1. Record Nr. UNINA9910155255703321 The internet of things and data analytics handbook / / edited by Titolo Hwaiyu Geng Hoboken, New Jersey:,: John Wiley & Sons,, 2017 Pubbl/distr/stampa [Piscatagay, New Jersey]:,: IEEE Xplore,, [2016] **ISBN** 1-119-17362-0 1-119-17363-9 1-119-17360-4 Descrizione fisica 1 online resource (811 pages) : illustrations Disciplina 004.67/8 Soggetti Internet of things Data mining Cooperating objects (Computer systems) Big data Lingua di pubblicazione Inglese **Formato** Materiale a stampa Monografia Livello bibliografico Nota di bibliografia Includes bibliographical references and index. Nota di contenuto -- -- List of Contributors xix -- Foreword xxiii -- Preface xxvii --Acknowledgments xxix -- Part I INTERNET OF THINGS 1 -- 1 Internet of Things and Data Analytics in the Cloud with Innovation and Sustainability 3 /Hwaiyu Geng -- 1.1 Introduction 3 -- 1.2 The IoT and the Fourth Industrial Revolution 4 -- 1.3 Internet of Things Technology 6 -- 1.4 Standards and Protocols 11 -- 1.5 IoT Ecosystem 11 -- 1.6 Definition of Big Data 13 -- 1.7 IoT, Data Analytics, and Cloud Computing 18 -- 1.8 Creativity, Invention, Innovation, and Disruptive Innovation 18 -- 1.9 Polya's "How to Solve it" 20 -- 1.10 Business Plan and Business Model 20 -- 1.11 Conclusion and Future Perspectives 23 -- 2 Digital Services and Sustainable Solutions 29 /Rikke Gram-Hansen -- 2.1 Introduction 29 -- 2.2 Why IoT is not Just "Nice to Have" 30 --2.3 Services in a Digital Revolution 32 -- 2.4 Mobile Digital Services and the Human Sensor 32 -- 2.5 Not Just Another App 33 -- 2.6 The Hidden Life of Things 34 -- 2.7 The Umbrellas are not what they Seem

35 -- 2.8 Interacting with the Invisible 36 -- 2.9 Society as Open Source 36 -- 2.10 Learn from your Hackers 37 -- 2.11 Ensuring High-

