Mathware & Soft Computing

The magazine of the European Society for Fuzzy Logic and Technology

Dialogue between Bernadette Bouchon-Meunier and Vladik Kreinovich

Celebration on the 50th anniversary of the theory of fuzzy sets

Conference reports

News and calls

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Message from the Editor-in-Chief (June 2016)

HUMBERTO BUSTINCE

Dear colleagues and friends:

Here it is the summer issue of our Mathware & Soft Computing online magazine. As usual, we have made our best efforts to prepare for you an interesting variety of topics and news all around our community. These are busy days, plenty of conferences and trips, but I am sure all of us will find some time to enjoy the contents of the issue.

Starting from the interview between Bernadette Bouchon-Meunier and Vladik Kreinovich, which brings together not only two of the main figures in our area that all of us know and appreciate, but also links Europe and America. This talk is specially interesting in this year in which we are still celebrating the fifty anniversary of fuzzy sets theory. And in this sense, and also thanks to Bernadette, we include in this issue a work to appropriately celebrate such an important date.

And of course, this issue also includes summaries of conferences, of Ph.D. theses and of several events which are undoubtfully part of the large and interesting EUSFLAT scientific life. But, for this time, let me go one step beyond the usual presentation of contents to ask for help. I think, and all of you have heard me so, that our Mathware should be much more. It should be useful to disseminate the excellent scientific work we make. I know this is not an easy task in times where impact factors and h-indexes are all, but I consider all of us should make an effort so that the pages of our magazine could also include scientific works, reviews and texts which may help to build bridges among the manhy differente groups and researchers which share the reading of the magazine.

For this reason, once again, I recall you that Mathware & Soft Comptuing is your magazine, also for making your research known, for opening discussion with other colleagues and for any activity or proposal which may help to boost our community. All of them are welcome in these pages.

And with this reminder, I leave you to start enjoying of this new issue. Have a nice read!!

Humberto Bustince
Editor-in-chief

Message from the President (June 2016)

GABRIELLA PASI

Dear EUSFLAT members,

this letter includes a number of news that I am pleased to communicate you. These events witness the dynamicity and the aliveness of our Society, which is promoting new initiatives and events.

But first, I am very pleased to open this letter with the acknowledgment of an important achievement that one of our distinguished members, Janusz Kacprzyk has obtained in 2016. Prof. Kacprzyk has been elected a Member of the European Academy of Sciences and Arts, one of the largest pan-European academies of sciences, with about 1700 scientists, including Nobel Prize Winners (`http://www.euro-acad.eu`). Many congratulations!

I am happy to announce the first instantiation of an initiative that has been launched in July 2015 by the board of our Society; this initiative is related to the promotion of EUSFLAT Excellence Centres, and it has been conceived to motivate and support the generation of research centers in the topical areas of EUSFLAT. A EUSFLAT research centre is aimed at sealing existing or newly generated research centres that are focused on fuzzy logic and on related technologies, and that are strongly engaged in EUSFLAT activities. The goal of such a concept is to motivate the research centres to obtain the seal of EUSFLAT by keeping or improving their scientific quality in the connection with the EUSFLAT scientific focus and with the engagement in the EUSFLAT activities. Detailed information and guidelines can be found on the EUSFLAT Web site: `http://www.eusflat.org/research_research_centre.php`. In relation to this initiative, an important news is that the EUSFLAT Board has received the first application: the Institute for Research and Applications of Fuzzy Modeling (IRAFM) of the University of Ostrava has set up a consortium that has submitted a proposal for an OP RDE (Operational Programme Research, Development and Education) EU project; this proposal involves several partners to the aim of obtaining a financial support to their research and internalization activities within the scope and compliance of the EUSFLAT research focus. A significant milestone would be to establish a new Central European Centre for Fuzzy Logic and Related Applications (ECFLA) with the status of EUSFLAT Research Centre. ECFLA representatives (University of Ostrava, Technical University of Ostrava, Institute of Computer Science of the Czech Academy of Sciences, and Institute of Information Theory and Automation of the Czech Academy of Sciences) submitted an application form to the EUSFLAT board that decided, in accordance with the rules, to release a temporary conditional approval of the application itself. This approval constitutes an official annex of the OP RDE project application. I am happy to say that with this initiative EUSFLAT opens a new era, by acting as an important professional society that plays a significant role in supporting and establishing big international projects. We wish our colleagues that their application be successful!

The 16^th IPMU (Information Processing and Management of Uncertainty) Conference (endorsed by EUSFLAT) was held from 20^th to 24^th June 2016 in Eindhoven (The Netherlands) with a rich scientific program including 127 papers authored by researchers from 34 different countries, five plenary talks, four tutorials, several panels, and an industry round table. Professor Joseph Halpern (Cornell University, USA) has been selected for the Kampé de Fériet Award for his pioneering work in numerous aspects of Artificial Intelligence.

The EUSFLAT General Assembly was held during IPMU on Tuesday, June 21st. Three EUSFLAT Grants have been assigned to support students for attending the Conference.

An important news related to the Assembly is the approval of a new Working Group on "Fuzzy logic-based decision modeling in economics and social sciences (FULDESS)". The initiators and coordinators of the group are well-known and active members of our community: Gisella Facchinetti (University of Salento, Italy), Mario Fedrizzi (University of Trento, Italy), Benedetto Matarazzo (University of Catania, Italy), and Aldo Ventre (University of Napoli II, Italy). Both the aim and the scope of the Working Group were presented by Gisella Facchinetti during the Assembly. They include establishing and intensifying international cooperation between researchers active in the fields of fuzzy logic and decision theory with an emphasis on applications in economics and social sciences. In the latter fields human perceptions play a very important role and the cross-fertilizations with the former fields has a huge potential. Despite the long history of such a multidisciplinary research, it still seems that both communities are somehow separated and getting them to communicate and collaborate more closely should bring very interesting results.

The founders of the group aim to bridge this gap, and due to their research experience they are the best candidates to achieve that. The Web page of the working group is in preparation. The activities of Working Groups are extremely important to promote the research and the collaborations within our scientific community. Many thanks to Slawomir Zadrozny who in the Board is supporting them actively. Please check the list of Working Groups on the EUSFLAT Website, and join those within which you could contribute (`http://www.eusflat.org/research_workinggroups.php`).

Another important news is that during the EUSFLAT Assembly the EUSFLAT Honorary Membership has been awarded to Janusz Kacprzyk. The candidature was proposed by the EUSFLAT board as a recognition of both the numerous

scientific achievements and the invaluable contributions to EUSFLAT of Janusz Kacprzyk. The proposal has been unanimously approved by the EUSFLAT members attending the Assembly. Many congratulations Janusz!

Another new that I am pleased to announce is that Javier Montero, past EUSFLAT President and current President Elect of IFSA, has launched together with the President of IFSA, Shun-Feng Su, and the last President of IFSA, Christer Carlsson, three IFSA task force committees, each under the coordination of one President. The objective is to analyze the situation of the IFSA federation from different perspectives and to study possible strategies about key issues. Some Presidents of fuzzy associations are joining these committees.

An important event: I am very happy to announce that the 2nd EUSFLAT School on Fuzzy Logic and Applications (SFLA 2016) will take place in a nice location on the Beskydy mountains close to Ostrava, under the organization of the Institute for Research and Applications of Fuzzy Modeling (University of Ostrava, Czech Republic).

