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collaborations across disciplines.

This volume of *Lecture Notes in*
pers presented at IDEAL 2006 held a
September 20–23, 2006. The conferen
countries around the world, which we
Committee and many additional review
papers were accepted and included in
only 30%, which ensured an extreme
The buoyant number of submitted p
increased importance of the fields rel
the rising popularity of the IDEAL c

IDEAL 2006 enjoyed outstanding
speakers: José Mira of the Universida
Xin Yao of the University of Birming
versity, USA and Nigel Allinson of the
enjoyed a special session on “Nature
NISIS.

This year IDEAL also teamed up
the *International Journal of Neural*
gineering and the *Journal of Math*
special issues on *Bioinformatics and*
Hybrid Systems and Algorithms for
been scheduled from selected papers
together with contributed articles re
will go through further rounds of p
journals.

Table of Contents

Learning and Information Processing

On Some of the Neural Mechanisms Underlying Adaptive Behavior	1
<i>José Mira Mira</i>	
On Correlation Measures of Intuitionistic Fuzzy Sets	16
<i>Zeshui Xu</i>	
A More Effective Constructive Algorithm for Permutation Flowshop Problem	25
<i>Xingye Dong, Houkuan Huang, Ping Chen</i>	
A Fast Algorithm for Relevance Vector Machine	33
<i>Zheng Rong Yang</i>	
Time Series Relevance Determination Through a Topology-Constrained Hidden Markov Model	40
<i>Isván Olier, Alfredo Vellido</i>	
A Fast Data Preprocessing Procedure for Support Vector Regression	48
<i>Zhifeng Hao, Wen Wen, Xiaowei Yang, Jie Lu, Guangquan Zhang</i>	
Classification by Weighting, Similarity and kNN	57
<i>Naohiro Ishii, Tsuyoshi Murai, Takahiro Yamada, Yongguang Bao</i>	
An Improved EM Algorithm for Statistical Segmentation of Brain MRI	65
<i>Yong Yang</i>	
Process State and Progress Visualization Using Self-Organizing Map	73
<i>Risto Hakala, Timo Similä, Miki Sirola, Jukka Parviainen</i>	
Exploiting Spatio-temporal Data for the Multiobjective Optimization of Cellular Automata Models	81
<i>Giuseppe A. Trunfio</i>	
Comparing Support Vector Machines and Feed-forward Neural Networks with Similar Parameters	90
<i>Enrique Romero, Daniel Toppo</i>	

A New Model Selection Method for SVM <i>G. Lebrun, O. Lezoray, C. Charrier, H. Cardot</i>	99
Speed-Up LOO-CV with SVM Classifier <i>G. Lebrun, O. Lezoray, C. Charrier, H. Cardot</i>	108
Integration of Strategies Based on Relevance Feedback into a Tool for the Retrieval of Mammographic Images <i>A. Fornells, E. Golobardes, X. Vilasís, J. Martí</i>	116
Generalization Performance of Exchange Monte Carlo Method for Normal Mixture Models <i>Kenji Nagata, Sumio Watanabe</i>	125
Evolutionary Design of gdSOPNN for Modeling and Prediction of NOx Emission Process <i>Tae-Chon Ahn, Ho-Sung Park</i>	133
Upper Bounds for Variational Stochastic Complexities of Bayesian Networks <i>Kazuho Watanabe, Motoki Shiga, Sumio Watanabe</i>	139
A Neural Stochastic Optimization Framework for Oil Parameter Estimation <i>Rafael E. Banchs, Hector Klie, Adolfo Rodriguez, Sunil G. Thomas, Mary F. Wheeler</i>	147
Bootstrap Prediction Intervals for Nonlinear Time-Series <i>Daisuke Haraki, Tomoya Suzuki, Tohru Ikeguchi</i>	155
Effectiveness of Considering State Similarity for Reinforcement Learning <i>Sertan Girgin, Faruk Polat, Reda Alhajj</i>	163
On the Structural Robustness of Evolutionary Models of Cooperation <i>Segismundo S. Izquierdo, Luis R. Izquierdo</i>	172
Prediction of Chaotic Time Series Based on Multi-scale Gaussian Processes <i>Yatong Zhou, Taiyi Zhang, Xiaohe Li</i>	183
Visual Sensitivity Analysis for Artificial Neural Networks <i>Roberto Therón, Juan Francisco De Paz</i>	191

