

Santanu Chaudhury Sushmita Mitra
C.A. Murthy P.S. Sastry
Sankar K. Pal (Eds.)

LNCS 5909

Pattern Recognition and Machine Intelligence

Third International Conference, PReMI 2009
New Delhi, India, December 2009
Proceedings

 Springer

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Alfred Kobsa

University of California, Irvine, CA, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Germany

Madhu Sudan

Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Santanu Chaudhury Sushmita Mitra
C.A. Murthy P.S. Sastry
Sankar K. Pal (Eds.)

Pattern Recognition and Machine Intelligence

Third International Conference, PReMI 2009
New Delhi, India, December 16-20, 2009
Proceedings

Volume Editors

Santanu Chaudhury
Indian Institute of Technology Delhi
Electrical Engineering Department
New Delhi 110016, India
E-mail: santanuc@ee.iitd.ernet.in

Sushmita Mitra
C.A. Murthy
Sankar K. Pal
Indian Statistical Institute
Center for Soft Computing Research
Machine Intelligence Unit
Kolkata 700108, India
E-mail: {sushmita, murthy, sankar}@isical.ac.in

P.S. Sastry
Indian Institute of Science
Department of Electrical Engineering
Bangalore 560012, India
E-mail: sastry@ee.iisc.ernet.in

Library of Congress Control Number: 2009940419

CR Subject Classification (1998): I.4, F.1, I.2, I.5, J.3, C.2.1, C.1.3

LNCS Sublibrary: SL 6 – Image Processing, Computer Vision, Pattern Recognition,
and Graphics

ISSN 0302-9743
ISBN-10 3-642-11163-7 Springer Berlin Heidelberg New York
ISBN-13 978-3-642-11163-1 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.com

© Springer-Verlag Berlin Heidelberg 2009
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 12823147 06/3180 5 4 3 2 1 0

Preface

This volume contains the proceedings of the third international conference on Pattern Recognition and Machine Intelligence (PReMI 2009) which was held at the Indian Institute of Technology, New Delhi, India, during December 16–20, 2009. This was the third conference in the series. The first two conferences were held in December at the Indian Statistical Institute, Kolkata in 2005 and 2007.

PReMI has become a premier conference in India presenting state-of-art research findings in the areas of machine intelligence and pattern recognition. The conference is also successful in encouraging academic and industrial interaction, and in promoting collaborative research and developmental activities in pattern recognition, machine intelligence and other allied fields, involving scientists, engineers, professionals, researchers and students from India and abroad. The conference is scheduled to be held every alternate year making it an ideal platform for sharing views and experiences in these fields in a regular manner.

The focus of PReMI 2009 was soft-computing, machine learning, pattern recognition and their applications to diverse fields. As part of PReMI 2009 we had two special workshops. One workshop focused on text mining. The other workshop show-cased industrial and developmental projects in the relevant areas.

Premi 2009 attracted 221 submissions from different countries across the world. Each paper was subjected to at least two reviews; the majority had three reviews. The review process was handled by the Program Committee members with the help of additional reviewers. These reviews were analyzed by the PC Co-chairs. Finally, on the basis of reviews, it was decided to accept 98 papers. We are really grateful to the PC members and reviewers for providing excellent reviews. This volume contains the final version of these 98 papers after incorporating reviewers' suggestions. These papers have been organized into ten thematic sections.

For PReMI 2009 we had a distinguished panel of plenary speakers. We are grateful to Andrew G. Barto, Andrzej Skowron and Ramesh Jain for agreeing to deliver plenary talks. We also had invited talks delivered by Ajith Abraham, Pawan Lingras, Alfredo Petrosino, Partha Pratim Chakrabarti and Venu Govindaraju. Our Tutorial Co-chairs arranged an excellent set of pre-conference tutorials. We are grateful to all our invited and tutorial speakers.

We would like to thank the host institute, IIT Delhi, for providing all facilities for organizing this conference. We are grateful to Springer and National Centre for Soft Computing Research, ISI Kolkata for the necessary logistics and financial support. The success of the conference is also due to funding received from different government agencies and industrial partners. We are grateful to all of them for their active support. We are grateful to the Organizing Committee for their endeavor in making this conference a success.

