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Proceedings of the
10th International
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 Springer

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Preface

The goal of the CORES series of conferences is the development of theories, algorithms, and applications of pattern recognition and machine learning methods. These conferences have always served as useful forum where researchers, practitioners, and students working in different areas of pattern recognition can meet to come together and help each other keeping up with this active field of research. This book is a collection of 52 carefully selected works which have been reviewed by the experts from the domain and accepted for presentation during the 10th International Conference on Computer Recognition Systems CORES 2017. We hope that the book can become the valuable source of information on contemporary research trends and most popular areas of application.

Editors would like to express their deep thanks to authors for their valuable submissions and all reviewers for their hard work, and we believe that this book could be a reference tool for scientists who deal with the problems of designing computer pattern recognition systems.

This year we are celebrating the 85th Anniversary of Prof. Juliusz L. Kulikowski from Nalecz Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences, who will be also plenary speaker during the conference. We will have also possibility to attend two outstanding keynote speeches by Prof. Katarzyna Stapor from Silesian University of Technology, Poland, and Dr. Bartosz Krawczyk from Virginia Commonwealth University, USA.

Although the last, not least, we would like to give special thanks to local organizing team (Konrad Jackowski, Dariusz Jankowski, Maciej Krysmann, Paweł Trajdos, Andrzej Żołnierek) who did a great job.

We would like also to fully acknowledge support from the Wrocław University of Technology, especially Prof. Andrzej Kasprzak—Chair of Department of Systems and Computer Networks and Prof. Czesław Smutnicki—Dean of Faculty of Electronics which have also supported this event.

We believe that this book could be a great reference tool for scientists who deal with the problems of designing computer pattern recognition systems.

May 2017

Robert Burduk
Marek Kurzynski
Michal Wozniak

Memories of Professor Co-workers

Juliusz L. Kulikowski received MSc. degree in electronic engineering from the Warsaw Technical University in 1955, CandSc. degree from the Moscow Higher School of Technology in 1959, and DSc. degree from the Warsaw Technical University in 1966. Since 1966, he was a scientific worker in several Institutes of the Polish Academy of Sciences. He was a nominated professor in 1973. Since 1981, he is employed in the Institute of Biocybernetics and Biomedical Engineering PAS in Warsaw. He published about 300 papers in information science, signals detection in noise, image processing methods, artificial intelligence, application of computers in medicine as well as 8 books and monographs in these domains. For many years, he was the Editor in Chief of a scientific quarterly “Computer Graphics & Vision”, a member of IFIP TC13 on “Human-Computer Interaction” and of IFAC TC on “Stochastic Systems”, and a Chairman of the Polish National Committee for cooperation with the Committee of Data for Science and Technology CODATA. He is an ordinary member of the Warsaw Scientific Society.

Professor Juliusz Lech Kulikowski appeared in our life when he started working at the Institute of Automation in 1966 as an associate professor—specialist in frequency modulation technology. He was appointed the head of a department at the institute. Then, we were not yet his employees. He immediately gained a reputation for modest, hardworking, and demanding person. Our first contact with him was participating in a doctoral seminar, which he led next to managing of his team.

We were fascinated by his depth knowledge and at the same time a clear presentation of statistical methods in both theoretical and practical terms. In 1973, he received the title of associate professor, and in 1989 the title of professor. At that time, a team headed by Professor had his first success in the form of Award Scientific Secretary of the Polish Academy of Sciences in the field of digital image processing. Then, the first Polish system of computer image analysis CPO-1/Odra 1204 was developed.

In 1976, Professor left the Institute and started working as a director of the Computer Science Committee chaired by Prime Minister Piotr Jaroszewicz. At that time, under the direction of Professor Kulikowski, “Program for the development of public IT services for the years 1978–1980” was developed and approved by the Minister of Science, Technology, and Higher Education Prof. Sylwester Kaliski. The program included the development of government information systems, manufacturing hardware, and the establishment of a system of government SINTO (System for Scientific Technical and Organizational Information), which was supposed to improve the circulation of scientific information in the country, integrating functional activities of centers of scientific and technical information in the ministries, the unions and the workplaces as well as the activities of archives and libraries.

Then, watching the activity of Professor at such a high state level while he was combining this activity with work in the Institute of Computer Science Polish Academy of Science, we did not think he would ever come back to us (to our Institute). This happened in 1981 when the Institute of Biocybernetics and Biomedical Engineering Polish Academy of Science was established. Professor Kulikowski was appointed the head of the Department of Information Processing Method, where his former and new employees were found. The team employed in the Department counted over 20 people. In the eighties and early nineties, next system for image analysis CPO-1-3, minicomputer system CPO/M6810 with television camera, and finally improved systems of computer vision VIST and SUPERVIST were created.

In 1984, the Institute moved from its headquarter at Twarda street to newly built buildings at Ks. Trojden street. There were new topics of work and new achievements: the design of DIAVENT system—a computer system for analysis of ultrasound images of the heart, based on the original mathematical model of ventricular contractility (1996); the design of an electronic field orientation for the blind ESOT (1999); and the design of computer diagnosis of urine bladder cancer. After started working at the Institute of Biocybernetics and Biomedical Engineering, Professor intensified his scientific activity in theoretical issues, such as the use of discriminant analysis and nonparametric tests for the detection of signals, extended relational algebra, the measure of the quality of information, tripartite graphs, topological logic (relative), and morphological spectra. He worked also on the concept of hyper-relation as a generalization relationship, which is useful to describe and recognize complex images, the use of deontic logic, and the concept of recognizing contents of the images based on the ontology of domain describing their structure using a system of interconnected relationships.

All the time he has been writing and publishing articles, textbooks, and monographs and also acted as an editor. He was always very conscientious, thorough, and well prepared.

He collaborated with the editorial offices, lectured at home and abroad, promoted 20 doctors (including many among us). He was active in the national and international organizations (CODATA, IFIP TC-13 Human-Computer Interaction), in a number of scientific councils of institutes, reviewed doctoral dissertations, post-doctoral research projects, articles in scientific journals. He was always up to date

with publications in his areas of scientific interest for what allowed him knowledge of foreign languages (Russian, German, English, and French). In the seventies, he was repeatedly invited as a visiting professor for lectures to the Dipartimento di Informatica Università Degli Studi Di Udine and later to the TU Otto von Guericke University in Magdeburg. It was, among others, in recognition of his high position in the scientific field of algebraic methods of recognition.

He was always willing to help with scientific support, add courage, and serve good advice. His kindness, serenity, and a great sense of humor cause that every day we gather with pleasure at his secretariat even for a moment to feel the friendly atmosphere. He cared diligently for our scientific development, but he did it subtly and without any stress for us. We gratefully and respectfully still admire his diligence, modesty, tolerance, honesty, and his serenity, great sense of humor and common sense, and distance to matters less important. He is always cheerful and with a visible need of bringing joy to others.

Privately, a lover of literature and music, a talented poet.

Annamonika Dulewicz

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