Performance of BSDT Decoding Algorithms Based on Locally Damaged Neural Networks <i>Petro Gopych</i>	199
K Nearest Sequence Method and Its Application to Churn Prediction <i>Dymitr Ruta, Detlef Nauack, Ben Azvine</i>	207
Evolutionary Computation Technique Applied to HSPF Model Calibration of a Spanish Watershed <i>F. Castanedo, M.A. Patricia, J.M. Molina</i>	216
Genetic Algorithms and Sensitivity Analysis Applied to Select Inputs of a Multi-Layer Perceptron for the Prediction of Air Pollutant Time-Series <i>Harri Niska, Mikko Heikkinen, Mikko Kolehmainen</i>	224
Genetic Algorithms for Estimating Longest Path from Inherently Fuzzy Data Acquired with GPS <i>José Villar, Adolfo Otero, José Otero, Luciano Sánchez</i>	232
The Topographic Neural Gas <i>Marian Peña, Colin Fyfe</i>	241
A Fast Classification Algorithm Based on Local Models <i>Sabela Platero-Santos, Oscar Fontenla-Romero, Amparo Alonso-Betanzos</i>	249
Human Activity Recognition in Videos: A Systematic Approach <i>Sameer Singh, Jessica Wang</i>	257
Application of Artificial Neural Network to Building Compartment Design for Fire Safety <i>Eric Wai Ming Lee, Po Chi Lau, Kitty Kit Yan Yuen</i>	265
A Method of Motion Segmentation Based on Region Shrinking <i>Zhihui Li, Fenggang Huang, Yongmei Liu</i>	275
A Family of Novel Clustering Algorithms <i>Wesam Barbakh, Malcolm Crowe, Colin Fyfe</i>	283
Vector Quantization Segmentation for Head Pose Estimation <i>José Lopes, Sameer Singh</i>	291
Neural Network Detectors for Composite Hypothesis Tests <i>D. de la Mata-Moya, P. Jarabo-Amores, R. Vicen-Bueno, M. Rosa-Zurera, F. López-Ferreras</i>	298

Automatic Sound Classification for Improving Speech Intelligibility in Hearing Aids Using a Layered Structure	306
<i>Enrique Alexandre, Lucas Cuadra, Lorena Álvarez, Manuel Rosa-Zurera, Francisco López-Ferreras</i>	
Directed Laplacian Kernels for Link Analysis	314
<i>Pawel Majewski</i>	
Pruning Adaptive Boosting Ensembles by Means of a Genetic Algorithm	322
<i>Daniel Hernández-Lobato, José Miguel Hernández-Lobato, Rubén Ruiz-Torrubiano, Angel Valle</i>	
On the Fusion of Polynomial Kernels for Support Vector Classifiers	330
<i>Isaac Martín de Diego, Javier M. Moguerza, Alberto Muñoz</i>	
Speech and Gesture Recognition-Based Robust Language Processing Interface in Noise Environment	338
<i>Jung-Hyun Kim, Kwang-Seok Hong</i>	
Heterogeneous Answer Acquisition Methods in Encyclopedia QA	346
<i>Hyo-Jung Oh, Chung-Hee Lee, Changki Lee, Ji-Hyun Wang, Yi-Gyu Hwang, Hyeon-Jin Kim, Myung-Gil Jang</i>	
Face Recognition Using DCT and Hierarchical RBF Model	355
<i>Yuehui Chen, Yaou Zhao</i>	
Chaotic Dynamics for Avoiding Congestion in the Computer Network ...	363
<i>Takayuki Kimura, Tohru Ikeguchi</i>	
Combined Effects of Class Imbalance and Class Overlap on Instance-Based Classification	371
<i>V. García, R. Alejo, J.S. Sánchez, J.M. Sotoca, R.A. Mollineda</i>	
Melt Index Predict by Radial Basis Function Network Based on Principal Component Analysis	379
<i>Xingqiao Liu, Zhengbing Yan</i>	
Thinking Capability of Saplings Growing Up Algorithm	386
<i>Ali Karci, Bilal Alatas</i>	
Functional Networks and the Lagrange Polynomial Interpolation	394
<i>Cristina Solares, Eduardo W. Vieira, Roberto Minguez</i>	

