International Workshop
“What can FCA do for Artificial Intelligence?”
FCA4AI
August 28, 2012
Montpellier, France
held at the
European Conference on Artificial Intelligence 2012

Editors
Sergei O. Kuznetsov (NRU HSE Moscow)
Amedeo Napoli (LORIA Nancy)
Sebastian Rudolph (AIFB KIT Karlsruhe)

http://www.fca4ai.hse.ru
What FCA Can Do for Artificial Intelligence?
FCA4AI: An International Workshop

Preface

Formal Concept Analysis (FCA) is a mathematically well-founded theory aimed at data analysis and classification. FCA allows one to build a concept lattice and a system of dependencies (implications) which can be used for many AI needs, e.g. knowledge processing involving learning, knowledge discovery, knowledge representation and reasoning, ontology engineering, as well as information retrieval and text processing. Thus, there exist many “natural links” between FCA and AI.

Recent years have been witnessing increased scientific activity around FCA, in particular a strand of work emerged that is aimed at extending the possibilities of FCA w.r.t. knowledge processing, such as work on pattern structures and relational context analysis. These extensions are aimed at allowing FCA to deal with more complex than just binary data, both from the data analysis and knowledge discovery points of view and from the knowledge representation point of view, including, e.g., ontology engineering.

All these works extend the capabilities of FCA and offer new possibilities for AI activities in the framework of FCA. Accordingly, in this workshop, we are interested in two main issues:

- How can FCA support AI activities such as knowledge processing (knowledge discovery, knowledge representation and reasoning), learning (clustering, pattern and data mining), natural language processing, information retrieval.
- How can FCA be extended in order to help AI researchers to solve new and complex problems in their domains.

The workshop is dedicated to discuss such issues. The papers submitted to the workshop were carefully peer-reviewed by two members of the program committee and 11 papers with the highest scores were selected. We thank all the PC members for their reviews and all the authors for their contributions. We also thank the organizing committee of ECAI-2012 and especially workshop chairs Jérôme Lang and Michèle Sebag for the support of the workshop.

The Workshop Chairs
Sergei O. Kuznetsov
National Research University Higher Schools of Economics, Moscow, Russia
Amedeo Napoli
LORIA (CNRS – INRIA – Université de Lorraine), Vandoeuvre les Nancy, France
Sebastian Rudolph
AIFB Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
Program Committee

Mathieu D’Aquin (Open University, UK)
Franz Baader (Technische Universität Dresden, Germany)
Radim Bělohlávek (Palacký University, Olomouc, Czech Republic)
Claudio Carpineto (Fondazione Ugo Bordoni, Roma, Italy)
Felix Distel (Technische Universität Dresden, Germany)
Sébastien Ferré (IRISA Rennes, France)
Bernhard Ganter (Technische Universität Dresden, Germany)
Pascal Hitzler (Wright State University, Dayton, Ohio, USA)
Marianne Huchard (LIRMM Montpellier, France)
Dmitry I. Ignatov (NRU Higher School of Economics, Moscow, Russia)
Mehdi Kaytoue (Universidade Federal Minas Gerais, Belo Horizonte, Brazil)
Markus Krötzsch (University of Oxford, UK)
Sergei A. Obiedkov (NRU Higher School of Economics, Moscow, Russia)
Uta Priss (Ostfalia University of Applied Sciences, Wolfenbüttel, Germany)
Baris Sertkaya (SAP Dresden, Germany)
Gerd Stumme (Universität Kassel, Germany)
Petko Valtchev (Université du Québec à Montréal, Montréal, Canada)
# Table of Contents

1. **Invited Talk**  
   *Relational Concept Analysis: A Synthesis and Open Questions*  
   Marianne Huchard ........................................ 5

2. **Formal Concept Analysis Applied to Transcriptomic Data**  
   Mehwish Alam, Adrien Coulet, Amedeo Napoli and Malika Smaiıl-Tabbone 7

3. **A New Approach to Classification by Means of Jumping Emerging Patterns**  
   Aleksey Buzmakov, Sergei O. Kuznetsov, and Amedeo Napoli ........ 15

4. **Semantic Querying of Data Guided by Formal Concept Analysis**  
   Victor Codocedo, Ioanna Lykourentzou and Amedeo Napoli .......... 23

5. **Information Retrieval by On-line Navigation in the Latticial Space-search of a Database, with Limited Objects Access**  
   Christophe Demko and Karell Bertet ............................. 33

6. **Relational Data Exploration by Relational Concept Analysis**  
   Xavier Dolques, Marianne Huchard, Florence Le Ber and Clémentine Nebut 41

7. **Let the System Learn a Game: How Can FCA Optimize a Cognitive Memory Structure**  
   William Dyce, Thibaut Marmin, Namrata Patel, Clement Sipieter, Guillaume Tisserant and Violaine Prince ....................... 45

8. **An Approach to Semantic Content Based Image Retrieval Using Logical Concept Analysis. Application to Comicbooks**  
   Clément Guérin, Karell Bertet and Arnaud Revel ..................... 53

9. **Classification Reasoning as a Model of Human Commonsense Reasoning**  
   Xenia A. Naidenova ............................................. 57

10. **Finding Errors in New Object in Formal Contexts**  
    Artem Revenko, Sergei O. Kuznetsov and Bernhard Ganter .......... 65

11. **Finding Minimal Rare Itemsets in a Depth-first Manner**  
    Laszlo Szathmary, Petko Valtchev, Amedeo Napoli and Robert Godin .... 73

12. **A System for Knowledge Discovery in Big Dynamical Text Collections**  
    Sergei O. Kuznetsov, Alexey A. Neznanov and Jonas Poelmans ........ 81