The PC Co-chairs would like to especially thank our Publication Chair, Sumantra Dutta Roy, for his excellent contributions toward the publication process. We are also grateful to Dominic Šlęzak for his co-operation and help. Our patron, Surendra Prasad, and members of our Advisory Committee provided the required guidance.

PReMI 2005 and PReMI 2007 were successful conferences. We believe that you will find the proceedings of PReMI 2009 to be a valuable source of reference for your ongoing and future research activities.

Santanu Chaudhury
C.A. Murthy
S. Mitra
P.S. Sastry
S.K. Pal

Organization

Patron

Surendra Prasad IIT Delhi

General Chair

Sankar Pal ISI Kolkata

Advisory Committee

Amitava Bagchi	IISER Kolkata
B.L. Deekshatulu	University of Hyderabad
Dwijesh Dutta Majumdar	ISI Kolkata
S.C. DuttaRoy	IIT Delhi
Madan Gopal	IIT Delhi
R.K. Shyamasundar	TIFR
R.M.K. Sinha	IIT Kanpur

Program Co-chairs

Santanu Chaudhury	IIT Delhi
Sushmita Mitra	ISI Kolkata
C.A. Murthy	ISI Kolkata
P.S. Sastry	IISc Bangalore

Program Committee

Sanghamitra Bandyopadhyay	ISI Kolkata
Anupam Basu	IIT Kharagpur
Pushpak Bhattacharyya	IIT Bombay
K.K. Biswas	IIT Delhi
Isabelle Bloch	ENST France
Lorenzo Bruzzone	University of Trento
Bhabatosh Chanda	ISI Kolkata
Niladri Chatterjee	IIT Delhi
Subhasis Chaudhuri	IIT Bombay
Sukhendu Das	IIT Madras
Rajat K De	ISI Kolkata
Andreas Dengel	DFKI
Lipika Dey	TCS
Sumantra Dutta Roy	IIT Delhi

Asish Ghosh	ISI Kolkata
H. Ghosh	TCS
Mark A. Girolami	University of Glasgow
Larry Hall	USF
Gaurav Harit	IIT Kharagpur
C.V. Jawahar	IIIT Hyderabad
Jayadeva	IIT Delhi
Mohan Kankanhalli	NUS
I.N. Kar	IIT Delhi
Ravi Kothari	IBM-IRL
Anjaneyulu Kuchibhotla	HP Labs India
Arun Kumar	IIT Delhi
Krishna Kummamuru	IBM-IRL
Malay Kumar Kundu	ISI Kolkata
Brejesh Lall	IIT Delhi
Wang Lei	NTU
Sriganesh Madhvanath	HP Labs India
A.K. Majumdar	IIT Kharagpur
Dipti Prasad Mukherjee	ISI Kolkata
Jayanta Mukherjee	IIT Kharagpur
Sudipto Mukherjee	IIT Delhi
Hema A. Murthy	IIT Madras
Mike Nachtgaele	Ghent University
Nasser Nasrabadi	ARL
Olfa Nasraoui	University of Louisville
Ram Nevatia	USC
N.R. Pal	ISI Kolkata
Swapan K. Parui	ISI Kolkata
Alfredo Petrosino	University of Naples Parthenope
Arun K. Pujari	University of Hyderabad
A.G. Ramakrishnan	IISc Bangalore
Gerald Schaefer	Loughborough University, UK
Srinivasan H. Sengamedu	Yahoo
Rahul Sukthankar	CMU
Jason T.L. Wang	NJIT
Jakub Wroblewski	Infobright