The Evolution of OSI Network Management by Integrated the Expert Knowledge	402
<i>Antonio Martín, Carlos León, Inigo Monedero</i>	
Learning the Complete-Basis-Functions Parameterization for the Optimization of Dynamic Molecular Alignment by ES	410
<i>Ofer M. Shir, Joost N. Kok, Thomas Bäck, Marc J.J. Vrakking</i>	
Multi Criteria Wrapper Improvements to Naive Bayes Learning	419
<i>José Carlos Cortizo, Ignacio Giraldez</i>	
BP Neural Networks Combined with PLS Applied to Pattern Recognition of Vis/NIRs	428
<i>Di Wu, Yong He, Yongqi Shao, Shuijuan Feng</i>	
Speeding Up Shape Classification by Means of a Cyclic Dynamic Time Warping Lower Bound	436
<i>Vicente Palazón, Andrés Marzal</i>	
Using Genetic Algorithm for Network Status Learning and Worm Virus Detection Scheme	444
<i>Donghyun Lim, Jinwook Chung, Seongjin Ahn</i>	
Clustering by Integrating Multi-objective Optimization with Weighted K-Means and Validity Analysis	454
<i>Tansel Özyer, Reda Alhajji, Ken Barker</i>	
Improving the Classification Accuracy of RBF and MLP Neural Networks Trained with Imbalanced Samples	464
<i>R. Alejo, V. García, J.M. Sotoca, R.A. Mollineda, J.S. Sánchez</i>	
Learning Discrete Probability Distributions with a Multi-resolution Binary Tree	472
<i>F.A. Sanchís, F. Aznar, M. Sempere, M. Pujol, R. Rizo</i>	
Combining Unsupervised and Supervised Approaches to Feature Selection for Multivariate Signal Compression	480
<i>Victor Erubimov, Vladimir Martynov, Peter Raulefs, Eugene Tu</i>	
Cohesion Factors: Improving the Clustering Capabilities of Consensus	488
<i>Guiomar Corral, Albert Fornells, Elisabet Golobardes, Jaume Abella</i>	
Using Neural Networks to Detect Microfossil Teeth in Somosaguas Sur Paleontological Site	496
<i>R. Gil-Pita, N. Sala-Burgos</i>	

A Fast Grid Search Method in Support Vector Regression Forecasting Time Series	504
<i>Yukun Bao, Zhitao Liu</i>	
Fast Global k -Means with Similarity Functions Algorithm	512
<i>Saúl Lóez-Escobar, J.A. Carrasco-Ochoa, J. Fco Martínez-Trinidad</i>	
NN-Based Detector for Known Targets in Coherent Weibull Clutter	522
<i>R. Vicen-Bueno, M. Rosa-Zurera, M.P. Jarabo-Amores, R. Gil-Pita</i>	
ICA with Sparse Connections	530
<i>Kun Zhang, Lai-Wan Chan</i>	
Two-Stage User Mobility Modeling for Intention Prediction for Location-Based Services	538
<i>Moon-Hee Park, Jin-Hyuk Hong, Sung-Bae Cho</i>	
Partition-Based Similarity Joins Using Diagonal Dimensions in High Dimensional Data Spaces	546
<i>Hyoseop Shin</i>	
Evolving Feed-forward Neural Networks Through Evolutionary Mutation Parameters	554
<i>M. Annunziato, I. Bertini, R. Iannone, S. Pizzuti</i>	
Computer Interface Using Eye Tracking for Handicapped People	562
<i>Eun Yi Kim, Se Hyun Park</i>	
Local Negative Correlation with Resampling	570
<i>Ricardo Nanculef, Carlos Valle, Héctor Allende, Claudio Moraga</i>	
Convex Perceptrons	578
<i>Daniel García, Ana González, José R. Dorronsoro</i>	
Hybridizing Cultural Algorithms and Local Search	586
<i>Trung Thanh Nguyen, Xin Yao</i>	
ICA and Genetic Algorithms for Blind Signal and Image Deconvolution and Deblurring	595
<i>Hujun Yin, Israr Hussain</i>	
Data Mining, Retrieval and Management	
Electroencephalogram Signals from Imagined Activities: A Novel Biometric Identifier for a Small Population	604
<i>Ramaswamy Palaniappan</i>	

