Lecture Notes in Artificial Intelligence 4201

Edited by J. G. Carbonell and J. Siekmann

Subseries of Lecture Notes in Computer Science

Yasubumi Sakakibara Satoshi Kobayashi
Kengo Sato Tetsuro Nishino
Etsuji Tomita (Eds.)

Grammatical Inference: Algorithms and Applications

8th International Colloquium, ICGI 2006
Tokyo, Japan, September 20-22, 2006
Proceedings

Springer

Volume Editors

Yasubumi Sakakibara
Keio University, Yokohama, Japan
E-mail: yasu@bio.keio.ac.jp

Satoshi Kobayashi
University of Electro-Communications, Tokyo, Japan
E-mail: satoshi@cs.uec.ac.jp

Kengo Sato
National Institute of Advanced Industrial Science and Technology, Tokyo, Japan
E-mail: sato-kengo@aist.go.jp

Tetsuro Nishino
University of Electro-Communications, Tokyo, Japan
E-mail: nishino@ice.uec.ac.jp

Etsuji Tomita
University of Electro-Communications, Tokyo, Japan
E-mail: tomita@ice.uec.ac.jp

Library of Congress Control Number: 2006932583

CR Subject Classification (1998): I.2, F.4, F.3

LNCS Sublibrary: SL 7 – Artificial Intelligence

ISSN 0302-9743
ISBN-10 3-540-45264-8 Springer Berlin Heidelberg New York
ISBN-13 978-3-540-45264-5 Springer Berlin Heidelberg New York

Springer is a part of Springer Science+Business Media

springer.com

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11872436 06/3142 5 4 3 2 1 0

Preface

The 8th International Colloquium on Grammatical Inference (ICGI 2006) was held at the University of Electro-Communications (UEC), Tokyo, Japan on September 20-22, 2006. ICGI 2006 was the eighth in a series of successful biennial international conferences in the area of grammatical inference. Previous meetings were held in Essex, UK; Alicante, Spain; Montpellier, France; Ames, Iowa, USA; Lisbon, Portugal; Amsterdam, Netherlands; Athens, Greece. ICGI 2006 was the first conference in this series to be held in Asia. This series of conferences seeks to provide a forum for presentation and discussion of original research papers on all aspects of grammatical inference.

Grammatical inference, the study of learning grammars from data, is an established research field in artificial intelligence, dating back to the 1960s and has been extensively addressed by researchers in automata theory, language acquisition, computational linguistics, machine learning, pattern recognition, computational learning theory and neural networks. ICGI 2006 successively emphasized on the multi-disciplinary nature of the research field and the diverse domains in which grammatical inference is being applied, such as natural language acquisition, computational biology, structural pattern recognition, information retrieval, Web mining, text processing, data compression and adaptive intelligent agents.

We received 44 high-quality papers from 14 countries around the world. The papers were reviewed by three reviewers. Based on the positive comments of the reviewers, 25 full papers were accepted. In addition, we decided to accept 8 short papers for poster presentation. Short papers appear as two-page extended abstracts in a separate section of this volume. The topics of the accepted papers vary from theoretical results of learning algorithms to innovative applications of grammatical inference, and from learning several interesting classes of formal grammars to applications to natural language processing.

In parallel to the submission and reviewing of research papers, a machine translation competition, named Tenjinno, took place. In a separate paper in this volume, the organizers of the competition report on the peculiarities of such an endeavor and some interesting theoretical findings to which they have been led. Last but not least, we were honored by the contributions of our two invited speakers, Yuji Matsumoto, from Nara Institute of Science and Technology, Japan, and Jean-Philippe Vert, from Ecole des Mines de Paris, France. Both invited speakers provided interesting talks on the topics of natural language processing and bioinformatics, and we hope both talks invoked potential applications of grammatical inference.

