
Contents

Particle Swarm Optimization and Differential Evolution Algorithms: Technical Analysis, Applications and Hybridization Perspectives	
<i>Swagatam Das, Ajith Abraham, and Amit Konar</i>	
1	Introduction
2	Classical PSO
3	Selection of Parameters for PSO
3.1	The Inertia Weight ω
3.2	The Maximum Velocity V_{\max}
3.3	The Constriction Factor χ
3.4	The Swarm Size
3.5	The Acceleration Coefficients C_1 and C_2
4	The Neighborhood Topologies in PSO
5	The Binary PSO
6	Hybridization of PSO with Other Evolutionary Techniques
7	The Differential Evolution (DE)
7.1	Classical DE – How Does it Work?
7.2	The Complete DE Family of Storn and Price
7.3	More Recent Variants of DE
8	A Synergism of PSO and DE – Towards a New Hybrid Evolutionary Algorithm
8.1	The PSO-DV Algorithm
9	PSO-DV Versus Other State-of-the-Art Optimizers
10	Applications
11	Conclusions
	References

Web Services, Policies, and Context: Concepts and Solutions	
<i>Zakaria Maamar, Quan Z. Sheng, Djamel Benslimane, and Philippe Thiran</i>	39
1 Introduction	39
2 The Proposed Composition Approach	40
2.1 Presentation	40
2.2 Description of the Three Levels	41
2.3 Description of the Three Contexts	43
2.4 Description of the Two Policies	45
3 Role of Policies	45
3.1 Behavioral Web Services	45
3.2 Specification of Policies	46
4 Exception Handling	50
4.1 Rationale	50
4.2 Exception Types per Policy Type	51
5 Related Work	52
6 Conclusion	54
References	54
Data Mining with Privacy Preserving in Industrial Systems	
<i>Kevin Chiew</i>	57
1 Introduction	57
1.1 Background and Motivation	57
1.2 Our Solution	59
1.3 Organization of the Chapter	60
2 Literature Review	60
3 Our Solution: Bloom Filter-Based Approach	61
3.1 Bloom Filters	62
3.2 Mining Processes and Algorithms	64
4 Experiments	66
4.1 Experimental Settings	66
4.2 Experimental Results	67
5 Conclusions	70
References	77
Kernels for Text Analysis	
<i>Evgeni Tsivtsivadze, Tapio Pahikkala, Jorma Boberg, and Tapio Salakoski</i>	81
1 Introduction	81
2 Kernel Methods	82
2.1 General Properties of Kernels	82
2.2 Bag of Words Kernel	83
2.3 String Kernels	84
2.4 Gappy String Kernels	85
2.5 Convolution Kernels	86
2.6 Graph Kernels	87

3	Application	89
3.1	Bag of Features	89
3.2	Graph Representation	91
3.3	Evaluation Using Bag of Features	93
3.4	Evaluation Using Graph Feature Representation	94
3.5	Summary of the Experiments	95
	References	96

Discovering Time-Constrained Patterns from Long Sequences

	<i>Changzhou Wang, Anne Kao, Jai Choi, and Rod Tjoelker</i>	99
1	Introduction	99
2	Related Work	102
3	Disjoint Occurrences	103
4	Counting Algorithm	105
4.1	Correctness of Algorithm	109
5	Calculating and Estimating O-Frequency	111
6	Conclusion	115
	References	115

Gauging Image and Video Quality in Industrial Applications

	<i>Weisi Lin</i>	117
1	Overview of Practical Quality Metrics	118
1.1	Basic Requirements	118
1.2	Metric Classification	119
2	Just-Noticeable Difference (JND)	120
2.1	JND with Sine-Wave Gratings	120
2.2	Formulation of CSF in DCT Domain	121
2.3	JND for Real-World Video	122
3	Visual Attention	124
3.1	Feature Extraction	125
3.2	Integration	125
3.3	Modulation for JND	126
4	Signal Decomposition	126
4.1	Spatiotemporal Filtering	126
4.2	Contrast Gain Control	127
5	Common Artifact Detection	128
5.1	Blockiness	128
5.2	Blurring	129
5.3	Frame Freeze	129
6	Case Studies	130
6.1	JNDmetrix TM as Quality Measurement	130
6.2	Quality Monitoring Systems	132
6.3	Modulated JNDs in Visual Communication	133
7	Concluding Remarks	133
	References	135

