the field, the contributed chapters in this book include explanations of the main metaheuristics techniques, including simulated annealing, tabu search, evolutionary algorithms, artificial ants, and particle swarms, followed by chapters that demonstrate their applications to problems such as multiobjective optimization, logistics, vehicle routing, and air traffic management. The authors are leading researchers in this domain, with considerable teaching and applications experience, and the book will be of value to industrial practitioners, graduate students, and research academics.

Meta-Heuristics - Stefan Voß
2012-12-06

Meta-Heuristics: Advances and Trends in Local Search Paradigms for Optimizations comprises a carefully refereed selection of extended versions of the best papers presented at the Second Meta-Heuristics

Conference (MIC 97). The selected articles describe the most recent developments in theory and applications of meta-heuristics, heuristics for specific problems, and comparative case studies. The book is divided into six parts, grouped mainly by the techniques considered. The extensive first part with twelve papers covers tabu search and its application to a great variety of well-known combinatorial optimization problems (including the resource-constrained project scheduling problem and vehicle routing problems). In the second part we find one paper where tabu search and simulated annealing are investigated comparatively and two papers which consider hybrid methods combining tabu search with genetic algorithms. The third part has four papers on genetic and evolutionary algorithms. Part four arrives at a new paradigm within meta-heuristics. The fifth part studies the behavior of parallel

local search algorithms mainly from a tabu search perspective. The final part examines a great variety of additional meta-heuristics topics, including neural networks and variable neighbourhood search as well as guided local search. Furthermore, the integration of meta-heuristics with the branch-and-bound paradigm is investigated.

Matheuristics - Vittorio Maniezzo
2009-09-18

Metaheuristics support managers in decision-making with robust tools that provide high-quality solutions to important applications in business, engineering, economics, and science in reasonable time frames, but finding exact solutions in these applications still poses a real challenge. However, because of advances in the fields of mathematical optimization and metaheuristics, major efforts have been made on their interface regarding efficient hybridization.

This edited book will provide a survey of the state of the art in this field by providing some invited reviews by well-known specialists as well as refereed papers from the second Matheuristics workshop to be held in Bertinoro, Italy, June 2008. Papers will explore mathematical programming techniques in metaheuristics frameworks, and especially focus on the latest developments in Mixed Integer Programming in solving real-world problems.

Time-dependent Routing - Rabie Jaballah 2022

The vehicle routing problem (VRP), introduced more than 60 years ago, is at the core of transportation systems. With decades of development, the VRP is one of the most studied problems in the literature, with a very rich set of variants. Yet, primarily due to the lack of data, two critical assumptions make the VRP fail to adapt effectively to traffic

and congestion. The first assumption considers that the travel speed is constant over time ; the second, that each pair of customers is connected by an arc, ignoring the underlying street network. Traffic congestion is one of the biggest challenges in transportation systems. As traffic directly affects transportation activities, the whole supply chain needs to adjust to this factor. The continuous growth of freight in recent years worsens the situation, and a renewed focus on mobility, environment, and city logistics has shed light on these issues. Recently, advances in communications and real-time data acquisition technologies have made it possible to collect vehicle data such as their location, acceleration, driving speed, deceleration, etc. With the availability of this data, one can question the way we define, model, and solve transportation problems. This allows us to overcome the two

issues indicated before and integrate congestion information and the whole underlying street network. We start by considering the whole underlying street network, which means we have customer nodes and intermediate nodes that constitute the street network. Then, we model the travel time of each street during the day. By dividing the day into small intervals, up to a precision of a second, we consider precise traffic information. This results in a new problem called the time-dependent shortest path vehicle routing problem (TD-SPVRP), in which we combine the time-dependent shortest path problem (TD-SPP) and the time-dependent VRP (TD-VRP), creating a more general and very challenging problem. The TD-SPVRP is closer to what can be found in real-world conditions, and it constitutes the topic of Chapter 2, where we formulate it as a mixed-integer linear programming model and design a fast and efficient heuristic

algorithm to solve this problem. We test it on instances generated from actual traffic data from the road network in Québec City, Canada. Results show that the heuristic provides high-quality solutions with an average gap of only 5.66%, while the mathematical model fails to find a solution for any real instance. To solve the challenging problem, we emphasize the importance of a high-performance implementation to improve the speed and the execution time of the algorithms. Still, the problem is huge especially when we work on a large area of the underlying street network alongside very precise traffic data. To this end, we use different techniques to optimize the computational effort to solve the problem while assessing the impact on the precision to avoid the loss of valuable information. Two types of data aggregation are developed, covering two different levels of information. First, we manipulated

