Smart Factory Applications In Discrete Manufacturing

This book debates and discusses the present and future of Disruptive Technologies in general and military Disruptive Technologies in particular. Its primary goal is to discuss various critical and advanced elucidations on strategic technologies. The focus is less on extrapolating the future of technology in a strict sense, and more on understanding the Disruptive Technology paradigm. It is widely accepted that technology alone cannot win any military campaign or war. However, technological superiority always offers militaries an advantage. More importantly, technology also has a great deterrent value. Hence, on occasion, technology can help to avoid wars. Accordingly, it is important to effectively manage new technologies by identifying their strategic utility and role in existing military architectures and the possible contributions they could make towards improving overall military capabilities. This can also entail doctrinal changes, so as to translate these new technologies into concrete advantages.

This book provides a complete picture of several decision support tools for predictive maintenance. These include embedding early anomaly/fault detection, diagnosis and reasoning, remaining useful life prediction (fault prognostics), quality prediction and self-reaction, as well as optimization, control and self-healing techniques. It shows recent applications of these techniques within various types of industrial (production/utilities/equipment/plants/smart devices, etc.) systems addressing several challenges in Industry 4.0 and different tasks dealing with Big Data Streams, Internet of Things, specific infrastructures and tools, high system dynamics and non-stationary environments . Applications discussed include production and manufacturing systems, renewable energy production and management, maritime systems, power plants and turbines, conditioning systems, compressor valves, induction motors, flight simulators, railway infrastructures, mobile robots, cyber security and Internet of Things. The contributors go beyond state of the art by placing a specific focus on dynamic systems, where it is of utmost importance to update system and maintenance models on the fly to maintain their predictive power.

The book shows how simulation's long history and close ties to industry since the third industrial revolution have led to its growing importance in Industry 4.0. The book emphasises the role of simulation in the new industrial revolution, and its application as a key aspect of making Industry 4.0 a reality – and thus achieving the complete digitisation of manufacturing and business. It presents various perspectives on simulation and demonstrates its applications, from augmented or virtual reality to process engineering, and from quantum computing to intelligent management. Simulation for Industry 4.0 is a guide and milestone for the simulation community, as well as those readers working to achieve the goals of Industry 4.0. The connections between simulation and Industry 4.0 drawn here will be of interest not only to beginners, but also to practitioners and researchers as a point of departure in the subject, and as a guide for new lines of

study.

This book constitutes the refereed proceedings of the 6th International Conference on Industrial Applications of Holonic and Multi-Agent Systems, HoloMAS 2013, held in Prague, Czech Republic, in August 2013, in conjunction with DEXA 2013. The 25 revised full papers presented together with two invited talks were carefully reviewed and selected from 37 submissions. The papers are organized in the following topical sections: MAS in automation and manufacturing; design, simulation and validation; MAS in transportation systems; industrial applications; and new trends.

This book provides a holistic perspective on Digital Twin (DT) technologies, and presents cutting-edge research in the field. It assesses the opportunities that DT can offer for smart cities, and covers the requirements for ensuring secure, safe and sustainable smart cities. Further, the book demonstrates that DT and its benefits with regard to: data visualisation, real-time data analytics, and learning leading to improved confidence in decision making; reasoning, monitoring and warning to support accurate diagnostics and prognostics; acting using edge control and what-if analysis; and connection with back-end business applications hold significant potential for applications in smart cities, by employing a wide range of sensory and data-acquisition systems in various parts of the urban infrastructure. The contributing authors reveal how and why DT technologies that are used for monitoring, visualising, diagnosing and predicting in real-time are vital to cities' sustainability and efficiency. The concepts outlined in the book represents a city together with all of its infrastructure elements, which communicate with each other in a complex manner. Moreover, securing Internet of Things (IoT) which is one of the key enablers of DT's is discussed in details and from various perspectives. The book offers an outstanding reference guide for practitioners and researchers in manufacturing, operations research and communications, who are considering digitising some of their assets and related services. It is also a valuable asset for graduate students and academics who are looking to identify research gaps and develop their own proposals for further research.

