# Manufacturing Optimization Through Intelligent Techniques Manufacturing Engineering And Materials Processing

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Optimizing Big Data Management and Industrial Systems with Intelligent Techniques Springer

This book comprises peer-reviewed papers presented at the International Conference on Advanced Engineering **Optimization Through Intelligent** Techniques (AEOTIT) 2022. The book combines contributions from academics and industry professionals and covers advanced optimization techniques across all major engineering disciplines like mechanical, manufacturing, civil, automobile, electrical, chemical, computer, and electronics engineering. The book discusses different optimization techniques and algorithms such as genetic algorithm, nondominated sorting genetic algorithm-II, and III, differential search, particle swarm optimization, fruit fly algorithm,

cuckoo search, teaching – learning-based optimization algorithm, grey wolf optimization, Jaya algorithm, Rao algorithms, and many other latest metaheuristic techniques and their applications. Various multi-attribute decision-making methods such as AHP, TOPSIS, ELECTRE, PROMETHEE, DEMATEL, R-method, fuzzy logic, and their applications are also discussed. This book serves as a valuable reference for students, researchers, and practitioners and helps them in solving a wide range of optimization problems.

Proceedings of International Conference on Intelligent Manufacturing and Automation Springer Nature Artificial Intelligence in Manufacturing: Concepts and Methods explains the most successful emerging techniques for applying AI to engineering problems. Artificial intelligence is increasingly being applied to all engineering disciplines, producing more insights into how we understand the world and allowing us to create products in new ways. This book unlocks the advantages of this technology for manufacturing by drawing on work by leading researchers who have successfully developed methods that can apply to a

range of engineering applications. The book implementing IoTs for data addresses educational challenges needed for widespread implementation of AI and also provides detailed technical instructions for the implementation of AI methods. Drawing on research in computer science, physics and a range of engineering disciplines, this book tackles the interdisciplinary challenges of the subject to introduce new thinking to important manufacturing problems. Presents AI concepts from the computer science field using language and examples designed to inspire engineering graduates Provides worked examples throughout to help readers fully engage with the methods described Includes concepts that are supported by definitions for key terms and chapter summaries

Advanced Engineering Optimization Through Intelligent Techniques Walter de Gruyter GmbH & Co KG Optimization of Manufacturing Systems Using the Internet of Things extends the IoT (Internet of Things) into the manufacturing field to develop an IoMT (Internet of Manufacturing Things) architecture with real-time traceability, visibility, and interoperability in production planning, execution, and control. This book is essential reading for anyone interested in the optimization and control of an intelligent manufacturing system. As modern manufacturing shopfloors can create bottlenecks in the capturing and collection of real-time field information, and because paper-based manual systems are time-consuming and prone to errors, this book helps readers understand how to alleviate these issues, assisting them in their decision-making on shop-floors .. Includes case studies in

acquisition, monitoring, and assembly in manufacturing. Helps manufacturers to tackle the growing complexities and uncertainties of manufacturing systems in globalized business environments Acts as an introduction to using IoT for readers across industrial and manufacturing engineering Smart Manufacturing Elsevier To date, reconfigurable manufacturing systems (RMSs) are among the most effective manufacturing styles that can offer manufacturers an alternative way of facing up to the challenges of continual changes in production requirements within the global, competitive and dynamic manufacturing environments. However, availability of optimal process plans that are suitable for reconfigurable manufacturing is one of the key enablers - yet to be fully unlocked - for realizing the full benefits of true RMSs. To unlock the process planning key and advance the state of art of reconfigurable manufacturing in the manufacturing industry, a number of questions need to be answered: (i) what decision making models and (ii) what computational techniques, can be applied to provide optimal manufacturing process planning solutions that are suitable for logical reconfiguration in manufacturing systems? To answer these questions, you must understand how to model reconfigurable manufacturing activities in an optimization perspective. You must also understand how to develop and select appropriate optimization techniques for solving process planning problems in manufacturing systems. To this end, Process Planning Optimization in Reconfigurable Manufacturing Systems covers: the design and operation of RMSs, optimal process planning modelling for