I remind you that the School has been conceived as an annual event addressed to PhD students and to young researchers, to the aim of introducing the core aspects and recent developments of Fuzzy Logic and related applications. This second edition of the School will consist of several courses, which will be delivered by world-leading experts in the field, in particular by Libor BÄŻhounek, Ulrich Bodenhofer, Petr Cintula, Bernard De Baets, Frank Klawonn, Vladik Kreinovich, Rudolf Kruse, VilÃľm NovÃąk, Irina Perfilieva, Henri Prade. The organisers have obtained a prestigious Standard Grant by the International Visegrad Fund. EUSFLAT has provided 8 student grants to support the studentsâĂŹ participation. All details may be found on the home page `http://irafm.osu.cz/sfla2016/`.

Many thanks to the organisers! We wish them a big success of this event, which offers an important learning opportunity to young researchers.

Another extremely important event for our community is the EUSFLAT conference that will take place in 2017. It is with big pleasure that I announce that the EUSFLAT 2017 conference will be held in Warsaw (Poland), from September 12th to September 15th, and it will be co-sponsored by the Polish Academy of Sciences, in collaboration with the Polish OR and SR Society. The submission deadline is April 30. Please take note of this important dates on your agenda! The conference venue will be at a nice hotel in the center of Warsaw. I solicit a massive presence of the EUSFLAT members at this important Conference! During the conference the new EUSFLAT board will be elected.

I close this letter by thanking all board members and all EUSFLAT members who work to make the Society more active and visible. In particular a special thanks to Humberto Bustince, for his constructive and precious work for our Magazine, and Jorge Casillas, for maintaining our Web Site updated. About our Magazine: as usual I solicit all of you to contribute to the contents of the Magazine with scientific reports, panels, news and calls (PhD thesis, books, comments, events, etc.). Contributions may be submitted via `http://eusflat.org/msc` or by sending an email to the editor-in-chief, Humberto Bustince.

Warm wishes

Gabriella Pasi
President of EUSFLAT

INTERVIEW

Dialogue between Bernadette Bouchon-Meunier and Vladik Kreinovich

Bernadette Bouchon-Meunier and Vladik Kreinovich surrounded by other colleagues at the WCCI 2012.

How did you discover fuzzy sets?

BERNADETTE BOUCHON-MEUNIER: In fact, I discovered fuzzy sets and systems by serendipity in 1973. I was working in information structures and theory, in particular, on so-called fuzzy questionnaires - regarded as arborescent weighted graphs – used in decision-making support. Colleagues working in sociology asked me to collaborate with them in the automatic preparation of surveys, and the tools I had were not sufficient to take into account the imprecision of natural language they wanted to preserve. I then explored the Library of Mathematics of the University Paris 6 I was used to visit, looking for original solutions to my problem. I discovered Lotfi Zadeh's seminal paper published in 1965, around 8 years before. I remember that I presented my discovery in a research group meeting and all attendants were enthusiastic about this new paradigm! My professional life would not have been the same without this lucky encounter with Lotfi Zadeh's awesome new paradigm, and I will be grateful to him forever for the power of his innovative ideas.

VLADIK KREINOVICH: My path was different, it started in the early 1970s, with my philosophy-for-math-majors classes at St. Petersburg University, where our instructor described Hegel's ideas of "dialetical logic" that was supposed to go beyond the usual true-or-false dichotomy and thus, become closer to the actual human reasoning. He mentioned that Zadeh's ideas of fuzzy logic can be viewed as an important step in this direction. I was very much interested, and I even gave a presentation on fuzzy logic at our department's student philosophical seminar. Later, I heard many talks on fuzzy logic at logical conferences and reviewed some related papers; this made me interested in the mathematical aspects of fuzzy ideas.

When did you meet Lotfi Zadeh?

BBM: The first opportunity I was given to meet Lotfi A. Zadeh occurred in 1977 during a colloquium in Cachan, near Paris – sponsored by the National Center for Scientific Research -

that I helped to organize. This colloquium was focused on information theory and its recent developments and applications. Lotfi A. Zadeh had given very few lectures in France before and his talk at the colloquium was a really memorable event. I remember how impressed I was by his simplicity and his kindness, even though he was already internationally celebrated.

L.A. Zadeh's Doctorate Honoris Causa of the Pierre et Marie Curie University, Paris, 2001, with his wife Fay Zadeh and Bernadette Bouchon-Meunier.

After this first meeting, he came again to France, to participate in the International Colloquium on Fuzzy set Theory and Applications organized by Elie Sanchez in Marseille in 1978; this visit helped speed up the development of research in fuzzy set theory in France. This colloqium was my first contact with Arnold Kaufmann, who, via his numerous books, helped to promote Fuzzy sets and systems in France.

Starting in 1979, Lotfi Zadeh regularly gave lectures in Paris to my research group at the Paris 6 - Pierre et Marie Curie University. His last lecture was given at the occasion of the Doctorate Honoris Causa that he received in 2001. It was a great honor for us to welcome him in our laboratory after his recognition at the university level.

VK: I heard a lot about Zadeh, read many of his papers, but I only met Lotfi Zadeh after I myself came to the US in the Fall of 1989. Since first meeting him in 1991, I have met him regularly at numerous conferences. By that time, I attended many meetings and seminars related to AI and Computational Intelligence, where proponents of different research directions were sometimes aggressively promoting their ideas - while describing alternative ideas in a rather negatively criticial way. In contrast, Lotfi Zadeh, in his talks, emphasized that each of many different approaches to computational intelligence had its own advantages - otherwise it would not have had successful applications. He suggested that since each approach also has its own limitations, we need to combine these approaches, so as to utilize the advantages and overcome the limitations of different approaches. His "let hundred flowers bloom" attitude has led to the current sucess of soft computing - a fruitful combination of fuzzy, neural, genetic, and probabilistic techniques. Zadeh made sure that everyone felt comfortable in this common endeavor. I was impressed by his scientific ideas, but, honestly, I was even more impressed by his leadership skills. In my opinion, these skills were one of the main reasons why fuzzy logic became so successful in many applications - because many of these practical successes were possible when fuzzy techniques were combined with other methods, such as neural networks (and machine learning in general), probabilistic approaches, etc.

How did you start collaborations with other members of the fuzzy community?

BBM: I had the good luck to attend international workshops or conferences in which special sessions or tracks were dedicated to fuzzy modelling. I remember, in particular, the International Congress on Applied Systems Research and Cybernetics, held in Acapulco (Mexico) in December 1980, where Lotfi A. Zadeh received the Congress Award, and the IFAC Symposium on Theory and Applications of Digital Control, held in Delhi (India) in January 1982. I also have nice memories of the CNRS Round Table on Fuzzy Sets, organized in Lyon (France) by Robert Féron in 1980. Fuzzy community was emerging at this time, and these moments were very special to its members, gathering here and there all over the world around Lotfi A. Zadeh. I particularly remember discussions at this time with Lotfi Zadeh, Enrique Ruspini, Dan Ralescu, Janusz Kacprzyk, Madan Gupta, Abraham Kandel, Ellen Hisdal, Henri Prade, Didier Dubois, Elie Sanchez and Ronald R. Yager.

