

Lecture Notes in Artificial Intelligence 4065

Edited by J. G. Carbonell and J. Siekmann

Subseries of Lecture Notes in Computer Science

Petra Perner (Ed.)

# Advances in Data Mining

Applications in Medicine, Web Mining,  
Marketing, Image and Signal Mining

6th Industrial Conference on Data Mining, ICDM 2006  
Leipzig, Germany, July 14-15, 2006  
Proceedings

Series Editors

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA  
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

Volume Editor

Petra Perner  
Institute of Computer Vision and Applied Computer Sciences, IBaI  
Körnerstr. 10, 04107 Leipzig, Germany  
E-mail: pperner@ibai-institut.de

Library of Congress Control Number: 2006928502

CR Subject Classification (1998): I.2.6, I.2, H.2.8, K.4.4, J.3, I.4, J.6, J.1

LNCS Sublibrary: SL 7 – Artificial Intelligence

ISSN 0302-9743  
ISBN-10 3-540-36036-0 Springer Berlin Heidelberg New York  
ISBN-13 978-3-540-36036-0 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media  
springer.com

© Springer-Verlag Berlin Heidelberg 2006  
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India  
Printed on acid-free paper SPIN: 11790853 06/3142 5 4 3 2 1 0

## Preface

The Industrial Conference on Data Mining ICDM-Leipzig was the sixth event in a series of annual events which started in 2000. We are pleased to note that the topic data mining with special emphasis on real-world applications has been adopted by so many researchers all over the world into their research work. We received 156 papers from 19 different countries.

The main topics are data mining in medicine and marketing, web mining, mining of images and signals, theoretical aspects of data mining, and aspects of data mining that bundle a series of different data mining applications such as intrusion detection, knowledge management, manufacturing process control, time-series mining and criminal investigations.

The Program Committee worked hard in order to select the best papers. The acceptance rate was 30%. All these selected papers are published in this proceedings volume as long papers up to 15 pages. Moreover we installed a forum where work in progress was presented. These papers are collected in a special poster proceedings volume and show once more the potentials and interesting developments of data mining for different applications.

Three new workshops have been established in connection with ICDM: (1) Mass Data Analysis on Images and Signals, MDA 2006; (2) Data Mining for Life Sciences, DMLS 2006; and (3) Data Mining in Marketing, DMM 2006. These workshops are developing new topics for data mining under the aspect of the special application. We are pleased to see how many interesting developments are going on in these fields.

We would like to express our appreciation to the reviewers for their precise and highly professional work. We appreciate the help and understanding of the editorial staff at Springer and in particular Alfred Hofmann, who supported the publication of these proceedings in the LNAI series.

We wish to thank all speakers, participants, and industrial exhibitors who contributed to the success of the conference.

We are looking forward to welcoming you to ICDM 2007 ([www.data-mining-forum.de](http://www.data-mining-forum.de)) and to the new work presented there.

July 2006

Petra Pernert

# Table of Contents

## Data Mining in Medicine

Using Prototypes and Adaptation Rules for Diagnosis of Dysmorphic Syndromes

*Rainer Schmidt, Tina Waligora* . . . . . 1

OVA Scheme vs. Single Machine Approach in Feature Selection for Microarray Datasets

*Chia Huey Ooi, Madhu Chetty, Shyh Wei Teng* . . . . . 10

Similarity Searching in DNA Sequences by Spectral Distortion Measures

*Tuan Duc Pham* . . . . . 24

Multispecies Gene Entropy Estimation, a Data Mining Approach

*Xiaoxu Han* . . . . . 38

A Unified Approach for Discovery of Interesting Association Rules in Medical Databases

*Harleen Kaur, Siri Krishan Wasan, Ahmed Sultan Al-Hegami, Vasudha Bhatnagar* . . . . . 53

Named Relationship Mining from Medical Literature

*Isabelle Bichindaritz* . . . . . 64

Experimental Study of Evolutionary Based Method of Rule Extraction from Neural Networks in Medical Data

*Urszula Markowska-Kaczmar, Rafal Matkowski* . . . . . 76

## Web Mining and Logfile Analysis

HTTPHunting: An IBR Approach to Filtering Dangerous HTTP Traffic

*Florentino Fdez-Riverola, Lourdes Borrajo, Rosalia Laza, Francisco J. Rodríguez, David Martínez* . . . . . 91

A Comparative Performance Study of Feature Selection Methods for the Anti-spam Filtering Domain

*Jose Ramon Méndez, Florentino Fdez-Riverola, Fernando Díaz, Eva Lorenzo Iglesias, Juan Manuel Corchado* . . . . . 106