Model Construction for Knowledge-Intensive Engineering Tasks

Benno Stein 139

1 Introduction 140

2 Top-Down Model Construction 141

 2.1 Top-Down Model Construction Support:
 A Classification Scheme 142

3 Horizontal Model Construction 146

 3.1 Model Simplification 148

 3.2 Model Compilation 149

 3.3 Model Reformulation 152

 3.4 Discussion and Related Work 153

4 Case Studies 154

 4.1 Case Study 1: Plant Design in Chemical Engineering 155

 4.2 Case Study 2: Generating Control Knowledge
 for Configuration Tasks 158

 4.3 Case Study 3: Synthesis of Wave Digital Structures 161

5 Summary 164

References 164

Artificial Intelligence Applied to the Modeling and Implementation of a Virtual Medical Office

*Sandro Moretti Correia de Almeida, Lourdes Mattos Brasil,
Edilson Fernalda, Hervaldo Sampaio Carvalho,
and Renata de Paiva Silva* 169

1 Medical Diagnosis and Knowledge Transfer 169

2 Case-Based Reasoning 170

 2.1 The History of CBR 170

 2.2 The CBR Cycle 172

3 Genetic Algorithm 173

 3.1 Overview 173

 3.2 History 173

 3.3 Biological Terminology in a Simple GA 174

 3.4 The Latest Developments 177

4 Context and Methodology 178

 4.1 The IACVIRTUAL Project 178

 4.2 The CBR Model 178

 4.3 The GA Model 181

5 Case Study 183

 5.1 Database Preparation 183

 5.2 The Implementation of CBR Recovery 184

 5.3 The Implementation of the GA Module 184

 5.4 New Version of the CBR Module 186

 5.5 Results 187

6 Conclusions 188
 References 188

DICOM-Based Multidisciplinary Platform for Clinical Decision Support: Needs and Direction

Lawrence Wing-Chi Chan, Phoebe Suk-Tak Chan, Yongping Zheng, Alex Ka-Shing Wong, Ying Liu, and Iris Frances Forster Benzie 191

1 Introduction 191
 2 Multidisciplinary Health Studies 193
 3 DICOM Standard 194
 3.1 Initiatives 195
 3.2 DICOM Document 195
 4 Multidisciplinary DICOM Multimedia Archive 196
 4.1 Object-Oriented Approach 198
 4.2 Properties of DICOM Objects and Services 199
 4.3 Design of MDMA 203
 5 Biomedical Data Processing 204
 5.1 Biomedical Feature Extraction 205
 5.2 Biomedical Feature Selection 206
 6 Biomedical Knowledge Discovery 207
 6.1 Multidisciplinary Analytical Model 208
 7 Synergistic Clinical Decision Support Platform 209
 8 Conclusion and New Direction 211
 References 211

Improving Neural Network Promoter Prediction by Exploiting the Lengths of Coding and Non-Coding Sequences

Rachel Caldwell, Yun Dai, Sheenal Srivastava, Yan-Xia Lin, and Ren Zhang 213

1 Introduction 213
 1.1 Currently Used Algorithms 214
 1.2 Further Improvements in Promoter Prediction 214
 2 Gene Expression 216
 3 Statistical Characteristics on Quantitative Measurements 217
 4 The Algorithms for TLS-NNPP and TSC-TSS-NNPP 220
 4.1 Scenario 1 – TLS-NNPP Algorithm 222
 4.2 Scenario 2 – TSC-TSS-NNPP Algorithm 224
 5 Applications of the Algorithms TLS-NNPP and TSC-TSS-NNPP and the Comparisons to NNPP2.2 224
 5.1 *E. coli* Sequence Study Using the TLS-NNPP Algorithm 225
 5.2 Human Sequence Study Using the TSS-TSC-NNPP Algorithm 226
 6 Conclusion 228
 References 228

**Artificial Immune Systems for Self-Nonsself Discrimination:
Application to Anomaly Detection**

<i>Sanjoy Das, Min Gui, and Anil Pahwa</i>	231
1 Introduction	231
2 Real Valued Negative Selection.....	233
2.1 Recent Approaches.....	233
3 Results with Koch Curve	239
4 An Application to Anomaly Detection in Distribution Systems	243
5 Conclusion and Further Research	247
References	248

