

Intelligent Sensor Networks The Integration Of Sensor Networks Signal Processing And Machine Learning

Technological advancements in recent years have enabled the development of tiny, cheap disposable and self contained battery powered computers, known as sensor nodes or " motes ", which can accept input from an attached sensor, process this input and transmit the results wirelessly to some interested device(s). When a number of these nodes work together, conceivably up to hundreds of thousands, a Wireless Sensor Network (WSN) is formed. Research in the area of wireless sensor networks has become increasingly wid- pread in recent years, partly due to their wide range of potential uses and also partly due to the fact that the technology enabling such networks is now widely available from many dif'erent suppliers, such as: Crossbow, MotEiv, Intel and SUN (java based motes). These wireless sensor networks have the potential to allow a level of integration between computers and the physical world that, to date, has been virtually impos- ble. The uses for such networks is almost limitless and include such diverse ap- plications as a counter sniper system for urban warfare [1] tracking the path of a forest re [2], determining the structural stability of a building after an earthquake [3], or tracking people or objects inside a building [4], etc.

Biomedical sciences and its technology, wireless biosensors, are ever-evolving subjects, striving for rapid improvement in terms of performance and expanding the target range to meet the vast societal and market demands. The key performance factors for a biosensor that drive the research are selectivity, sensitivity, response time, accuracy, and reproducibility, with additional requirements of its portability and inexpensive nature. These performance factors are largely governed by the materials and techniques being used in these bioanalytical platforms. The selection of materials to meet these requirements is critical, as their interaction or involvement with the biological recognition elements should initiate or improve these performance factors. The technique discussed primarily applies to transducers involved in converting a biochemical signal to optical or electrical signals. Over the years, the emergence of novel materials and techniques has drastically improved the performance of these bioanalytical systems, enabling them to expand their analytical horizon. These advanced materials and techniques are central to modern bioanalytical and biosensor research. Advanced Materials and Techniques for Biosensors and Bioanalytical Applications provides a comprehensive review of the subject, including a knowledge platform for both academics and researchers. Considering biosensors as a central theme to this book, an outline on this subject with background principles has been included, with a scope of extending the utility of the book to coursework in graduate and postgraduate schools. Features • Basic principles on different classes of biosensors, recent advances and applications • Smart materials for biosensors and other rapid, portable detection devices • Metal nanoparticles and nanocrystals for analytical applications • Carbon-based nanoparticles and quantum dots for sensing applications • Nanozymes as potential catalysts for sensing applications • Bioelectrochemiluminescence and photoelectrochemical-based biosensors • Paper electronics and paper-based biosensors • Microbial biosensors: artificial intelligence, genetic engineering, and synthetic biology • Biofuel cells as a signal transduction platform • FET-based biosensors, including ISFET and BioFET This book serves as a reference for scientific investigators and a textbook for a graduate-level course in biosensors and advanced bioanalytical techniques.

Security and privacy protection within computer networks can be a challenge. By examining the current problems and challenges this domain is facing, more efficient strategies can be established to safeguard personal information against invasive pressures. Security and Privacy in Smart Sensor Networks is a critical scholarly resource that examines recent developments and emerging trends in smart sensor security and privacy by providing new models, practical solutions, and technological advances related to security. Featuring coverage on a broad range of topics such as cloud security, encryption, and intrusion detection systems, this book is geared towards academicians, engineers, IT specialists, researchers, and students seeking current research on authentication and intrusion detection.