Publication Chair

Sumantra Dutta Roy	IIT Delhi
--------------------	-----------

Tutorial Co-chairs

Jayadeva	ISSA Delhi
Ganesh Ramakrishnan	IBM-IRL Delhi

Organizing Co-chairs

H. Ghosh	TCS
I.N. Kar	IIT Delhi

Organizing Committee

Ramesh Agarwal	JNU
C. Anantaram	TCS
Ashok Chakravarty	MIT
Niladri Chatterjee	IIT Delhi
Sumantra Dutta Roy	IIT Delhi
Poonam Gupta	CDAC NOIDA
S. Indu	DCE
R.S. Jadon	MITS Gwalior
Ashish Khare	TCS
B.M. Mehtre	CMC Ltd., Hyderabad
Sona Minz	JNU
Sukumar Mishra	IIT Delhi
Sumant Mukherjee	ISSA, Delhi
K.R. Murali Mohan	DST
B.K. Panigrahi	IIT Delhi
Ram Ramaswamy	JNU
Sohan Ranjan	GE Research
Geetika Sharma	TCS
R. Shivakumar	DST/NSDI
Ajay Shukla	PMI, NTPC

International Liason and Co-ordination Co-chairs

Simon C.K. Shiu	Hong Kong Polytechnic University, Hong Kong
Dominik Ślęzak	Infobright, Poland

External Reviewers

Tinku Acharya	Jayanta Basak
M. Abulaish	Anupam Basu
Avinash Achar	Laxmidhar Behera
Amir Ahmad	Narayan Bhamidipati
Ramakrishnan Angarai G	Rajen Bhatt
Sanghamitra Bandyopadhyay	R.K.P. Bhatt
Subhashis Banerjee	Pushpak Bhattacharyya
Rana Barua	Arijit Bishnu

S.N. Biswas	Srivatsan Laxman
K.K. Biswas	Sriganesh Madhvanath
Prabir Kumar Biswas	Anuj Mahajan
Isabelle Bloch	Subhamoy Maitra
Lorenzo Bruzzone	Santi Prasad Maity
Partha Pratim Chakrabarti	Pradipta Maji
Bhabatosh Chanda	A.K. Majumdar
Sharat Chandran	Sharmila Mande
Niladri Chatterjee	Naresh Manwani
Subhasis Chaudhuri	Mona Mathur
Tapan Kumar Chaudhuri	Ujjwal Maulik
Sukhendu Das	Shashi Mehta
Zhang David	Suman K. Mitra
Rajat Kumar De	Pabitra Mitra
Lipika Dey	Atanendu Mondal
Chitra Dutta	Jayanta Mukherjee
Sumantra Dutta Roy	Dipti Prasad Mukherjee
Utpal Garain	M.N. Murthy
Anil K. Ghosh	Hema Murthy
Ashish Ghosh	Mike Nachtegaele
Hiranmay Ghosh	Sarif Kumar Naik
Mark Girolami	Anoop M. Namboodiri
Sujit Gujar	Sukumar Nandi
Amarnath Gupta	P.J. Narayanan
Phalguni Gupta	Nasser Nasrabadi
Larry Hall	J. Saketha Nath
Sk. Mirajul Haque	Ram Nevatia
Gaurav Harit	Pinakpani Pal
Rakesh Jadon	Sarbani Palit
C.V. Jawahar	P.C. Pandey
Jayadeva	Bijaya Ketan Panigrahi
Joby Joseph	Swapan Kumar Parui
Shiv Dutt Joshi	Debprakash Patnaik
Mohan Kankanhalli	Amit Patra
Indra Narayan Kar	Alfredo Petrosino
Prem Karla	Arun Pujari
Sunil Kumar Kopparapu	B. Ravindran
Ravi Kothari	Shubhra Sankar Ray
Arun Kumar	Dipanwita Roy Chowdhury
Krishna Kumamuru	Sanjay Saha
Malay Kumar Kundu	Sudeshna Sarkar
Brejesh Lall	Palash Sarkar

Gerald Schaefer
Srinivasan H. Sengamedu
Debasis Sengupta
Debapriya Sengupta
Shesha Shah
B. Uma Shankar

Dominik Slezak
Rahul Sukthankar
Susmita Sur-Kolay
Jason T.L. Wang
Jakub Wroblewski