reconfigurable manufacturing and the design and implementation of heuristic algorithm design techniques. The author explores how to: model optimization problems, select suitable optimization techniques, develop optimization algorithms, comparatively analyze the performance of candidate metaheuristics and how to investigate the effects of optimal process planning solutions on operating levels in manufacturing systems. This book delineates five alternative heuristic algorithm design techniques based on simulated annealing, genetic algorithms and the boltzmann machine that are tasked to solve manufacturing process planning optimization problems in RMSs. After reading models, ontology, and decision field theory this book, you will understand: how a reconfigurable manufacturing system works, the different types of manufacturing optimization problems associated with reconfigurable manufacturing, as well as the conventional and intelligent techniques that are suitable for solving process planning optimization problems. You will also be able to develop and implement effective optimization procedures and algorithms for a wide spectrum of optimization problems in design and reconfigurable manufacturing."

#### Data-Driven Optimization of Manufacturing industrial problems of the manufacturing **Processes** Springer

Artificial intelligence (AI) techniques and the finite element method (FEM) are both powerful computing tools, which are extensively used for modeling and optimizing manufacturing processes. The combination of these tools has resulted in a new flexible and robust approach as several recent studies have shown. This book aims to review the work already done in this field as well as to expose the new possibilities and foreseen trends. The book is expected to be useful for postgraduate students and researchers, working in the area of modeling and optimization of manufacturing processes.

# Intelligent Manufacturing John Wiley & Sons

The text comprehensively discusses computational models including artificial neural networks, agent-based models, and decision field theory for reliability engineering. It will serve as an ideal reference text for graduate students and academic researchers in the fields of industrial engineering, manufacturing engineering, computer engineering, and materials science. Discusses the development of sustainable materials using metaheuristic approaches. Covers computational models such as agent-based for reliability engineering. Presents swarm intelligence methods such as ant colony optimization, particle swarm optimization, and grey wolf optimization for solving the manufacturing process. Include case studies for industrial optimizations. Explores the use of computational optimization for reliability and maintainability theory. The text covers swarm intelligence techniques including ant colony optimization, particle swarm optimization, cuckoo search, and genetic algorithms for solving complex industry as well as predicting reliability, maintainability, and availability of several industrial components.

Advanced Engineering Optimization Through Intelligent Techniques Springer This book presents computational and statistical methods used by intelligent systems within the concept of Industry 4.0. The methods include among others evolution-based and swarm intelligence-based methods. Each method is explained in its fundamental aspects, while some notable bibliography is provided for further reading. This book describes each methods' principles and compares them. It is intended for researchers who are new in computational and

### statistical methods but also to experienced users. Intelligent Manufacturing Management Systems Springer Nature

Advanced Manufacturing Methods: Smart Processes and Modeling for Optimization describes developments in advanced manufacturing processes and applications considering typical and advanced materials. It helps readers implement manufacturing 4.0 production techniques and highlights why a consolidated source and robust platform are necessary for implementing machine learning processes in the manufacturing sector. Discusses the industrial impact of manufacturing process Provides novel fundamental manufacturing solutions Presents the various aspects of applications in advanced materials in correlation of physical properties with macro-, micro- and nanostructures Reviews both classical and artificial manufacturing when applied with typical and novel innovative materials Aimed at those working in manufacturing, mechanical and optimization of manufacturing processes, this work provides readers with a comprehensive view of current development in, and applications of, advanced manufacturing. Process Planning Optimization in **Reconfigurable Manufacturing Systems** John Wiley & Sons This book discusses comprehensively the advanced manufacturing processes, including illustrative examples of the processes, mathematical modeling, and the need to optimize associated parameter problems. In addition, it describes in detail the cohort intelligence methodology and its variants along with illustrations, to help readers gain a better understanding of the framework. The theoretical and statistical

rigor is validated by comparing the solutions with evolutionary algorithms, simulation annealing, response surface methodology, the firefly algorithm, and experimental work. Lastly, the book critically reviews several socio-inspired optimization methods. Intelligent Decision-making Models for Production and Retail Operations CRC Press 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.

