Preface to the WILF 2021 proceedings: Back together again!

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The 13th International Workshop on Fuzzy Logic and Applications, WILF 2021, was held in Vietri sul Mare, Italy during December 20-22, 2021.

This is the latest instance of an established series of interdisciplinary meetings. Organised by the Italian community of researchers in fuzzy logic and soft computing, it started as a national workshop, but rapidly evolved into an event with an international perspective, hosting renown scientists from all over the world in various capacities as delegates, organisers, keynote speakers. The previous editions of WILF have been held in Naples (1995), Bari (1997), Genoa (1999), Milan (2001), Naples (2003), Crema (2005), Camogli (2007), Palermo (2009), Trani (2011), Genoa (2013), Naples (2016), and Genoa (2018).

For the 2021 edition, we wanted to provide an occasion for meeting each other and for person-to-person interaction, rather than one-directional communication. We opted for a format that emphasizes exchange of ideas and discussion. Contributions were of three types. Besides regular ones, aimed at presenting novel research results, we also encouraged brief, "highlight" presentations of mature research to give it higher visibility, and "ideas" that described research in an early or preliminary stage, to foster discussion and produce suggestions. In this way, the conference covered present, as well as past and future, research.

The topical focus of this edition was on the relationship of Fuzzy Set theory and methods with humans, society, and data-driven approaches to Computational Intelligence, that is to say essentially Machine Learning. Nowadays, Artificial Intelligence has become an enabling technology that pervades many aspects of our daily life. Machine Learning is of course at the forefront of this advancement. However, as the role of Artificial Intelligence becomes more and more important, so does the need for reliable solutions to several issues that go well beyond technological aspects. These include, among many others: accountability and explainability; interaction between artificial and human intelligence, including issues of nonverbal communication; monitoring and minimising the effects of biases (gender, race, culture…) on machine-guided decision making.

Notwithstanding their huge success, purely data-driven technologies are showing their limits precisely in these areas. There is a growing need for methods that, in a tight interaction with them, provide different degrees of control over the several facets of automated decision making,

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allowing the use of explicit knowledge beyond what can be extracted from data. The diversity and complementarity of Computational Intelligence techniques in addressing these issues is bound to play a crucial role.

The contributions we received were fully in line with these topics. After a rigorous peer-review process, among the submissions received from all Europe we selected 20 high-quality regular manuscripts, 6 idea papers and 4 highlight abstracts. These were accepted for presentation at the conference and are published in this volume.

In addition, the event hosted three very interesting keynote talks by high profile researchers:

- *Extensions of fuzzy integrals and applications to the computational brain* – by Humberto Bustince, full professor of Computer Science and Artificial Intelligence in the Public University of Navarra (Spain) and Honorary Professor at the University of Nottingham (UK).
- *Fuzzy Logic and XAI: Past, Present, and Some Thoughts on the Future* – by Scott Dick, professor at the Faculty of Engineering - Electrical & Computer Engineering Dept, University of Alberta (Canada).
- *Fuzzy sets: the legacy and its future* – by Didier Dubois, Emeritus Research Advisor at IRIT, the Computer Science Department of Paul Sabatier University in Toulouse, France and French National Centre for Scientific Resarch (CNRS).

Finally, two thematic round tables were held:

- *Computational Intelligence methods for Digital Health, INdAM-GNCS research day* – chair Giovanna Castellano, University of Bari "Aldo Moro" (Italy)
- *Towards national laboratories on soft computing* – chair Antonio di Nola, University of Salerno (Italy)

During the past two years, due to the COVID-19 pandemic there have been many obstacles to the organisation of meetings. Some WILF 2021 delegates were not able to travel, and the event was held in a mixed format, in presence and in teleconferencing. Still, the participation was high, and there was a very rich social activity program. The success of this edition can be summarised by the motto we chose since the very beginning: "Back together again!".

Credit for this success, however, is due to the contribution of many people, in particular the Program Committee members for their commitment to providing high-quality, constructive reviews, the keynote speakers, the round table organisers, all the contributors and delegates, and last but by no means least the local organising secretariat (IIASS, Dr. Tina Nappi) for making everything run smoothly and flawlessly.

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