The rise of multi-sensor fusion and integration is growing into significance as our society's transition into ubiquitous computing environments with robotic services everywhere under ambient intelligence. What surround us are to be the networks of sensors and actuators that monitor our environment, health, security and safety, as well as the service robots, intelligent vehicles, and autonomous systems of ever heightened autonomy and dependability with integrated heterogeneous sensors and actuators. The "eld of multi-sensor fusion and integration plays key role for m- ing the above transition possible by providing fundamental theories and tools for implementation. This volume is an edition of the papers selected from the 7th IEEE International Conference on Multi-Sensor Integration and Fusion, IEEE MFI ' 08, held in Seoul, Korea, August 20–22, 2008. Only 32 papers out of the 122 papers accepted for IEEE MFI ' 08 were chosen and requested for revision and extension to be included in this volume. The 32 contributions to this volume are organized into three parts: Part I is dedicated to the Theories in Data and Information Fusion, Part II to the Multi-Sensor Fusion and Integration in Robotics and Vision, and Part III to the Applications to Sensor Networks and Ubiquitous Computing Environments. To help readers understand better, a part summary is included in each part as an introduction. The summaries of Parts I, II, and III are prepared respectively by Prof. Hanseok Ko, Prof. Sukhan Lee and Prof. Hensoo Hahn. The rapid development of advanced, arguably, intelligent sensors and their massive deployment provide a foundation for new paradigms to combat the challenges that arise in significant tasks such as positioning, tracking, navigation, and smart sensing in various environments. Relevant advances in artificial intelligence (AI) and machine learning (ML) are also finding rapid adoption by industry and fan the fire. Consequently, research on intelligent sensing systems and technologies has attracted considerable attention during the past decade, leading to a variety of effective applications related to intelligent transportation, autonomous vehicles, wearable computing, wireless sensor networks (WSN), and the internet of things (IoT). In particular, the sensors community has a great interest in novel, intelligent information fusion, and data mining methods coupling AI and ML for substantial performance enhancement, especially for the challenging scenarios that make traditional approaches inappropriate. This reprint book has collected 14 excellent papers that represent state-of-the-art achievements in the relevant topics and provides cutting-edge coverage of recent advances in sensor signal and data mining techniques, algorithms, and approaches, particularly applied for positioning, tracking, navigation, and smart sensing.

RFID and Sensor Networks

A Course Guide

Technologies for Smart Sensors and Sensor Fusion

Smart Sensors and Systems

Smart Environments

Sensor Networks and Configuration

A complete guide to the state of the art theoretical and manufacturing developments of body sensor network, design, and algorithms In Body Sensor Networking, Design, and Algorithms, professionals in the field of Biomedical Engineering and e-health get an in-depth look at advancements, changes, and developments. When it comes to advanced noninvasive and implantable sensor microelectronics, wireless sensor networks, platforms, and optimization—to name a few. Each chapter provides essential information needed to understand the current landscape of technology and mechanical developments. It covers subjects including Physiological Sensors, Sleep Stage Classification, Continuous Monitoring of Human Systems, Integration (HSI 2018), held on January 7–9, 2018, in Dubai, United Arab Emirates. The book also examines the forces that are currently shaping the nature of computing and cognitive systems, such as the need for decreasing hardware costs; the importance of infusing intelligence and automation into systems; the necessity for a better assimilation of computation in the environment; and the social concerns regarding access to computers and systems for people with special needs. It offers a timely survey and a practice-oriented reference guide to policy- and decision-makers, human factors engineers, systems developers and users alike.

This book provides a systematic examination of the developing business model, service enterprise integration. It investigates the proven concepts, models, methods, and techniques in manufacturing operations and examines all aspects relevant to service productivity. Chapters written by leading researchers provide critical literature reviews. Material-Integrated Intelligent Systems Technology, Protocols and Applications Smart Sensor Networks Using AI for Industry 4.0 Cyber Security Intelligence and Analytics Intelligent Sensor Networks Intelligent Data Sensing and Processing for Health and Well-being Applications Energy Generation, Transmission and Distribution

The book identifies the performance challenges concerning Wireless Sensor Networks (WSN) and Radio Frequency Identification (RFID) and analyzes their impact on the performance of routing protocols. It presents a thorough literature survey to identify the issues affecting routing protocol performance, as well as a mathematical model for calculating the end-to-end delays of the routing protocol ACQUIRE; a comparison of two routing protocols (ACQUIRE and DIRECTED DIFFUSION) is also provided for evaluation purposes. On the basis of the results and literature review, recommendations are made for better selection of protocols regarding the nature of the respective application and related challenges. In addition, this book covers a proposed simulator that integrates both RFID and WSN technologies. Therefore, the manuscript is divided in two major parts: an integrated architecture of smart nodes, and a power-optimized protocol for query and information interchange.

Although governments worldwide have invested significantly in intelligent sensor network research and applications, few books cover intelligent sensor networks from a machine learning and signal processing perspective. Filling this void, Intelligent Sensor Networks: The Integration of Sensor Networks, Signal Processing and Machine Learning focuses on the close integration of sensing, networking, and smart signal processing via machine learning. Based on the world-class research of award-winning authors, the book provides a firm grounding in the fundamentals of intelligent sensor networks, including compressive sensing and sampling, distributed signal processing, and intelligent signal learning. Presenting recent research results of world-renowned sensing experts, the book is organized into three parts: Machine Learning—describes the application of machine learning and other AI principles in sensor network intelligence—covering smart sensor/transducer architecture and data representation for intelligent sensors Signal Processing—considers the optimization of sensor network performance based on digital signal processing techniques—including cross-layer integration of routing and application-specific signal processing as well as compressive sensing in wireless sensor networks for intelligent transportation systems Networking—focuses on network protocol design in order to achieve intelligent sensor networking—covering energy-efficient opportunistic routing protocols for sensor networking and multi-agent-driven wireless sensor cooperation Maintaining a focus on "intelligent" designs, the book details signal processing principles in sensor networks. It elaborates on critical platforms for intelligent sensor networks and illustrates key applications—including target tracking, object identification, and structural health monitoring. It also includes a paradigm for validating the extent of spatiotemporal associations among data sources to enhance data cleaning in sensor networks, a sensor stream reduction application, and also considers the use of Kalman filters for attack detection in a water system sensor network that consists of water level sensors and velocity sensors.