Industrial internet of things (IIoT) is changing the face of industry by completely redefining the way stakeholders, enterprises, and machines connect and interact with each other in the industrial digital ecosystem. Smart and connected factories, in which all the machinery transmits real-time data, enable industrial data analytics for improving operational efficiency, productivity, and industrial processes, thus creating new business opportunities, asset utilization, and connected services. IIoT leads factories to step out of legacy environments and arcane processes towards open digital industrial ecosystems. Innovations in the Industrial Internet of Things (IIoT) and Smart Factory is a pivotal reference source that discusses the development of models and algorithms for predictive control of industrial operations and focuses on optimization of industrial operational efficiency, rationalization, automation, and maintenance. While

highlighting topics such as artificial intelligence, cyber security, and data collection, this book is ideally designed for engineers, manufacturers, industrialists, managers, IT consultants, practitioners, students, researchers, and industrial industry professionals.

The Industry 4.0 paradigm has led to the creation of new opportunities for taking advantage of a set of diverse technologies in the manufacturing domain. This book touches on a series of advanced technologies and research fields, including Internet of Things, Augmented and Virtual Reality, Machine Learning, Advanced Robotics, Additive Manufacturing, System and Process Simulation, Computer-Aided Design/Engineering/Manufacturing/Process Planning Systems as well as Product Lifecycle Management Platforms. The topics covered span a series of diverse areas related to a) product design and development, b) manufacturing systems and operations, c) process engineering, and d) Industry 4.0 technologies review and realization.

Smart manufacturing uses big data, the Internet of things (IoT) and the Internet of Services (IoS), and flexible and dynamic workforces to cope with ever-increasing demand in low-volume, high-mix production. Companies worldwide are already pivoting towards dynamic and reconfigurable production as a smarter way to build and make things. As such, this book discusses the next generation of manufacturing, which will involve the transformational convergence of intelligent machines, powerful computing and analytics, and unprecedented networking of people, products, and services.

Build your first digital twin MVP and gain first-hand experience of using the technology, the challenges it presents, and its impact on your organization Key Features Create a digital twin prototype using Microsoft Azure Digital Twin Explore the digital twin approach to the design, operations, and maintenance of industrial assets and products Understand key characteristics and components of a digital twin through practical use cases and business scenarios Book Description Digital twin technology enables organizations to create digital representations of physical entities such as assets, systems, and processes throughout their life cycle. It improves asset performance, utilization, and safe operations and reduces manufacturing, operational, and maintenance costs. The book begins by introducing you to the concept of digital twins and sets you on a path to develop a digital twin strategy to positively influence business outcomes in your organization. You'll understand how digital twins relate to physical assets, processes, and technology and learn about the prerequisite conditions for the right platform, scale, and use case of your digital twins. You'll then get hands-on with Microsoft's Azure Digital Twins platform for your digital twin development and deployment. The book equips you with the knowledge to evaluate enterprise and specialty platforms, including the cloud and industrial IoT required to set up your digital twin prototype. Once you've built your prototype, you'll be able to test and validate it relative to the intended purpose of the twin through pilot deployment, full deployment, and value tracking techniques. By the end of this book, you'll have developed the skills to build and deploy your digital twin prototype, or minimum viable twin, to demonstrate, assess, and monitor your asset at specific stages in the asset life cycle. What you will learn Identify key criteria for the applicability of digital twins in your organization Explore the RACI matrix and rapid experimentation for choosing the right tech stack for your

digital twin system Evaluate public cloud, industrial IoT, and enterprise platforms to set up your prototype Develop a digital twin prototype and validate it using a unit test, integration test, and functional test Perform an RoI analysis of your digital twin to determine its economic viability for the business Discover techniques to improve your digital twin for future enhancements Who this book is for The digital twin book is for mid-career subject experts, including engineers and operations managers, building their first prototype (MVP) using digital twin technology. The book will help professionals responsible for mechanical, process, and reliability engineering domains. You don't have to be a developer or programmer, but beginner-level programming skills will be helpful.

