Contents

Part I Type-2 and Intuitionistic Fuzzy Logic

General Type-2 Fuzzy Edge Detection in the Preprocessing of a Face Recognition System .................................................. 3
Claudia I. Gonzalez, Patricia Melin, Juan R. Castro, Olivia Mendoza and Oscar Castillo

An Overview of Granular Computing Using Fuzzy Logic Systems .... 19
Mauricio A. Sanchez, Oscar Castillo and Juan R. Castro

Optimization of Type-2 and Type-1 Fuzzy Integrator to Ensemble Neural Network with Fuzzy Weights Adjustment ........ 39
Fernando Gaxiola, Patricia Melin, Fevrier Valdez and Juan R. Castro

Interval Type-2 Fuzzy Possibilistic C-Means Optimization Using Particle Swarm Optimization ............................................. 63
Elid Rubio and Oscar Castillo

Choquet Integral and Interval Type-2 Fuzzy Choquet Integral for Edge Detection ............................................................... 79
Gabriela E. Martínez, D. Olivia Mendoza, Juan R. Castro, Patricia Melin and Oscar Castillo

Bidding Strategies Based on Type-1 and Interval Type-2 Fuzzy Systems for Google AdWords Advertising Campaigns ............ 99
Quetzali Madera, Oscar Castillo, Mario Garcia and Alejandra Mancilla

On the Graphical Representation of Intuitionistic Membership Functions for Its Use in Intuitionistic Fuzzy Inference Systems .... 115
Amaury Hernandez-Aguila, Mario Garcia-Valdez and Oscar Castillo

A Gravitational Search Algorithm Using Type-2 Fuzzy Logic for Parameter Adaptation .......................................................... 127
Beatriz González, Fevrier Valdez and Patricia Melin
Part II Neural Networks Theory and Applications

Particle Swarm Optimization of the Fuzzy Integrators for Time Series Prediction Using Ensemble of IT2FNN Architectures .......... 141
Jesus Soto, Patricia Melin and Oscar Castillo

Long-Term Prediction of a Sine Function Using a LSTM Neural Network ................................................................. 159
Magdiel Jiménez-Guarneros, Pilar Gómez-Gil,
Rigoberto Fonseca-Delgado, Manuel Ramírez-Cortés
and Vicente Alarcón-Aquino

UAV Image Segmentation Using a Pulse-Coupled Neural Network for Land Analysis .................................................. 175
Mario I. Chacon-Murguia, Luis E. Guerra-Fernandez and Hector Erives

Classification of Arrhythmias Using Modular Architecture of LVQ Neural Network and Type 2 Fuzzy Logic .............. 187
Jonathan Amezcua and Patricia Melin

A New Method Based on Modular Neural Network for Arterial Hypertension Diagnosis ........................................... 195
Martha Pulido, Patricia Melin and German Prado-Arechiga

Spectral Characterization of Content Level Based on Acoustic Resonance: Neural Network and Feedforward Fuzzy Net Approaches ................................................................. 207
Juan Carlos Sanchez-Diaz, Manuel Ramirez-Cortes, Pilar Gomez-Gil,
Jose Rangel-Magdaleno, Israel Cruz-Vega and Hayde Peregrina-Barreto

Comparison of Optimization Techniques for Modular Neural Networks Applied to Human Recognition ......................... 225
Daniela Sánchez, Patricia Melin, Juan Carpio and Hector Puga

A Competitive Modular Neural Network for Long-Term Time Series Forecasting ..................................................... 243
Eduardo Méndez, Omar Lugo and Patricia Melin

Part III Fuzzy Metaheuristics

Differential Evolution Using Fuzzy Logic and a Comparative Study with Other Metaheuristics .................................. 257
Patricia Ochoa, Oscar Castillo and José Soria

An Adaptive Fuzzy Control Based on Harmony Search and Its Application to Optimization ........................................ 269
Cinthia Peraza, Fevrier Valdez and Oscar Castillo
A Review of Dynamic Parameter Adaptation Methods for the Firefly Algorithm ......................................................... 285
Carlos Soto, Fevrier Valdez and Oscar Castillo

Fuzzy Dynamic Adaptation of Parameters in the Water Cycle Algorithm ................................................................. 297
Eduardo Méndez, Oscar Castillo, José Soria and Ali Sadollah

Fireworks Algorithm (FWA) with Adaptation of Parameters Using Fuzzy Logic .......................................................... 313
Juan Barraza, Patricia Melin, Fevrier Valdez and Claudia González

Imperialist Competitive Algorithm with Dynamic Parameter Adaptation Applied to the Optimization of Mathematical Functions ... 329
Emer Bernal, Oscar Castillo and José Soria

Modification of the Bat Algorithm Using Type-2 Fuzzy Logic for Dynamical Parameter Adaptation ........................................ 343
Jonathan Pérez, Fevrier Valdez and Oscar Castillo

