

Lecture Notes in Artificial Intelligence 1398

Subseries of Lecture Notes in Computer Science

Edited by J. G. Carbonell and J. Siekmann

Lecture Notes in Computer Science

Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Claire Nédellec Céline Rouveirol (Eds.)

Machine Learning: ECML-98

10th European Conference on Machine Learning
Chemnitz, Germany, April 21-23, 1998
Proceedings



Springer

Series Editors

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

Volume Editors

Claire Nédellec

Céline Rouveirol

Laboratoire de Recherche en Informatique

Unité de Recherche Associée 410 du CNRS

Bât. 490, Université Paris-Sud, F-91405 Orsay, France

E-mail: {cn,celine}@lri.fr

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

**Machine learning : proceedings / ECML-98, 9th European
Conference on Machine Learning, Chemnitz, Germany, April 1998.
Claire Nédellec ; Céline Rouveirol (ed.). - Berlin ; Heidelberg ; New
York ; Barcelona ; Budapest ; Hong Kong ; London ; Milan ; Paris ;
Santa Clara ; Singapore ; Tokyo : Springer, 1998
(Lecture notes in computer science ; Vol. 1398 : Lecture notes in
artificial intelligence)
ISBN 3-540-64417-2**

CR Subject Classification (1991): I.2, F.2.2

ISSN 0302-9743

ISBN 3-540-64417-2 Springer-Verlag 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-Verlag. Violations are liable for prosecution under the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 1998
Printed in Germany

Typesetting: Camera ready by author
SPIN 10637011 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

Foreword

The Tenth European Conference on Machine Learning (ECML-98), held in Chemnitz, Germany, April 21 - 23, 1998 continues the tradition of earlier EWSL (European Working Session on Learning) and ECML conferences, being the major European scientific forum for presenting the latest advances in Machine Learning research.

The scientific program of ECML-98 consists of two invited talks by Kenneth De Jong and David D. Lewis, plenary paper presentations, and one-day workshops.

This volume contains the papers relating the invited talks and the papers presented at the conference. There are two kinds of papers: full papers (12 pages in the proceedings) and research notes (6 pages). The selection of papers was based on at least two reviews per submission. Among 100 papers submitted to ECML'98, 46 were accepted for publication and presentation (21 as full papers and 25 as research notes). The proceedings of the workshops appear as technical reports of the Department of Computer Science in Chemnitz.

We first wish to thank all the authors for submitting their papers and thus making this conference possible. We address special thanks to the members of the program committee and reviewers for their great work which contributed to the high quality of these proceedings. We wish to extend our gratitude to the invited speakers for presenting us their views on innovative fields of Machine Learning.

ECML'98 was organized by the AI Group at Chemnitz University of Technology, Dept. of Computer Science supported by FIRST Business Travel International, Chemnitz. Our gratitude goes to all members of the Organizing Committee, and all other individuals who helped in the organization of the conference. We would like to acknowledge all the sponsors of the ECML'98 for supporting this scientific event.

February 1998
Orsay

Claire Nédellec
Céline Rouveirol

Program Chairs

Claire Nédellec, Céline Rouveirol, LRI, Université Paris-Sud, France

Local Chair

Werner Dilger, Chemnitz University of Technology, Germany

Organizing Institutions

Chemnitz University of Technology, Dept. of Computer Science, AI Group
FIRST Business Travel International, Chemnitz

Organizing Committee

Werner Dilger, Andreas Ittner, Michael Schlosser, Jens Zeidler

Sponsors

Daimler-Benz AG
Chemnitz University of Technology
FIRST Business Travel International, Chemnitz
DORINT Parkhotel, Chemnitz
Parsytec, Chemnitz
City of Chemnitz
Chemnitzer Wirtschaftsförderungs- und Entwicklungsgesellschaft mbH
Prudential Systems, Knowledge Discovery and Data Mining, Chemnitz
LRI, Université Paris-Sud

Program Committee

Agnar Aamodt (Norway)
David W. Aha (USA)
Francesco Bergadano (Italy)
Ivan Bratko (Slovenia)
Pavel Brazdil (Portugal)
Walter Daelemans (Netherlands)
Luc De Raedt (Belgium)
Marco Dorigo (Belgium)
Florian Esposito (Italy)
Terry Fogarty (UK)
Johannes Fuernkranz (Austria)
Yves Kodratoff (France)