A practical guide to microgrid systems architecture, design topologies, control strategies and integration approaches Microgrid Planning and Design offers a detailed and authoritative guide to microgrid systems. The authors - noted experts on the topic - explore what is involved in the design of a microgrid, examine the process of mapping designs to accommodate available technologies and reveal how to determine the efficacy of the final outcome. This practical book is a compilation of collaborative research results drawn from a community of experts in 8 different universities over a 6-year period. Microgrid Planning and Design contains a review of microgrid benchmarks for the electric power system and covers the mathematical modeling that can be used during the microgrid design processes. The authors include real-world case studies, validated benchmark systems and the components needed to plan and design an effective microgrid system. This important guide: Offers a practical and up-to-date book that examines leading edge technologies related to the smart grid Covers in detail all aspects of a microgrid from conception to completion Explores a modeling approach that combines power and communication systems Recommends modeling details that are appropriate for the type of study to be performed Defines typical system studies and requirements associated with the operation of the microgrid Written forgraduate students and professionals in the electrical engineering industry, Microgrid Planning and Design is a guide to smart microgrids that can help with their strategic energy objectives such as increasing reliability, efficiency, autonomy and reducing greenhouse gases.

This revised edition, issued in paperback, has been expanded to include exercises to reinforce the student's understanding of the concepts introduced. Whilst research continues to advance, the authors' fundamental approach, and their systematic treatment of the issues required to understand this fast-developing, multi-disciplinary field, will ensure that this book is required reading not only for sensor engineers designing intelligent sensor systems but also serves as a course text for graduate students specialising in instrumentation, and those in the final year of relevant undergraduate physics, electronics and other engineering first degrees. The book presents the 2021 International Conference on Cyber Security Intelligence and Analytics (CSIA 2021), an international conference dedicated to promoting novel theoretical and applied research advances in the interdisciplinary field of cyber security, particularly focusing on threat intelligence, analytics, and countering cybercrime. The conference provides a forum for presenting and discussing innovative ideas, cutting-edge research findings and novel techniques, methods and applications on all aspects of cyber security intelligence and analytics. Due to COVID-19, Authors, Keynote Speakers and PC committees will attend the conference online.

Analytics, Sharing and Control Security and Resilience in Intelligent Data-Centric Systems and Communication Networks Emerging Trends in IoT and Integration with Data Science, Cloud Computing, and Big Data Analytics Smart Sensor Networks Smart Sensors and Sensing Technology Integration of Reusable Systems Security and Privacy in Smart Sensor Networks

The internet of things (IoT) has emerged to address the need for connectivity and seamless integration with other devices as well as big data platforms for analytics. However, there are challenges that IoT-based applications face including design and implementation issues; connectivity problems; data gathering, storing, and analyzing in cloud-based environments; and IoT security and privacy issues. Emerging Trends in IoT and Integration with Data Science, Cloud Computing, and Big Data Analytics is a critical reference source that provides theoretical frameworks and research findings on IoT and big data integration. Highlighting topics that include wearable sensors, machine learning, machine intelligence, and mobile computing, this book serves professionals who want to improve their understanding of the strategic role of trust at different levels of the information and knowledge society. It is therefore of most value to data scientists, computer scientists, data analysts, IT specialists, academicians, professionals, researchers, and students working in the field of information and knowledge management in various disciplines that include but are not limited to information and communication sciences, administrative sciences and management, education, sociology, computer science, etc. Moreover, the book provides insights and supports executives concerned with the management of expertise, knowledge, information, and organizational development in different types of work communities and environments.