This book gathers the peer-reviewed papers presented at the 8th edition of the International Workshop "Service Orientation in Holonic and Multi-Agent Manufacturing – SOHOMA'18" held at the University of Bergamo, Italy on June 11–12, 2018. The objective of the SOHOMA annual workshops is to foster innovation in smart and sustainable manufacturing and logistics systems by promoting new concepts, methods and solutions that use service orientation of agent-based control technologies with distributed intelligence. Reflecting the theme of SOHOMA'18: "Digital transformation of manufacturing with agent-based control and service orientation of Internet-scale platforms", the research included focuses on how the digital transformation, as advocated by the "Industry 4.0", "Industrial Internet of Things", "Cyber-Physical Production Systems" and "Cloud Manufacturing" frameworks, improves the efficiency, agility and sustainability of manufacturing processes, products, and services, and how it relates to the interaction between the physical and informational worlds, which is implemented in the virtualization of products, processes and resources managed as services.

This book develops the core system science needed to enable the development of a complex industrial internet of things/manufacturing cyber-physical systems (IIoT/M-CPS). Gathering contributions from leading experts in the field with years of experience in advancing manufacturing, it fosters a research community committed to advancing research and education in IIoT/M-CPS and to translating applicable science and technology into engineering practice. Presenting the current state of IIoT and the concept of cybermanufacturing, this book is at the nexus of research advances from the engineering and computer and information science domains. Readers will acquire the core system science needed to transform to cybermanufacturing that spans the full spectrum from ideation to physical realization.

Since publication of the initial papers in 2006, compressed sensing has captured the imagination of the international signal processing community, and the mathematical foundations are nowadays quite well understood. Parallel to the progress in mathematics, the potential applications of compressed sensing have been explored by many international groups of, in particular, engineers and applied mathematicians, achieving very promising advances in various areas such as communication theory, imaging sciences, optics, radar technology, sensor networks, or tomography. Since many applications have reached a mature state, the research center MATHEON in Berlin focusing on "Mathematics for Key Technologies", invited leading researchers on applications of compressed sensing from mathematics, computer science, and engineering to the "MATHEON Workshop 2013: Compressed Sensing and its

Applications" in December 2013. It was the first workshop specifically focusing on the applications of compressed sensing. This book features contributions by the plenary and invited speakers of this workshop. To make this book accessible for those unfamiliar with compressed sensing, the book will not only contain chapters on various applications of compressed sensing written by plenary and invited speakers, but will also provide a general introduction into compressed sensing. The book is aimed at both graduate students and researchers in the areas of applied mathematics, computer science, and engineering as well as other applied scientists interested in the potential and applications of the novel methodology of compressed sensing. For those readers who are not already familiar with compressed sensing, an introduction to the basics of this theory will be included.

This book presents novel algorithms for designing Discrete-Time Sliding Mode Controllers (DSMCs) for Networked Control Systems (NCSs) with both types of fractional delays namely deterministic delay and random delay along with different packet loss conditions such as single packet loss and multiple packet loss that occur within the sampling period. Firstly, the switching type and non-switching type algorithms developed for the deterministic type fractional delay where the delay is compensated using Thiran's approximation technique. A modified discrete-time sliding surface is proposed to derive the discrete-time sliding mode control algorithms. The algorithm is further extended for the random fractional delay with single packet loss and multiple packet loss situations. The random fractional delay is modelled using Poisson's distribution function and packet loss is modelled by means of Bernoulli's function. The condition for closed loop stability in all above situations are derived using the Lyapunov function. Lastly, the efficacy of the proposed DSMC algorithms are demonstrated by extensive simulations and also experimentally validated on a servo system.

Advances in Production Management Systems. Towards Smart and Digital ManufacturingIFIP WG 5.7 International Conference, APMS 2020, Novi Sad, Serbia, August 30 – September 3, 2020, Proceedings, Part IISpringer Nature

The volume set LNAI 11740 until LNAI 11745 constitutes the proceedings of the 12th International Conference on Intelligent Robotics and Applications, ICIRA 2019, held in Shenyang, China, in August 2019. The total of 378 full and 25 short papers presented in these proceedings was carefully reviewed and selected from 522 submissions. The papers are organized in topical sections as follows: Part I: collective and social robots; human biomechanics and human-centered robotics; robotics for cell manipulation and characterization; field robots; compliant mechanisms; robotic grasping and manipulation with incomplete information and strong disturbance; human-centered robotics; development of high-performance joint drive for robots; modular robots and other mechatronic systems; compliant manipulation learning and control for lightweight robot. Part II: power-assisted system and control; bio-inspired wall climbing robot; underwater acoustic and optical signal processing for environmental cognition; piezoelectric actuators and micro-nano manipulations; robot vision and scene understanding; visual and motional learning in robotics; signal processing and underwater bionic robots; soft locomotion robot; teleoperation robot; autonomous control of unmanned aircraft systems. Part III: marine bio-inspired robotics and soft robotics: materials,