Nada Lavrač (Slovenia)
Ramon Lopez de Mantaras (Spain)
Stan Matwin (Canada)
Katharina Morik (Germany)
G. Nakhaeizadeh (Germany)
David Page (USA)
Lorenza Saitta (Italy)
Derek Sleeman (UK)
Maarten Van Someren (Netherlands)
Paul Vitányi (Netherlands)
Stefan Wrobel (Germany)
Gerhard Widmer (Austria)

Additional Referees

Gilles Bisson	Daniele Gunetti	Maria Teresa Pazienza
Antal van den Bosch	Arvid Holme	Hervé Perdrix
Andrea Bonarini	Thorsten Joachims	Bernhard Pfahringer
Gianluca Bontempi	Alipio Jorge	Enric Plaza
Peter Brockhausen	Hermann von Hasseln	Caroline Ravise
Oliver Buechter	Tamas Horvath	Riverson Rios
Rui Camacho	Jörg-Uwe Kietz	Ursula Robers
Pawel Cichosz	Mathias Kirsten	Marko Robnik Šikonja
Antoine Cornuéjols	Volker Klingspor	Giancarlo Ruffo
Vincent Corruble	Igor Kononenko	Marc Schoenauer
Florence Dalche	Stefan Kramer	Michèle Sebag
Keith Downing	Matjaz Kukar	Dorian Suc
Gert Durieux	Carster Lanquillon	Luís Torgo
Sašo Džeroski	Donato Malerba	Rafal Salustowicz
Stefano Ferilli	Joel Martin	Giovanni Semeraro
Bogdan Filipič	Fraser Mitchell	Gilles Venturini
João Gama	Marjorie Moulet	Marco Wiering
Matjaz Gams	Paul Munteanu	Jakub Zavrel
Frederic Garcia	S.M. Ndiaye	Jieyu Zhao

Table of Contents

Invited Papers

Learning in Agent-Oriented Worlds	3
<i>K. De Jong</i>	

Naive (Bayes) at Forty: The Independence Assumption in Information Retrieval.....	4
<i>D. D. Lewis</i>	

Regular Papers

Applications of ML

Learning Verbal Transitivity Using LogLinear Models.....	19
<i>N. M. Marques, G. Pereira Lopes, C. A. Coelho</i>	

Part-of-Speech Tagging Using Decision Trees	25
<i>L. Márquez, H. Rodríguez</i>	

Inference of Finite Automata: Reducing the Search Space with an Ordering of Pairs of States	37
<i>F. Coste, J. Nicolas</i>	

Automatic Acquisition of Lexical Knowledge from Sparse and Noisy Data .	43
<i>R. Schneider</i>	

A Normalization Method for Contextual Data: Experience from a Large-Scale Application.....	49
<i>S. Létourneau, S. Matwin, F. Famili</i>	

Learning to Classify X-Ray Images Using Relational Learning	55
<i>C. Sammut, T. Zrímeč</i>	

ILP Experiments in Detecting Traffic Problems	61
<i>S. Džeroski, N. Jacobs, M. Molina , C. Moure</i>	

Simulating Children Learning and Explaining Elementary Heat Transfer Phenomena: A Multistrategy System at Work	67
<i>F. Neri</i>	

Bayesian Networks

Bayes Optimal Instance-Based Learning	77
<i>P. Kontkanen, P. Myllymäki, T. Silander, H. Tirri</i>	

Bayesian and Information-Theoretic Priors for Bayesian Network Parameters	89
<i>P. Kontkanen, P. Myllymäki, T. Silander, H. Tirri, P. Grünwald</i>	

Feature Selection

Feature Subset Selection in Text Learning	95
<i>D. Mladenić</i>	
A Monotonic Measure for Optimal Feature Selection	101
<i>H. Liu, H. Motoda, M. Dash</i>	

Decision Trees

Inducing Models of Human Control Skills	107
<i>R. Camacho</i>	
God doesn't Always Shave with Occam's Razor - Learning When and How to Prune	119
<i>H. Bensusan</i>	
Error Estimators for Pruning Regression Trees	125
<i>L. Torgo</i>	
Pruning Decision Trees with Misclassification Costs	131
<i>J. P. Bradford, C. Kunz, R. Kohavi, C. Brunk, C. E. Brodley</i>	