A very important opportunity for me was a one-month stay in Berkeley in February 1981 in the Department of Electrical Engineering and Computer Science at the University of California at Berkeley. This represented for me the core of research in fuzzy sets. Seminars and informal discussions around crepes provided opportunities to discuss emerging topics and ideas. I met several friends there, for instance Ramon Lopez de Mantaras and Christian Freksa. Each time I went to Berkeley later on, I had the impression of a pilgrimage... Among other opportunities, I attended the Symposium on Mathematical Modelling organized in Berkeley in 1985 by Sergei Ovchinnikov, where we celebrated the 20th anniversary of fuzzy sets with (approximately) twenty friends. This was an occasion for the participants to present to Lotfi A. Zadeh a bound volume of his own papers on the subject. The size of the book highlighted the impressive achievements he had already obtained by this time. I did not imagine at that time that the 50th anniversary would be celebrated around the world with hundreds of participants.

In parallel, in 1979, I met Llorenç Valverde, who was a visiting PhD student in the University of Lille in Professor Kampé de Fériet's team, with which my research group was collaborating. We became friends and he introduced me to

Vladik Kreinovich with Ladislav Kohout and Vilém Novák.

his PhD advisor, Enric Trillas, and to other members of the Polytechnic University of Catalonia research team in Barcelona, in particular Francesc Esteva who co-authored papers with me later. From 1982 and during a few years, I visited them regularly, finding this group the most stimulating and encouraging environment. When Llorenç became an Associate Professor at the University of the Balearic Islands, he launched the annual Fall Seminar on Applied Logic in 1983 in Mallorca, and I attended it several times. The discussions we had there were important for me, as was my meeting with José Luis Verdegay and Miguel Delgado, which was the beginning of my friendly relations with the Department of Computer Science and Artificial Intelligence of the University of Granada. Later on, in 1992, I started to investigate fuzzy approaches to similarity and analogy, and my collaboration with Llorenç on this topic brought a new light to my vision.

Visits to the Artificial Intelligence Department of the Centre of Advanced Studies in Blanes, not far from Barcelona, from 1985 and then the Artificial Intelligence Research Institute in Bellaterra from 1994, were other stimulating environments that fostered my research. Another great occasion to have fruitful discussions and to progress on fuzzy set theory were the Linz Seminars on Fuzzy Set Theory organized by Peter Klement; I attended it for the first time in 1983.

M. Sugeno, J.L. Verdegay, M.T. Lamata, B. Bouchon-Meunier and E. Sanchez at IPMU 2006 in Paris.

Ronald Yager and I decided to co-organize a conference in Paris in 1986, the International Conference on Information Processing and Management of Uncertainty in knowledge-based systems ; this launched the series of IPMU conferences organized every other year since then, and continuously supported by Lotfi Zadeh. His twelve plenary talks at all IPMU conferences between 1986 and 2008 have been a key thread of the evolution of uncertainty management and fuzzy modelling over the years. I had the privilege to edit five books on uncertainty and intelligent systems with Lotfi Zadeh and Ronald Yager, twelve more with Ronald and other colleagues. The successive IPMU conferences gave me the opportunity to meet many researchers who became friends and co-authors.

Several of these researchers visited my laboratory and we published joint papers, often also with my colleagues. In particular, I have collaborated for many years with Hung T. Nguyen – with whom I published a book – and with Giulianella Coletti. I also co-authored several papers with Radko Mesiar, Anca Ralescu, Dan Ralescu, Arthur Ramer, Francesc Esteva, Sandra Sandri and Mingsheng Ying who spent a few weeks in Paris over the years to collaborate with us. Philippe Smets, Abe Mamdani, Eyke Hüllermeier, James Keller, and Nikhil Pal were also visiting professors in our research group and worked with my colleagues. Of course, Vladik's visiting professor position in my laboratory in 1996 was a great opportunity to have a fruitful cooperation leading to a number of joint papers.

R.R. Yager, M. Sugeno, L. A. Zadeh, B. Bouchon-Meunier, A. Mamdani, M. Wooldridge during IPMU 2006 in Paris.

VK: I had some fuzzy-related collaborations when in Russia, but my main collaborations started when I came to the US. In early 1991, as a new professor at the University of Texas at El Paso, I was invited to give a talk about my research directions at the nearby New Mexico State University (NMSU). Of course, since fuzzy is one of my main research directions, I mentioned my fuzzy ideas as well. This got an interest of the NMSU fuzzy researchers Elbert and Carol Walkers and especially of Hung T. Nguyen, a fuzzy researcher whose energy and enthusiasm have no bounds. This talk started our long-term collaboration with Hung T. Nguyen that continues today. Together, we published a book, published several edited books, and dozens joint journals and conference papers, mostly fuzzy-related.

Hung connected me to many other fuzzy researchers. In Summer 1996, I worked in Paris with Bernadette and her students and colleagues. In December 1998 - January 1999, I worked with Yeung Yam in Hong Kong. Several times I visited

Irina Perfilieva and Vilem Novak in Ostrava, Czech Republic, I worked with Van Nam Huynh at JAIST, Japan, and with several colleagues in Thailand - in Bangkok and in Chiang Mai.

Vladik Kreinovich with Jerry Mendel (2006).

Many fuzzy researchers visited El Paso to work with our research group: Roumen Anguelov from South Africa, Eduard Bartl, Michal Holcapek, Vilem Novak, and Irina Perfilieva from Czech Republic, Salem Benferhat from France, Jim Keller from Columbia, Missouri, Peter Klement from Austria, Weldon Lodwick from Denver, Colorado, Phuong Hoang Nguyen from Vietnam, Antony Popov from Bulgaria, Arthur Ramer and Leon Reznik from Australia, Rudolf Seising from Germany, Chrysostomos Stylios from Greece, Michio Sugeno from Japan, Dan Tavrov from Urkaine, Gozde Ulutagay from Turkey, and many many others.

I also collaborated with Burhan Turksen, Ron Yager, and numerous other researchers. I was privileged to work with all these great folks, I learned a lot from them, and I am grateful to all of them.

How did you start to work on industrial applications?

BBM: I signed my first contract with a company in 1986, to work on the design of surveys. Then in 1988, I was approached by an engineer from Electronique Serge Dassault (presently Thomson CSF) to work on a military application of possibility theory. But the real interest of manufacturers for fuzzy logic started in 1991, after a visit of French members of the industry and a few academics (including me) to Japan in December 1990. The results of this visit were reported at a well-attended press conference. The successful applications of fuzzy logic to industrial problems of all kinds, and the enthusiastic interest of companies for this new concept in Japan convinced the French companies to test it on various real-world problems. This resulted in a long series of collaborations with industry for my group.

VK: My interest in industrial applications of fuzzy started in 1982. Leon Reznik, then my colleague in St. Petersburg, was working on a system for measurement and control of an aircraft engine. To control the engine, it is important to know the processes inside, to know the corresponding temperature, pressure, etc. The problem is that the temperatures inside the engine are so high that direct measurement of these temperatures is not possible. Instead, we have to rely on expert knowledge.

Leon used fuzzy logic to formalize this expert knowledge, and came up with a very efficient controller. Since many engineers were not familiar with fuzzy techniques - they only learned statistical methods - my colleague Gennadi Solopchenko asked me to join this project to make the corresponding mathematics clearer to the engineering folks. I got interested and then I got hooked. We published several papers together with Leon and with Solopchenko. When I came to the US, I started working with my colleagues from our College of Engineering.

I like applications, they motivate meaningful theoretical research. This is what our research group is focused on - application-motivated theoretical research.

What do you consider the most important part of your work?