Quality Services to Citizens 37 -- 2.12 Government as a Platform 38 --2.13 Conclusion 38 -- 3 The Industrial Internet of Things (liot): Applications and Taxonomy 41 /Stan Schneider -- 3.1 Introduction to the lioT 41 -- 3.2 Some Examples of liot Applications 43 -- 3.3 Toward a Taxonomy of the liot 52 -- 3.4 Standards and Protocols for Connectivity 66 -- 3.5 Connectivity Architecture for the liot 73 -- 3.6 Data-Centricity Makes Dds Different 79 -- 3.7 The Future of the liot 80 -- 4 Strategic Planning for Smarter Cities 83 /Jonathan Reichental --4.1 Introduction 83 -- 4.2 What is a Smart City? 84 -- 4.3 Smart Cities and the Internet of Things 85 -- 4.4 Why Strategic Planning Matters 86 -- 4.5 Beginning the Journey: First Things First 87 -- 4.6 From Vision to Objectives to Execution 89 -- 4.7 Pulling it all Together 91 -- 5 Next-Generation Learning: Smart Medical Team Training 95 /Brenda Bannan, Shane Gallagher and Bridget Lewis. 5.1 Introduction 95 -- 5.2 Learning, Analytics, and Internet of Things 96 -- 5.3 IoT Learning Design Process 98 -- 5.4 Conclusion 103 -- 6 The Brain / Computer Interface in the Internet of Things 107 /Jim McKeeth -- 6.1 Introduction 107 -- 6.2 The Science Behind Reading the Brain 109 -- 6.3 The Science of Writing to the Brain 112 -- 6.4 The Human Connectome Project 113 -- 6.5 Consumer Electroencephalography Devices 113 -- 6.6 Summary 115 -- 7 lot Innovation Pulse 119 / John Mattison -- 7.1 The Convergence of Exponential Technologies as a Driver of Innovation 119 -- 7.2 Six Dimensions of the Plecosystem 119 -- 7.3 Five Principles of the Plecosystem 120 -- 7.4 The Biologic Organism Analogy for the IoT 121 -- 7.5 Components for Innovation with the Organismal Analog 122 --7.6 Spinozan Value Trade-Offs 123 -- 7.7 Human IoT Sensor Networks 123 -- 7.8 Role of the IoT in Social Networks 124 -- 7.9 Security and Cyberthreat Resilience 124 -- 7.10 IoT Optimization for Sustainability of our Planet 124 -- 7.11 Maintenance of Complex IoT Networks 125 -- 7.12 The Accordion Model of Learning as a Source of Innovation 126 -- 7.13 Summary 126 -- Part II INTERNET OF THINGS TECHNOLOGIES 129 -- 8 Internet of Things Open-Source Systems 131 /Scott Amyx --8.1 Introduction 131 -- 8.2 Background of Open Source 131 -- 8.3 Drivers for Open Source 132 -- 8.4 Benefits of Using Open Source 132 -- 8.5 IoT Open-Source Consortiums and Projects 134 -- 8.6 Finding the Right Open-Source Project for the Job 137 -- 8.7 Conclusion 143 -- 9 MEMS: An Enabling Technology for the Internet of Things (IoT) 147 /Michael A. Huff -- 9.1 The Ability to Sense, Actuate, and Control 148 -- 9.2 What are MEMS? 150 -- 9.3 MEMS as an Enabling Technology for the IoT 153 -- 9.4 MEMS Manufacturing Techniques 155 -- 9.5 Examples of MEMS Sensors 158 -- 9.6 Example of MEMS Actuator 163 -- 9.7 The Future of MEMS for the IoT 163 -- 9.8 Conclusion 165 --10 Electro-Optical Infrared Sensor Technologies for the Internet of Things 167 /Venkataraman Sundareswaran, Henry Yuan, Kai Song, Joseph Kimchi and Jih-Fen Lei. 10.1 Introduction 167 -- 10.2 Sensor Anatomy and Technologies 169 -- 10.3 Design Considerations 176 -- 10.4 Applications 179 -- 10.5 Conclusion 184 -- 11 Ipv6 for IoT and Gateway 187 /Geoff Mulligan --11.1 Introduction 187 -- 11.2 lp: The Internet Protocol 187 -- 11.3 IPv6: The Next Internet Protocol 189 -- 11.4 6LoWPAN: Ip for IoT 191 -- 11.5 Gateways: A Bad Choice 191 -- 11.6 Example IoT Systems 192 -- 11.7 An IoT Data Model 194 -- 11.8 The Problem of Data Ownership 194 -- 11.9 Managing the Life of an IoT Device 195 -- 11.10 Conclusion: Looking forward 195 -- 12 Wireless Sensor Networks 197 /David Y. Fong -- 12.1 Introduction 197 -- 12.2 Characteristics of Wireless Sensor Networks 198 -- 12.3 Distributed Computing 201 --