Evaluation of Web Robot Discovery Techniques: A Benchmarking Study	
<i>Nick Geens, Johan Huysmans, Jan Vanthienen</i> . . . . .	121
Data Preparation of Web Log Files for Marketing Aspects Analyses	
<i>Meike Reichle, Petra Perner, Klaus-Dieter Althoff</i> . . . . .	131
UP-DRES: User Profiling for a Dynamic REcommendation System	
<i>Enza Messina, Daniele Toscani, Francesco Archetti</i> . . . . .	146
Improving Effectiveness on Clickstream Data Mining	
<i>Cristina Wanzeller, Orlando Belo</i> . . . . .	161
Conceptual Knowledge Retrieval with FooCA: Improving Web Search Engine Results with Contexts and Concept Hierarchies	
<i>Bjoern Koester</i> . . . . .	176
 <b>Theoretical Aspects of Data Mining</b>	
A Pruning Based Incremental Construction Algorithm of Concept Lattice	
<i>Ji-Fu Zhang, Li-Hua Hu, Su-Lan Zhang</i> . . . . .	191
Association Rule Mining with Chi-Squared Test Using Alternate Genetic Network Programming	
<i>Kaoru Shimada, Kotaro Hirasawa, Jinglu Hu</i> . . . . .	202
Ordinal Classification with Monotonicity Constraints	
<i>Tomáš Horváth, Peter Vojtáš</i> . . . . .	217
Local Modelling in Classification on Different Feature Subspaces	
<i>Gero Szepannek, Claus Weihs</i> . . . . .	226
Supervised Selection of Dynamic Features, with an Application to Telecommunication Data Preparation	
<i>Sylvain Ferrandiz, Marc Boullé</i> . . . . .	239
Using Multi-SOMs and Multi-Neural-Gas as Neural Classifiers	
<i>Nils Goerke, Alexandra Scherbart</i> . . . . .	250
Derivative Free Stochastic Discrete Gradient Method with Adaptive Mutation	
<i>Ranadhir Ghosh, Moumita Ghosh, Adil Bagirov</i> . . . . .	264

## Data Mining in Marketing

Association Analysis of Customer Services from the Enterprise Customer Management System <i>Sung-Ju Kim, Dong-Sik Yun, Byung-Soo Chang</i> .....	279
Feature Selection in an Electric Billing Database Considering Attribute Inter-dependencies <i>Manuel Mejía-Lavalle, Eduardo F. Morales</i> .....	284
Learning the Reasons Why Groups of Consumers Prefer Some Food Products <i>Juan José del Coz, Jorge Díez, Antonio Bahamonde, Carlos Sañudo, Matilde Alfonso, Philippe Berge, Eric Dransfield, Costas Stamataris, Demetrios Zygoyiannis, Tyri Valdimarsdottir, Edi Piasentier, Geoffrey Nute, Alan Fisher</i> .....	297
Exploiting Randomness for Feature Selection in Multinomial Logit: A CRM Cross-Sell Application <i>Anita Prinzie, Dirk Van den Poel</i> .....	310
Data Mining Analysis on Italian Family Preferences and Expenditures <i>Paola Annoni, Pier Alda Ferrari, Silvia Salini</i> .....	324
Multiobjective Evolutionary Induction of Subgroup Discovery Fuzzy Rules: A Case Study in Marketing <i>Francisco Berlanga, María José del Jesus, Pedro González, Francisco Herrera, Mikel Mesonero</i> .....	337
A Scatter Search Algorithm for the Automatic Clustering Problem <i>Rasha Shaker Abdule-Wahab, Nicolas Monmarché, Mohamed Slimane, Moaid A. Fahdil, Hilal H. Saleh</i> .....	350
Multi-objective Parameters Selection for SVM Classification Using NSGA-II <i>Li Xu, Chunping Li</i> .....	365
Effectiveness Evaluation of Data Mining Based IDS <i>Agustín Orfila, Javier Carbó, Arturo Ribagorda</i> .....	377

## Mining Signals and Images

Spectral Discrimination of Southern Victorian Salt Tolerant Vegetation <i>Chris Matthews, Rob Clark, Leigh Callinan</i> .....	389
--	-----

A Generative Graphical Model for Collaborative Filtering of Visual Content <i>Sabri Boutemedjet, Djemel Ziou</i> .....	404
A Variable Initialization Approach to the EM Algorithm for Better Estimation of the Parameters of Hidden Markov Model Based Acoustic Modeling of Speech Signals <i>Md. Shamsul Huda, Ranadhir Ghosh, John Yearwood</i> .....	416
Mining Dichromatic Colours from Video <i>Vassili A. Kovalev</i> .....	431
Feature Analysis and Classification of Classical Musical Instruments: An Empirical Study <i>Christian Simmermacher, Da Deng, Stephen Crane field</i> .....	444
Automated Classification of Images from Crystallisation Experiments <i>Julie Wilson</i> .....	459

## Aspects of Data Mining

An Efficient Algorithm for Frequent Itemset Mining on Data Streams <i>Zhi-jun Xie, Hong Chen, Cuiping Li</i> .....	474
Discovering Key Sequences in Time Series Data for Pattern Classification <i>Peter Funk, Ning Xiong</i> .....	492
Data Alignment Via Dynamic Time Warping as a Prerequisite for Batch-End Quality Prediction <i>Geert Gins, Jairo Espinosa, Ilse Y. Smets, Wim Van Brempt, Jan F.M. Van Impe</i> .....	506
A Distance Measure for Determining Similarity Between Criminal Investigations <i>Tim K. Cocx, Walter A. Kusters</i> .....	511
Establishing Fraud Detection Patterns Based on Signatures <i>Pedro Ferreira, Ronnie Alves, Orlando Belo, Luís Cortesão</i> .....	526
Intelligent Information Systems for Knowledge Work(ers) <i>Klaus-Dieter Althoff, Björn Decker, Alexandre Hanft, Jens Mänz, Régis Newo, Markus Nick, Jörg Rech, Martin Schaaf</i> .....	539



Nonparametric Approaches for e-Learning Data <i>Paolo Baldini, Silvia Figini, Paolo Giudici</i> .....	548
An Intelligent Manufacturing Process Diagnosis System Using Hybrid Data Mining <i>Joon Hur, Hongchul Lee, Jun-Geol Baek</i> .....	561
Computer Network Monitoring and Abnormal Event Detection Using Graph Matching and Multidimensional Scaling <i>Horst Bunke, Peter Dickinson, Andreas Humm, Christophe Irrniger, Miro Kraetzl</i> .....	576
<b>Author Index</b> .....	591