BBM: The part of my professional life I am the most attached to is probably the supervision of PhD students, the associated mentoring and more importantly the collaborative work with them leading to new results, joint publications and continuous cooperation. More than 50 doctoral students completed their doctoral thesis under my supervision or co-supervision, not all of them with the same passion for research, but all forming an enthusiastic cooperating team, evolving over the years. I would like to mention several of them who are still active in fuzzy logic, being now university or research professors: Herman Akdag, Maria Rifqi, Christophe Marsala, Marcin Detyniecki, Anne Laurent, Marie-Jeanne Lesot and Jean-François Omhover in France, Mohammed Ramdani and Mohamed Kissi in Morocco, Mohamed Nazih Omri in Tunisia. They contributed so much to my achievements, be they research papers, published or edited books or conference organization, that I owe them a lot.

VK: More than 50! Wow, I am impressed. I only graduated 12 PhD students, I know how much time it takes to nurture one good PhD student, so I am truly impressed. But I agree, students are important. I have published many papers, and without students and other collaborators, I would not have been able to achieve that much.

Students are our future, they are the ones who will continue exploring new directions and getting new exciting ideas and results. I am very proud of all of my former and current students, I just want to mention Christian Servin, who is now member of the Board of the North American Fuzzy Information Processing Society (NAFIPS), and who won the 2015 NAFIPS Early Career Award, also Gang Xiang, Francisco Zapata, Roberto Araiza, Octavio Lerma, Jan Beck, Raul Trejo - I am happy to have helped all of them.

A group of B. Bouchon-Meunier's former PhD students and some of their own PhD students, November 2013.

How do you see the evolution of research on fuzzy set theory and applications?

BBM: Until the middle of the 80s, many developments were done on mathematical aspects of fuzzy sets and systems, because everything had to be done. Applications were mainly focused on economy, medical support systems and all kinds of knowledge-based systems. Then came the success of fuzzy control in Japan, leading to an explosion of fundamental and applied research on the topic all over the world. In the 21st century, focus was mainly placed on data mining and information retrieval, and more recently on big data. No mathematical domain is really emerging, as if everything were already covered. One of the most promising theoretical aspects is probably aggregation and fusion of information. It should nevertheless be noted that creating a new aggregation method just for the "glory" to be the first, without any justification of its need (e.g., due to the limitations of existing solutions) is useless and uninteresting.

Another modern tendency is the extension of existing concepts to new forms of management of uncertainty. After fuzzy sets introduced in 1965, type-2 fuzzy sets were proposed in 1975 by the same inventor, Lotfi Zadeh, because of the difficulties pointed out at this time to define a membership function. Techniques have considerably evolved since then with the use of machine learning and optimization methods to tune membership functions, and type-2 fuzzy sets have been widely studied. Later on, intuitionistic fuzzy sets were introduced, with the purpose of considering not only the membership to a category, but also the non-membership. Z. Pawlack introduced rough sets to address a different vision of uncertain knowledge in 1991. There have been many developments on these types of uncertainty management, and it seems now useless to continue to extend concepts introduced in the framework of fuzzy sets to them. From my point of view, any more complex notion such as intuitionistic type-2 fuzzy sets or fuzzy rough sets needs to be strongly motivated to prove its interest, as are other concepts to manage uncertainty such as uncertainty theory, always strongly based on documents written by Baoding Liu, soft sets (supposed to be a generalization of fuzzy sets), neutrosophic logic (extending intuitionistic fuzzy logic), hesitant fuzzy sets and others. While such concepts are, by themselves, interesting to investigate, justification of their potentials must underlie any new paper: these concepts are supposed to help to deal with some categories of real-world problems faced by engineers and decision-makers.

Group picture at IPMU 2000 in Madrid.

Dinner with H.T. Nguyen, V. Kreinovich and B. Bouchon-Meunier in Paris in 1996.

I certainly do not think that research must be driven solely by applications, but I strongly believe that theory and applications must work hand in hand in the domain of intelligent systems - the domain that we are all working on. It is unimaginable for us not to participate in solving real-world problems around us.

The specificity of fuzzy sets is focused on its capability to manage graduality, to establish an interface between numerical data and natural language elements, and to cope with subjective data. These qualities should be more used in everyday problems. I remember that some Japanese industrials using fuzzy control in the 90s were claiming that fuzzy methods save energy. Are we exploiting enough this capacity in the time of green economy we are living in? Fuzzy methods have been successful in image and video understanding for years. Are our methods still interesting in the environment of big data we are now facing? A very active domain were we should probably invest more energy is big data summarization, since the seminal works on linguistic summaries by Ronald Yager and Janusz Kacprzyk met with great success. But much research remains to be done to deal with the variety of expectations, the size of data, the need of evolving summaries associated with flows of data and the customization of solutions in some cases.

Another domain where it is surprizing not to see more efforts to apply fuzzy models is affective computing, including the recognition of emotions in images and videos, the production of emotions on avatars and cartoon characters, emotion mining in texts or the recognition of emotions by robots. The analysis of biological signals provided by sensors is another important potential application domain when it takes into account the psychological state of the patient, in the case of eldercare or medical environments for instance, or when a machine or a robot interacts with disabled people through brain-computer interface.

I would like to highlight a last domain where subjectivity is important and fuzzy models should contribute efficiently, namely data quality. The confidence of experts in information sources and the reliability of these sources is a subjectivity factor involved in the evaluation of data veracity, be they big data or regular-size data. All forms of natural language descriptions entail subjective uncertainty because of the imprecision of expressed information. The popular case of crowdsourced information is remarkable because it in-

volves social media content as well as information provided by volunteers and the quality of resulting information may be critical. Extracting information from social networks of sources – or interpreting events in the case of news flow – requires also to take into account many factors which may be crucial in the case of strategic or business intelligence. I am convinced that such problems would greatly benefit from the use of fuzzy modeling.

G. Shafer, B. Bouchon-Meunier, G. Coletti, L. A. Zadeh and V. Kreinovich in Paris in 2006.

This above list of promising application domains for fuzzy models is not meant to be exhaustive. I think that there are many niches where fuzzy logic should prove its superiority over other methods, and it is important not to trample always the same paths but to investigate modern complex environments. It would also be important to give more visibility to our successful achievements in the practitioner world. Lotfi Zadeh's recent attempt to gather information on interesting medical applications through the BISC mailing list is remarkable, as are all his efforts to liven the fuzzy community up. We also need to improve our outreach beyond this community.

VK: At last year's NAFIPS Conference, many of us were surprised to learn, from a plenary talk on computer games, than fuzzy techniques - unexpectedly to us - are actively used in game development. It was a surprise because in the past, when fuzzy techniques were used somewhere, we learned about it at our conferences first, and we bragged about it to others - not the other way around.

I think that this a good sign. When someone uses differentiation to find a maximum in an applied problem, we do not write articles bragging about yet another application of calculus, we do not sent a paper to an Applications of Calculus Journal - this is a normal activity. And I am glad to see that fuzzy techniques are becoming as mainstream as calculus. Many car manufacturers are using fuzzy controllers in automatic transmission - and most people outside automotive industry do not even know about it. Fuzzy has become mainstream.

Are there challenges? Definitely, there are challenges, and there is room for improvement. I agree with Bernadette that our main challenge is moving into new application areas. Expert knowledge is important in many application areas, and the fuzzy character of this knowledge is what has prevented specialists in these areas from formalizing this knowledge. Fuzzy logic was designed to capture such knowledge, and we should try our best to use fuzzy techniques for this purpose.

In addition to the areas that Bernadette mentioned, I would like to mention theoretical physics. To an outsider, it may seem that this is the last area where fuzzy is needed: they have exact (and very complex) mathematical equations, so why do not need fuzzy there? But in reality, equations are only one side of physics, equally (and even more) important are physical intuitions, ability to find a right approximation - that helped geniuses like Einstein to solve many complex problems sometimes literally on the back of an envelope. Just like fuzzy controllers help translate the experience of expert controllers into a precise control strategy, we need to translate intuition of great physicists into precise techniques that others can use.

