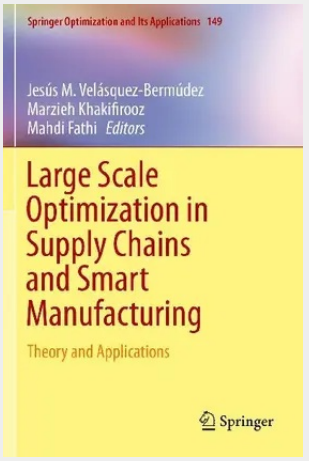
Velásquez-Bermúdez / Khakifirooz / Fathi

Large Scale Optimization in Supply Chains and Smart Manufacturing

Theory and Applications



In this book, theory of large scale optimization is introduced with case studies of real-world problems and applications of structured mathematical modeling. The large scale optimization methods are represented by various theories such as Benders' decomposition, logic-based Benders' decomposition, Lagrangian relaxation, Dantzig – Wolfe decomposition, multi-tree decomposition, Van Roy' cross decomposition and parallel decomposition for mathematical programs such as mixed integer nonlinear programming and stochastic programming.

Case studies of large scale optimization in supply chain management, smart manufacturing, and Industry 4.0 are investigated with efficient implementation for real-time solutions. The features of case studies cover a wide range of fields including the Internet of things, advanced transportation systems, energy management, supply chain networks, service systems, operations management, risk management, and financial and sales management.

Instructors, graduate students, researchers, and practitioners, would benefit from this book finding the applicability of large scale optimization in asynchronous parallel optimization, real-time distributed network, and optimizing the knowledge-based expert system for convex and non-convex problems.

1. Large Scale Optimization: Concepts and Fundamentals (Jesús Velásquez, Mahdi Fathi, Marzieh Khakifirooz). -2. Benders Theory Fundamentals & Extensions (Jesús Velásquez). -3. Lagrangian Relaxation(TBA). -4. Cross Decomposition (Ignacio Grossmann & & Braulio Braund). -5. Stochastic Optimization & Risk Management (Laureano Escudero & Juan Monge). -6. Economic Interpretation (Jesús Velásquez). - 7. Structured Mathematical Modeling (Jesús Velásquez). -8. Fundamentals of Sales & Operation Planning using Mathematical Programming (Jesús Velásquez). -9. Modeling using Superstructures (Jesús Velásquez). -10. Capacity Expansion Planning along a Time Horizon in Supply Chain Networks under Uncertainty with Risk Averse Reduction (Jeff Kelly). -11. Large-Scale Optimization for Modeling Multiplex Blockchain Networks based on Trust for Internet of Things (Laureano Escudero & Juan Monge). -12. Large-Scale Optimization for Modeling Retails 4.0 (Mahdi Fathi, Marzieh Khakifirooz). -13. Optimization in Process Industries (Mahdi Fathi, Marzieh Khakifirooz). -14. Multi-Echelon Dynamic Inventory Management using Stochastic Optimization 9 Ignacio Grossmann, Braulio Braund). -15. Multimodal Transport Systems (Jesús Velásquez). -16. Integrating Models of Operations (S&OP) and Financial (ALM) Models (Angel Marin). -17. The Berth Allocation and Quay Crane Assignment-Scheduling Problem: A Detailed Events Approach (Federico Trigos, Carolina Saldaña, Jesús Velásquez). -18. Real Time Optimization Applied to Heavy Oil Pumping and Transportation (Danilo Abril, Jesús Velásquez). -19. Real Time Optimization Applied to Heavy Oil Pumping and Transportation (Raul Rodriguez, Jesús Velásquez). -21. New Approaches to Optimization in the Short Term (Jesús Velásquez, Mahdi Fathi, Marzieh Khakifirooz). -22. Optimization Technologies.

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