The Industrial Information Technology Handbook focuses on existing and emerging industrial applications of IT, and on evolving trends that are driven by the needs of companies and by industry-led consortia and organizations. Emphasizing fast growing areas that have major impacts on industrial automation and enterprise integration, the Handbook covers topics such as industrial communication technology, sensors, and embedded systems. The book is organized into two parts. Part 1 presents material covering new and quickly evolving aspects of IT. Part 2 introduces cutting-edge areas of industrial IT. The Handbook presents material in the form of tutorials, surveys, and technology overviews, combining fundamentals and advanced issues, with articles grouped into sections for a cohesive and comprehensive presentation. The text contains 112 contributed reports by industry experts from government, companies at the forefront of development, and some of the most renowned academic and research institutions worldwide. Several of the reports on recent developments, actual deployments, and trends cover subject matter presented to the public for the first time.

This book provides a comprehensive analysis of Brooks-Iyengar Distributed Sensing Algorithm, which brings together the power of Byzantine Agreement and sensor fusion in building a fault-tolerant distributed sensor network. The authors analyze its long-term impacts, advances, and future prospects. The book starts by discussing the Brooks-Iyengar algorithm, which has made significant impact since its initial publication in 1996. The authors show how the technique has been applied in many domains such as software reliability, distributed systems and OS development, etc. The book exemplifies how the algorithm has enhanced new real-time features by adding fault-tolerant capabilities for many applications. The authors posit that the Brooks-Iyengar Algorithm will continue to be used where fault-tolerant solutions are needed in redundancy system scenarios. This book celebrates S.S. Iyengar's accomplishments that led to his 2019 Institute of Electrical and Electronics Engineers' (IEEE) Cybermatics Congress "Test of Time Award" for his work on creating Brooks-Iyengar Algorithm and its impact in advancing modern computing.

Combining different perspectives from materials science, engineering, and computer science, this reference provides a unified view of the various aspects necessary for the successful realization of intelligent systems. The editors and authors are from academia and research institutions with close ties to industry, and are thus able to offer first-hand information here. They adopt a unique, three-tiered approach such that readers can gain basic, intermediate, and advanced topical knowledge. The technology section of the book is divided into chapters covering the basics of sensor integration in materials, the challenges associated with this approach, data processing, evaluation, and validation, as well as methods for achieving an autonomous energy supply. The applications part then goes on to showcase typical scenarios where material-integrated intelligent systems are already in use, such as for structural health monitoring and smart textiles.

This book provides IT professionals, educators, researchers, and students a compendium of knowledge on smart sensors and devices, types of sensors, data analysis and monitoring with the help of smart sensors, decision making, impact of machine learning algorithms, and artificial intelligence-related methodologies for data analysis and understanding of smart applications in networks. Smart sensor networks play an important role in the establishment of network devices which can easily interact with physical world through plethora of variety of sensors for collecting and monitoring the surrounding context and allowing environment information. Apart from military applications, smart sensor networks are used in many civilian applications nowadays and there is a need to manage high volume of demands in related applications. This book comprises of 9 chapters and presents a valuable insight on the original research and review articles on the latest achievements that contributes to the field of smart sensor networks and their usage in real-life applications like smart city, smart home, e-healthcare, smart social sensing networks, etc. Chapters illustrate technological advances and trends, examine research opportunities, highlight best practices and standards, and discuss applications and adoption. Some chapters also provide holistic and multiple perspectives while examining the impact of smart sensor networks and the role of data analytics, data sharing, and its control along with future prospects.

Technology and Applications of 3D Integrated Circuits

Fundamentals of Brooks-Iyengar Distributed Sensing Algorithm

The Integration of Sensor Networks, Signal Processing and Machine Learning

Microgrid Planning and Design

Handbook of 3D Integration, Volume 1

The Industrial Information Technology Handbook

Integration of WSNs into Internet of Things

Technologies in today's society are rapidly developing at a pace that is challenging to stay up to date with. As an increasing number of global regions are implementing smart methods and strategies for sustainable development, they are continually searching for modern advancements within computer science, sensor networks, software engineering, and smart materials. This comprehensive reference is needed that displays current applications of computing methodologies in the progression of global cities and how smart technologies are being utilized. Sensor Network Methodologies for Smart Applications is a collection of innovative research on the methods of intelligent systems and technologies and their various applications within sustainable development practices. While highlighting topics including machine learning, network security, and optimization algorithms, this book is ideally designed for researchers, scientists, developers, programmers, engineers, educators, policymakers, geographers, planners, and students seeking current research on smart technologies and sensor networks.