12.4 Parallel Computing 202 -- 12.5 Self-Organizing Networks 205 --

12.6 Operating Systems for Sensor Networks 206 -- 12.7 Web of Things (WoT) 207 -- 12.8 Wireless Sensor Network Architecture 208 --12.9 Modularizing the Wireless Sensor Nodes 209 -- 12.10 Conclusion 210 -- 13 Networking Protocols and Standards for Internet of Things 215 /Tara Salman and Raj Jain -- 13.1 Introduction 215 -- 13.2 IoT Data Link Protocols 218 -- 13.3 Network Layer Routing Protocols 224 -- 13.4 Network Layer Encapsulation Protocols 225 -- 13.5 Session Layer Protocols 227 -- 13.6 IoT Management Protocols 232 -- 13.7 Security in IoT Protocols 233 -- 13.8 IoT Challenges 234 -- 13.9 Summary 235 -- 14 IoT Architecture 239 /Shyam Varan Nath -- 14.1 Introduction 239 -- 14.2 Architectural Approaches 239 -- 14.3 Business Markitecture 242 -- 14.4 Functional Architecture 243 -- 14.5 Application Architecture 243 -- 14.6 Data and Analytics Architecture 246 -- 14.7 Technology Architecture 246 -- 14.8 Security and Governance 248 -- 15 A Designer's Guide to the Internet of Wearable Things 251 /David Hindman and Peter Burnham -- 15.1 Introduction 251 -- 15.2 Interface Glanceability 252 -- 15.3 The Right Data at the Right Time 254 -- 15.4 Consistency Across Channels 255 -- 15.5 From Public to Personal 260. 15.6 Nonvisual Ui 262 -- 15.7 Emerging Patterns 264 -- 15.8 Conclusion 265 -- 16 Beacon Technology with IoT and Big Data 267 /Nick Stein and Stephanie Urbanski -- 16.1 Introduction to Beacons 267 -- 16.2 What is Beacon Technology 269 -- 16.3 Beacon and BLE Interaction 270 -- 16.4 Where Beacon Technology can be Applied/Used 271 -- 16.5 Big Data and Beacons 273 -- 16.6 San Francisco International Airport (Sfo) 274 -- 16.7 Future Trends and Conclusion 280 -- 17 SCADA Fundamentals and Applications in the IoT 283 /Rich Hunzinger -- 17.1 Introduction 283 -- 17.2 What Exactly is SCADA? 285 -- 17.3 Why is SCADA the Right Foundation for an IoT Platform? 287 -- 17.4 Case Study: Algae Lab Systems 290 -- 17.5 The Future of SCADA and the Potential of the IoT 290 -- Part III DATA ANALYTICS TECHNOLOGIES 295 -- 18 Data Analysis and Machine Learning Effort in Healthcare: Organization, Limitations, and Development of an Approach 297 /Oleg Roderick, Nicholas Marko, David Sanchez and Arun Aryasomajula -- 18.1 Introduction 297 -- 18.2 Data Science Problems in Healthcare 298 -- 18.3 Qualifications and Personnel in Data Science 306 -- 18.4 Data Acquisition and Transformation 310 --18.5 Basic Principles of Machine Learning 316 -- 18.6 Case Study: Prediction of Rare Events on Nonspecific Data 321 -- 18.7 Final Remarks 324 -- 19 Data Analytics and Predictive Analytics in the Era of Big Data 329 /Amy Shi-Nash and David R. Hardoon -- 19.1 Data Analytics and Predictive Analytics 329 -- 19.2 Big Data and Impact to Analytics 334 -- 19.3 Conclusion 343 -- 20 Strategy Development and Big Data Analytics 347 /Neil Fraser -- 20.1 Introduction 347 -- 20.2 Maximizing the Influence of Internal Inputs for Strategy Development 348 -- 20.3 A Higher Education Case Study 352 -- 20.4 Maximizing the Influence of External Inputs for Strategy Development 356 -- 20.5 Conclusion 363 -- 21 Risk Modeling and Data Science 365 / Joshua Frank -- 21.1 Introduction 365 -- 21.2 What is Risk Modeling 365 --21.3 The Role of Data Science in Risk Management 366. 21.4 How to Prepare and Validate Risk Model 367 -- 21.5 Tips and Lessons Learned 374 -- 21.6 Future Trends and Conclusion 380 -- 22 Hadoop Technology 383 /Scott Shaw -- 22.1 Introduction 383 -- 22.2 What is Hadoop Technology and Application? 384 -- 22.3 Why Hadoop? 386 -- 22.4 Hadoop Architecture 388 -- 22.5 HDFS: What and how to use it 391 -- 22.6 YARN: What and how to use it 392 -- 22.7 Mapreduce: What and how to use it 394 -- 22.8 Apache: what and how to use it 395 -- 22.9 Future Trend and Conclusion 396 -- 23 Security