Another important challenge comes from the need to combine expert knowledge with a more traditional knowledge described in probabilistic and crisp-equations terms. To be able to efficiently combine them, we need to more deeply entangle fuzzy techniques with more traditional probabilistic and optimization techniques. This is also Zadeh's dream: starting from his early papers on probabilities of fuzzy events, he continues to generate results, ideas, and challenges about such entanglement. This is what we worked on with Bernadette in 1996, when I visited her group. This is still one of the main foci of our group's research.

This brings me back to what I mentioned earlier, the let-hundred-flowers-bloom spirit of Lotfi Zadeh: yes, this is what we need, a beautiful garden of knowledge in which hundred flowers intertwine and help each other bloom, and one of these flowers is a little gem of fuzzy logic originally grown and nurtured by Lotfi Zadeh. This is our garden, and, as Voltaire reminds us at the end of Candide: "We must cultivate our garden."

M. Rifqi, A. Revault d'Allonnes, C. Marsala, M.-J. Lesot, M. Detyniecki around B. Bouchon-Meunier at IEEE SSCI 2011 in Paris, April 2011.

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Bernadette Bouchon-Meunier is a director of research emeritus at the National Centre for Scientific Research, the former head of the department of Databases and Machine Learning in the Computer Science Laboratory of the University Pierre et Marie Curie-Paris 6 (LIP6). She is the Editor-in-Chief of the International Journal of Uncertainty, Fuzziness and Knowledge-based Systems, the (co)-editor of 25 books, and the (co)-author of five. She has (co-)authored more than 400 papers on approximate and similarity-based reasoning, as well as the application of fuzzy logic and machine learning techniques to decision-making, data mining, risk forecasting, information retrieval, user modelling, sensorial and emotional information processing.

Co-executive director of the IPMU International Conference held every other year since 1986, she also served as the FUZZ-IEEE 2010 and FUZZ-IEEE 2013 Program Chair, the IEEE Symposium Series on Computational Intelligence (SSCI 2011) General Chair and the FUZZ-IEEE 2012 Conference Chair, as well as the Honorary chair of IEEE SSCI 2013 and IEEE CIVEMSA 2013.

She is currently the IEEE Computational Intelligence Society Vice-President for Conferences, the IEEE France Section Vice-President for Chapters and the IEEE France Section Computational Intelligence chapter chair. She is an IEEE fellow and an International Fuzzy Systems Association fellow. She received the IEEE Computational Intelligence Society Meritorious Service Award in 2012.

Vladik Kreinovich received his MS in Mathematics and Computer Science from St. Petersburg University, Russia, in 1974, and PhD from the Institute of Mathematics, Soviet Academy of Sciences, Novosibirsk, in 1979.

From 1975 to 1980, he worked with the Soviet Academy of Sciences; during this time, he worked with the Special Astrophysical Observatory (focusing on the representation and processing of uncertainty in radioastronomy). For most of the 1980s, he worked on error estimation and intelligent information processing for the National Institute for Electrical Measuring Instruments, Russia. In 1989, he was a visiting scholar at Stanford University. Since 1990, he has worked in the Department of Computer Science at the University of Texas at El Paso. In addition, he has served as an invited professor in Paris (University of Paris VI), France; Hong Kong; St. Petersburg, Russia; and Brazil.

His main interests are the representation and processing of uncertainty, especially interval computations and intelligent control. He has published six books, eleven edited books, and more than 1,100 papers. Vladik is a member of the editorial board of the international journal "Reliable Computing" (formerly "Interval Computations") and several other journals. In addition, he is the co-maintainer of the international Web site on interval computations `http://www.cs.utep.edu/interval-comp`.

Vladik is Vice President for Publications of IEEE Systems, Man, and Cybernetics Society; he served as President of the North American Fuzzy Information Processing Society 2012-14; is a foreign member of the Russian Academy of Metrological Sciences; was the recipient of the 2003 El Paso Energy Foundation Faculty Achievement Award for Research awarded by the University of Texas at El Paso; and was a co-recipient of the 2005 Star Award from the University of Texas System.

ACTIVITY REPORT

Celebration on the 50th anniversary of the theory of fuzzy sets

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In 2015, the IEEE Computational Intelligence Society organized a celebration of the 50th Anniversary of the pioneering work of Lotfi Zadeh introducing the concept of fuzzy sets. This celebration was co-located with the 2015 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2015) in Kadir Has University, Istanbul, Turkey, on August 3-4, 2015, with free participation.

This event was prepared by a committee chaired by Enrique H. Ruspini, IEEE CIS Vice-President for Finances, and it included a series of plenary lectures introduced by Enrique H. Ruspini and Adnan Yazici, FUZZ-IEEE 2015 General Chair, as well as an exhibition and a panel.

First, Rudolf Seising gave a lecture chaired by Adnan Yazici, on "Fuzzy Sets: how it all began" to put L.A. Zadeh's seminal work in its historical context.

Then, James C. Bezdek presented a talk, chaired by Bernadette Bouchon-Meunier, entitled "The posterity of Zadeh's 50-year-old paper: a retrospective in 101 easy pieces - and a few more"[1] prepared with Didier Dubois and Henri Prade. This talk presented a list of 100 books and papers, in addition to L.A. Zadeh's seminal paper, regarded as important for the development of fuzzy set theory and applications by the group of all IEEE CIS Fuzzy Systems Pioneers.

After a coffee break, time was given to the participants to visit the exhibition on "50 Years Ago: The Genesis of Fuzzy Sets" prepared by Rudolf Seising, presenting historical documents and pictures on the first years of research on fuzzy set theory.

The day was concluded by a lecture chaired by Jerry Mendel, given by Piero P. Bonissone on "Hybrid Systems in Real-world Applications" to provide examples of successful real-world industrial applications.

The day after, a panel session on challenges, opportunities and threats of fuzzy logic was chaired by Enrique H. Ruspini, with panelists James C. Bezdek, Piero P. Bonissone, Bernadette Bouchon-Meunier, Adnan Yazici, Rudolf Seising and Ronald R. Yager who presented their vision of the future of fuzzy sets and answered questions asked by the attendees.

[1] J. C. Bezdek, D. Dubois and H. Prade, "The posterity of Zadeh's 50-year-old paper", 2015 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE), Istanbul, 2015, pp. 1-9.

Panelists: from right to left, P.P. Bonissone, J.C. Bezdek, R. Seising (also plenary lecturers of the event), B. Bouchon-Meunier, and E. H. Ruspini (front).

CONFERENCE REPORT

FuzzyMAD 2015

The 8th edition of FuzyMAD held at Complutense University of Madrid last December 15, reaching the historic record of 75 participants. This series of meetings for researchers with interests on Fuzzy Logic and Soft Computing started in 2008, with the declared objective of assuring a regular general meeting between scientists and Ph.D. students within Madrid, a small region of Spain with a busy life and 16 Universities and many other research institutions and companies.

FuzzyMAD 2015 was organized by the FORaid group at Complutense University, in collaboration with the CASI-CAM-CM network, which participated by another three Universities (Autonomous University of Madrid, Carlos III University of Madrid and Technical University of Madrid). FuzzyMAD 2015 kept a quite similar structure to previous years.