Table of Contents

Pattern Recognition and Machine Learning

New Approaches to Design and Control of Time Limited Search Algorithms	1
<i>Partha Pratim Chakrabarti and Sandip Aine</i>	
Feature Selection Using Non Linear Feature Relation Index	7
<i>Namita Jain and C.A. Murthy</i>	
Classification of Multi-variate Varying Length Time Series Using Descriptive Statistical Features	13
<i>S. Chandrakala and C. Chandra Sekhar</i>	
2D-LPI: Two-Dimensional Locality Preserving Indexing	19
<i>S. Manjunath, D.S. Guru, M.G. Suraj, and R. Dinesh</i>	
A Geometric Algorithm for Learning Oblique Decision Trees	25
<i>Naresh Manwani and P.S. Sastry</i>	
Kernel Optimization Using a Generalized Eigenvalue Approach	32
<i>Jayadeva, Sameena Shah, and Suresh Chandra</i>	
Zero Norm Least Squares Proximal SVR	38
<i>Jayadeva, Sameena Shah, and Suresh Chandra</i>	
Effect of Subsampling Rate on Subbagging and Related Ensembles of Stable Classifiers	44
<i>Faisal Zaman and Hideo Hirose</i>	
Metric in Feature Space	50
<i>C.A. Murthy and Sourav Pradhan</i>	
Speeding-Up the K-Means Clustering Method: A Prototype Based Approach	56
<i>T. Hitendra Sarma and P. Viswanath</i>	
Constructive Semi-Supervised Classification Algorithm and Its Implement in Data Mining	62
<i>Arvind Singh Chandel, Aruna Tiwari, and Narendra S. Chaudhari</i>	
Novel Deterministic Heuristics for Building Minimum Spanning Trees with Constrained Diameter	68
<i>C. Patvardhan and V. Prem Prakash</i>	

Multi-objective Evolutionary Feature Selection	74
<i>Partha Pratim Kundu and Sushmita Mitra</i>	
A Fast Supervised Method of Feature Ranking and Selection for Pattern Classification	80
<i>Suranjana Samanta and Sukhendu Das</i>	
Clustering in Concept Association Networks	86
<i>Arun R., V. Suresh, and C.E. Veni Madhavan</i>	

Soft Computing and Applications

Interactive Rough-Granular Computing in Pattern Recognition	92
<i>Andrzej Skowron, Jan Bazan, and Marcin Wojnarski</i>	
Application of Neural Networks in Preform Design of Aluminium Upsetting Process Considering Different Interfacial Frictional Conditions	98
<i>Ajay Kumar Kaviti, K.K. Pathak, and M.S. Hora</i>	
Case Indexing Using PSO and ANN in Real Time Strategy Games	106
<i>Peng Huo, Simon Chi-Keung Shiu, HaiBo Wang, and Ben Niu</i>	
Construction of Fuzzy Relation by Closure Systems	116
<i>Vladimír Janiš, Magdalena Renčova, Branimir Šešelja, and Andreja Tepavčević</i>	
Incorporating Fuzziness to CLARANS	122
<i>Sampreeti Ghosh and Sushmita Mitra</i>	
Development of a Neuro-fuzzy MR Image Segmentation Approach Using Fuzzy C-Means and Recurrent Neural Network	128
<i>Dipankar Ray and D. Dutta Majumder</i>	
Weak Fuzzy Equivalence and Equality Relations	134
<i>Branimir Šešelja and Andreja Tepavčević</i>	
Estimation of Tailor-Welded Blank Parameters for Acceptable Tensile Behaviour Using ANN	140
<i>Abhishek Dhumal, R. Ganesh Narayanan, and G. Saravana Kumar</i>	

Bio and Chemo Informatics

Identification of N-Glycosylation Sites with Sequence and Structural Features Employing Random Forests	146
<i>Shreyas Karnik, Joydeep Mitra, Arunima Singh, B.D. Kulkarni, V. Sundarajan, and V.K. Jayaraman</i>	

