Innovative Applications in Smart Cities

Editors Alberto Ochoa-Zezzatti, Genoveva Vargas-Solar, and Javier Alfonso Espinosa Oviedo



Innovative Applications in Smart Cities

Editors

Alberto Ochoa-Zezzatti Universidad Autónoma de Ciudad Juárez

Genoveva Vargas-Solar

French Council of Scientific Research (CNRS) Laboratory of Informatics on Images and Information Systems France

Javier Alfonso Espinosa Oviedo University of Lyon, ERIC Research lab France



CRC Press is an imprint of the Taylor & Francis Group, an **informa** business A SCIENCE PUBLISHERS BOOK First edition published 2021 by CRC Press 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742 and by CRC Press

2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

© 2021 Taylor & Francis Group, LLC

CRC Press is an imprint of Taylor & Francis Group, LLC

Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, access www.copyright.com or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. For works that are not available on CCC please contact mpkbookspermissions@tandf.co.uk

Trademark notice: Product or corporate names may be trademarks or registered trademarks and are used only for identification and explanation without intent to infringe.

Library of Congress Cataloging-in-Publication Data

Names: Ochoa Ortiz Zezzatti, Carlos Alberto, 1974- editor. | Vargas-Solar, Genoveva, 1971- editor. | Espinosa Oviedo, Javier Alfonso, 1983- editor.

Title: Innovative applications in smart cities / editors, Alberto Ochoa-Zezzatti, Universidad Ciudad Juárez, México, Genovera Vargas-Solar, French Council of Scientific Research (CNRS), Laboratory of Informatics on Images and Information Systems, Cedex, France, Javier Alfonso Espinosa Oviedo, University of Lyon, ERIC Research Lab, Cedex, France.

Description: First edition. | Boca Raton : CRC Press, Taylor & Francis Group, 2021. | "A science publishers book." | Includes bibliographical references and index. | Summary: "This research book is a novel, innovative and adequate reference that compiles interdisciplinary perspectives about diverse issues related with Industry 4.0 and Smart Cities on different ways about Intelligent Optimisation, Industrial Applications on the real world, Social applications and Technology

applications with a different perspective about existing solutions. Chapters report research results improving Optimisation related with Smart Manufacturing, Logistics of products and services, Optimisation of

different elements in the time and location, Social Applications to enjoy our life of a better way and Applications that increase Daily Life Quality. This book is organised into three scopes of knowledge: (1) applications of Industry 4.0; (2) applications to improve the life of the citizens in a Smart City; and finally (3) research associated with

the welfare of the working-age population and their expectations in their jobs correlated with the welfare - work relationship"-- Provided by publisher. Identifiers: LCCN 2021000974 | ISBN 9780367820961 (hardcover)

Subjects: LCSH: Smart cities. Classification: LCC TD159.4 .I486 2021 | DDC 307.760285--dc23

LC record available at https://lccn.loc.gov/2021000974

ISBN: 978-0-367-82096-1 (hbk) ISBN: 978-1-032-04256-5 (pbk) ISBN: 978-1-003-19114-8 (ebk)

Typeset in Times New Roman by Radiant Productions

Preface

"Innovation" is a moto in the development of current and future Smart Cities. Innovation understood by newness, improvement and spread, is often promoted by Information and Communication Technologies (ICTs) that make it possible to automate, accelerate and change the perspective of the way economy and "social good" challenges can be addressed.

In economics, innovation is generally considered to be the result of a process that brings together various novel ideas to affect society and increase competitiveness. In this sense, future Smart Cities societies' economic competitiveness is defined as increasing consumers' satisfaction given by the right products price/quality ratio. Therefore, it is necessary to design production workflows that maximise the resources used to produce the right quality products and services. Companies' competitiveness refers to their capacity to produce goods and services efficiently (decreasing prices and increasing quality), making their products attractive in global markets. Thus, it is necessary to achieve high productivity levels that increase profitability and generate revenue. Beyond the importance of stable macroeconomic environments that can promote confidence, attract capital and technology, a necessary condition to build competitive societies is to create virtuous creativity circles that can propose smart and disruptive applications and services that can spread across different social sectors strata.

Smart Cities have been willing to create technology-supported environments to make urban, social and industrial spaces friendly, competitive and productive contexts in which natural and material resources can be accessible to people, where citizens can develop their potential skills in the best conditions possible. Since countries in different geographic locations, natural, cultural and industrial ecosystems have to adapt their strategies to these conditions, Smart Cities solutions are materialised differently. This book shows samples of experiences where industrial, urban planning, health and sanitary problems are addressed with technology leading to disruptive data and artificial intelligence centred applications. Sharing applied research experiences and results mostly applied in Latin American countries, authors and editors show how they contribute to making cities and new societies smart through scientific development and innovation.



