

Preface

This volume features the supplementary papers of the 15th International Conference on Formal Concept Analysis (ICFCA 2019), held during June 25-28, 2019, at Frankfurt University of Applied Sciences, Frankfurt, Germany, and the accepted papers of two workshops associated with the conference. Formal Concept Analysis (FCA) is a mathematical field rooted in lattice and order theory which, although being of such a theoretical nature, has proved to be of interest to various applied fields such as knowledge discovery and data mining, database theory, data visualization, and many others. The workshops focused on two aspects, namely, *Applications and Tools of FCA*, and *FCA in the Big Data Era*.

The main conference received 36 submissions by authors from 14 different countries. Each paper was reviewed by at least three members of the program committee or editorial board. Twenty papers are included in the conference proceedings published by Springer (LNAI volume 11511). Three others, considered valuable for presentation during the conference, are included in this volume.

The workshop *Applications and Tools of FCA* received 14 submissions. Each paper was reviewed by two members of the program committee: 12 were selected and are included as short papers in this volume. The workshop *FCA in the Big Data Era* received 8 submissions. Each paper was reviewed by four members of the program committee. Four of them were selected, and are included in this volume.

Our gratitude goes to all the authors of submitted papers, and to the program committees of the conference and workshops whose commitment allowed the publication of this volume.

June 2019

Diana Cristea
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Workshop "Applications and Tools of Formal Concept Analysis"

This workshop seeks to bring together researchers that have developed tools for FCA or interesting applications based on different FCA algorithms. Its aim is to help the FCA community get an overview and to help researchers understand how to use the existing tools. Nowadays, although there are a number of implementations available, many researchers implement their own solutions instead of taking advantage of the existing ones. Reasons behind this are multiple: needing a new feature or a slight modification of an existing feature (for example a different input type), not fully understanding what the tool comprises of, the lack of documentation, etc. We hope that this workshop can bridge the gap between existing tools and possible users. Therefore, both categories would benefit from it: on one hand authors will get useful feedback for improving and further developing the tool, on the other hand the audience will get a better understanding of the tools and can easily start using the tools in their future research. There are twelve contributions to the workshop that mainly concentrate on how to use the implemented features, and even have a form of user manual for the tool.

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Workshop "Formal Concept Analysis in the Big Data Era"

With the advent of *Big Data* and the increasing number of studies towards their management and analysis, it becomes important to get a better insight into existing studies, trends and challenges and rely on promising theories such as *Formal Concept Analysis* together with recently developed technologies to design new, accurate and scalable solutions for big data analytics.

Big Data (BD) are very large and possibly heterogeneous and unstructured data collections defined by at least 7 V's: **V**olume (*e.g.*, zettabytes), **V**elocity (*i.e.*, evolving and stream data), **V**ariety, (*e.g.*, text, image, video), **V**ariability (*i.e.*, changes in the data flow rates), **V**eracity (accuracy), **V**isualization, and **V**alue (*i.e.*, extracted information and knowledge).

Formal Concept Analysis (FCA) is an important formalism that is associated with a variety of research areas such as lattice theory, knowledge representation, data mining, machine learning, and semantic Web, to name a few. It is successfully exploited in an increasing number of application domains such as software engineering, information retrieval, social network analysis, and bioinformatics. The mathematical power of FCA comes from its concept lattice formalization in which each element in the lattice captures a formal concept while the whole structure represents a conceptual hierarchy that offers browsing, clustering and rule mining facilities.

Although there are significant theoretical and practical contributions within the FCA community in a variety of topics, including the design and implementation of efficient algorithms and tools for concept lattice computation and exploitation, the goal of this workshop is to pinpoint and examine a set of important and relevant research directions in Big Data management, and see where the FCA community can very likely make significant contributions. As an example, we expect to have fruitful discussions about how Formal Concept Analysis and some of its extensions can be exploited, revisited and coupled with recent processing paradigms (*e.g.*, *MapReduce* and *Hadoop*) to maximize the benefits of Big Data through their analysis.

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