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Achim Hoffmann
Hiroshi Motoda
Tobias Scheffer (Eds.)

Discovery Science

8th International Conference, DS 2005
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Proceedings



← **DIALOGUES** →
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Discovery Science

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Lecture Notes in Artificial Intelligence

3735

Edited by J. G. Carbonell and J. Siekmann

Subseries of Lecture Notes in Computer Science

Preface

This volume contains the papers presented at the 8th International Conference on Discovery Science (DS 2005) held in Singapore, Republic of Singapore, during the days from 8–11 of October 2005.

The main objective of the Discovery Science (DS) conference series is to provide an open forum for intensive discussions and the exchange of new ideas and information among researchers working in the area of automating scientific discovery or working on tools for supporting the human process of discovery in science. It has been a successful arrangement in the past to co-locate the DS conference with the International Conference on Algorithmic Learning Theory (ALT). This combination of ALT and DS allows for a comprehensive treatment of the whole range, from theoretical investigations to practical applications. Continuing in this tradition, DS 2005 was co-located with the 16th ALT conference (ALT 2005). The proceedings of ALT 2005 were published as a twin volume 3734 of the LNCS series.

The International Steering Committee of the Discovery Science conference series provided important advice on a number of issues during the planning of Discovery Science 2005. The members of the Steering Committee are Hiroshi Motoda, (Osaka University), Alberto Apostolico (Purdue University), Setsuo Arikawa (Kyushu University), Achim Hoffmann (University of New South Wales), Klaus P. Jantke (DFKI and FIT Leipzig, Germany), Massimo Melucci (University of Padua), Masahiko Sato (Kyoto University), Ayumi Shinohara (Tohoku University), Einoshin Suzuki (Yokohama National University), and Thomas Zeugmann (Hokkaido University).

We received 112 full paper submissions out of which 21 long papers (up to 15 pages), 7 regular papers (up to 9 pages), and 9 project reports (3 pages) were accepted for presentation and are published in this volume. Each submission was reviewed by at least two members of the Program Committee of international experts in the field. The selection was made after careful evaluation of each paper based on originality, technical quality, relevance to the field of discovery science, and clarity.

The Discovery Science 2005 conference had three types of presentations: long papers were presented in a plenary session; regular papers were presented in a short spotlight presentation to generate interest and a presentation during a poster session for intensive discussions and presentation of details; project reports were presented in a poster session to allow intensive discussion on ongoing work and interesting ideas that had not been developed to the same degree of maturity as long and regular papers.

The Carl Smith Award was presented this year for the first time in honor of Professor Carl Smith to the student author of the best paper in the Discovery Science conference authored or co-authored by a student. The prize of 555 Euro

was awarded to Qianjun Xu for the paper entitled *Active Constrained Clustering by Examining Spectral Eigenvectors*.

This volume consists of four parts. The first part contains invited talks of ALT 2005 and DS 2005. Since the talks were shared between the two conferences, for the speakers invited specifically for ALT 2005 only abstracts are contained in this volume, while the full paper is found in the twin volume LNCS 3734 (the proceedings of ALT 2005). We were delighted that Gary Bradshaw (Invention and Artificial Intelligence), Vasant Honovar (Algorithms and Software for Collaborative Discovery from Autonomous, Semantically Heterogeneous, Distributed, Information Sources), Chih-Jen Lin (Optimization Issues in Training Support Vector Machines), Ross D. King (The Robot Scientist Project), and Neil Smalheiser (The Arrowsmith Project: 2005 Status Report) followed our invitation to present their work.

The second part of this volume contains the papers accepted as long papers (acceptance rate of less than 21%). The third part of this volume contains the regular papers, which were found to belong to the best 27% of all submissions. Finally, the fourth part of this volume contains the project reports; the total acceptance rate for all three paper categories sums to 37% of all submissions.