Flower Pollination Algorithm with Fuzzy Approach for Solving Optimization Problems .................................................. 357
Luis Valenzuela, Fevrier Valdez and Patricia Melin

A Study of Parameters of the Grey Wolf Optimizer Algorithm for Dynamic Adaptation with Fuzzy Logic ................................. 371
Luis Rodríguez, Oscar Castillo and José Soria

Gravitational Search Algorithm with Parameter Adaptation Through a Fuzzy Logic System ................................................. 391
Frumen Olivas, Fevrier Valdez and Oscar Castillo

Part IV Metaheuristic Applications

Particle Swarm Optimization of Ensemble Neural Networks with Type-1 and Type-2 Fuzzy Integration for the Taiwan Stock Exchange ................................................................. 409
Martha Pulido, Patricia Melin and Olivia Mendoza

A New Hybrid PSO Method Applied to Benchmark Functions .................................................. 423
Alfonso Uriarte, Patricia Melin and Fevrier Valdez

On the Use of Parallel Genetic Algorithms for Improving the Efficiency of a Monte Carlo-Digital Image Based Approximation of Eelgrass Leaf Area I: Comparing the Performances of Simple and Master-Slaves Structures ................................................................. 431
Cecilia Leal-Ramírez, Héctor Echavarria-Heras, Oscar Castillo and Elia Montiel-Arzate
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Spider Algorithm to Improve Intelligent Drones Used in Humanitarian Disasters Related to Floods</td>
<td>457</td>
</tr>
<tr>
<td>Alberto Ochoa, Karina Juárez-Casimiro, Tannya Olivier, Raymundo Camarena and Irving Vázquez</td>
<td></td>
</tr>
<tr>
<td>An Optimized GPU Implementation for a Path Planning Algorithm Based on Parallel Pseudo-bacterial Potential Field</td>
<td>477</td>
</tr>
<tr>
<td>Ulises Orozco-Rosas, Oscar Montiel and Roberto Sepúlveda</td>
<td></td>
</tr>
<tr>
<td>Estimation of Population Pharmacokinetic Parameters Using a Genetic Algorithm</td>
<td>493</td>
</tr>
<tr>
<td>Carlos Sepúlveda, Oscar Montiel, José. M. Cornejo Bravo and Roberto Sepúlveda</td>
<td></td>
</tr>
<tr>
<td>Optimization of Reactive Control for Mobile Robots Based on the CRA Using Type-2 Fuzzy Logic</td>
<td>505</td>
</tr>
<tr>
<td>David de la O, Oscar Castillo and Jose Soria</td>
<td></td>
</tr>
<tr>
<td>Part V Fuzzy Logic Applications</td>
<td></td>
</tr>
<tr>
<td>A FPGA-Based Hardware Architecture Approach for Real-Time Fuzzy Edge Detection</td>
<td>519</td>
</tr>
<tr>
<td>Emanuel Ontiveros-Robles, José González Vázquez, Juan R. Castro and Oscar Castillo</td>
<td></td>
</tr>
<tr>
<td>A Hybrid Intelligent System Model for Hypertension Diagnosis</td>
<td>541</td>
</tr>
<tr>
<td>Ivette Miramontes, Gabriela Martinez, Patricia Melin and German Prado-Arechiga</td>
<td></td>
</tr>
<tr>
<td>Comparative Analysis of Designing Differents Types of Membership Functions Using Bee Colony Optimization in the Stabilization of Fuzzy Controllers</td>
<td>551</td>
</tr>
<tr>
<td>Leticia Amador-Angulo and Oscar Castillo</td>
<td></td>
</tr>
<tr>
<td>Neuro-Fuzzy Hybrid Model for the Diagnosis of Blood Pressure</td>
<td>573</td>
</tr>
<tr>
<td>Juan Carlos Guzmán, Patricia Melin and German Prado-Arechiga</td>
<td></td>
</tr>
<tr>
<td>Microcalcification Detection in Mammograms Based on Fuzzy Logic and Cellular Automata</td>
<td>583</td>
</tr>
<tr>
<td>Yoshio Rubio, Oscar Montiel and Roberto Sepúlveda</td>
<td></td>
</tr>
<tr>
<td>Sensor Less Fuzzy Logic Tracking Control for a Servo System with Friction and Backlash</td>
<td>603</td>
</tr>
<tr>
<td>Nataly Duarte, Luis T. Aguilar and Oscar Castillo</td>
<td></td>
</tr>
</tbody>
</table>
Part VI Optimization: Theory and Applications

Differential Evolution with Self-adaptive Gaussian Perturbation 617
M.A. Sotelo-Figueroa, Arturo Hernández-Aguirre, Andrés Espinal
and J.A. Soria-Alcaraz