the structure of the network by reducing its size, and second by controlling the time aggregation level to generate the traffic data, thus the data used to determine the speed of a vehicle at any time. For the network structure, we used different reduction techniques of the road graph to reduce its size. We studied the value and the trade-off of spatial information. Solutions generated using the reduced graph are analyzed in Chapter 3 to evaluate the quality and the loss of information from the reduction. We show that the transformation of the TD-SPVRP into an equivalent TD-VRP results in a large graph that requires significant preprocessing time, which impacts the solution quality. Our development shows that solving the TD-SPVRP is about 40 times faster than solving the related TD-VRP. Keeping a high level of precision and successfully reducing the size of the graph is possible. In particular, we develop

two reduction procedures, node reduction and parallel arc reduction. Both techniques reduce the size of the graph, with different results. While the node reduction leads to improved reduction in the gap of 1.11%, the parallel arc reduction gives a gap of 2.57% indicating a distortion in the reduced graph. We analyzed the compromises regarding the traffic information, between a massive amount of very precise data or a smaller volume of aggregated data with some potential information loss. This is done while analyzing the precision of the aggregated data under different travel time models, and these developments appear in Chapter 4. Our analysis indicates that a full coverage of the street network at any time of the day is required to achieve a high level of coverage. Using high aggregation will result in a smaller problem with better data coverage but at the cost of a loss of information. We analyzed

two travel time estimation models, the link travel model (LTM) and the flow speed model (FSM). They both shared the same performance when working with large intervals of time (120, 300, and 600 seconds), thus a higher level of aggregation, with an absolute average gap of 5.5% to the observed route travel time. With short periods (1, 10, 30, and 60 seconds), FSM performs better than LTM. For 1 second interval, FSM gives an average absolute gap of 6.70%, while LTM provides a gap of 11.17%. This thesis is structured as follows. After a general introduction in which we present the conceptual framework of the thesis and its organization, Chapter 1 presents the literature review for the two main problems of our development, the shortest path problem (SPP) and the VRP, and their time-dependent variants developed over the years. Chapter 2 introduces a new VRP variant, the TD-SPVRP. Chapter 3 presents the different

techniques developed to reduce the size of the network by manipulating spatial information of the road network. The impact of these reductions is evaluated and analyzed on real data instances using multiple heuristics. Chapter 4 covers the impact of time aggregation data and travel time models when computing travel times on the precision of their estimations against observed travel times. The conclusion follows in the last chapter and presents some research perspectives for our works.

Solving Transport Problems - Walid Besbes 2020-02-26

Solving Transport Problems establishes fundamental points and good practice in resolving matters regarding green transportation. This is to prompt further research in conveyance issues by providing readers with new knowledge and grounds for integrated models and solution methods. Focusing on green transportation, this book covers

various sub-topics and thus consists of diverse content. Traditionally, academia and transport practitioners have mainly concentrated on efficient fleet management to achieve economic benefits and better-quality service. More recently, due to growing public environmental concerns and the industry understanding of the issue, the academic community has started to address environmental issues. The studies of green transportation compiled in this book have identified certain areas of interest, such as references, viewpoints, algorithms and ideas. Solving Transport Problems is for researchers, environmental decision-makers and other concerned parties, to start discussion on developing optimized technology and alternative fuel-based integrated models for environmentally cleaner transport systems.

Hybrid Construction Heuristics for Vehicle Routing Problem by Parameter Tuning Process - Hok Lie 2013

The vehicle routing problem (VRP) is very popular due to its practicality for modelling real-life optimisation problem in the areas of logistics and transportation. The various objectives and constraints that arise in different circumstances often lead to the development of new variants of the VRP, which requires the development of a solution method that is robust and flexible. It has been proven that VRP and its extension are NP-complete problems. Thus, VRPs with large sizes could usually only be solved by using non-exact algorithms, such as meta-heuristic algorithms. Meta-heuristic algorithms have high reusability components that make its implementation a straightforward task. However, choosing the right heuristic components of the meta-heuristic and their parameter setting is not easy. These problems are regarded as meta-heuristic algorithm configuration problems. There is a considerable quantity of well-

established methodology to tackle the parameter tuning problem. This thesis attempts to solve the heuristic selection problem with a parameter tuning method that is available in the literature - the response surface methodology. The case study in this thesis is a construction heuristic for the VRP that considers problem characteristics. By employing a procedure called 'normalisation', this study was able to combine several heuristics into a new hybrid construction heuristic. The methodology proceeded in two stages. First, a screening experiment was conducted in order to choose the right combination of heuristics. Second, each chosen heuristic was given a weight based on the model developed in stage two. The results were then evaluated against a popular benchmark instance: VRP with time windows constraint (VRPTW). The computational results showed that the new heuristic performed better than

the default setting in more than 80% of test cases. However, the experiment to incorporate the new heuristic into a higher-level framework - called 'adaptive large neighbourhood search' (ALNS) - indicated that further investigation is needed to achieve satisfying performance.