We are deeply indebted to the Program Committee members as well as their subreferees who had the critically important role of reviewing the submitted papers and contributing to the intense discussions which resulted in the selection of the papers published in this volume. Without this enormous effort, ensuring the high quality of the work presented at Discovery Science 2005 would not have been possible.

We also thank all the authors who submitted their work to Discovery Science 2005 for their efforts.

We wish to express our gratitude to the invited speakers for their acceptance of the invitation and their stimulating contributions to the conference.

Finally, we wish to thank everyone who contributed to make Discovery Science 2005 a success: the DS Steering committee, the ALT conference chairs, invited speakers, and last but not least Lee Wee Sun, the Local Arrangements Chair and his team of supporters.

October 2005

Achim Hoffmann
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The Carl Smith Award

Starting with this year, the “Carl Smith Award” is presented to the most outstanding paper written or co-authored by a student. The selection is made by the actual program committee of the Discovery Science conference. The award carries a scholarship prize of 555 Euro.

The decision to introduce this award has been proposed at the ALT/DS-business meeting of last year’s conference in Padua after remembering Carl Smith, who passed away on July 21, 2004 after a long and valiant battle with cancer, with a minute of silence. Subsequently, this decision has been happily approved by Patricia Smith.

Carl performed his undergraduated studies in Vermont and received his Bachelor of Science Degree from the University of Vermont in 1972. Then, he moved to State University of New York at Buffalo where he received his Ph.D. Subsequently, he was Assistant Professor of Computer Science at Purdue University. Then he was at the University of Maryland at College Park, where he got promoted to Associate and Full Professor. In 1993, Carl received the Habilitation degree from the University of Latvia in Riga. He is also one of the very few non-Latvian scientists who got elected to the Latvian Academy of Science.

Additionally, Carl spent several years as program manager at the National Science Foundation’s theoretical computer science program and continued to work for the National Science Foundation by working on programs and panel reviews for many years.

Carl also contributed to the computer science community as an editor of the International Journal of the Foundations of Computer Science, Theoretical Computer Science, and Fundamenta Informaticae.

The Discovery Science conference series is still a young one but many researchers remember Carl for a much longer time, because of his very active role in the algorithmic or computational learning communities.

Let us look back to 1986 when the 1st International Workshop on Analogical and Inductive Inference was held in Wendisch-Rietz near Berlin. This was the starting point of the first international conference series on learning theory which merged in 1994 with the Algorithmic Learning Theory series established in 1990. At this workshop Carl gave a talk “On the Inference of Sequence of Functions” (co-authored with Bill Gasarch) in which he developed a model of “learning how to learn.” Of course, by this time Carl was already well known through his work on comparison of identification criteria for machine inductive inference, his work on team learning, and the beautiful survey paper “Inductive Inference: Theory and Methods” (co-authored with Dana Angluin).

Besides the very fruitful scientific discussions we all enjoyed at this workshop, it was also the beginning or continuation of a lasting friendship many of us had with Carl which in turn led to many teams including Carl all over

the world. These long and fruitful collaborations included leading groups from Japan, Latvia, Germany, USA, Australia, and Singapore among many countries. As a result, papers on query learning, on memory limitation, on learning with anomalies, on the complexity of inductive inference, on Barzdins's conjecture, on procrastination, on mind change complexity as well as on a logic of discovery emerged.

Besides his regular papers, Carl contributed in many ways to the ALT and DS conference series by serving for their Program Committees and the DS Steering Committee, and by serving as local chair, as conference chair and arrangements as invited speaker.

He also chaired IFIP WG 1.4 on Computational Learning Theory and organized many funding to support, in particular, young scientists.

Since Carl Smith did so much for the ALT and DS conferences, his spirit, his contributions, his passion, and his ideas will be remembered and passed to the young generations by the "Carl Smith Award."