Resolving Ambiguities in the Semantic Interpretation of Natural Language Questions	612
<i>Serge Linckels, Christoph Meinel</i>	
Mining the K-Most Interesting Frequent Patterns Sequentially	620
<i>Quang Tran Minh, Shigeru Oyanagi, Katsuhiko Yamazaki</i>	
Discovering Non-taxonomic Relations from the Web	629
<i>David Sánchez, Antonio Moreno</i>	
A New Algorithm of Similarity Measuring for Multi-experts' Qualitative Knowledge Based on Outranking Relations in Case-Based Reasoning Methodology	637
<i>Hui Li, Xiang-Yang Li, Jie Gu</i>	
Comparing and Combining Spatial Dimension Reduction Methods in Face Verification	645
<i>Lúcesio J. Rodríguez-Aragón, Cristina Conde, Angel Serrano, Enrique Cabello</i>	
A New Semi-supervised Dimension Reduction Technique for Textual Data Analysis	654
<i>Manuel Martín-Merino, Jesus Román</i>	
CBR Model for the Intelligent Management of Customer Support Centers	663
<i>Stella Heras Barberá, Juan Angel García-Pardo, Rafael Ramos-Garijo, Alberto Palomares, Vicente Julián, Miguel Rebollo, Vicent Botti</i>	
Non Parametric Local Density-Based Clustering for Multimodal Overlapping Distributions	671
<i>Damaris Pascual, Filiberto Pla, J. Salvador Sánchez</i>	
Application of Bidirectional Probabilistic Character Language Model in Handwritten Words Recognition	679
<i>Jerzy Sas</i>	
Efficient Classification Method for Complex Biological Literature Using Text and Data Mining Combination	688
<i>Yun Jeong Choi, Seung Soo Park</i>	
Classifying Polyphony Music Based on Markov Model	697
<i>Yukiteru Yoshihara, Takao Miura</i>	

Two Phase Semi-supervised Clustering Using Background Knowledge.....	707
<i>Kwangechol Shin, Ajith Abraham</i>	
Using Rough Set to Find the Factors That Negate the Typical Dependency of a Decision Attribute on Some Condition Attributes.....	713
<i>Honghai Feng, Hao Xu, Baoyan Liu, Bingru Yang, Zhuge Gao, Yueli Li</i>	
Automatic Extraction and Classification of Footwear Patterns.....	721
<i>Maria Paulou, Nigel M. Allinson</i>	
Description of Combined Spatial Relations Between Broad Boundary Regions Based on Rough Set.....	729
<i>Shihong Du, Qimin Qin, Qiao Wang, Haijian Ma</i>	
Active Sketch for Finding Primary Structures in Images.....	738
<i>Shulin Yang, Cunlu Xu, Qin Lei</i>	
Shape Matching Using Chord-Length Function.....	746
<i>Bin Wang, Chaojian Shi</i>	
Spectral High Resolution Feature Selection for Retrieval of Combustion Temperature Profiles.....	754
<i>Esteban García-Cuesta, Inés M. Galván, Antonio J. de Castro</i>	
Sentence Ordering in Extractive MDS.....	763
<i>Zengchang Zhang, Deri Liu</i>	
Query Expansion with an Automatically Generated Thesaurus.....	771
<i>José R. Pérez-Aguerra, Lourdes Araujo</i>	
An Interactive Hybrid System for Identifying and Filtering Unsolicited E-mail.....	779
<i>M. Dolores del Castillo, J. Ignacio Serrano</i>	
Topological Tree Clustering of Web Search Results.....	789
<i>Richard T. Freeman</i>	
Reduced Attribute Oriented Inconsistency Handling in Decision Generation.....	798
<i>Yucui Feng, Wenhai Li, Zehua Lv, Xiaoming Ma</i>	
A Non-parametric Method for Data Clustering with Optimal Variable Weighing.....	807
<i>Ji-Won Chung, In-Chan Choi</i>	