Smart Environments contains contributions from leading researchers, describing techniques and issues related to developing and living in intelligent environments. Reflecting the multidisciplinary nature of the design of smart environments, the topics covered include the latest research in smart environment philosophical and computational architecture considerations, network protocols for smart environments, intelligent sensor networks and powerline control of devices, and action prediction and identification. The use of cyber-physical systems in recent computing, communication, and control methods to design and operate intelligent and autonomous systems using cutting-edge technologies has led to many advances. By studying emerging trends in these systems, programming techniques can be optimized and strengthened to create a higher level of effectiveness. Cyber-Physical Systems for Next-Generation Networks provides emerging research on using cyber-physical systems (CPS) as a method to control design and operation of intelligent systems through next-generation networks. While highlighting issues such as increasing CPS complexity due to components within physical and industrial systems, this publication explores information on real-time sensing, reasoning, and adaptation for cyber-physical systems while gaining an understanding of evolutionary computing for it. This book is a valuable resource for engineers, academicians, researchers, and graduate-level students seeking current research on CPS in cutting-edge technologies.

As the field of communications networks continues to evolve, the challenging area of wireless sensor networks is rapidly coming of age. Recent advances have made it possible to make sensor components more compact, robust, and energy efficient than ever, earning the idiosyncratic alias ofSmart Dust. Production has also improved, yielding larger. This textbook provides a comprehensive overview of smart grids, their role in the development of new electricity systems, as well as issues and problems related to smart grid evolution, operation, management, control, protection, entities and components. The book consists of eleven chapters, covering core topics such as energy, environmental issues, basic of power systems to renewable energy, distributed generation and energy storage, smart grid challenges, benefits and drivers, smart power transmission and distribution. It includes chapters focusing on smart grid communication, power flow analysis, smart grid sensing tools, energy management and microgrids. Each chapter ends with several practical and advanced problems that instill critical thinking and applies to industrial applications. The book can be used as an introductory and basic textbook, reference and training resource by engineers, students, faculty and interested readers to gain the essential knowledge of the power and energy systems, smart grid fundamentals, concepts and features, as well as the main energy technologies, including how they work and operate, characteristics and how they are evaluated and selected for specific applications.

Body Sensor Networking, Design and Algorithms

Intelligent Sensors for Positioning, Tracking, Monitoring, Navigation and Smart Sensing in Smart Cities

Autonomous Planning and Resource Allocation in Reconfigurable Smart Sensing Networks

2021 International Conference on Cyber Security Intelligence and Analytics (CSIA2021), Volume 1

Intelligent Human Systems Integration

Integration of WSN and IoT for Smart Cities

Integration of Wireless Sensor Networks in Pervasive Computing Scenarios

This book exploits the benefits of integration of wireless sensor networks (WSN) and Internet of Things (IoT) for smart cities. The authors discuss WSN and IoT in tackling complex computing tasks and challenges in the fields of disaster relief, security, and weather forecasting (among many others). This book highlights the challenges in the field of quality of service metrics (QoS) in the WSN based IoT applications. Topics include IoT Applications for eHealth, smart environments, intelligent transportation systems, delay tolerant models for IoT applications, protocols and architectures for industrial IoT, energy efficient protocols, and much more. Readers will get to know the solutions of these problems for development of smart city applications with the integration of WSN with IoT. The Internet has gone from an Internet of people to an Internet of Things (IoT). This has brought forth strong levels of complexity in handling interoperability that involves the integrating of wireless sensor networks (WSNs) into IoT. This book offers insights into the evolution, usage, challenges, and proposed countermeasures associated with the integration. Focusing on the integration of WSNs into IoT and shedding further light on the subtleties of such integration, this book aims to highlight the encountered problems and provide suitable solutions. It throws light on the various types of threats that can attack both WSNs and IoT along with the recent approaches to counter them. This book is designed to be the first choice of reference at research and development centers, academic institutions, university libraries, and any institution interested in the integration of WSNs into IoT. Undergraduate and postgraduate students, Ph.D. scholars, industry technologists, young entrepreneurs, and researchers working in the field of security and privacy in IoT are the primary audience of this book.

