

Preface

The two-volume set of proceedings of IJCRS 2017, the 2017 International Joint Conference on Rough Sets, contains the results of the meeting of the International Rough Set Society held at the University of Warmia and Mazury in Olsztyn, Poland, during July 3–7, 2017.

Conferences in the IJCRS series are held annually and comprise four main tracks relating the topic rough sets to other topical paradigms: rough sets and data analysis covered by the RSCTC conference series from 1998, rough sets and granular computing covered by the RSFDGrC conference series since 1999, rough sets and knowledge technology covered by the RSKT conference series since 2006, and rough sets and intelligent systems covered by the RSEISP conference series since 2007. Owing to the gradual emergence of hybrid paradigms involving rough sets, it was deemed necessary to organize Joint Rough Set Symposiums, first in Toronto, Canada, in 2007, followed by Symposiums in Chengdu, China in 2012, Halifax, Canada, 2013, Granada and Madrid, Spain, 2014, Tianjin, China, 2015, where the acronym IJCRS was proposed, continuing with the IJCRS 2016 conference in Santiago de Chile.

The IJCRS conferences aim at gathering together experts from academia and industry representing fields of research in which theoretical and applicational aspects of rough set theory already find or may potentially find usage. They also provide a venue for researchers wanting to present their ideas before the rough set community, or for those who would like to learn about rough sets and find out whether they could be useful for their problems.

This year's conference, IJCRS 2017, celebrated the 35th anniversary of the seminal work by Prof. Zdzisław Pawlak published in 1982, in which the notion of a rough set emerged.

Professor Zdzisław Pawlak (1926–2006) contributed to computer science with many achievements such as addressless Pawlak machines, a random number generator, a participant in the design and production of the Polish computing machine UMC-2, and a proposition of the first genomic grammar (1965).

The emergence of the rough set idea owes much to Prof. Pawlak's deep interest in the foundations of logics and mathematics — in the 1960s he conducted seminars with the eminent logician and mathematician Prof. Andrzej Ehrenfeucht at the Mathematical Institute of the Polish Academy of Sciences. At the root of the idea of a rough set lie the mathematical notions of the lower and the upper approximation known in geometry and analysis, and the idea of an inexact concept as possessing a boundary that consists of things belonging neither in the concept nor in its complement, going back to Gottlob Frege.

The second motive for celebration was the 50th anniversary of the dissemination in the scientific world by Prof. Solomon Marcus (1924–2015) of the Pawlak model of the DNA grammar, published in 1965 in Polish, in a small popular monograph on grammar

theory, intended for high schoolers. This grammar, constructed also visually by means of chains of triangles, was the precursor of visual and mosaic grammars.

The conference commemorated Prof. Pawlak with a special session on “Zdzisław Pawlak — Life and Heritage” with Prof. Grzegorz Rozenberg as the honorary chair and Professor Andrzej Skowron as the chair; there were also commemorative talks by Prof. Grzegorz Rozenberg, Sankar Kumar Pal, Lech Polkowski, Roman Słowiski, Shusaku Tsumoto, Guoyin Wang, Zbigniew Ras, and Urszula Wybraniec-Skardowska. The essay by Prof. Wybraniec-Skardowska opens the proceedings.

The conference included six keynote lectures by Prof. Rakesh Agrawal, Jan Komorowski, Eric Matson, Sankar Kumar Pal, Grzegorz Rozenberg, and Guoyin Wang as well as four plenary lectures by Profs. Tianrui Li, Son Hung Nguyen, Pradipta Maji, Amedeo Napoli, and Zbigniew Ras.

For the process of submission, review, acceptance, updating, and compilation of the proceedings, the EasyChair Pro system was used that allowed for subdivision of submissions into tracks: Rough Sets (68 submissions), Special Session on Vagueness, Rough Sets and Mereology (11 submissions), Special Session on Trends in Multi-Agent Systems (five submissions), Special Session on Formal Concept Analysis, Rough Set Theory and Their Applications (five submissions), Special Session: Software and Systems for Rough Sets (four submissions), Workshop Three-Way Decisions, Uncertainty, Granular Computing (The 5th International Workshop on Three-way Decisions, Uncertainty, and Granular Computing, TWDUG 2017; 17 submissions), Workshop: Recent Advances in Biomedical Data Analysis (three submissions), and one invited submission to the Special Session “Zdzisław Pawlak — Life and Heritage.” In all, 114 (130 with invited talks) submissions were received. Submissions were allowed to be regular at 10–20 long length and short at 6–8 pages. They were reviewed by members of Program Committee (PC) and invited reviewers, each submission reviewed by at least three reviewers in certainly positive cases and by four or five reviewers in cases of conflicting reviews by the first three reviewers. Finally, the most complex cases were decided by the conference and PC chairs.