of IoT Data: Context, Depth, and Breadth Across Hadoop 399 /Pratik Verma -- 23.1 Introduction 399 -- 23.2 IoT Data in Hadoop 402 --23.3 Security in IoT Platforms Built on Hadoop 402 -- 23.4 Architectural Considerations for Implementing Security in Hadoop 403 -- 23.5 Breadth of Control 403 -- 23.6 Context for Security 404 --23.7 Security Policies and Rules Based on Pxp Architecture 404 -- 23.8 Conclusion 405 -- Part Iv SMART EVERYTHING 407 -- 24 Connected Vehicle 409 / Adrian Pearmine -- 24.1 Introduction 409 -- 24.2 Connected, Automated, and Autonomous Vehicle Technologies 410 --24.3 Connected Vehicles from the Department of Transportation Perspective 413 -- 24.4 Policy Issues Around DSRC 414 -- 24.5 Alternative forms of V2X Communications 414 -- 24.6 DOT Connected Vehicle Applications 415 -- 24.7 Other Connected Vehicle Applications 418 -- 24.8 Migration Path from Connected and Automated to Fully Autonomous Vehicles 419 -- 24.9 Autonomous Vehicle Adoption Predictions 419 -- 24.10 Market Growth for Connected and Autonomous Vehicle Technology 422 -- 24.11 Connected Vehicles in the Smart City 423 -- 24.12 Issues not Discussed in this Chapter 423 -- 24.13 Conclusion 425 -- 25 In-Vehicle Health and Wellness: An Insider Story 427 / Pramita Mitra, Craig Simonds, Yifan Chen and Gary Strumolo -- 25.1 Introduction 427 -- 25.2 Health and Wellness Enabler Technologies inside the Car 429 -- 25.3 Health and Wellness as Automotive Features 435 -- 25.4 Top Challenges for Health and Wellness 440.

25.5 Summary and Future Directions 444 -- 26 Industrial Internet 447 /David Bartlett -- 26.1 Introduction (History, Why, and Benefits) 447 --26.2 Definitions of Components and Fundamentals of Industrial Internet 448 -- 26.3 Application in Healthcare 450 -- 26.4 Application in Energy 451 -- 26.5 Application in Transport/Aviation and Others 453 -- 26.6 Conclusion and Future Development 454 -- 27 Smart City Architecture and Planning: Evolving Systems through IoT 457 /Dominique Davison and Ashley Z. Hand -- 27.1 Introduction 457 --27.2 Cities and the Advent of Open Data 459 -- 27.3 Buildings in Smarter Cities 460 -- 27.4 The Trifecta of Technology 461 -- 27.5 Emerging Solutions: Understanding Systems 462 -- 27.6 Conclusion 464 -- 28 Nonrevenue Water 467 /Kenneth Thompson, Brian Skeens and Jennifer Liggett -- 28.1 Introduction and Background 467 -- 28.2 NRW Anatomy 467 -- 28.3 Economy and Conservation 468 -- 28.4 Best Practice Standard Water Balance 469 -- 28.5 NRW Control and Audit 469 -- 28.6 Lessons Learned 472 -- 28.7 Case Studies 473 --28.8 The Future of Nonrevenue Water Reduction 479 -- 28.9 Conclusion 479 -- 29 IoT and Smart Infrastructure 481 /George Lu and Y.J. Yang -- 29.1 Introduction 481 -- 29.2 Engineering Decisions 482 -- 29.3 Conclusion 492 -- 30 Internet of Things and Smart Grid Standardization 495 / Girish Ghatikar -- 30.1 Introduction and Background 495 -- 30.2 Digital Energy Accelerated by the Internet of Things 497 -- 30.3 Smart Grid Power Systems and Standards 500 --30.4 Leveraging IoTs and Smart Grid Standards 503 -- 30.5 Conclusions and Recommendations 510 -- 31 IoT Revolution in Oil and Gas Industry 513 /Satyam Priyadarshy -- 31.1 Introduction 513 -- 31.2 What is IoT Revolution in Oil and Gas Industry? 515 -- 31.3 Case Study 516 -- 31.4 Conclusion 519 -- 32 Modernizing the Mining Industry with the Internet of Things 521 /Rafael Laskier -- 32.1 Introduction 521 -- 32.2 How IoT will Impact the Mining Industry 523 -- 32.3 Case Study 535 -- 32.4 Conclusion 541. 33 Internet of Things (IoT)-Based Cyber / Physical Frameworks for