FuzzyMAD 2015 started with three invited talks on topics of high interests for our Ph.D. students. Gherado Varando spoke about Bayesian Networks, José Dorronsoro spoke about Deep Networks and Aníbal R. Figueiras spoke about Deep Learning.

A second section of FuzzyMAD 2015 was devoted to Ph.D. projects, presented by selected students (Jorge Herrera, José L. González, Gloria Sánchez, Javier León, Israel Alonso, Javier J. Bonilla and Carely Guada), and followed by an open discussion with FuzzyMAD participants.

Then we had the traditional buffet lunch around the posters each group had prepared about their activities last year, where different groups can explore future collaborations. Ten group posters were presented in this edition of FuzzyMAD.

In the last section of FuzzyMAD 2015, six invited companies talked with us about their activities and interests in the field.

FuzzyMAD 2015 was possible thanks to the support of the Government of Spain (grant TIN2012-32482), the Community of Madrid (grant S2013/ICCE-2845), the Institute for Interdisciplinary Mathematics (IMI), and the dedication of my colleagues Daniel Gómez, Begoña Vitoriano, Javier Yáñez, Carely Guada, Javier León, Javier Martín and J. Tinguaro Rodríguez.

Javier Montero
Complutense University of Madrid, Spain

CONFERENCE REPORT

International Conference on Mathematics of Fuzziness (ICMF)

Audience in ICMF

The International Conference on Mathematics of Fuzziness (ICMF) took place at Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan-Iran from April 27^th to April 29^th, 2016. The aim of the conference was to bring experts and researchers who are working on mathematical foundations of fuzzy sets and systems and their applications. The conference provided a platform for researchers and practitioners to interact with each other and discuss the state-of-the-art developments in the field.

The official opening of ICMF on April 27^th was attended by the President and Vice-presidents of Institute for Advanced Studies in Basic Sciences (IASBS), Vice-president of Iranian fuzzy systems society, Director of Institute for Research and Applications of Fuzzy Modeling (IRAFM).

Based on the outcome of the review process and recommendations of the members of the program committee, 60 papers and 10 posters were accepted for inclusion in the conference program and this number of standard 30 minutesŠ talks took place in three parallel sections.

In addition, the scientific program of ICMF 2016 was enriched with five plenary talks which were given by distinguished researchers:

- Vilem Novák (The Institute for Research and Applications of Fuzzy Modeling (IRAFM), University of Ostrava, Ostrava-Czech Republic) “On tools for linguistic fuzzy modeling”,
- Irina Perfilieva (The Institute for Research and Applications of Fuzzy Modeling (IRAFM), University of Ostrava, Ostrava-Czech Republic) “Mathematical problems where fuzzy models are efficient and competitive”,
- Saeid Abbasbandy (Imam Khomeini International University, Iran) “Fuzzy interpolation”,
- Reza Ameri (University of Tehran, Iran) “From fuzzy vector space to fuzzy hyperspace: A brief survey”,
- Fariba Bahrami (University of Tabriz, Iran), “On fuzzy partial differential equations”.

In order to promote the city of Zanjan and surroundings, conference participants took part in a trip to Soltaniyeh Dam (One of the UNESCO World Heritage Sites, 30 km from Zanjan) culminating in a gala dinner in city center of Zanjan. The organizing committee of ICMF 2016 announced that the next conference will be ICMF 2018.

Reza Ameri and Faraba Bahrami

Finally, it is worthy to note the fact that this conference was the result of the hard work and dedication of a large number of people, and the collaboration of several institutions. We want to acknowledge the support of the sponsors and the help of the different organizations that in any way were involved in making possible the conference. We also sincerely thank the help of different people for their outstanding cooperation: the Chairs, the members of the International Program Committee, the reviewers of papers, and the Local Organizing Committee. But at the end, the most important ingredients for the success of a conference, like this one, are authors and participants who made it happen. Thus, we would like to extend our gratitude to all participants in ICMF 2016. It has been a pleasure to be involved in the organization of this conference, to prepare its technical program and the proceedings and to welcome in Zanjan all the participants. We hope that everyone enjoyed the conference as well as the social program along with the staying in Zanjan-Iran.

Dr. Alireza Khastan (Chair of ICMF 2016)

CONFERENCE REPORT

18th Spanish Conference on Fuzzy Technologies and Logic (ESTYLF 2016)

The 18th Spanish Conference on Fuzzy Technologies and Logic ESTYLF 2016 (in Spanish, " "XVIII Congreso Español sobre Tecnologías y Lógica Fuzzy") was organized in San Sebastian, Spain, in May 25-27, 2016. This series of conferences is devoted to different topics related to the theory and applications of the Fuzzy Set Theory. The more recent editions of the conference held biennially, although the oldest editions were celebrated on an annual basis.

Enric Trillas, as Honorific President, was in charge of giving the opening talk. The president of the organizing committee was Cristina Alcalde (University of the Basque Country).

The conference hosted around 100 registered participants belonging to different institutions, including non-Spanish universities. For the first time, this year instead of long contributions only abstracts where required for submission . Finally, 110 of them were accepted for presentation. Presented papers were distributed in 13 special sessions and 3 regular sessions.

The conference program also included some invited plenary lectures given by three distinguished keynote speakers, namely:

- Enric Trillas: "Things I have learnt in 40 years working on fuzzy logic";
- Manuel Ojeda Aciegp (University of Malaga): "Bonds in fuzzy environments";
- Francisco Herrera (University of Granada): "Why should we use fuzzy logic based classifiers in Big Data and Data Science? Oportunities and challenges";
- Bernard De Baets (University of Ghent): "The age of aggregation";
- Gaspar Mayor (University of the Balearic Islands): "From aggregation functions to multidistances: a full experience".

The social program included a banquet in the restaurant of the Kursaal building, just next to the sea.

During the dinner, a special recognition was given to some researchers in commemoration of their ?rst publications in fuzzy logic, honoring their 25 years of dedication to the research in the ?eld.

During the conference, it was decided that the next edition of the conference ESTYLF 2018 will be held at the same time as the Spanish Coneference in Artificial Intelligence in Granada.

NEWS

Ph.D. Thesis defended by Gabriella Casalino

Dept. of Informatics, University of Bari, Italy

Gabriella Casalino defended her Ph.D. Thesis entitled "Non negative factorization methods for extracting semantically relevant features in Intelligent Data Analysis".

Intelligent Data Analysis (IDA) is a methodology for extracting useful knowledge from data, with special emphasis on human involvement in the analysis process. Within IDA, dimensionality reduction methods play an important role, as they enable to represent data in low-dimensional spaces. With this representation, it is indeed possible to discover hidden structures in data by disregarding irrelevant information. Non-negative Matrix Factorization (NMF) is a low-rank approximation method that is widely used for dimensionality reduction and clustering. Its characteristic non-negativity constraint leads to representing data as linear additive combinations of latent factors, which, in turn, can be interpreted as building-blocks of the final data. NMF can play a prominent role among dimensionality reduction methods within IDA, yet classical approaches to NMF may fail to provide data representations that are semantically relevant, hence easily interpretable, for the data analyst.

In this thesis, new variants of NMF have been proposed, with the aim of extracting semantically relevant features, so as to improve the usefulness of NMF within IDA. The common theme of these variants is the ability of injecting prior information in the factorization process.