Of 114 (130) submissions, after positive reviews and decisions, 74 papers were selected to be included as regular papers and 16 as short papers in the proceedings, which comprise two volumes. Section 1, Invite Talks, contains the essay by Urszula Wybraniec Skardowska in remembrance of Prof. Pawlak, abstracts of the keynote, plenary, IRSS fellow talks and tutorials, as submitted by respective speakers, making up 16 chapters. Section 2 on “General Rough Sets” contains papers devoted to the rough set theory in its foundational and decision-theoretic aspects, collected in 44 chapters. Section 3 on “Software and Systems for Rough Sets” contains papers submitted and accepted to the special session with this title. These sections constitute the first volume of proceedings.

The second volume of proceedings opens with Section 4, which collects papers submitted and accepted to the special session on “Vagueness, Rough Sets, Mereology” is devoted to foundational concept-theoretical and logical analysis of the rough set idea, as well as papers on applications of mereology in intelligent methods of computer science, containing ten chapters. Section 5, “Workshop on Three-Way Decisions, Uncertainty, Granular Computing,” comprises 17 chapters. In these papers, the classic trichotomy introduced by Prof. Pawlak into data objects with respect to a given concept

as belonging certainly in the concept, certainly not belonging in the concept, and belonging into the boundary of the concept is extended to soft computing with these regions; the topic of granular computing fits naturally in this section since rough sets, from their very inception, are computed with elementary granules defined by attribute-value descriptors. In Section 6 on “Recent Advances in Biomedical Data Analysis, Trends in Multi-Agent Systems, Formal Concept Analysis, Rough Set Theory and Their Applications,” we find submitted and accepted regular papers on these topics that are strongly tied to the rough set domain. Section 6 contains 13 chapters; 24 papers were rejected, i.e., 21% of submissions. In the “General Rough Sets” track, 22 papers were rejected, i.e., 32% of submissions to this track.

In addition to the proceedings, participants of the conference found in the conference sets a booklet, “The Polish Trace,” consisting of four chapters dedicated to the little known yet spectacular achievements of Polish scientists in the area of computer science: on the work by Jan Czocharlski, “the forefather of the silicon era”; on achievements of cryptologists Jan Kowalewski and professors of Warsaw University Stanisław Leśniewski, Stefan Mazurkiewicz, and Waław Sierpiński in deciphering codes of the Red Army during the Polish–Russian war of 1918–1920; on cryptologists Marian Rejewski, Jerzy Różycki, and Henryk Zygalski, who broke the German Enigma code in the 1930s; and on the contributions of Stanisław Leśniewski, Jan Łukasiewicz, and Alfred Tarski to the theory of concepts, computing, and soft computing.

An additional booklet contained texts of talks in the Special Session devoted to the memory of Prof. Zdzisław Pawlak.

We acknowledge the acceptance of our proposal of organizing IJCRS 2017 in Poland at the University of Warmia and Mazury by authorities of the International Rough Set Society, the owner of rights to the series.

Honorary patronage of the conference was accepted by Gustaw Marek Brzezina, Marshal of the Province of Warmia and Mazury, Prof. Ryszard Górecki, Rector of the University of Warmia and Mazury, and by Dr. Piotr Grzymowicz, President of the City of Olsztyn.

Scientific patronage was given by the International Rough Set Society and by the Committee on Informatics of the Polish Academy of Science.

Many eminent scientists offered us their kind help by accepting our invitations. Thanks go to the honorary chairs of the conference, Profs. Ryszard Górecki, Sankar Kumar Pal, Roman Słowiński, Andrzej Skowron, and Jerzy Nowacki as well as Wojciech Samulowski, Director of the Olsztyn Park of Science and Technology, to Guoyin Wang, to the keynote speakers Profs. Rakesh Agrawal, Jan Komorowski, Eric Matson, Sankar Kumar Pal, Grzegorz Rozenberg, and Guoyin Wang, and to the plenary speakers, Profs. Tianrui Li, Nguyen Hung Son, Pradipta Maji, Amedeo Napoli, and Zbigniew Ras. The Steering Committee members are gratefully acknowledged for their support.

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