mechanisms, modelling, and control; robot intelligence technologies and system integration; continuum mechanisms and robots; unmanned underwater vehicles; intelligent robots for environment detection or fine manipulation; parallel robotics; human-robot collaboration; swarm intelligence and multi-robot cooperation; adaptive and learning control system; wearable and assistive devices and robots for healthcare; nonlinear systems and control. Part IV: swarm intelligence unmanned system; computational intelligence inspired robot navigation and SLAM; fuzzy modelling for automation, control, and robotics; development of ultra-thin-film, flexible sensors, and tactile sensation; robotic technology for deep space exploration; wearable sensing based limb motor function rehabilitation; pattern recognition and machine learning; navigation/localization. Part V: robot legged locomotion; advanced measurement and machine vision system; man-machine interactions; fault detection, testing and diagnosis; estimation and identification; mobile robots and intelligent autonomous systems; robotic vision, recognition and reconstruction; robot mechanism and design. Part VI: robot motion analysis and planning; robot design, development and control; medical robot; robot intelligence, learning and linguistics; motion control; computer integrated manufacturing; robot cooperation; virtual and augmented reality; education in mechatronics engineering; robotic drilling and sampling technology; automotive systems; mechatronics in energy systems; human-robot interaction. This book comprises the select proceedings of the 2nd International Conference on Future Learning Aspects of Mechanical Engineering (FLAME) 2020. In particular, this volume discusses different topics of industrial and production engineering such as sustainable manufacturing processes, logistics, Industry 4.0 practices, circular economy, lean six sigma, agile manufacturing, additive manufacturing, IoT and Big Data in manufacturing, 3D printing, simulation, manufacturing management and automation, surface roughness, multi-objective optimization and modelling for production processes, developments in casting, welding, machining, and machine tools. The contents of this book will be useful for researchers as well as industry professionals.

This book celebrates Professor Mathukumalli Vidyasagar's outstanding achievements in systems, control, robotics, statistical learning, computational biology, and allied areas. The contributions in the book summarize the content of invited lectures given at the workshop "Emerging Applications of Control and Systems Theory" (EACST17) held at the University of Texas at Dallas in late September 2017 in honor of Professor Vidyasagar's seventieth birthday. These contributions are the work of twenty-eight distinguished speakers from eight countries and are related to Professor Vidyasagar's areas of research. This Festschrift volume will remain as a permanent scientific record of this event.

The book includes selected high-quality research papers presented at the Third International Congress on Information and Communication Technology held at Brunel University, London on February 27–28, 2018. It discusses emerging topics pertaining to information and communication technology (ICT) for managerial

applications, e-governance, e-agriculture, e-education and computing technologies, the Internet of Things (IOT), and e-mining. Written by experts and researchers working on ICT, the book is suitable for new researchers involved in advanced studies.

This fourth edition of the book provides readers with a detailed explanation of PLM, enabling them to gain a full understanding and the know-how to implement PLM within their own business environment. This new and expanded edition has been fully updated to reflect the numerous technological and management advances made in PLM since the release of the third edition in 2014, including chapters on both the Internet of Things and Industry 4.0. The book describes the environment in which products are ideated, developed, manufactured, supported and retired before addressing the main components of PLM and PLM Initiatives. These include product-related business processes, product data, product data management (PDM) systems, other PLM applications, best practices, company objectives and organisation. Key activities in PLM Initiatives include Organisational Change Management (OCM) and Project Management. Lastly, it addresses the PLM Initiative, showing the typical steps and activities of a PLM project or initiative. Enhancing readers' understanding of PLM, the book enables them to develop the skills needed to implement PLM successfully and achieve world-class product performance across the lifecycle.