Support Vector Learning

Text Categorization with Support Vector Machines: Learning with many Relevant Features	137
<i>T. Joachims</i>	
A Short Note About the Application of Polynomial Kernels with Fractional Degree in Support Vector Learning	143
<i>R. Rossius, G. Zenker, A. Ittner, W. Dilger</i>	

Multiple Models for Classification

Classification Learning Using All Rules	149
<i>M. Viswanathan, G. I. Webb</i>	
Improved Pairwise Coupling Classification with Correcting Classifiers	160
<i>M. Moreira, E. Mayoraz</i>	
Experiments on Solving Multiclass Learning Problems by n^2 -classifier	172
<i>J. Jelonek, J. Stefanowski</i>	
Combining Classifiers with Constructive Induction	178
<i>J. Gama</i>	

Boosting Trees for Cost-Sensitive Classifications	190
<i>K. M. Ting, Z. Zheng</i>	
Naive Bayesian Classifier Committees	196
<i>Z. Zheng</i>	
Batch Classifications with Discrete Finite Mixtures	208
<i>P. Kontkanen, P. Myllymäki, T. Silander, H. Tirri</i>	
Inductive Logic Programming	
Induction of Recursive Program Schemes	214
<i>U. Schmid, F. Wyszotzki</i>	
Predicate Invention and Learning from Positive Examples Only	226
<i>H. Boström</i>	
An Inductive Logic Programming Framework to Learn a Concept from Ambiguous Examples	238
<i>D. Bouthinon, H. Soldano</i>	
Relational Learning	
First-Order Learning for Web Mining	250
<i>M. Craven, S. Slattery, K. Nigam</i>	
Explanation-Based Generalization in Game Playing: Quantitative Results .	256
<i>S. Schrödl</i>	
Instance Based Learning	
Scope Classification: An Instance-Based Learning Algorithm with a Rule-Based Characterization	268
<i>N. Lachiche, P. Marquis</i>	
Error-Correcting Output Codes for Local Learners	280
<i>F. Ricci, D. W. Aha</i>	
Recursive Lazy Learning for Modeling and Control	292
<i>G. Bontempi, M. Birattari, H. Bersini</i>	
Using Lattice-Based Framework as a Tool for Feature Extraction	304
<i>E. Mephu Nguifo, P. Njiwoua</i>	
Clustering	
Determining Property Relevance in Concept Formation by Computing Correlation between Properties	310
<i>J. J. Furtado Vasco</i>	

A Buffering Strategy to Avoid Ordering Effects in Clustering	316
<i>L. Talavera, J. Roure</i>	

Genetic Algorithms

Coevolutionary, Distributed Search for Inducing Concept Descriptions	322
<i>C. Anglano, A. Giordana, G. Lo Bello, L. Saitta</i>	
Continuous Mimetic Evolution	334
<i>A. Ducoulombier, M. Sebag</i>	
A Host-Parasite Genetic Algorithm for Assymmetric Tasks	346
<i>B. Olsson</i>	

Reinforcement Learning

Speeding Up $Q(\lambda)$ -Learning	352
<i>M. Wiering, J. Schmidhuber</i>	
Q-Learning and Redundancy Reduction in Classifier Systems with Internal State	364
<i>A. Giani, A. Sticca, F. Baiardi, A. Starita</i>	
Composing Functions to Speed Up Reinforcement Learning in a Changing World	370
<i>C. Drummond</i>	
Theoretical Results on Reinforcement Learning with Temporally Abstract Options	382
<i>D. Precup, R. S. Sutton, S. Singh</i>	
A General Convergence Method for Reinforcement Learning in the Continuous Case	394
<i>R. Munos</i>	

Neural Networks

Interpretable Neural Networks with BP-SOM	406
<i>T. Weijters, A. van den Bosch, J. van den Herik</i>	
Convergence Rate of Minimization Learning for Neural Networks	412
<i>M. H. Mohamed, T. Minamoto, K. Niijima</i>	

Author Index	419
--------------------	-----