Optimization Mathematical Functions for Multiple Variables
Using the Algorithm of Self-defense of the Plants 631
Camilo Caraveo, Fevrier Valdez and Oscar Castillo

Evaluation of the Evolutionary Algorithms Performance
in Many-Objective Optimization Problems Using Quality
Indicators 641
Daniel Martinez-Vega, Patricia Sanchez, Guadalupe Castilla,
Eduardo Fernandez, Laura Cruz-Reyes, Claudia Gomez
and Enith Martinez

Generating Bin Packing Heuristic Through Grammatical
Evolution Based on Bee Swarm Optimization 655
Marco Aurelio Sotelo-Figueroa, Héctor José Puga Soberanes,
Juan Martín Carpio, Héctor J. Fraire Huacuja, Laura Cruz Reyes,
Jorge Alberto Soria Alcaraz and Andrés Espinal

Integer Linear Programming Formulation and Exact
Algorithm for Computing Pathwidth 673
Héctor J. Fraire-Huacuja, Norberto Castillo-García, Mario C. López-Lóquez,
José A. Martínez Flores, Rodolfo A. Pazos R., Juan Javier González
Barbosa and Juan M. Carpio Valadez

Iterated VND Versus Hyper-heuristics: Effective and General
Approaches to Course Timetabling 687
Jorge A. Soria-Alcaraz, Gabriela Ochoa, Marco A. Sotelo-Figueroa,
Martín Carpio and Hector Puga

AMOSA with Analytical Tuning Parameters for Heterogeneous
Computing Scheduling Problem 701
Héctor Joaquín Fraire Huacuja, Juan Frausto-Solís,
J. David Terán-Villanueva, José Carlos Soto-Monterrubio,
J. Javier González Barbosa and Guadalupe Castilla-Valdez

Increase Methodology of Design of Course Timetabling
Problem for Students, Classrooms, and Teachers 713
Lucero de M. Ortiz-Aguilar, Martín Carpio, Héctor Puga,
Jorge A. Soria-Alcaraz, Manuel Ornelas-Rodríguez and Carlos Lino

Solving the Cut Width Optimization Problem with a Genetic
Algorithm Approach 729
Hector Joaquin Fraire-Huacuja, Mario César López-Löcés,
Norberto Castillo García, Johnatan E. Pecero and Rodolfo Pazos Rangel
Part VII  Hybrid Intelligent Systems

A Dialogue Interaction Module for a Decision Support System Based on Argumentation Schemes to Public Project Portfolio .......................... 741
Laura Cruz-Reyes, César Medina-Trejo, María Lucila Morales-Rodríguez, Claudia Guadalupe Gómez-Santillan, Teodoro Eduardo Macías-Escobar, César Alejandro Guerrero-Nava and Mercedes Pérez-Villafuerte

Implementation of an Information Retrieval System Using the Soft Cosine Measure ................................................. 757
Juan Javier González Barbosa, Juan Frausto Solís, J. David Terán-Villanueva, Guadalupe Castilla Valdés, Rogelio Florencia-Juárez, Lucía Janeth Hernández González and Martha B. Mojica Mata

TOPSIS-Grey Method Applied to Project Portfolio Problem .......................... 767
Fausto Balderas, Eduardo Fernandez, Claudia Gomez, Laura Cruz-Reyes and Nelson Rangel V

Comparing Grammatical Evolution’s Mapping Processes on Feature Generation for Pattern Recognition Problems ......................... 775
Valentín Calzada-Ledesma, Héctor José Puga-Soberanes, Alfonso Rojas-Domínguez, Manuel Ornelas-Rodríguez, Juan Martín Carpio-Valadez and Claudia Guadalupe Gómez-Santillán

Hyper-Parameter Tuning for Support Vector Machines by Estimation of Distribution Algorithms .............................................. 787
Luis Carlos Padierna, Martín Carpio, Alfonso Rojas, Héctor Puga, Rosario Baltazar and Héctor Fraire

Viral Analysis on Virtual Communities: A Comparative of Tweet Measurement Systems ......................................................... 801
Daniel Azpeitia, Alberto Ochoa-Zezzatti and Judith Cavazos

Improving Decision-Making in a Business Simulator Using TOPSIS Methodology for the Establishment of Reactive Stratagems ............ 809
Alberto Ochoa, Saúl González, Emmanuel Moriel, Julio Arreola and Fernando García

Non-singleton Interval Type-2 Fuzzy Systems as Integration Methods in Modular Neural Networks Used Genetic Algorithms to Design ........ 821
Denisse Hidalgo, Patricia Melin and Juan R. Castro
Nature-Inspired Design of Hybrid Intelligent Systems
Melin, P.; Castillo, O.; Kacprzyk, J. (Eds.)
2017, XII, 838 p. 390 illus., 258 illus. in color., Hardcover
ISBN: 978-3-319-47053-5