Advanced Manufacturing and Medicine 545 /J. Cecil -- 33.1 Introduction 545 -- 33.2 Manufacturing and Medical Application

Contexts 546 -- 33.3 Overview of IoT-Based Cyber / Physical Framework 548 -- 33.4 Case Studies in Manufacturing and Medicine 548 -- 33.5 Conclusion: Challenges, Road Map for the Future 556 --Part V IoT/DATA ANALYTICS CASE STUDIES 563 -- 34 Defragmenting Intelligent Transportation: A Practical Case Study 565 /Alan Carlton, Rafael Cepeda and Tim Gammons -- 34.1 Introduction 565 -- 34.2 The Transport Industry and Some Lessons from the Past 566 -- 34.3 The Transport Industry: a Long Road Traveled 567 -- 34.4 The Transpoprt Industry: Current Status and Outlook 570 -- 34.5 Use Case: oneTRANSPORT - a Solution to Today's Transport Fragmentation 572 -- 34.6 oneTRANSPORT: Business Model 575 -- 34.7 Conclusion 578 -- 35 Connected and Autonomous Vehicles 581 /Levent Guvenc, Bilin Aksun Guvenc and Mumin Tolga Emirler -- 35.1 Brief History of Automated and Connected Driving 581 -- 35.2 Automated Driving Technology 583 -- 35.3 Connected Vehicle Technology and the Cv Pilots 587 -- 35.4 Automated Truck Convoys 589 -- 35.5 On-Demand Automated Shuttles for a Smart City 590 -- 35.6 A Unified Design Approach 591 -- 35.7 Acronym and Description 592 -- 36 Transit Hub: A Smart Decision Support System for Public Transit Operations 597 /Shashank Shekhar, Fangzhou Sun, Abhishek Dubey, Aniruddha Gokhale, Himanshu Neema, Martin Lehofer and Dan Freudberg -- 36.1 Introduction 597 -- 36.2 Challenges 600 -- 36.3 Integrated Sensors 600 -- 36.4 Transit Hub System with Mobile Apps and Smart Kiosks 601 -- 36.5 Conclusion 610 -- 37 Smart Home Services Using the Internet of Things 613 /Gene Wang and Danielle Song -- 37.1 Introduction 613 -- 37.2 What Matters? 613 -- 37.3 IoT for the Masses 614 -- 37.4 Lifestyle Security Examples 615 -- 37.5 Market Size 617 -- 37.6 Characteristics of an Ideal System 619 -- 37.7 IoT Technology 624.