This book incorporates a selection of research and development papers. Its scope is on history and background, underlying design methodology, application domains and recent developments. The readers will be able to understand the underlying technology, philosophy, concepts, ideas, and principles, with regard to broader areas of sensor network. Aspects of sensor network and experimental results have been presented in proper order. The escalating demand for ubiquitous computing along with the complementary and flexible nature of Radio Frequency Identification (RFID) and Wireless Sensor Networks (WSNs) have sparked an increase in the integration of these two dynamic technologies. Although a variety of applications can be observed under development and in practical use, there

Exciting new developments are enabling sensors to go beyond the realm of simple sensing of movement or capture of images to deliver information such as location in a built environment, the sense of touch, and the presence of chemicals. These sensors unlock the potential for smarter systems, allowing machines to interact with the world around them in more intelligent and sophisticated ways. Featuring contributions from authors working at the leading edge of sensor technology, Technologies for Smart Sensors and Sensor Fusion showcases the latest advancements in sensors with biotechnology, medical science, chemical detection, environmental monitoring, automotive, and industrial applications. This valuable reference describes the increasingly varied number of sensors that can be integrated into arrays, and examines the growing availability and computational power of communication devices that support the algorithms needed to reduce the raw sensor data from multiple sensors and convert it into the information needed by the sensor array to enable rapid transmission of the results to the required point. Using both SI and US units, the text: Provides a fundamental and analytical understanding of the underlying technology for smart sensors Discusses groundbreaking software and sensor systems as well as key issues surrounding sensor fusion Exemplifies the richness and diversity of development work in the world of smart sensors and sensor fusion Offering fresh insight into the sensors of the future, Technologies for Smart Sensors and Sensor Fusion not only exposes readers to trends but also inspires

Innovation in smart sensor and sensor system development.

Cyber-Physical Systems for Next-Generation Networks

Sensor Network Methodologies for Smart Applications

An Edition of the Selected Papers from the IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems 2008

A Security Perspective

Sensor Networks for Sustainable Development

Collective Sensing Strategies for Analytical Purposes

Technology Advancement and Application Demonstrations

This book describes for readers technology used for effective sensing of our physical world and intelligent processing techniques for sensed information, which are essential to the success of Internet of Things (IoTs). The authors provide a multidisciplinary view of sensor technology from materials, process, circuits, and big data domains and showcase smart sensor systems in real applications including smart home, transportation, smart environments, etc. Unlike earlier books on sensors, this book will provide a "global" view on smart sensors covering abstraction level from device, circuit, systems, and algorithms. Profiles active research on smart sensors based on CMOS microelectronics; Describes applications of sensors and sensor systems in cyber physical systems; The social information infrastructure in our modern world; Includes coverage of a variety of related information technologies supporting the application of sensors; Discusses the integration of computation, networking, actuation, databases, and various sensors, in order to embed smart sensor systems into actual social systems.

Intelligent Data Sensing and Processing for Health and Well-being Applications uniquely combines full exploration of the latest technologies for sensor-collected intelligence with detailed coverage of real-case applications for healthcare and well-being at home and in the workplace. Forward-thinking in its approach, the book presents concepts and technologies needed for the implementation of today's mobile, pervasive and ubiquitous systems, and for tomorrow's IoT and cyber-physical systems. Users will find a detailed overview of the fundamental concepts of gathering, processing and analyzing data from devices disseminated in the environment, as well as the latest proposals for collecting, processing and abstraction of data-sets. In addition, the book addresses algorithms, methods and technologies for diagnosis and informed decision-making for healthcare and well-being. Topics include emotional interface with ambient intelligence and emerging applications in detection and diagnosis of neurological diseases. Finally, the book explores the trends and challenges in an array of areas, such as applications for intelligent monitoring in the workplace for well-being, acquiring data traffic in cities to improve the assistance of first aiders, and applications for supporting the elderly at home. Examines the latest applications and future directions for mobile data sensing in an array of health and well-being scenarios Combines leading computing paradigms and technologies, development applications, empirical studies, and future trends in the multidisciplinary field of smart sensors, smart sensor networks, data analysis and machine intelligence methods Features an analysis of security, privacy and ethical issues in smart sensor health and well-being applications Equips readers interested in interdisciplinary projects in ubiquitous computing or pervasive computing and ambient intelligence with the latest trends and developments