Identification of Defensins Employing Recurrence Quantification Analysis and Random Forest Classifiers	152
<i>Shreyas Karnik, Ajay Prasad, Alok Diwevedi, V. Sundararajan, and V.K. Jayaraman</i>	
Data Mining by Navigation – An Experience with Systems Biology	158
<i>Amarnath Gupta, Michael Baitaluk, Animesh Ray, and Aditya Bagchi</i>	
A Least Squares Fitting-Based Modeling of Gene Regulatory Sub-networks	165
<i>Ranajit Das, Sushmita Mitra, C.A. Murthy, and Subhasis Mukhopadhyay</i>	
Automated Identification of Protein Structural Features	171
<i>Chandrasekhar Mamidipally, Santosh B. Noronha, and Sumantra Dutta Roy</i>	
Using Supervised Learning and Comparing General and ANTI-HIV Drug Databases Using Chemoinformatics	177
<i>Taneja Shweta, Raheja Shipra, and Kaur Savneet</i>	
Multiple Sequence Alignment Based Upon Statistical Approach of Curve Fitting	184
<i>Vineet Jha, Mohit Mazumder, Hrishikesh Bhuyan, Ashwani Jha, and Abhinav Nagar</i>	
A Constraint Based Method for Optimization in Metabolic Pathways . . .	193
<i>Mouli Das, Subhasis Mukhopadhyay, and Rajat K. De</i>	
Cross-Correlation and Evolutionary Biclustering: Extracting Gene Interaction Sub-networks	199
<i>Ranajit Das, Sushmita Mitra, and Subhasis Mukhopadhyay</i>	
Text and Data Mining	
Learning Age and Gender of Blogger from Stylistic Variation	205
<i>Mayur Rustagi, R. Rajendra Prasath, Sumit Goswami, and Sudeshna Sarkar</i>	
Hypertext Classification Using Tensor Space Model and Rough Set Based Ensemble Classifier	213
<i>Suman Saha, C.A. Murthy, and Sankar K. Pal</i>	
Feature and Opinion Mining for Customer Review Summarization	219
<i>Muhammad Abulaish, Jahiruddin, Mohammad Najmud Doja, and Tanvir Ahmad</i>	

A Semi-supervised Approach for Maximum Entropy Based Hindi Named Entity Recognition	225
<i>Sujan Kumar Saha, Pabitra Mitra, and Sudeshna Sarkar</i>	
A News Analysis and Tracking System	231
<i>Sk. Mirajul Haque, Lipika Dey, and Anuj Mahajan</i>	
Anomaly Detection from Call Data Records	237
<i>Nithi and Lipika Dey</i>	
Mining Calendar-Based Periodicities of Patterns in Temporal Data	243
<i>Mala Dutta and Anjana Kakoti Mahanta</i>	
A Relation Mining and Visualization Framework for Automated Text Summarization	249
<i>Muhammad Abulaish, Jahiruddin, and Lipika Dey</i>	
Mining Local Association Rules from Temporal Data Set	255
<i>Fokrul Alom Mazarbhuiya, Muhammad Abulaish, Anjana Kakoti Mahanta, and Tanvir Ahmad</i>	
Multi-label Text Classification Approach for Sentence Level News Emotion Analysis	261
<i>Plaban Kr. Bhowmick, Anupam Basu, Pabitra Mitra, and Abhishek Prasad</i>	
Semantic Relation between Words with the Web as Information Source	267
<i>Tanmay Basu and C.A. Murthy</i>	
Automatic Keyphrase Extraction from Medical Documents	273
<i>Kamal Sarkar</i>	

Image Analysis

An Approach for Preparing Groundtruth Data and Evaluating Visual Saliency Models	279
<i>Rajarshi Pal, Jayanta Mukherjee, and Pabitra Mitra</i>	
Evaluation of Segmentation Techniques Using Region Size and Boundary Information	285
<i>Debi Prosad Dogra, Arun Kumar Majumdar, and Shamik Sural</i>	
Unsupervised Color Image Segmentation Using Compound Markov Random Field Model	291
<i>Sucheta Panda and P.K. Nanda</i>	
A New Statistical Restoration Method for Spatial Domain Images	297
<i>Arijit Sur, Piyush Goel, and Jayanta Mukherjee</i>	