A Closed Model for Measuring Intangible Assets: A New Dimension of Profitability Applying Neural Networks.....	815
<i>Ana Maria Lara Palma, Lourdes Sáiz Barcená, Joaquín Pacheco</i>	
Audio and Video Feature Fusion for Activity Recognition in Unconstrained Videos.....	823
<i>José Lopes, Sameer Singh</i>	
Multi-stage Classification for Audio Based Activity Recognition.....	832
<i>José Lopes, Charles Lin, Sameer Singh</i>	
A Simple Approximation for Dynamic Time Warping Search in Large Time Series Database.....	841
<i>Jie Gu, Xiaomin Jin</i>	
Regression Analysis of Segmented Parametric Software Cost Estimation Models Using Recursive Clustering Tool.....	849
<i>M. Garre, M.A. Sicilia, J.J. Cuadrado, M. Charro</i>	
An Efficient Attribute Reduction Algorithm.....	859
<i>Yuguo He</i>	
Conceptual Classification to Improve a Web Site Content.....	869
<i>Sebastián A. Ríos, Juan D. Velásquez, Hiroshi Yasuda, Terumasa Aoki</i>	
Automated Learning of RVM for Large Scale Text Sets: Divide to Conquer.....	878
<i>Catarina Silva, Bernardete Ribeiro</i>	
Using Rules Discovery for the Continuous Improvement of e-Learning Courses.....	887
<i>Enrique García, Cristóbal Romero, Sebastián Ventura, Carlos de Castro</i>	
Generating Adaptive Presentations of Hydrologic Behavior.....	896
<i>Martin Molina, Victor Flores</i>	
A New Measure for Query Disambiguation Using Term Co-occurrences.....	904
<i>Hiromi Wakaki, Tomonari Masada, Atsuhiko Takasu, Jun Adachi</i>	
Unsupervised Word Categorization Using Self-Organizing Maps and Automatically Extracted Morphs.....	912
<i>Mikaela Klami, Krista Lagus</i>	

Effective Classification by Integrating Support Vector Machine and Association Rule Mining	920
<i>Kewan Kianmehr, Reda Alhajj</i>	
A Design of Dynamic Network Management System	928
<i>Myung Jin Lee, Eun Hee Kim, Keun Ho Ryu</i>	
QoS Multicast Routing Based on Particle Swarm Optimization	936
<i>Jing Liu, Jun Sun, Wenbo Xu</i>	
Evolutionary Search of Optimal Features	944
<i>Manuel del Valle, Luis F. Lago-Fernández, Fernando J. Corbacho</i>	
Biased Minimax Probability Machine Active Learning for Relevance Feedback in Content-Based Image Retrieval	953
<i>Xiang Peng, Irwin King</i>	
Evidential Integration of Semantically Heterogeneous Aggregates in Distributed Databases with Imprecision	961
<i>Xin Hong, Sally McClean, Bryan Scotney, Philip Morrow</i>	
Describing Customer Loyalty to Spanish Petrol Stations Through Rule Extraction	970
<i>Alfredo Vellido, Terence A. Etchells, David L. García, Angela Nebot</i>	
Strangeness Minimisation Feature Selection with Confidence Machines ...	978
<i>Tony Bellofti, Zhiyuan Luo, Alex Gammerman</i>	
Indexing and Mining of Graph Database Based on Interconnected Subgraph	986
<i>Hanchuan Shang, Xiaoming Jin</i>	
Evaluation of Decision Tree Pruning with Subadditive Penalties	995
<i>Sergio García-Moratilla, Gonzalo Martínez-Muñoz, Alberto Suárez</i>	
Categorization of Large Text Collections: Feature Selection for Training Neural Networks	1003
<i>Pensiri Mamomatsuyap, Bogdan Vrusias, Khurshid Ahmad</i>	
Towards Healthy Association Rule Mining (HARM): A Fuzzy Quantitative Approach	1014
<i>Maybin Muyeaba, M. Sulaiman Khan, Zarrar Malik, Christos Tjortjis</i>	
State Aggregation in Higher Order Markov Chains for Finding Online Communities	1023
<i>Xin Wang, Ata Kabán</i>	