Structural health monitoring (SHM) uses sensor data to quantitatively assess the integrity and performance of infrastructure, as a basis for extending the lifespan of aging systems. Wireless sensor networks promise to enable the installation of dense arrays of battery operated sensor nodes at dramatically lower cost than traditional wired systems. However, typical vibration based health monitoring approaches sample at high frequencies, and wirelessly transmitting the resulting large volumes of data can rapidly deplete sensor node batteries. Rather than extending the behaviour of a traditional wired SHM system, intelligent sensor nodes can analyse vibration data within the sensor network, reducing transmission volumes and conserving battery. Coordinating, configuring, and managing the resources of networks of intelligent sensor nodes, is however a distinct challenge. This first book provides a new computational framework for distributed in-network processing of vibration sensing data, and develop a sensor system which implements this framework. A critical advantage of this framework is its flexibility, allowing data processing logic to be remotely reconfigured almost instantaneously. We then extend this approach, developing a resource allocation algorithm which continually tracks network resources (battery life, computational power and communication bandwidth), and ensures that its in-network computations utilise these resources optimally. The efficacy of this approach is then demonstrated by deploying a wireless sensor network on a steel frame tower and conducting a series of experiments investigating the performance of the proposed framework. Lastly, we consider the problem of event detection in energy-harvesting wireless sensor networks. In SHM applications, long periods of time elapse without the occurrence of any event of interest. To conserve resources, a subset of nodes can actively listen for events, while the remainder power down. Judicious planning of the sequence of active node assignments is needed to ensure that as many nodes as possible can be reached upon the detection of an event, and that the system maintains the ability to detect events in times of low energy availability. We propose and develop a novel reinforcement learning approach to this problem, and through simulation demonstrate that strategies learned by the reinforcement learning agent outperform baseline approaches. The integration of the proposed computational framework, resource allocation algorithm and collaborative event detection strategy enables fully autonomous operation of intelligent wireless SHM systems.

Sensors are the front end devices for information acquisition from the natural and/or artificial world. Higher performance of advanced sensing systems is achieved by using various types of machine intelligence. Intelligent sensors are smart devices with signal processing functions shared by distributed machine intelligence. Typical examples of intelligent sensors are the receptors and dedicated signal processing systems of the human sensory systems. The most important job of information processing in the sensory system is to extract necessary information from the receptors signals and transmit the useful information to the brain. This dedicated information processing is carried out in a distributed manner to reduce the work load of the brain. The processing also lightens the load of signal transmission through the neural network, the capacity of which is limited. Although the performance of the receptors in our human sensory system is not always ideal and is frequently inferior to that of man-made sensors, the total performance is usually far superior to those of our technical sensing systems. The weak points of human receptors are masked by the information processing. This processing makes our sensory system also adaptable to the environment and optimizes system performance. The basic idea of this book, which contains new computing paradigms, is that the most advanced intelligent sensing system is the human sensory system. Section I reviews the technologies of intelligent sensors and discusses how they developed. Typical approaches for the realization of intelligent sensors emphasizing the architecture of intelligent sensing systems are also described. In section II, fundamental technologies for the fabrication of intelligent sensors and actuators are presented. Integration and micro-miniaturization techniques are emphasized. Section III presents advanced technologies approaching human sensory systems, these technologies are not directly aimed at practical applications, but introduce the readers to the development of engineering models of sensory systems. Technologies of integrated intelligent sensors, which will shortly be in use are introduced in section IV. In section V, we discuss sensing systems which are used in industrial installations. Hardware for machine intelligence is not integrated at present, but can soon be implemented in the monolithic integrated structure. Without this machine intelligence, new functions, for example, self diagnosis or defects identification, cannot be realized. This section also demonstrates the potential of intelligent sensors in industry. Section VI introduces two interesting topics which are closely related to intelligent sensing systems. The first one is multisensor fusion. It is expected to be one of the fundamental and powerful technologies for realizing an advanced intelligent sensing systems. The second is visualizing technology of the sensed states for easy comprehension of the dynamic multi-dimensional state. This is useful for intelligent man-machine interfaces. This book will be recognised by readers as a milestone in the rapid progress of intelligent sensors.

Smart Sensor Networks (WSNs) using AI have led a mark on the lives of all by aiding in various sectors, such as manufacturing, education, healthcare, and monitoring of the environment and industries. This book covers recent AI applications and explores aspects of modern sensor technologies and the systems needed to operate them. The book reviews the fundamental concepts of gathering, processing, and analyzing different AI-based models and methods. It covers recent WSN techniques for the purpose of effective network management on par with the standards laid out by international organizations in related fields and focuses on both core concepts along with major applicational areas. The book will be used by technical developers, academicians, data sciences, industrial professionals, researchers, and students interested in the latest innovations on problem-oriented processing techniques in sensor networks using IoT and evolutionary computer applications for Industry 4.0.