The two-volume set IFIP AICT 535 and 536 constitutes the refereed proceedings of the International IFIP WG 5.7 Conference on Advances in Production Management Systems, APMS 2018, held in Seoul, South Korea, in August 2018. The 129 revised full papers presented were carefully reviewed and selected from 149 submissions. They are organized in the following topical sections: lean and green manufacturing; operations management in engineer-to-order manufacturing; product-service systems, customer-driven innovation and value co-creation; collaborative networks; smart production for mass customization; global supply chain management; knowledge based production planning and control; knowledge based engineering; intelligent diagnostics and maintenance solutions for smart manufacturing; service engineering based on smart manufacturing capabilities; smart city interoperability and cross-platform implementation; manufacturing performance management in smart factories; industry 4.0 - digital twin; industry 4.0 - smart factory; and industry 4.0 - collaborative cyber-physical production and human systems.

The book introduces the concept of 'smart technologies', especially 'Internet of Things' (IoT), and elaborates upon various constituent technologies, their evolution and their applications to various challenging problems in society. It then presents research papers and case studies based upon inception, application and implementation of IoT-based smart technologies for various application areas from some of the most technologically conservative domains like agriculture and farming to the most advanced areas such as automobiles, financial transactions and industrial applications. The book contents is thus

applicable not only to academic researcher, but also to interested readers from industries and corporates, and those involved in policy making. Excerpt from the Foreword (read the complete text on Springerlink): "This book contains besides the two introductory chapters, written by the project leaders from Indian Institute of Science (IISc) Bangalore, and TU Clausthal (TUC), Germany, the different areas of research work done within the INGPAR (Indo-German Partnership in Advanced Research, founded by DAAD in Germany and UGC in India) project so far by the Indian and German young researchers. It offers new perspectives and documents important progress in smart technologies. I can say without reservation that this book and, more specifically, the method it espouses will change fundamental ideas for cutting-edge innovation and disruption in the smart technology area." - Prof. Dr. Thomas Hanschke, President, TU Clausthal, Clausthal-Zellerfeld, Germany

This updated, second edition of the book offers an understanding of the management of technology and innovation, not in isolation, but as a dynamic integrated system connected to organizational culture, knowledge management and value creation. To enhance the understanding of the hypercompetitive industrial markets of the globe, this edition carries two new chapters focusing on how technological innovation can lead to wealth creation. In doing so, it weaves wealth creation with other seminal concepts of social capital, human capital and knowledge management. An additional appendix outlines a few technologies and approaches that are useful in technology management. Management of Technology and Innovation: Competing through Technological Excellence provides a synoptic account of the diverse dimensions of technology management, from incremental innovation, integration of design and manufacture to technological innovation and creation of hybrid technologies. It provides an outline of the rationale of the strategic evaluation of investments in technology, and brings about its contrast with the conventional accounting framework of net present value (NPV) and discount cash flow (DCF) analyses. It also discusses the national technological/industrial policies of USA and Japan. This book will be an invaluable resource for management students and teachers studying the theory and practice of technology management.

The two-volume set IFIP AICT 591 and 592 constitutes the refereed proceedings of the International IFIP WG 5.7 Conference on Advances in Production Management Systems, APMS 2020, held in Novi Sad, Serbia, in August/September 2020. The 164 papers presented were carefully reviewed and selected from 199 submissions. They discuss globally pressing issues in smart manufacturing, operations management, supply chain management, and Industry 4.0. The papers are organized in the following topical sections: Part I: advanced modelling, simulation and data analytics in production and supply networks; advanced, digital and smart manufacturing; digital and virtual quality management systems; cloud-manufacturing; cyber-physical production systems and digital twins; IIOT interoperability; supply chain planning and optimization;

digital and smart supply chain management; intelligent logistics networks management; artificial intelligence and blockchain technologies in logistics and DSN; novel production planning and control approaches; machine learning and artificial intelligence; connected, smart factories of the future; manufacturing systems engineering: agile, flexible, reconfigurable; digital assistance systems: augmented reality and virtual reality; circular products design and engineering; circular, green, sustainable manufacturing; environmental and social lifecycle assessments; socio-cultural aspects in production systems; data-driven manufacturing and services operations management; product-service systems in DSN; and collaborative design and engineering Part II: the Operator 4.0: new physical and cognitive evolutionary paths; digital transformation approaches in production management; digital transformation for more sustainable supply chains; data-driven applications in smart manufacturing and logistics systems; data-driven services: characteristics, trends and applications; the future of lean thinking and practice; digital lean manufacturing and its emerging practices; new reconfigurable, flexible or agile production systems in the era of industry 4.0; operations management in engineer-to-order manufacturing; production management in food supply chains; gastronomic service system design; product and asset life cycle management in the circular economy; and production ramp-up strategies for product