August 2005

Thomas Zeugmann

Lecture Notes in Artificial Intelligence (LNAI)

- Vol. 3735: A. Hoffmann, H. Motoda, T. Scheffer (Eds.), *Discovery Science*. XVI, 400 pages. 2005.
- Vol. 3734: S. Jain, H.U. Simon, E. Tomita (Eds.), *Algorithmic Learning Theory*. XII, 490 pages. 2005.
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- Vol. 3702: B. Beckert (Ed.), *Automated Reasoning with Analytic Tableaux and Related Methods*. XIII, 343 pages. 2005.
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- Vol. 3673: S. Bandini, S. Manzoni (Eds.), *AI*IA 2005: Advances in Artificial Intelligence*. XIV, 614 pages. 2005.
- Vol. 3662: C. Baral, G. Greco, N. Leone, G. Terracina (Eds.), *Logic Programming and Nonmonotonic Reasoning*. XIII, 454 pages. 2005.
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- Vol. 3625: S. Kramer, B. Pfahringer (Eds.), *Inductive Logic Programming*. XIII, 427 pages. 2005.
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Table of Contents

Invited Papers

Invention and Artificial Intelligence <i>Gary Bradshaw</i>	1
Algorithms and Software for Collaborative Discovery from Autonomous, Semantically Heterogeneous, Distributed Information Sources <i>Doina Caragea, Jun Zhang, Jie Bao, Jyotishman Pathak, Vasant Honavar</i>	14
Training Support Vector Machines via SMO-Type Decomposition Methods <i>Pai-Hsuen Chen, Rong-En Fan, Chih-Jen Lin</i>	15
The Robot Scientist Project <i>Ross D. King, Michael Young, Amanda J. Clare, Kenneth E. Whelan, Jem Rowland</i>	16
The Arrowsmith Project: 2005 Status Report <i>Neil R. Smalheiser</i>	26

Regular Contributions - Long Papers

Practical Algorithms for Pattern Based Linear Regression <i>Hideo Bannai, Kohei Hatano, Shunsuke Inenaga, Masayuki Takeda</i>	44
Named Entity Recognition for the Indonesian Language: Combining Contextual, Morphological and Part-of-Speech Features into a Knowledge Engineering Approach <i>Indra Budi, Stéphane Bressan, Gatot Wahyudi, Zainal A. Hasibuan, Bobby A.A. Nazief</i>	57
Bias Management of Bayesian Network Classifiers <i>Gladys Castillo, João Gama</i>	70
A Bare Bones Approach to Literature-Based Discovery: An Analysis of the Raynaud's/Fish-Oil and Migraine-Magnesium Discoveries in Semantic Space <i>Richard J. Cole, Peter D. Bruza</i>	84

Assisting Scientific Discovery with an Adaptive Problem Solver <i>Christopher Dartnell, Jean Sallantin</i>	99
Cross-Language Mining for Acronyms and Their Completions from the Web <i>Udo Hahn, Philipp Daumke, Stefan Schulz, Kornél Markó</i>	113
Mining Frequent δ -Free Patterns in Large Databases <i>Céline Hébert, Bruno Crémilleux</i>	124
An Experiment with Association Rules and Classification: Post-Bagging and Conviction <i>Alípio M. Jorge, Paulo J. Azevedo</i>	137
Movement Analysis of Medaka (<i>Oryzias Latipes</i>) for an Insecticide Using Decision Tree <i>Sengtai Lee, Jeehoon Kim, Jae-Yeon Baek, Man-Wi Han, Chang Woo Ji, Tae-Soo Chon</i>	150
Support Vector Inductive Logic Programming <i>Stephen Muggleton, Huma Lodhi, Ata Amini, Michael J.E. Sternberg</i>	163
Measuring Over-Generalization in the Minimal Multiple Generalizations of Biosequences <i>Yen Kaow Ng, Hirotaka Ono, Takeshi Shinohara</i>	176
The q -Gram Distance for Ordered Unlabeled Trees <i>Nobuhito Ohkura, Kouichi Hirata, Tetsuji Kuboyama, Masateru Harao</i>	189
Monotone Classification by Function Decomposition <i>Viara Popova, Jan C. Bioch</i>	203
Learning On-Line Classification via Decorrelated LMS Algorithm: Application to Brain-Computer Interfaces <i>Shiliang Sun, Changshui Zhang</i>	215
An Algorithm for Mining Implicit Itemset Pairs Based on Differences of Correlations <i>Tsuyoshi Taniguchi, Makoto Haraguchi</i>	227
Pattern Classification via Single Spheres <i>Jigang Wang, Predrag Neskovic, Leon N. Cooper</i>	241