A Simulation Approach

Handbook of Sensor Networks

Technology and Applications

Intelligent Sensor Systems

Service Enterprise Integration

Trends, Advances, and Future Prospects

Proceedings of the 1st International Conference on Intelligent Human Systems Integration (IHSI 2018): Integrating People and Intelligent Systems, January 7-9, 2018, Dubai, United Arab Emirates

The first encompassing treatise of this new, but very important field puts the known physical limitations for classic 2D electronics into perspective with the requirements for further electronics developments and market necessities. This two-volume handbook presents 3D solutions to the feature density problem, addressing all important issues, such as wafer processing, die bonding, packaging technology, and thermal aspects. It begins with an introductory part, which defines necessary goals, existing issues and relates 3D integration to the semiconductor roadmap of the industry. Before going on to cover processing technology and 3D structure fabrication strategies in detail. This is followed by fields of application and a look at the future of 3D integration. The contributions come from key players in the field, from both academia and industry, including such companies as Lincoln Labs, Fraunhofer, RPI, ASET, IMEC, CEA-LETI, IBM, and Renesas.

Structural health monitoring (SHM) uses one or more in situ sensing systems placed in or around a structure, providing real-time evaluation of its performance and ultimately preventing structural failure. Although most commonly used in civil engineering, such as in roads, bridges, and dams, SHM is now finding applications in other engineering environments, such as naval and aerospace engineering. Written by a highly respected expert in the field, Structural Sensing, Health Monitoring, and Performance Evaluation provides the first comprehensive coverage of SHM. The text begins with a review of the various types of sensors currently used in SHM, including point sensors and noncontact systems. Subsequent chapters explain the processing and interpretation of data from a number of sensors working in parallel. After considering issues related to the structures themselves, the author surveys the design of a tailor-made SHM system. He also presents a collection of case studies, many of which are drawn from his own experiences. Exploring the power of sensors, this book

shows how SHM technologies can be applied to a variety of structures and systems, including multistory buildings, offshore wind energy plants, and ecological systems. Software reuse and integration has been described as the process of creating software systems from existing software rather than building software systems from scratch. Whereas reuse solely deals with the artifacts creation, integration focuses on how reusable artifacts interact with the already existing parts of the specified transformation. Currently, most reuse research focuses on creating and integrating adaptable components at development or at compile time. However, with the emergence of ubiquitous computing, reuse technologies that can support adaptation and reconfiguration of architectures and components at runtime are in demand. This edited book includes 15 high quality research papers written by experts in information reuse and integration to cover the most recent advances in the field. These papers are extended versions of the best papers which were presented at IEEE International Conference on Information Reuse and Integration and IEEE International Workshop on Formal Methods Integration, which was held in San Francisco in August 2013.

Intelligent Sensor NetworksThe Integration of Sensor Networks, Signal Processing and Machine LearningCRC Press

Security and Resilience in Intelligent Data-Centric Systems and Communication Networks presents current, state-of-the-art work on novel research in theoretical and practical resilience and security aspects of intelligent data-centric critical systems and networks. The book analyzes concepts and technologies that are successfully used in the implementation of intelligent data-centric critical systems and communication networks, also touching on future developments. In addition, readers will find in-demand information for domain experts and developers who want to understand and realize the aspects (opportunities and challenges) of using emerging technologies for designing and developing more secure and resilient intelligent data-centric critical systems and communication networks. Topics covered include airports, seaports, rail transport systems, plants for the provision of water and energy, and business transactional systems. The book is well suited for researchers and PhD interested in the use of security and resilient computing technologies. Includes tools and techniques to prevent and avoid both accidental and malicious behaviors Explains the state-of-the-art technological solutions for main issues hindering the development of monitoring and reaction solutions Describes new methods and technologies, advanced prototypes, systems, tools and techniques of future direction

Fundamentals, Standards, Platforms, and Applications

Intelligent Sensors

Structural Sensing, Health Monitoring, and Performance Evaluation

An Enterprise Engineering Perspective

Compact Wireless and Wired Sensing Systems

RFID-WSN Integrated Architecture for Energy and Delay-Aware Routing

Smart Grid Fundamentals

This volume surveys recent research on autonomous sensor networks from the perspective of enabling technologies that support medical, environmental and military applications. State of the art, as well as emerging concepts in wireless sensor networks, body area networks and ambient assisted living introduce the reader to the field, while subsequent chapters deal in depth with established and related technologies, which render their implementation possible. These range from smart textiles and printed electronic devices to implanted devices and specialized packaging, including the most relevant technological features. The last four chapters are devoted to customization, implementation difficulties and outlook for these technologies in specific applications.

Architectures, Protocols, Security, and Integrations

Multisensor Fusion and Integration for Intelligent Systems

Autonomous Sensor Networks

Applications and New Opportunities

Advanced Materials and Techniques for Biosensors and Bioanalytical Applications