For the past couple of years, network automation techniques that include software-defined networking (SDN) and dynamic resource allocation schemes have been the subject of a significant research and development effort. Likewise, network functions virtualization (NFV) and the foreseeable usage of a set of artificial intelligence techniques to facilitate the processing of customers' requirements and the subsequent design, delivery, and operation of the corresponding services are very likely to dramatically distort the conception and the management of networking infrastructures. Some of these techniques are being specified within standards developing organizations while others remain perceived as a "buzz" without any concrete deployment plans disclosed by service providers. An in-depth understanding and analysis of these approaches should be conducted to help internet players in making appropriate design choices that would meet their requirements as well as their customers. This is an important area of research as these new developments and approaches will inevitably reshape the internet and the future of technology. Design Innovation and Network Architecture for the Future Internet sheds light on the foreseeable yet dramatic evolution of internet design principles and offers a comprehensive overview on the recent advances in networking techniques that are likely to shape the future internet. The chapters provide a rigorous in-depth analysis of the promises, pitfalls, and other challenges raised by these initiatives, while avoiding any speculation on their expected outcomes and technical benefits. This book covers essential topics such as content delivery networks, network functions virtualization, security, cloud computing, automation, and more. This

book will be useful for network engineers, software designers, computer networking professionals, practitioners, researchers, academicians, and students looking for a comprehensive research book on the latest advancements in internet design principles and networking techniques.

Fast advances in information technology have led to a smarter world vision with ubiquitous interconnection and intelligence. Smart Manufacturing Innovation and Transformation: Interconnection and Intelligence covers both theoretical perspectives and practical approaches to smart manufacturing research and development triggered by ubiquitous interconnection and intelligence. This reference work discusses the transformation of manufacturing, the latest developments in smart manufacturing innovation, current and emerging technology opportunities, and market imperatives that enable manufacturing innovation and transformation, useful tools for readers in industry, academia, and government.

This book provides a new perspective on modeling cyber-physical systems (CPS), using a data-driven approach. The authors cover the use of state-of-the-art machine learning and artificial intelligence algorithms for modeling various aspect of the CPS. This book provides insight on how a data-driven modeling approach can be utilized to take advantage of the relation between the cyber and the physical domain of the CPS to aid the first-principle approach in capturing the stochastic phenomena affecting the CPS. The authors provide practical use cases of the data-driven modeling approach for securing the CPS, presenting novel attack models, building and maintaining the digital twin of the physical system. The book also presents novel, data-driven algorithms to handle non-Euclidean data. In summary, this book presents a novel perspective for modeling the CPS.

The three-volume set CCIS 923, CCIS 924, and CCIS 925 constitutes the thoroughly refereed proceedings of the First International Conference on Intelligent Manufacturing and Internet of Things, and of the 5th International Conference on Intelligent Computing for Sustainable Energy and Environment, ICSEE 2018, held in Chongqing, China, in September 2018.The 135 revised full papers presented were carefully reviewed and selected from over 385 submissions.The papers of this volume are organized in topical sections on: digital manufacturing; industrial product design; logistics, production and operation management; manufacturing material; manufacturing optimization; manufacturing process; mechanical transmission system; robotics.

This book provides energy efficiency quantitative analysis and optimal methods for discrete manufacturing systems from the perspective of global optimization. In order to analyze and optimize energy efficiency for discrete manufacturing systems, it uses real-time access to energy consumption information and models of the energy consumption, and constructs an energy efficiency quantitative index system. Based on the rough set and analytic hierarchy process, it also proposes a principal component quantitative analysis and a combined energy

efficiency quantitative analysis. In turn, the book addresses the design and development of quantitative analysis systems. To save energy consumption on the basis of energy efficiency analysis, it presents several optimal control strategies, including one for single-machine equipment, an integrated approach based on RWA-MOPSO, and one for production energy efficiency based on a teaching and learning optimal algorithm. Given its scope, the book offers a valuable guide for students, teachers, engineers and researchers in the field of discrete manufacturing systems.