Contents

| Pref | lace and the second s | iii |
|------|---|-----|
| | Prologue Khalid Belhajjame | |
| | Part I: Daily Life in a Smart City | |
| 1. | Segmentation of Mammogram masses for Smart Cities Health Systems Paula Andrea Gutiérrez-Salgado, Jose Mejia, Leticia Ortega, Nelly Gordillo, Boris Mederos and Alberto Ochoa-Zezzatti | 1 |
| 2. | Serious Game for Caloric Burning in Morbidly Obese Children José Díaz-Román, Alberto Ochoa-Zezzatti, Jose Mejía-Muñoz, Juan Cota-Ruiz and Erika Severeyn | 10 |
| 3. | Intelligent Application for the Selection of the Best Fresh Product According to its Presentation and the Threshold of Colors Associated with its Freshness in a Comparison of Issues of a Counter in a Shop of Healthy Products in a Smart City Iván Rebollar-Xochicale, Fernando Maldonado-Azpeitia and Alberto Ochoa-Zezzatti | 22 |
| 4. | Analysis of Mental Workload on Bus Drivers in the Metropolitan Area of Querétaro and its Comparison with three other Societies to Improve the Life in a Smart City Aarón Zárate, Alberto Ochoa-Zezzatti, Fernando Maldonado and Juan Hernández | 34 |
| 5. | Multicriteria analysis of Mobile Clinical Dashboards for the Monitoring of Type II Diabetes in a Smart City Mariana Vázquez-Avalos, Alberto Ochoa-Zezzatti and Mayra Elizondo-Cortés | 47 |
| 6. | Electronic Color Blindness Diagnosis for the Detection and Awareness of Color Blindness in Children Using Images with Modified Figures from the Ishihara Test <i>Martín Montes, Alejandro Padilla, Julio Ponce, Juana Canul, Alberto Ochoa-Zezzatti</i> and <i>Miguel Meza</i> | 75 |
| 7. | An Archetype of Cognitive Innovation as Support for the Development of Cognitive Solutions in Smart Cities Jorge Rodas-Osollo, Karla Olmos-Sánchez, Enrique Portillo-Pizaña, Andrea Martínez-Pérez and Boanerges Alemán-Meza | 89 |
| | Part II: Applications to Improve a Smart City | |
| 8. | From Data Harvesting to Querying for Making Urban Territories Smart <i>Genoveva Vargas-Solar, Ana-Sagrario Castillo-Camporro, José Luis Zechinelli-Martini</i> and <i>Javier A. Espinosa-Oviedo</i> | 107 |

| 9. | Utilization of Detection Tools in a Human Avalanche that Occurred in a Rugby Stadium, Using Multi-Agent Systems Tomás Limones, Carmen Reaiche and Alberto Ochoa-Zezzatti | 117 |
|-------|---|-----|
| 10. | Humanitarian Logistics and the Problem of Floods in a Smart City Aztlán Bastarrachea-Almodóvar, Quirino Estrada Barbosa, Elva Lilia Reynoso Jardón and Javier Molina Salazar | 135 |
| 11. | Simulating Crowds at a College School in Juarez, Mexico: A Humanitarian Logistics Approach Dora Ivette Rivero-Caraveo, Jaqueline Ortiz-Velez and Irving Bruno López-Santos | 145 |
| 12. | Perspectives of State Management in Smart Cities <i>Zhang Jieqiong</i> and <i>Jesús García-Mancha</i> | 155 |
| | Part III: Industry 4.0, Logistics 4.0 and Smart Manufacturing | |
| 13. | On the Order Picking Policies in Warehouses: Algorithms and their Behavior <i>Ricardo Arriola, Fernando Ramos, Gilberto Rivera, Rogelio Florencia,</i> <i>Vicente Garcia</i> and <i>Patricia Sánchez-Solis</i> | 165 |
| 14. | Color, Value and Type Koi Variant in Aquaculture Industry Economic Model with Tank's Measurement Underwater using ANNs <i>Alberto Ochoa-Zezzatti, Martin Montes Rivera</i> and <i>Roberto Contreras Masse</i> | 186 |
| 15. | Evaluation of a Theoretical Model for the Measurement of Technological Competencies in the Industry 4.0 <i>Norma Candolfi-Arballo, Bernabé Rodríguez-Tapia, Patricia Avitia-Carlos,</i> <i>Yuridia Vega</i> and <i>Alfredo Hualde-Alfaro</i> | 203 |
| 16. | Myoelectric Systems in the Era of Artificial Intelligence and Big Data Bernabé Rodríguez-Tapia, Angel Israel Soto Marrufo, Juan Miguel Colores-Vargas and Alberto Ochoa-Zezzatti | 216 |
| 17. | Implementation of an Intelligent Model based on Big Data and Decision Making using Fuzzy Logic Type-2 for the Car Assembly Industry in an Industrial Estate in Northern Mexico José Luis Peinado Portillo, Alberto Ochoa-Zezzatti, Sara Paiva and Darwin Young | 229 |
| 18. | Weibull Reliability Method for Several Fields Based Only on the Modeled Quadratic Form Manuel R. Piña-Monarrez and Paulo Sampaio | 235 |
| Inde: | x | 267 |