Artificial Intelligence Techniques for Networked Manufacturing Enterprises Management Springer Science & Business Media

This book comprises select peer-reviewed papers presented at the International

Conference on Advanced Engineering **Optimization Through Intelligent Techniques** (AEOTIT) 2018. The book combines contributions from academics and industry professionals, and covers advanced optimization techniques across all major engineering disciplines like mechanical, manufacturing, civil, automobile, electrical, chemical, computer and electronics engineering. Different optimization techniques and algorithms such as genetic algorithm (GA), differential evolution (DE), simulated annealing (SA), particle swarm optimization (PSO), artificial bee colony (ABC) algorithm, artificial immune algorithm (AIA), teaching-learningbased optimization (TLBO) algorithm and many other latest meta-heuristic techniques and their applications are discussed. This book will serve as a valuable reference for students. researchers and practitioners and help them in solving a wide range of optimization problems. Soft Computing in Smart Manufacturing Springer This work gives a concise introduction to four important optimization techniques, presenting a range of applications drawn from electrical, manufacturing, mechanical, and systems engineering-such as the design of microstrip antennas, digital FIR filters, and fuzzy logic controllers. The book also contains the C programs used to implement the main techniques for those wishing to experiment with them.

### **Evolutionary Computing in Advanced Manufacturing** Springer

This book sheds light on the development of traditional and advanced optimization methods. Their use in various tradition and non-tradition manufacturing and machining processes for an improved manufacturability is reported. This includes

key elements of implementing conventional statistical methods, multi-objective and multi-criteria decision-making methods and evolution of single and multi-target optimization techniques using soft computing to enhance production

performance, efficiency and sustainability in manufacturing. The latest research in this area as well as possible avenues of future research are also highlighted.

Nature-Inspired Optimization in Advanced Manufacturing Processes and Systems Springer

This book forms an excellent basis for the development of intelligent manufacturing system for Industry 4.0, digital and distributed manufacturing, and factories for future. This book of new developments and advancement in intelligent control and optimization system for production engineering serves as a good companion to scholars, manufacturing companies, and RTO to improve the efficiency of production systems.

#### **Optimization of Manufacturing Processes** IGI Global

This book aims at addressing the challenges of contemporary manufacturing in Industry 4.0 environment and future manufacturing (aka Industry 5.0), by implementing soft computing as one of the major sub-fields of artificial intelligence. It contributes to development and application of the soft computing systems, including links to hardware, software and enterprise systems, in resolving modern manufacturing issues in complex, highly dynamic and globalized industrial circumstances. It embraces heterogeneous complementary aspects, such as control, monitoring and modeling of different manufacturing tasks, including intelligent robotic systems and processes, addressed by various machine learning and fuzzy techniques; modeling and parametric optimization of advanced conventional and non-conventional, eco-friendly manufacturing processes by using machine learning and evolutionary computing techniques; cybersecurity framework for Internet of Things-based systems addressing trustworthiness and resilience in machine-tomachine and human-machine collaboration; static and dynamic digital twins integration and family formation, selection of robot synchronization in a smart factory environment; STEP-NC technology for a smart machine vision system, and integration of Open CNC with Service-Oriented Architecture for STEP-NC monitoring system in a smart manufacturing. Areas of interest include but are not limited to applications of soft computing to address the following: dynamic process/system modeling and simulation, dynamic process/system parametric optimization, dynamic planning and scheduling, smart, predictive maintenance, intelligent and autonomous systems, improved machine cognition, effective digital twins integration, human-machine collaboration, robots, and cobots.