This book first provides a comprehensive review of state-of-the-art IoT technologies and applications in different industrial sectors and public services. The authors give in-depth analyses of fog computing architecture and key technologies that fulfill the challenging requirements of enabling computing services anywhere along the cloud-to-thing continuum. Further, in order to make IoT systems more intelligent and more efficient, a fog-enabled service architecture is proposed to address the latency requirements, bandwidth limitations, and computing power issues in realistic cross-domain application scenarios with limited priori domain knowledge, i.e. physical laws, system statuses, operation principles and execution rules. Based on this fog-enabled architecture, a series of data-driven self-learning applications in different industrial sectors and public services are investigated and discussed, such as robot SLAM and formation control, wireless network self-optimization, intelligent transportation system, smart home and user behavior recognition. Finally, the advantages and future directions of fog-enabled intelligent IoT systems are summarized. Provides a comprehensive review of state-of-the-art IoT technologies and applications in different industrial sectors and public services Presents a fog-enabled service architecture with detailed technical approaches for realistic cross-domain application scenarios with limited prior domain knowledge Outlines a series of data-driven self-learning applications (with new algorithms) in different industrial sectors and public services

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.

This book provides a review of advanced topics relating to the theory, research, analysis and implementation in the context of big data platforms and their applications, with a focus on methods, techniques, and performance evaluation. The explosive growth in the volume, speed, and variety of data being produced every day requires a continuous increase in the processing speeds of servers and of entire network infrastructures, as well as new resource management models. This poses significant challenges (and provides striking development opportunities) for data intensive and high-performance computing, i.e., how to efficiently turn extremely large datasets into valuable information and meaningful knowledge. The task of context data management is further complicated by the variety of sources such data derives from, resulting in different data formats, with varying storage, transformation, delivery, and archiving requirements. At the same time rapid responses are needed for real-time applications. With the emergence of cloud infrastructures, achieving highly scalable data management in such contexts is a critical problem, as the overall application performance is highly dependent on the properties of the data management service.

This approachable text studies discrete objects and the relationsips that bind them. It helps students understand and apply the power of discrete math to digital computer systems and other modern applications. It provides excellent preparation for courses in linear algebra, number theory, and modern/abstract algebra and for computer science courses in data structures, algorithms, programming languages, compilers, databases, and computation. * Covers all recommended topics in a self-contained, comprehensive, and understandable format for students and new professionals * Emphasizes problem-solving techniques, pattern recognition, conjecturing, induction, applications of varying nature, proof techniques, algorithm development and correctness, and numeric computations * Weaves numerous applications into the text * Helps students learn by doing with a wealth of examples and exercises: - 560 examples worked out in detail - More than 3,700 exercises - More than 150 computer assignments - More than 600 writing projects * Includes chapter summaries of important vocabulary, formulas, and properties, plus the chapter review exercises * Features interesting anecdotes and biographies of 60 mathematicians and computer scientists * Instructor's Manual available for adopters * Student Solutions Manual available separately for purchase (ISBN: 0124211828)

This book reports innovative deep learning and big data analytics technologies for smart manufacturing applications. In this book, theoretical foundations, as well as the state-of-the-art and practical implementations for the relevant technologies, are covered. This book details the relevant applied research conducted by the authors in some important manufacturing applications, including intelligent prognosis on manufacturing processes, sustainable

manufacturing and human-robot cooperation. Industrial case studies included in this book illustrate the design details of the algorithms and methodologies for the applications, in a bid to provide useful references to readers. Smart manufacturing aims to take advantage of advanced information and artificial intelligent technologies to enable flexibility in physical manufacturing processes to address increasingly dynamic markets. In recent years, the development of innovative deep learning and big data analytics algorithms is dramatic. Meanwhile, the algorithms and technologies have been widely applied to facilitate various manufacturing applications. It is essential to make a timely update on this subject considering its importance and rapid progress. This book offers a valuable resource for researchers in the smart manufacturing communities, as well as practicing engineers and decision makers in industry and all those interested in smart manufacturing and Industry 4.0.

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