SCALETRACK: A System to Discover Dynamic Law Equations Containing Hidden States and Chaos <i>Takashi Washio, Fuminori Adachi, Hiroshi Motoda</i>	253
Exploring Predicate-Argument Relations for Named Entity Recognition in the Molecular Biology Domain <i>Tuangthong Wattarujeekrit, Nigel Collier</i>	267
Massive Biomedical Term Discovery <i>Joachim Wermter, Udo Hahn</i>	281
Active Constrained Clustering by Examining Spectral Eigenvectors <i>Qianjun Xu, Marie desJardins, Kiri L. Wagstaff</i>	294
Learning Ontology-Aware Classifiers <i>Jun Zhang, Doina Caragea, Vasant Honavar</i>	308

Regular Contributions - Regular Papers

Automatic Extraction of Proteins and Their Interactions from Biological Text <i>Kiho Hong, Junhyung Park, Jihoon Yang, Eunok Paek</i>	322
A Data Analysis Approach for Evaluating the Behavior of Interestingness Measures <i>Xuan-Hiep Huynh, Fabrice Guillet, Henri Briand</i>	330
Unit Volume Based Distributed Clustering Using Probabilistic Mixture Model <i>Keunjoon Lee, Jinu Joo, Jihoon Yang, Sungyong Park</i>	338
Finding Significant Web Pages with Lower Ranks by Pseudo-Clique Search <i>Yoshiaki Okubo, Makoto Haraguchi, Bin Shi</i>	346
CLASSIC'CL: An Integrated ILP System <i>Christian Stolle, Andreas Karwath, Luc De Raedt</i>	354
Detecting and Revising Misclassifications Using ILP <i>Masaki Yokoyama, Tohgoroh Matsui, Hayato Ohwada</i>	363

Project Reports

Self-generation of Control Rules Using Hierarchical and Nonhierarchical Clustering for Coagulant Control of Water Treatment Plants <i>Hyeon Bae, Sungshin Kim, Yejin Kim, Chang-Won Kim</i>	371
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A Semantic Enrichment of Data Tables Applied to Food Risk Assessment
Hélène Gagliardi, Ollivier Haemmerlé, Nathalie Pernelle, Fatiha Saïs 374

Knowledge Discovery Through Composited Visualization, Navigation and Retrieval
Wei-Ching Lim, Chien-Sing Lee 377

A Tabu Clustering Method with DHB Operation and Mergence and Partition Operation
Yongguo Liu, Dong Zheng, Shiqun Li, Libin Wang, Kefei Chen 380

Discovering User Preferences by Using Time Entries in Click-Through Data to Improve Search Engine Results
Parthasarathy Ramachandran 383

Network Boosting for BCI Applications
Shijun Wang, Zhonglin Lin, Changshui Zhang 386

Rule-Based FCM: A Relational Mapping Model
Ying Yang, Tao-shen Li, Jia-jin Le 389

Effective Classifier Pruning with Rule Information
Xiaolong Zhang, Mingjian Luo, Daoying Pi 392

Text Mining for Clinical Chinese Herbal Medical Knowledge Discovery
Xuezhong Zhou, Baoyan Liu, Zhaohui Wu 396

Author Index 399