#### Advanced Engineering Optimization Through Intelligent Techniques IGI Global

"This book present applications of intelligent optimization techniques in data management and manufacturing systems. It discusses optimization techniques in terms of heuristic and metaheuristic methods to manage and optimize the problems in data mining, recommender systems and advanced manufacturing systems and examines the decision making issues"--

# **Computational Methods for Optimizing Manufacturing Technology: Models and Techniques** IGI Global

Effective utilization of equipment is critical to any manufacturing operation, especially with today's sophisticated, high-cost equipment and increased global competition. To meet these challenges in the manufacturing industry, you must understand and implement the myriad conventional and intelligent techniques for different types of manufacturing problems. Manufacturing Optimization Through Intelligent Techniques covers design of machine elements, integrated product development, machining tolerance allocation, selection of operating parameters

for CNC machine tools, scheduling, part coordinates, robot trajectory planning and both conventional and intelligent techniques, providing the tools to design and implement a suitable optimization technique. The author explores how to model optimization problems, select suitable techniques, develop the optimization algorithm and software, and implement the program. The book delineates five new techniques using examples taken from the literature for optimization problems in design, tolerance allocation; selection of machining parameters, integrated product development, scheduling, concurrent formation of machine groups and part families, selection of robot co-ordinates, robot trajectory planning and intelligent machining. All the manufacturing functions described have been successfully solved by Genetic Algorithm. Other intelligent techniques have been implemented only for solving certain types of problems: simulated annealing; design and scheduling, particle swarm optimization and ant colony optimization; tolerance allocation and tabu search; as well as machining parameters optimization. After reading this book, you will understand the different types of manufacturing optimization problems as well as the conventional and intelligent techniques suitable for solving them. You will also be able to develop and implement effective optimization procedures and algorithms for a wide variety of problems in design manufacturing.

<u>Manufacturing Optimization through</u> <u>Intelligent Techniques (2006)</u> Springer 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 INTRELLIGENT MANUFACTURING (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.

Supply Chain Optimization, Design, and Management: Advances and Intelligent Methods Academic Press

This book presents the outcomes of the International Conference on Intelligent Manufacturing and Automation (ICIMA 2018) organized by the Departments of Mechanical Engineering and Production Engineering at Dwarkadas J. Sanghvi College of Engineering, Mumbai, and the Indian Society of Manufacturing Engineers. It includes original research and the latest advances in the field, focusing on automation, mechatronics and robotics: CAD/CAM/CAE/CIM/FMS in manufacturing; product design and development; DFM/DFA/FMEA; MEMS and Nanotechnology; rapid prototyping; computational techniques; industrial engineering; manufacturing process management; modelling and optimization techniques; CRM, MRP and ERP; green, lean, agile and sustainable manufacturing; logistics and supply chain management; quality assurance and environment protection; advanced material processing and characterization; and composite and smart materials.

Manufacturing Intelligence for Industrial Engineering: Methods for System Self-Organization, Learning, and Adaptation

**CRC** Press

MANAGEMENT SYSTEMS The book explores the latest manufacturing techniques in relation to AI and evolutionary algorithms that can monitor and control the manufacturing environment. The concepts that pertain to the application of digital evolutionary technologies in the sphere of industrial engineering and manufacturing are presented in this book. A few chapters demonstrate stepwise discussion, case studies, structured literature review, rigorous experimentation results, and applications. Further chapters address the challenges encountered by industries in integrating these digital technologies into their operational activities, as well as the opportunities for this integration. In addition, the reader will find: Systemic explanations of the unique characteristics of big data, cloud computing, and AI used for decision-making in intelligent production systems; Highlights of the current and highly relevant topics in manufacturing management; Structured presentations resolving the issues being faced by many real-world applications in a broad range of areas such as smart supply chains, knowledge management, intelligent inventory management, IoT adoption in manufacturing management, and more; Intelligent techniques for sustainable practices in industrial waste management. Audience The book will be used by researchers, industry engineers, and data scientists/AI specialists working in industrial engineering, mechanical engineering, production engineering, manufacturing engineering, and operations and supply chain management. The book will also be valuable to the service sector

industry, such as logistics and those implementing smart cities.