The editors would like to acknowledge the contribution of the conference's Program Committee and the Additional Reviewers in reviewing the submitted papers and thank the Organizing Committee for their invaluable help in organizing the conference. Particularly, we would like to thank Colin de la Higuera, Menno van Zaannen, Bradford Starkie, and Dominique Estival for their additional voluntary service to the grammatical inference community, through this conference. We would also like to acknowledge the use of the Cyberchair software, from Borbala online conference services, in the submission and reviewing process. Finally, we are grateful for the generous support and sponsorship of the conference by the University of Electro-Communications, the PASCAL, Inoue foundation for Science, SIG Mathematical Modeling and Problem Solving in Information Processing Society of Japan and New Horizons in Computing (NHC) (Scientific Research on Priority Areas, supported by MEXT, Japan).

September 2006

Yasubumi Sakakibara
Satoshi Kobayashi
Kengo Sato
Tetsuro Nishino
Etsuji Tomita

Organization

Conference Chair

Etsuji Tomita	University of Electro-Communications, Japan

Technical Program Committee Co-chairs

Yasubumi Sakakibara	Keio University, Japan
Satoshi Kobayashi	University of Electro-Communications, Japan

Technical Program Committee

Naoki Abe	IBM Thomas J. Watson Research Center, USA
Pieter Adriaans	Perot Systems Corporation/University of Amsterdam, Netherlands
Dana Angluin	Yale University, USA
Hiroki Arimura	Hokkaido University, Japan
Mitra Basu	City University of New York, USA
François Coste	Symbiose, INRIA/IRISA, France
Pierre Dupont	University of Louvain, Belgium
Henning Fernau	University of Hertfordshire, UK
Colin de la Higuera	EURISE, Univ. de St. Etienne, France
Vasant Honavar	Iowa State University, USA
Chih-Jen Lin	National Taiwan University, Taiwan
Laurent Miclet	ENSSAT, Lannion, France
Gopalakrishnaswamy Nagaraja	Indian Institute of Technology, India
Katsuhiko Nakamura	Tokyo Denki University, Japan
Jacques Nicolas	IRISA, France
Tim Oates	University of Maryland Baltimore County, USA
Arlindo Oliveira	Lisbon Technical University, Portugal
Jose Oncina Carratala	Universidad de Alicante, Spain
Georgios Paliouras	Inst. of Informatics and Telecommunications, NCSR , Greece
Rajesh Parekh	Yahoo!, USA
Kengo Sato	CBRC, NAIST, Japan
Giora Slutzki	Iowa State University, USA
Bradford Starkie	Starkie Enterprise, Australia
Eiji Takimoto	Tohoku University, Japan
Menno van Zaanen	Universiteit van Amsterdam, Netherlands
Enrique Vidal	Universidad Politecnica de Valencia, Spain
Osamu Watanabe	Tokyo Institute of Technology, Japan
Thomas Zeugmann	Hokkaido University, Japan

Additional Reviewers

T. Armstrong
L. Becerra-Bonache
M. Bugalho
D. Eisenstat
J.-C. Janodet
H.-U. Krieger
J. A. Laxminarayana
A. Martins
J. Poland
J. M. Vilar

Organizing Committee Chair

Tetsuro Nishino	University of Electro-Communications, Japan

Organizing Committee

Colin de la Higuera	EURISE, Univ. de St. Etienne, France
Kazuhiro Hotta	University of Electro-Communications, Japan
Satoshi Kobayashi	University of Electro-Communications, Japan
Yoichi Motomura	National Institute of Advanced Industrial Science and Technology, Japan
Katsuhiko Nakamura	Tokyo Denki University, Japan
Seiya Okubo	University of Electro-Communications, Japan
Yasuhiro Tajima	Tokyo University of Agriculture and Technology, Japan
Haruhisa Takahashi	University of Electro-Communications, Japan
Jun Tarui	University of Electro-Communications, Japan
Mitsuo Wakatsuki	University of Electro-Communications, Japan

Sponsoring Institutions

University of Electro-Communications

PASCAL Network

Inoue Foundation for Science

SIG Mathematical Modeling and Problem Solving in Information Processing Society of Japan

New Horizons in Computing (NHC) (Scientific Research on Priority Areas, supported by MEXT, Japan)

Table of Contents

Invited Papers

Regular Papers

Poster Papers