The first proposal concerns an initialization method for NMF based on Subtractive fuzzy Clustering (SC). In fact, NMF needs some initial matrices before starting the factorization process. Several alternatives exist, but most of them require the a-priori specification of the rank, i.e. the dimensionality of the new subspace the data will lie in the new representation. The use of SC enables to automatically determine the rank, by exploiting some additional information concerning the similarity of data being provided by the analyst. This approach has been applied to document clustering, where an improvement of the interpretability of the results coming from NMF has been empirically observed. Moreover, when NMF is used for clustering documents in latent topics, the resulting prototypes are more representative of these topics than when other initialization techniques are used.

The second proposal is mainly focused on the optimization process of NMF. The point of departure is the observation that classical NMF returns a new representation of data that can be hardly described in terms of parts, a part being a selection of features of the original space where a linear correlation holds for a subset of data. To enforce a part-based representation, the standard NMF optimization process has been modified so as to take into account a binary mask that regulates the factorization process so as to describe data as composition of parts conforming to the mask. The resulting Masked NMF (MNMF) puts at the analyst's disposal a tool to query the dataset so as to extract a subset of the available data which can be represented in terms of user-specified parts. This approach, called Query-based NMF, is accompanied by some metrics that evaluate the quality of the query in terms of representativeness of MNMF results as well as their conformity to the query. The whole approach has been tested on some synthetic data and a benchmark dataset so as to show the potential benefits within IDA.

The third and last proposal is a modification of Non-negative Matrix Underapproximation (NMU), which in turn is a variant of NMF where the factorization process is carried out via an iterative approximation of the original data matrix in rank-one matrices. Here, NMU has been modified in order to accommodate some constraints that enhance the interpretability of the final results. In essence, these constraints enforce sparsity and spatial (local) information, thus resulting particularly suited for hyper-spectral images, where the proposed approach has been successfully applied to classify the pixels of real-world images according to the materials of the scanned objects.

These three proposals show that a proper injection of expert knowledge in the factorization process enables the discovery of hidden structures in data that could be easily interpreted by the data analyst. In all cases, an interaction is established between the analyst and the computational machinery, thus achieving an intelligent support for data analysis.

Part of this research work has been accomplished within a 5-months studentship at the University of Mons, under the supervision of prof. Nicolas Gillis.

Some results of this research work have been published in the following papers:

• Casalino G., Del Buono N., Mencar C., Subtractive clustering for seeding non-negative matrix factorizations, Information Sciences, Volume 257, 1 February 2014, Pages 369-387, ISSN 0020-0255, http://dx.doi.org/10.1016/j.ins.2013.05.038;

• Casalino G., Del Buono N., Mencar C., (2014) Part-Based Data Analysis with Masked Non-negative Matrix Factorization, 440–454. In Computational Science and Its Applications ICCSA 2014.

• G. Casalino, N. Gillis, Sequential Dimensionality Reduction for Extracting Localized Features, May 2015, CoRR, abs/1505.06957, http://arxiv.org/abs/1505.06957.

NEWS

Ph.D. Thesis defended by Wanda Niemyska

Dept. of Informatics, University of Bari, Italy

Wanda Niemyska defended her Ph.D. Thesis entitled "On the functional equations connected to the distributivity of fuzzy implications" on 6th June.

In classical logic conjunction distributes over disjunction and disjunction distributes over conjunction. Moreover, implication is left-distributive over conjunction and disjunction:

$$p \to (q \wedge r) \equiv (p \to q) \wedge (p \to r),$$
$$p \to (q \vee r) \equiv (p \to q) \vee (p \to r).$$

At the same time it is neither right-distributive over conjunction nor over disjunction. However, the following two equalities, that are kind of right-distributivity of implications, hold:

$$(p \wedge q) \to r \equiv (p \to r) \vee (q \to r),$$
$$(p \vee q) \to r \equiv (p \to r) \wedge (q \to r).$$

We can rewrite the above four classical tautologies in fuzzy logic and obtain the following distributivity equations:

$$I(x, C_1(y,z)) = C_2(I(x,y), I(x,z)), \quad \text{(D1)}$$
$$I(x, D_1(y,z)) = D_2(I(x,y), I(x,z)), \quad \text{(D2)}$$
$$I(C(x,y), z) = D(I(x,z), I(y,z)), \quad \text{(D3)}$$
$$I(D(x,y), z) = C(I(x,z), I(y,z)), \quad \text{(D4)}$$

that are satisfied for all $x, y, z \in [0,1]$, where I is some generalization of classical implication, C, C_1, C_2 are some generalizations of classical conjunction and D, D_1, D_2 are some generalizations of classical disjunction. We can define and study those equations in any lattice $\mathscr{L} = (L, \leqslant_L)$ instead of the unit interval $[0,1]$ with regular order „$\leqslant$" on the real line, as well. The above distributive equations play an important role in reducing the complexity of fuzzy systems, since the number of rules directly affects the computational duration of the overall application.

>From the functional equation's point of view J. Aczél was probably the one that studied right-distributivity first. He characterized solutions of the functional equation (D3) in the case of $C = D$, among functions I there are bounded below and functions C that are continuous, increasing, associative and have a neutral element. Part of the results presented in this thesis may be seen as a generalization of J. Aczél's theorem but with fewer assumptions on the functions F and G. As a generalization of classical implication we consider here a fuzzy implication and as a generalization of classical conjunction and disjunction - t-norms and t-conorms, respectively (or more general conjunctive and disjunctive uninorms). We study the distributivity equations (D1) - (D4) for such operators defined on different lattices with special focus on various functional equations that appear.

In the first two sections necessary fuzzy logic concepts are introduced. The background and history of studies on distributivity of fuzzy implications are outlined, as well. In Sections 3, 4 and 5 new results are presented and among them solutions to the following functional equations (with different assumptions):

$$f(m_1(x+y)) = m_2(f(x)+f(y)), \qquad x, y \in [0, r_1],$$
$$g(u_1+v_1, u_2+v_2) = g(u_1,u_2)+g(v_1,v_2), \qquad (u_1,u_2),(v_1,v_2) \in L^{\overline{\infty}},$$
$$h(xc(y)) = h(x)+h(xy), \qquad x, y \in (0,\infty),$$
$$k(\min(j(y),1)) = \min(k(x)+k(xy),1), \qquad x \in [0,1], y \in (0,1],$$

where:

- $f : [0, r_1] \to [0, r_2]$, for some constants r_1, r_2 that may be finite or infinite, and for functions m_2 that may be injective or not;
- $g\colon L^{\overline{\infty}} \to [-\infty, \infty]$, for $L^{\overline{\infty}} = \{(u_1,u_2) \in [-\infty,\infty]^2 \mid u_1 \leq u_2\}$ (function g satisfies two-dimensional Cauchy equation extended to the infinities);
- $h, c\colon (0,\infty) \to (0,\infty)$ and function h is continuous or is a bijection;
- $k\colon [0,1] \to [0,1]$, $j\colon (0,1] \to [1,\infty)$ and function k is continuous.

Most of the results in Sections 3, 4 and 5 are new and obtained by the author in collaboration with M. Baczyński, R. Ger, M. E. Kuczma or T. Szostok. Part of them have been already published either in scientific journals (see [5]) or in refereed papers in proceedings (see [4, 1, 2, 3]).