**Computational Intelligence Applied to the Automatic
Monitoring of Dressing Operations in an Industrial
CNC Machine**

<i>Arthur Plinio de Souza Braga, André Carlos Ponce de Leon Ferreira de Carvalho, and João Fernando Gomes de Oliveira</i>	249
1 Introduction	249
2 Acoustic Emission in Grinding and Dressing	250
3 Acoustic Maps	251
4 Extracting Textural Features from Acoustic Maps	254
4.1 The Gray-Level Co-Occurrence (GLC) Matrix	254
4.2 Haralick's Textural Descriptors	255
5 Pattern Classification	256
5.1 Multi-Layer Perceptron (MLP) Networks	257
5.2 Radial-Basis Function (RBF) Networks	257
5.3 Support Vector Machine (SVM)	258
5.4 Decision Trees (DT)	258
6 Intelligent Monitoring of Dressing Operations	259
7 Experiments and Results	260
7.1 Experimental Setup	261
7.2 Simulation Results	262
8 Conclusions	266
References	267

Automated Novelty Detection in Industrial Systems

<i>David A. Clifton, Lei A. Clifton, Peter R. Bannister, and Lionel Tarassenko</i>	269
1 Introduction	269
1.1 Novelty Detection.....	269
1.2 Chapter Overview	270
2 Novelty Detection for Industrial Systems	270
2.1 Existing Methods	270
2.2 Pre-Processing	272
2.3 Visualisation	273

2.4	Constructing a Model of Normality	276
2.5	Novelty Scores and Thresholds	278
3	Gas-Turbine Data Analysis	281
3.1	System Description	282
3.2	Off-Line Novelty Detection	283
3.3	On-Line Novelty Detection	285
3.4	Discussion	288
4	Combustion Data Analysis	288
4.1	System Description	289
4.2	Pre-Processing and Feature Extraction	289
4.3	On-Line Novelty Detection	290
4.4	Discussion	292
5	Conclusion	292
	References	293

Multiway Principal Component Analysis (MPCA) for Upstream/Downstream Classification of Voltage Sags Gathered in Distribution Substations

	<i>Abbas Khosravi, Joaquim Melendez, Joan Colomer, and Jorge Sanchez</i>	297
1	Introduction	297
2	Multiway Principal Component Analysis	300
3	Proposed Method for Sag Source Location	303
3.1	Database Construction	305
3.2	Model Creation	306
3.3	Model Exploitation	306
4	Classification Results with Sags Gathered in Distribution Substations	307
5	Conclusion	310
	References	311

Applications of Neural Networks to Dynamical System Identification and Adaptive Control

	<i>Xiao-Hua Yu</i>	313
1	Introduction	313
2	Rotorcraft Acoustic Noise Estimation	317
2.1	The Time History Data Modeling	318
2.2	The Sound Pressure Level Modeling	321
3	A Neural Network Controller for DC Voltage Regulator	323
	References	329

A Multi-Objective Multi-Colony Ant Algorithm for Solving the Berth Allocation Problem

	<i>Chun Yew Cheong and Kay Chen Tan</i>	333
1	Introduction	333
2	Problem Formulation	335

XVIII Contents

3	Ant Colony Optimization	337
3.1	Solution Encoding	337
3.2	Pareto Ranking	337
3.3	Solution Construction	338
4	Multi-Objective Multi-Colony Ant Algorithm	340
4.1	Island Model	341
4.2	Heterogeneous Colonies	341
5	Simulation Results and Analysis	342
5.1	Performances of Different MOMCAA Settings	342
5.2	Effects of Different Migration Intervals	347
6	Conclusions	348
	References	349

Query Rewriting for Semantic Multimedia Data Retrieval

*Samira Hammiche, Bernardo Lopez, Salima Benbernou,
and Mohand-Saïd Hacid*

		351
1	Introduction	351
2	Preliminaries and Motivating Example	352
2.1	MPEG-7: Multimedia Content Description Interface	352
2.2	Illustration Example	353
2.3	Querying MPEG-7 Descriptions	354
2.4	MPEG-7 and XQuery Limitations	355
3	Multimedia Data Description	356
3.1	Multi-Layered Representation of Multimedia Content	356
3.2	Conceptual Layer: Domain Knowledge Representation	357
3.3	How to Integrate Domain Knowledge in MPEG-7 Descriptions	360
3.4	How to Link the Conceptual Layer to the Metadata Layer	361
4	Querying MPEG-7 Descriptions of Multimedia Data	363
4.1	Query Form and Syntax	363
4.2	Query Pre-Processing Algorithm	363
4.3	Illustration Example	365
4.4	Query Translation	365
5	Implementation	366
5.1	Multimedia Data Annotation	366
5.2	Querying Multimedia Content	367
6	Related Work	367
6.1	Adding Semantics to MPEG-7 Descriptions	367
6.2	Query Languages to Retrieve the MPEG-7 Descriptions	369
6.3	Query Rewriting	370
7	Conclusion	370
	References	371

Index	373
------------------------	------------