

PREMIER REFERENCE SOURCE

Computational Modeling and Simulation of Intellect

Current State and Future Perspectives



Boris Igelnik

Table of Contents

Foreword 1	xviii
Foreword 2	xix
Preface	xxi
Acknowledgment	xxix

Section 1

Application of AI and CI Methods to Image and Signal Processing, Robotics, and Control

Chapter 1

Image Processing for Localization and Parameterization of the Glandular Ducts of Colon in Inflammatory Bowel Diseases	1
<i>Stanislaw Osowski, Warsaw University of Technology & Military University of Technology, Poland</i>	
<i>Michal Kruk, University of Life Sciences, Poland</i>	
<i>Robert Koktysz, Military Institute of Medicine, Poland</i>	
<i>Jaroslav Kurek, University of Life Sciences, Poland</i>	

Chapter 2

The Kolmogorov Spline Network for Image Processing.....	25
<i>Pierre-Emmanuel Leni, University of Burgundy, France</i>	
<i>Yohan D. Fougierolle, University of Burgundy, France</i>	
<i>Frédéric Truchetet, University of Burgundy, France</i>	

Chapter 3

Intelligent Information Description and Recognition in Biomedical Image Databases	52
<i>Khalifa Djemal, University of Evry Val d'Essonne, France</i>	
<i>Hichem Maaref, University of Evry Val d'Essonne, France</i>	

Chapter 4

Machine Learning for Visual Navigation of Unmanned Ground Vehicles	81
<i>Artem A. Lenskiy, University of Ulsan, South Korea</i>	
<i>Jong-Soo Lee, University of Ulsan, South Korea</i>	

Chapter 5

Adaptive Dynamic Programming Applied to a 6DoF Quadrotor	102
<i>Petru Emanuel Stingu, University of Texas at Arlington, USA</i>	
<i>Frank L. Lewis, University of Texas at Arlington, USA</i>	

Chapter 6

Cognitive Based Distributed Sensing, Processing, and Communication	131
<i>Roman Ilin, Air Force Research Laboratory, USA</i>	
<i>Leonid Perlovsky, Air Force Research Laboratory, USA</i>	

Chapter 7

Biogeography-Based Optimization for Robot Controller Tuning	162
<i>Pavel Lozovyy, Cleveland State University, USA</i>	
<i>George Thomas, Cleveland State University, USA</i>	
<i>Dan Simon, Cleveland State University, USA</i>	

Section 2

Application of AI and CI Methods to Medicine and Environment Monitoring and Protection

Chapter 8

An Exposition of Uncertain Reasoning Based Analysis: An Investigation of Total Hip Arthroplasty.....	183
<i>Malcolm J. Beynon, Cardiff University, UK</i>	
<i>Cathy Holt, Cardiff University, UK</i>	
<i>Gemma Whatling, Cardiff University, UK</i>	

Chapter 9

Sigma Tuning of Gaussian Kernels: Detection of Ischemia from Magnetocardiograms	206
<i>Long Han, Rensselaer Polytechnic Institute, USA</i>	
<i>Mark J. Embrechts, Rensselaer Polytechnic Institute, USA</i>	
<i>Boleslaw K. Szymanski, Rensselaer Polytechnic Institute, USA</i>	
<i>Karsten Sternickel, Cardiomag Imaging, Inc., USA</i>	
<i>Alexander Ross, Cardiomag Imaging, Inc., USA</i>	

Chapter 10

Artificial Neural Network Modelling for Waste: Gas and Wastewater Treatment Applications 224

Eldon R. Rene, University of La Coruña, Spain

M. Estefanía López, University of La Coruña, Spain

María C. Veiga, University of La Coruña, Spain

Christian Kennes, University of La Coruña, Spain

Section 3

Concepts

Chapter 11

Motivated Learning for Computational Intelligence 265

Janusz A. Starzyk, Ohio University at Athens, USA

Chapter 12

Topological Coding in the Hippocampus 293

Yuri Dabaghian, University of California at San Francisco, USA

Anthony G. Cohn, University of Leeds, UK

Loren Frank, University of California at San Francisco, USA

Chapter 13

Knowledge Representation as a Tool for Intelligence Augmentation..... 321

Auke J.J. van Breemen, Radboud University, The Netherlands

Jozsef I. Farkas, Radboud University, The Netherlands

Janos J. Sarbo, Radboud University, The Netherlands

Chapter 14

Data Discovery Approaches for Vague Spatial Data 342

Frederick E. Petry, Naval Research Laboratory, USA

Chapter 15

Feature Selection and Ranking 361

Boris Igelnik, BMI Research, Inc. & Case Western Reserve University, USA

Chapter 16

Brain-Like System for Audiovisual Person Authentication Based on Time-to-First Spike Coding 384

Simej Gomes Wisoski, Auckland University of Technology, New Zealand

Lubica Benuskova, University of Otago, New Zealand

Nikola Kasabov, Auckland University of Technology, New Zealand

Chapter 17	
Modeling the Intellect from a Coordination Perspective.....	413
<i>Lars Taxén, Linköping University, Sweden</i>	

Chapter 18	
Information Processing by Chemical Reaction-Diffusion Media: From Computing to Vision	455
<i>Nicholas G. Rambidi, Moscow State University, Russia</i>	

Section 4

Application of AI and CI Methods to Learning

Chapter 19	
MLVQ: A Modified Learning Vector Quantization Algorithm for Identifying Centroids of Fuzzy Membership Functions.....	485
<i>Kai Keng Ang, Agency for Science, Technology and Research (A*STAR), Singapore</i>	
<i>Chai Quek, Nanjang Technological Institute, Singapore</i>	

Chapter 20	
Outlier Detection in Linear Regression	510
<i>A. A. M. Nurunnabi, University of Rajshahi, Bangladesh</i>	
<i>A. H. M. Rahmatullah Imon, Ball State University, USA</i>	
<i>A. B. M. Shawkat Ali, Central Queensland University, Australia</i>	
<i>Mohammed Nasser, University of Rajshahi, Bangladesh</i>	

Chapter 21	
Artificial Intelligence Techniques for Unbalanced Datasets in Real World Classification Tasks.....	551
<i>Marco Vannucci, Scuola Superiore Sant'Anna, Italy</i>	
<i>Valentina Colla, Scuola Superiore Sant'Anna, Italy</i>	
<i>Silvia Cateni, Scuola Superiore Sant'Anna, Italy</i>	
<i>Mirko Sgarbi, Scuola Superiore Sant'Anna, Italy</i>	

Chapter 22	
Ability of the 1-n-1 Complex-Valued Neural Network to Learn Transformations.....	566
<i>Tohru Nitta, National Institute of Advanced Industrial Science and Technology (AIST), Japan</i>	

Compilation of References	597
About the Contributors	637
Index.....	649