Functional Networks and Analysis of Variance for Feature Selection	1031
<i>Noelia Sánchez-Marño, María Caamaño-Fernández, Enrique Castillo, Amparo Alonso-Betanzos</i>	
Automatic Categorization of Patent Applications Using Classifier Combinations	1039
<i>Henrik Mathiasen, Daniel Ortiz-Arroyo</i>	
Best Subset Feature Selection for Massive Mixed-Type Problems	1048
<i>Eugene Tuw, Alexander Borisov, Kari Torkkola</i>	
Planning Under Uncertainty with Abstraction Hierarchies	1057
<i>Leticia María Friske, Carlos Henrique Costa Ribeiro</i>	
Fusion of Domain Knowledge for Dynamic Learning in Transcriptional Networks	1067
<i>Oscar Harari, R. Romero-Zalaz, C. Rubio-Escudero, I. Zuñir</i>	
An Improved Discrete Immune Network for Multimodal Optimization ...	1079
<i>Jing-Xin Xie, Chun-Tian Cheng, Zhen-Hui Ren</i>	
Bioinformatics and Bio-inspired Models	
Using Fuzzy Patterns for Gene Selection and Data Reduction on Microarray Data	1087
<i>Fernando Díaz, Florentino Fdez-Riverola, Daniel Glez-Peña, Juan M. Corchado</i>	
Applying GCS Networks to Fuzzy Discretized Microarray Data for Tumour Diagnosis	1095
<i>Fernando Díaz, Florentino Fdez-Riverola, Daniel Glez-Peña, Juan M. Corchado</i>	
Refractory Effects of Chaotic Neurodynamics for Finding Motifs from DNA Sequences	1103
<i>Takafumi Matsuura, Tohru Ikeguchi</i>	
Neighborhood-Based Clustering of Gene-Gene Interactions	1111
<i>Norberto Díaz-Díaz, Domingo S. Rodríguez-Baena, Isabel Nepomuceno, Jesús S. Aguilar-Ruiz</i>	
Gene Expression Profiling Using Flexible Neural Trees	1121
<i>Yuehui Chen, Lizhi Peng, Ajith Abraham</i>	

Multivariate Crosstalk Models	1129
<i>Natasha Young, Zheng Rong Yang</i>	
Decision Making Association Rules for Recognition of Differential Gene Expression Profiles	1137
<i>C. Rubio-Escudero, Coral del Val, O. Cordon, I. Zuir</i>	
Application of Chemoinformatics to the Structural Elucidation of Natural Compounds	1150
<i>José Luis López-Pérez, Roberto Theron, Esther del Olmo, David Díez, Miguel Vaquero, José Francisco Adserias</i>	
Agents and Hybrid Systems	
Intelligent Coordinated Control of Multiple Teleoperated Robots	1158
<i>Washeng Chou, Tianniao Wang</i>	
SMAs: A Shopping Mall Multiagent Systems	1166
<i>Javier Bajo, Yanira de Paz, Juan Francisco de Paz, Quintin Martin, Juan M. Corchado</i>	
Protecting Agent from Attack in Grid Computing ¹¹	1174
<i>Byungryong Kim</i>	
A Graph Transformation System Model of Dynamic Reorganization in Multi-agent Systems	1182
<i>Zheng-guang Wang, Xiao-hui Liang, Qin-ping Zhao</i>	
Efficient Search of Winning Strategies in Multi-agent Systems on Random Network: Importance of Local Solidarity	1191
<i>Tin Yau Pang, K.Y. Szeto</i>	
Heterogeneous Domain Ontology for Location Based Information System in a Multi-agent Framework	1199
<i>Virginia Fuentes, Javier Carbó, José Manuel Molina</i>	
Intelligent Data Analysis for the Verification of Multi-Agent Systems Interactions	1207
<i>Juan A. Botia, Jorge J. Gómez-Sanz, Juan Pauón</i>	
Multi-agent Based Hybrid System for Dynamic Web-Content Adaptation	1215
<i>Jaewoo Cho, Seunghwa Lee, Eunseok Lee</i>	