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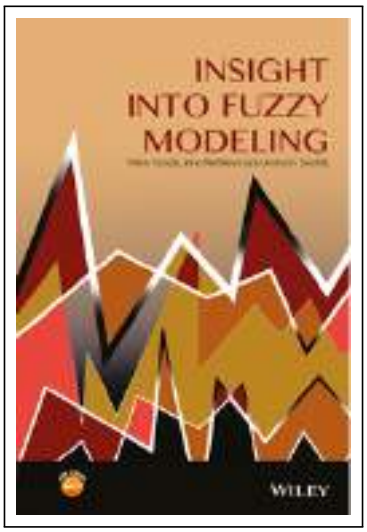
NEWS

New book on fuzzy modeling published in May 2016

Vilém Novák, Irina Perfilieva and Antonín Dvořák
Insight into Fuzzy Modeling
Wiley & Sons, Inc., Hoboken, New Jersey, U.S.A.
http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1119193184.html



There is nothing more practical than a good theory. Kurt Lewin

This motto was a source of inspiration for our new book, which is the result of our long and intensive research on fuzzy modeling. It provides a unique and methodologically consistent treatment of various areas of fuzzy modeling that utilizes also some of the results of mathematical fuzzy logic and linguistics. Moreover, various types of applications are also discussed. Our goal was to write a book that would be sufficiently precise but not too difficult for reading by non-specialists. In all places, however, we tried to provide theoretical justification of the presented methods. We also made a strong effort to provide consistent and appropriate treatment of the basic notions and use a transparent and unified notation all over the book.

The book is divided into two parts. In the first part, we present the theory of fuzzy modeling. In the second part, we present some selected applications in control, decision-making, image processing, and time series analysis and forecasting.

As it can be expected, we pay particular attention to the theory and modern applications of fuzzy IF-THEN rules. We present two complementary views of their methodology. The first, more traditional view involves fuzzy approximation and the theory of fuzzy relations. The second view is based on a combination of formal fuzzy logic and linguistics. We speak about fuzzy/linguistic interpretation, according to which the rule is interpreted as a conditional clause of natural language and a set of such rules is taken as a linguistic description, i.e., a special text on the basis of which a conclusion/decision can be made. We demonstrate the power of such approach in various kinds of decision situations, and also in fuzzy control and multi-criteria decision-making.

A very important topic covered for the first time in the book form is the fuzzy transform (F-transform). Besides the theory, we also present some of its applications, namely in image processing and in time series analysis and forecasting.

We believe that this book will be interesting to students (undergraduate, master and Ph.D.), researchers as well as to practitioners in industry. It is available in hardbound, and also in electronic form.

Basic information about the authors:

Vilém Novák, D.Sc. is Full Professor and Director of the Institute for Research and Applications of Fuzzy Modeling, University of Ostrava, Czech Republic.

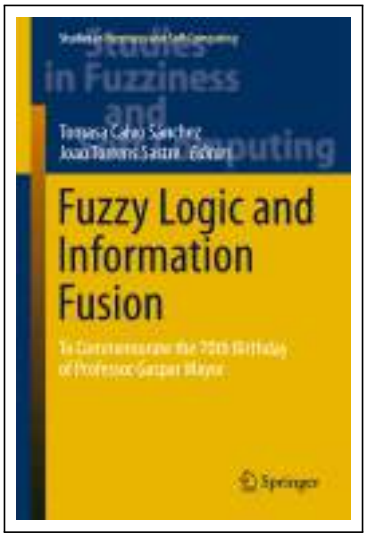
Irina Perfilieva, Ph.D. is Full Professor, Senior Scientist, and Head of the Department of Theoretical Research at the Institute for Research and Applications of Fuzzy Modeling, University of Ostrava, Czech Republic.

Antonín Dvořáak, Ph.D. is Associate Professor, and Senior Scientist at the Institute for Research and Applications of Fuzzy Modeling, University of Ostrava, Czech Republic.
All authors are members of EUSFLAT. More about this book can be found on the Wiley WEB page
http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1119193184.html
The book is accompanied by a special WEB page
www.wiley.com/go/novak/fuzzy/modeling
where the reader can find demos of specialized software and using it, test some of the methods described in the book.
Vilém Novák, Irina Perfilieva, Antonin Dvořák.

NEWS

New book on Fuzzy Logic and Information Fusion to commemorate the 70th birthday of Professor Gaspar Mayor

Tomasa Calvo and Joan Torrens
Fuzzy Logic and Information Fusion
Studies in Fuzziness and Soft Computing vol. 339, Springer
http://www.springer.com/us/book/9783319304199



This book has been written to commemorate the 70th birthday of the Prof. Gaspar Mayor, a full Professor at the University of the Balearic Islands (UIB) and a prolific researcher in the areas of fuzzy sets and information aggregation. The book includes 14 chapters which deal with different topics on fuzzy logic, aggregation functions, multidistances, fuzzy consensus models, fuzzy decision models, and so on. Most of them are related to some publications of Prof. Gaspar Mayor or to his area of interest. Nowadays, there are several monographs and books related to the topics of this book, but in essence they are rather different. The book contains nice and original contributions or reviews, authored by some of the most outstanding researchers in the field, for this reason it will be very useful both for the novel researchers and the seniors. The book also contains some chapters focussed on different fields of application of the mentioned areas. In general, the target audience of this book are computer scientists, knowledge engineers and decision scientists, as well as mathematicians.

The title of the book agrees with the one of the research groups of Prof. Mayor, that is, Fuzzy Logic and Information Fusion (LOBFI), for their initials in Catalan, currently a well-consolidated and recognized research group in the fuzzy community. We think that the book will contribute to make clear the intense work of Prof. Gaspar Mayor and to discover its relation or influence with the works of other researchers.

LOBFI Research Group. ESTYLF 2016

On the other hand, our purpose is to give the opportunity to the fuzzy community of knowing the more significant contributions of the Prof. Gaspar Mayor and provide these researchers with a small number of new contributions related to the previous one. All mathematical notations are auto-explained in each chapter of the book and also in the corresponding references.

Tomasa Calvo, Gaspar Mayor and Joan Torrens. ESTYLF 2016

The editors want to dedicate this book to Prof. Gaspar Mayor, and they also wish that this edited volume will contribute to promote new theoretical and practical results. They want to thank each one of the authors for all their contribution to this book, because without their enthusiastic efforts the book would have not been possible. Also, they present their gratitude to Springer Verlag for giving them the opportunity of publishing this book.

CALLS

Interdisciplinary colloquium in topology

Pamplona (Spain) 1-2 September 2016

The Interdisciplinary Colloquium in Topology will take place at the University of Navarra (Pamplona, Spain) on September 1-2, 2016. This meeting is one of the Interdisciplinary Thematic Workshops sponsored by the Spanish Topology Network (RET) this year.

The purpose of the Colloquium is to provide an opportunity for bringing together researchers working on different aspects of Topology that have in common the consideration of topological spaces endowed with an algebraic structure. In particular the following areas will be present: Functional Analysis, Algebra, General Topology, Computational Topology, Fuzzy Set Theory.

Participants may submit a proposal for a contributed talk at registration.

Invited speakers

- Lydia Auβenhofer (University of Passau, Germany)
- Eusebio Corbacho (University of Vigo, Spain)
- Pawel Dlotko (Inria Saclay, France)
- Susana Montes (University of Oviedo, Spain)
- Dmitri Shakhmatov (Ehime University, Japan)
- Ángel Tamariz (National Autonomous University, Mexico)
- Mikhail Tkachenko (Metropolitan Autonomous University, Mexico)

Organizing Committee

- Sergio Ardanza-Trevijano (University of Navarra, Spain)
- María Jesús Chasco (University of Navarra, Spain)
- Xabier Domínguez (University of A Coruña, Spain)
- Jorge Elorza (University of Navarra, Spain)
- Salvador Hernández (University Jaume I, Spain)