37.8 Conclusion 630 -- 38 Emotional Insights via Wearables 631 /Gawain Morrison -- 38.1 Introduction 631 -- 38.2 Measuring Emotions: What are they? 632 -- 38.3 Measuring Emotions: How does it Work? 632 -- 38.4 Leaders in Emotional Understanding 633 -- 38.5 The Physiology of Emotion 635 -- 38.6 Why Bother Measuring Emotions? 636 -- 38.7 Use Case 1 636 -- 38.8 Use Case 2 637 -- 38.9 Use Case 3 640 -- 38.10 Conclusion 640 -- 39 A Single Platform Approach for the Management of Emergency in Complex Environments such as Large Events, Digital Cities, and Networked Regions 643 /Francesco Valdevies -- 39.1 Introduction 643 -- 39.2 Resilient City: Selex Es Safety and Security Approach 645 -- 39.3 City Operating System: People, Place, and Organization Protection 646 -- 39.4 Cyber Security: Knowledge Protection 650 -- 39.5 Intelligence 651 -- 39.6 A Scalable Solution for Large Events, Digital Cities, and Networked Regions 652 -- 39.7 Selex ES Relevant Experiences in Security and Safety Management in Complex Situations 652 -- 39.8 Conclusion 657 -- 40 Structural Health Monitoring 665 /George Lu and Y.j. Yang --40.1 Introduction 665 -- 40.2 Requirement 666 -- 40.3 Engineering Decisions 667 -- 40.4 Implementation 669 -- 40.5 Conclusion 671 --41 Home Healthcare and Remote Patient Monitoring 675 /Karthi Jeyabalan -- 41.1 Introduction 675 -- 41.2 What the Case Study is About 676 -- 41.3 Who are the Parties in the Case Study 677 -- 41.4 Limitation, Business Case, and Technology Approach 678 -- 41.5 Setup and Workflow Plan 678 -- 41.6 What are the Success Stories in the Case Study 679 -- 41.7 What Lessons Learned to be Improved 681 -- Part Vi Cloud, Legal, Innovation, and Business Models 683 -- 42 Internet of Things and Cloud Computing 685 /James Osborne -- 42.1 Introduction 685 -- 42.2 What is Cloud Computing? 687 -- 42.3 Cloud Computing and IoT 688 -- 42.4 Common IoT Application Scenarios 690 -- 42.5

Cloud Security and IoT 693 -- 42.6 Cloud Computing and Makers 695 -- 42.7 An Example Scenario 696.

42.8 Conclusion 697 -- 43 Privacy and Security Legal Issues 699 /Francoise Gilbert -- 43.1 Unique Characteristics 699 -- 43.2 Privacy Issues 701 -- 43.3 Data Minimization 704 -- 43.4 Deidentification 708 -- 43.5 Data Security 710 -- 43.6 Profiling Issues 714 -- 43.7 Research and Analytics 715 -- 43.8 IoT and DA Abroad 716 -- 44 IoT and Innovation 719 / William Kao -- 44.1 Introduction 719 -- 44.2 What is Innovation? 719 -- 44.3 Why is Innovation Important? Drivers and Benefits 724 -- 44.4 How: the Innovation Process 725 -- 44.5 Who does the Innovation? Good Innovator Skills 727 -- 44.6 When: in a Product Cycle when does Innovation Takes Part? 729 -- 44.7 Where: Innovation Areas in IoT 730 -- 44.8 Conclusion 732 -- 45 Internet of Things Business Models 735 / Hubert C.Y. Chan -- 45.1 Introduction 735 -- 45.2 IoT Business Model Framework Review 736 -- 45.3 Framework Development 740 -- 45.4 Case Studies 743 -- 45.5 Discussion and Summary 755 -- 45.6 Limitations and Future Research 756 -- Index 759.

Sommario/riassunto

This book examines the Internet of Things (IoT) and Data Analytics from a technical, application, and business point of view. Internet of Things and Data Analytics Handbook describes essential technical knowledge, building blocks, processes, design principles, implementation, and marketing for IoT projects. It provides readers with knowledge in planning, designing, and implementing IoT projects. The book is written by experts on the subject matter, including international experts from nine countries in the consumer and enterprise fields of IoT. The text starts with an overview and anatomy of IoT, ecosystem of IoT, communication protocols, networking, and available hardware, both present and future applications and transformations, and business models. The text also addresses big data analytics, machine learning, cloud computing, and consideration of sustainability that are essential to be both socially responsible and successful. Design and implementation processes are illustrated with best practices and case studies in action. In addition, the book: . Examines cloud computing, data analytics, and sustainability and how they relate to IoT. Covers the scope of consumer, government, and enterprise applications. Includes best practices, business model, and real-world case studies.