Strategic Software Agents in Continuous Double Auction Under Dynamic Environments	1223
<i>Marta Posada</i>	
Student Modeling for Adaptive Teachable Agent to Enhance Interest and Comprehension	1234
<i>Sung-il Kim, Myung-Jin Lee, Woogul Lee, Yeonhee So, Cheon-woo Han, Karam Lim, Su-Young Hwang, Sung-Hyun Yun, Dong-Seong Choi, Misun Yoon</i>	
An Agent-Based Model of Personal Web Communities	1242
<i>José I. Santos, José M. Galán, Ricardo del Olmo</i>	
A Conceptual Framework for Automated Negotiation Systems	1250
<i>Manuel Resinas, Pablo Fernandez, Rafael Corchuelo</i>	
Development of New IFC-BRIDGE Data Model and a Concrete Bridge Design System Using Multi-agents	1259
<i>Nobuyoshi Yabuki, Zhantao Li</i>	
Multi-Agent Systems over RT-Java for a Mobile Robot Control	1267
<i>Marti Navarro, Vicente Julian, Stella Herras, Jose Soler, Vicent Boti</i>	
Financial Engineering	
Financial Risk Modeling with Markov Chains	1275
<i>Arturo Leccalito, Sergio Ortobelli Lozza, Emilio Russo, Gaetano Iaquinata</i>	
CNY Realignment and USD Expectation: Empirical Study Based on RND Function of Currency Option	1283
<i>Zhongzhong Ning</i>	
Investment Selection and Risk Management for Insurance Corporation	1289
<i>Yan-Ling Wang, De-Li Yang</i>	
Knowledge-Based Risk Assessment Under Uncertainty in Engineering Projects	1296
<i>Rashid Hafeez Khokhar, David A. Bell, Jiwen Guan, Qingxiang Wu</i>	
Fuzzy Regression with Quadratic Programming: An Application to Financial Data	1304
<i>Sergio Donoso, Nicolás Marrín, M. Amparo Vila</i>	

Special Session on Nature-Inspired Date Technologies

- Improving Search in Unstructured P2P Systems: Intelligent Walks (I-Walks) 1312
Francis Otto, Song Ouyang
- Evolutionary Product-Unit Neural Networks for Classification 1320
F. J. Martínez-Estudillo, C. Hervás-Martínez, P. A. Gutiérrez Peña, A. C. Martínez-Estudillo, S. Ventura-Soto
- Uncentered (Absolute) Correlation Clustering Method Fit for Establishing Theoretical SAPK/JNK Signaling Pathway in Human Soft Tissue Sarcoma Samples 1329
Jinling Zhang, Yinghua Lu, Lin Wang, Hongxin Zhang, Bo Zhang, Yeqiu Wang, Kai Wu, Stefan Wolfli
- Guiding Genetic Program Based Data Mining Using Fuzzy Rules 1337
James F. Smith III, Thanh Vu H. Nguyen
- Neural Network Models for Language Acquisition: A Brief Survey 1346
Jordi Poveda, Alfredo Vellido
- Incorporating Knowledge in Evolutionary Prototype Selection 1358
Salvador García, José Ramón Cano, Francisco Herrera
- Evidence Relationship Matrix and Its Application to D-S Evidence Theory for Information Fusion 1367
Xianfeng Fan, Hong-Zhong Huang, Qiang Miao
- Soft Computing in Context-Sensitive Multidimensional Ranking 1374
Weber Martins, Lauro Eugênio Guimarães Nalini, Marco Antonio Assfalk de Oliveira, Leonardo Guerra de Rezende Guedes
- Ontology-Based Classifier for Audio Scenes in Telemedicine 1382
Cong Phuong Nguyen, Ngoc Yen Pham, Eric Castelli
- PSO and ACO in Optimization Problems 1390
Lenka Lhotská, Martin Macas, Miroslav Burša
- Constraints in Particle Swarm Optimization of Hidden Markov Models 1399
Martin Macas, Daniel Novák, Lenka Lhotská

- Nature-Inspired Approaches to Mining Trend Patterns in Spatial Databases 1407
Ashkan Zarnani, Masoud Rahgozar, Caro Lucas
- A Proposal of Evolutionary Prototype Selection for Class Imbalance Problems 1415
Salvador García, José Ramón Cano, Alberto Fernández, Francisco Herrera
- MOVICAB-IDS: Visual Analysis of Network Traffic Data Streams for Intrusion Detection 1424
Alvaro Herrero, Emilio Corchado, José Manuel Sáiz
- Maximum Likelihood Topology Preserving Ensembles 1434
Emilio Corchado, Bruno Baruaque, Bogdan Gabrys
- Author Index** 1443

SMas: A Shopping Mall Multiagent Systems

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Abstract. This paper presents a multiagent model that facilitates aspects of shopping mall management, as well as increasing the quality of leisure facilities and shopping on offer. The work presented focuses on the use of a multi agent architecture, based on the use of deliberative agents that incorporates case-based planning. The architecture considers a dynamic framework, and the need to use autonomous models that are able to evolve over time. The architecture incorporates agents whose aim is to acquire knowledge and adapt themselves to the environmental changes. The system has been tested successfully, and the results obtained are presented in this paper.