Bio-inspired Algorithms for the Vehicle Routing Problem - Francisco Baptista Pereira 2008-09-29

The vehicle routing problem (VRP) is one of the most famous combinatorial optimization problems. In simple terms, the goal is to determine a set of routes with overall minimum cost that can satisfy several geographical scattered demands. Biological inspired computation is a field devoted to the development of computational tools modeled after principles that exist in natural systems. The adoption of such design principles enables the production of problem solving techniques with

enhanced robustness and flexibility, able to tackle complex optimization situations. The goal of the volume is to present a collection of state-of-the-art contributions describing recent developments concerning the application of bio-inspired algorithms to the VRP. Over the 9 chapters, different algorithmic approaches are considered and a diverse set of problem variants are addressed. Some contributions focus on standard benchmarks widely adopted by the research community, while others address real-world situations.

Geometric Modelling, Numerical Simulation, and Optimization: - Geir Hasle 2007-06-10

This edited volume addresses the importance of mathematics for industry and society by presenting highlights from contract research at the Department of Applied Mathematics at SINTEF, the largest independent research organization in Scandinavia. Examples range from computer-aided

geometric design, via general purpose computing on graphics cards, to reservoir simulation for enhanced oil recovery. Contributions are written in a tutorial style.

Metaheuristics for Vehicle Routing Problems - Nacima Labadie 2016-02-23

This book is dedicated to metaheuristics as applied to vehicle routing problems. Several implementations are given as illustrative examples, along with applications to several typical vehicle routing problems. As a first step, a general presentation intends to make the reader more familiar with the related field of logistics and combinatorial optimization. This preamble is completed with a description of significant heuristic methods classically used to provide feasible solutions quickly, and local improvement moves widely used to search for enhanced solutions. The overview of these fundamentals allows appreciating the core of the work

devoted to an analysis of metaheuristic methods for vehicle routing problems. Those methods are exposed according to their feature of working either on a sequence of single solutions, or on a set of solutions, or even by hybridizing metaheuristic approaches with others kind of methods.

Arc Routing - Angel Corberan
2015-01-01

This book provides a thorough and up-to-date discussion of arc routing by world-renowned researchers. Organized by problem type, the book offers a rigorous treatment of complexity issues, models, algorithms, and applications. Arc Routing: Problems, Methods, and Applications opens with a historical perspective of the field and is followed by three sections that cover complexity and the Chinese Postman and the Rural Postman problems; the Capacitated Arc Routing Problem and routing problems with min-max and profit maximization

objectives; and important applications, including meter reading, snow removal, and waste collection.

Smart Delivery Systems - Jakub Nalepa
2019-11

Smart Delivery Systems: Solving Complex Vehicle Routing Problems examines both exact and approximate methods for delivering optimal solutions to rich vehicle routing problems, showing both the advantages and disadvantages of each approach. It shows how to apply machine learning and advanced data analysis techniques to improve routing systems, familiarizing readers with the concepts and technologies used in successfully implemented delivery systems. The book explains both the latest theoretical and practical advances in intelligent delivery and scheduling systems and presents practical applications for designing new algorithms for real-life scenarios. Emphasizes both sequential

and parallel algorithms Uniquely combines methods and algorithms, real-life applications, and parallel computing Includes recommendations on how to choose between different methods for solving applications Provides learning aids, end of chapter references, bibliography, worked examples and exercises

Column Generation - Guy Desaulniers
2006-03-20

Column Generation is an insightful overview of the state of the art in integer programming column generation and its many applications. The volume begins with "A Primer in Column Generation" which outlines the theory and ideas necessary to solve large-scale practical problems, illustrated with a variety of examples. Other chapters follow this introduction on "Shortest Path Problems with Resource Constraints," "Vehicle Routing Problem with Time Window," "Branch-and-Price Heuristics," "Cutting Stock Problems," each dealing with

methodological aspects of the field. Three chapters deal with transportation applications: "Large-scale Models in the Airline Industry," "Robust Inventory Ship Routing by Column Generation," and "Ship Scheduling with Recurring Visits and Visit Separation Requirements." Production is the focus of another three chapters: "Combining Column Generation and Lagrangian Relaxation," "Dantzig-Wolfe Decomposition for Job Shop Scheduling," and "Applying Column Generation to Machine Scheduling." The final chapter by François Vanderbeck, "Implementing Mixed Integer Column Generation," reviews how to set-up the Dantzig-Wolfe reformulation, adapt standard MIP techniques to the column generation context (branching, preprocessing, primal heuristics), and deal with specific column generation issues (initialization, stabilization, column management strategies).

