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Tim Kovacs Xavier Llorà
Keiki Takadama Pier Luca Lanzi
Wolfgang Stolzmann Stewart W. Wilson (Eds.)

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Series Editors

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

Volume Editors

Tim Kovacs
University of Bristol, Bristol, BS8 1UB, UK
E-mail: kovacs@cs.bris.ac.uk

Xavier Llorà
University of Illinois at Urbana-Champaign, Urbana, IL, 61801, USA
E-mail: xllora@illigal.ge.uiuc.edu

Keiki Takadama
Tokyo Institute of Technology, Tokyo, 152-8550, Japan
E-mail: keiki@hc.uec.ac.jp

Pier Luca Lanzi
Politecnico di Milano, 20133 Milano, Italy
E-mail: lanzi@elet.polimi.it

Wolfgang Stolzmann
Daimler Chrysler AG, 71059 Sindelfingen, Germany
E-mail: wolfgang.stolzmann@daimlerchrysler.com

Stewart W. Wilson
Prediction Dynamics, Concord, MA 01742, USA
E-mail: wilson@prediction-dynamics.com

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Preface

The work embodied in this volume was presented across three consecutive editions of the International Workshop on Learning Classifier Systems that took place in Chicago (2003), Seattle (2004), and Washington (2005). The Genetic and Evolutionary Computation Conference, the main ACM SIGEvo conference, hosted these three editions. The topics presented in this volume summarize the wide spectrum of interests of the Learning Classifier Systems (LCS) community. The topics range from theoretical analysis of mechanisms to practical consideration for successful application of such techniques to everyday data-mining tasks.

When we started editing this volume, we faced the choice of organizing the contents in a purely chronological fashion or as a sequence of related topics that help walk the reader across the different areas. In the end we decided to organize the contents by area, breaking the time-line a little. This is not a simple endeavor as we can organize the material using multiple criteria. The taxonomy below is our humble effort to provide a coherent grouping. Needless to say, some works may fall in more than one category. The four areas are as follows:

Knowledge representation. These chapters elaborate on the knowledge representations used in LCS. Knowledge representation is a key issue in any learning system and has implications for what it is possible to learn and what mechanisms should be used. Four chapters analyze different knowledge representations and the LCS methods used to manipulate them.

Mechanisms. This is by far the largest area of research. Nine chapters relate theoretical and empirical explorations of the mechanisms that define LCS on the following subjects: (1) bloat control for variable-length representations, (2) classifier manipulation techniques: classifier ensembles and post processing (3) error guidance and the exploration/exploitation dilemma, (4) internal-model driven multistep LCS, (5) effects of class imbalance, (6) bounding convergence criteria for reinforcement-based LCS, and (7) techniques for dealing with missing data.

New directions. This group of chapters focuses on LCS applied to new and unconventional problems. Two chapters present work on the usage of LCS as learning models for system composition where they are used to create complex strategies based on properly assembling basic capabilities. Two other chapters explore seminal work on LCS as function approximators, exploring different architectures and methods to efficiently achieve this goal. Another chapter describes a new way of using LCS for determining relevant variables

for the predictive process, instead of only focusing on classification performance. The last chapter of this group explores formal relations between LCS and ant colony optimization for the traveling salesman problem, illustrating how LCS can also be used to solve such a class of problems.

Application-oriented research and tools. The last group of chapters describes applied research, mostly oriented to data-mining applications. Two chapters explore and analyze how to improve the performance and accuracy of LCS for data-mining tasks. Two other chapters explore a more practical path that involves the creations of tools for (1) assisting the process of knowledge discovery and its visualization for medical data, and (2) creating computer-aided design tools that can help designers to identify and explore application areas where LCS methods can provide an efficient solution.

As mentioned earlier, this volume is based on the 6th, 7th, and 8th editions of the International Workshop on Learning Classifier Systems and would not have been possible without all the authors who contributed to it via the workshop.

Jaume Bacardit	University of Nottingham, UK
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Olgierd Unold	Wroclaw University of Technology, Poland
Atsushi Wada	ATR Human Information Science Laboratories, Japan
Stewart W. Wilson	Prediction Dynamics, USA
David Wyatt	University of West England, UK

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IWLCS 2003 and 2004

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IWLCS 2005 and Additional Reviewing for this Volume

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Stewart W. Wilson	Prediction Dynamics, USA

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Tim Kovacs
Xavier Llorà
Keiki Takadama
Pier Luca Lanzi
Wolfgang Stolzmann
Stewart W. Wilson

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Pier Luca Lanzi, Wolfgang Stolzmann, Stewart W. Wilson

Tim Kovacs
University of Bristol,

Bristol, BS8 1UB, UK
kovacs@cs.bris.ac.uk

Xavier Llorà
University of Illinois at Urbana-Champaign,
Urbana, IL 61801, USA
xllora@illigal.ge.uiuc.edu

Keiki Takadama
Tokyo Institute of Technology,
Tokyo, 152-8550, Japan
keiki@hc.uec.ac.jp

Pier Luca Lanzi
Politecnico di Milano,
Milano, 20133, Italy
lanzi@elet.polimi.it

Wolfgang Stolzmann
Daimler Chrysler AG,
71059 Sindelfingen, Germany
wolfgang.stolzmann
@daimlerchrysler.com

Stewart W. Wilson
Prediction Dynamics,
Concord, MA 01742, USA
wilson@prediction-dynamics.com

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