Keywords: CBR, CBP-BDI, wireless multiagent system, shopping mall, SMAS.

1 Introduction

Agents and multiagent systems are adequate for developing applications in dynamic, flexible environments. Agents can be characterized through their capacities in areas such as autonomy, reactivity, pro-activity, social abilities, reasoning, learning and mobility. These capacities can be modelled in various ways, using different methodologies [1]. One of the possibilities is to use Case Based Reasoning (CBR). This paper presents a distributed architecture whose principal characteristic is the use of CBP agents [2, 3, 4]. These deliberative agents incorporate a reasoning CBP (Case Based Planning) engine, a variant of the CBR (Case Based Reasoning) system [5, 6]. The CBP system makes it possible for the agents to learn from initial knowledge, interact autonomously with the environment and system users, and allows it to adapt itself to environmental changes.

The aim of this work is to obtain an architecture that allows the development of multi-objective agents, which incorporate CBP reasoning mechanisms, for dynamic environments. To achieve this aim we have concentrated in a specific problem, the management of some aspects of a shopping mall, and we use an architecture that makes it possible to construct agents capable of adapting its knowledge to environmental changes. There are many different architectures for constructing

commercial techniques carried out the year before. We can observe that at the beginning, the results obtained with the multiagent system were worse than traditional techniques. However, as the system obtained more information about client profiles, products and habits, so the knowledge it obtained became more suitable and it was able to create optimal plans. Moreover the clients also needed some time to get used to the new system.

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References

1. Wooldridge, M. and Jennings, N. R. (1995) Agent Theories, Architectures, and Languages: a Survey. In: Wooldridge and Jennings, editors, *Intelligent Agents*, Springer-Verlag, pp. 1-22.
2. Corchado J. M., Pavón J., Corchado E. and Castillo L. F. (2005) Development of CBR-BDI Agents: A Tourist Guide Application. 7th European Conference on Case-based Reasoning 2004. *Lecture Notes in Artificial Intelligence* 3155, Springer Verlag. pp. 547-559.
3. Glez-Bedia M. and Corchado J. M. (2002) A planning strategy based on variational calculus for deliberative agents. *Computing and Information Systems Journal*. Vol 10, No 1, 2002. ISBN: 1352-9404, pp. 2-14.
4. Glez-Bedia M., Corchado J. M., Corchado E. S. and Fyfe C. (2002) Analytical Model for Constructing Deliberative Agents, *Engineering Intelligent Systems*, Vol 3: pp. 173-185.
5. Bajo J. and Corchado J.M. Evaluation and monitoring of the air-sea interaction using a CBR-Agents approach *Proceedings of the 6th Internacional Conference on Case-based Reasoning, ICCBR'05* pp. 50-62. Springer Verlag. (2005)
6. Corchado J. M. and Laza R. (2003). Constructing Deliberative Agents with Case-based Reasoning Technology, *International Journal of Intelligent Systems*. Vol 18, No. 12, December. pp.: 1227-1241
7. Bratman, M.E. (1987). *Intentions, Plans and Practical Reason*. Harvard University Press, Cambridge, M.A.
8. Wooldridge, M. and Jennings, N. R. and Kinny, D. (2000) The Gaia Methodology for Agent-Oriented Analysis and Design. *Journal of Autonomous Agents and Multi-Agent Systems*, 3 (3). pp. 285-312.
9. Bauer, B. and Huget, M. P. (2003) FIPA Modeling: Agent Class Diagrams.
10. Adams, F.G. (2003): *The E-Business Revolution & the New Economy: E-economics after the Dot-Com Crash*. South-Western Educational Pub.
11. Bellifime, F. Poggi, A. and Rimasa, G. (2001) JADE: a FIPA2000 compliant agent development environment. *Proceedings of the 5th international conference on autonomous agents (ACM)*.

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