Mathware & Soft Computing
The magazine of the European Society
for Fuzzy Logic and Technology

# Interview with former Presidents of EUSFLAT

## *Reflexions on Leadership, Challenges, and the Future of Fuzzy Logic*

## In Memory of Professor *Alexander Šostak*

## News and Calls

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## Eusflat Life



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# *LETTER FROM THE EDITOR-IN-CHIEF(March 2025)*

HUMBERTO BUSTINCE

Dear readers:

Once again, you have in your hands the latest issue of our Mathware & Soft Computing online magazine. First of all, let me excuse myself for the delay in the publication, which has been due to some unexpected problems which have been already solved, fortunately!

I would like to start this letter with a few words recalling a very dear colleague who has passed away a few months ago in an unexpected way: Alexander Šostak. Many of us have had the pleasure and the honor of meeting him, and we know that he is leaving an empty space that can not be filled. In this issue, we include an obituary in his memory, but in the end, there are no words to express such terrible loss. Let him rest in peace.

This is a very special year. As you know, sixty years ago the seminal work by Lofti Zadeh marked the beginning of fuzzy theory. And precisely at this time, sixty years later, we are living the explosion of generative models and the research on explainable and interpretable artificial intelligence. And probably, at least from my point of view, fuzzy theory is one of the most suitable tools to deal with this hard, but crucial problem. Hence an opportunity is opening for our community to show the richness and possibilities of our work. I am sure that we can, and even we must, reach our colleagues with our techniques and methods to help the advancement in this field. We are able to play a pivotal role, I am convinced that we must not lose this opportunity.

Such a relevant date for us is appropriate for a reflection. And, in this issue, that you are about to read you can find a very interesting overview with reflections and views from former presidents of the EUSFLAT Society. All of them make it possible for our society to be where it stands, and their thinking is of great value for our future. Thanks a lot to Susana and Luis for this nice work!

And, of course, news on the life of the society, from Ph.D, thesis to conferences and workshops. Recall that this is our magazine, so we need your collaboration to display the rich scientific life of the members of the community! You are always welcome!

And now, please, enjoy this new issue of the magazine!

Humberto Bustince
Editor-in-chief

# *Message from the President (March 2025)*

SUSANA MONTES

## A Look to the Future

I write these lines with a special feeling, as this is my last editorial as President of EUSFLAT. In July, I will pass the baton to my successor, who will undoubtedly take on this role with the same enthusiasm and dedication as all previous presidents. I have had the privilege of interviewing my predecessors for an article in this issue, and it has been a true pleasure to talk with them. Always willing to collaborate, share ideas, and reflect on our collective journey, their insights offer valuable lessons for all of us. I strongly encourage you to read their thoughts.

But rather than a farewell, this is a moment to look ahead. I hope to see you all at the next edition of our EUSFLAT conference, which will take place from July 21 to 25, 2025, in Riga. The organizing committee, led by Olga, is working tirelessly to ensure that this event is an absolute success. And I have no doubt that it will be. Their dedication is truly admirable. We owe them a great deal of gratitude for making this conference an event we can all look forward to with excitement.

During the event, we will also hold our General Assembly, where we will elect the next President of EUSFLAT. This is a crucial moment for our society, and I encourage all members to attend. EUSFLAT can only move forward if we all support it, and our presence at the assembly is crucial. Let's fill the room with ideas, enthusiasm, and recognition for the person who will take on this significant responsibility.

Of course, the conference is also an exceptional opportunity for scientific exchange. Our meetings have always been characterized by an enriching atmosphere where the discussion of ideas is constant and fruitful. And after the conference concludes, EUSFLAT's activities in Riga will continue with the VI European Summer School on Fuzzy Logic and Applications - SFLA2025. Following the great success of the edition in Toledo in 2024, its continuity and growth are a source of great satisfaction. Young researchers are the future of our society, and strengthening this initiative is an investment in that future.

I cannot finish without expressing my deepest gratitude to all the people who have accompanied me over the years on the EUSFLAT board committee. Their support has been invaluable, and together we have worked as a true team to bring all our initiatives to fruition. It has been an exciting journey, and I am profoundly grateful for every step we have taken together. Some members of the board have been particularly special to me. I won't mention names to avoid making distinctions, but they —-and I— know who they are. What I can say for certain is that they started as colleagues and have now become true friends.

We are at a time of great change, where Artificial Intelligence plays a central role in scientific and technological discussions. Fuzzy logic in general and EUSFLAT in particular must be present in these conversations, asserting its place and demonstrating the power of our techniques and their ability to integrate with and enhance other approaches. Now more than ever, we must stand united, advocating for our journals, our community, and the future of our society. I am confident that, together, we will rise to the challenge.

See you in Riga!

Susana Montes
President of EUSFLAT

INTERVIEW

# Reflections from former EUSFLAT Presidents

## Insights on Leadership, Challenges, and the Future of Fuzzy Logic

Founded in 1999, EUSFLAT began its journey under the leadership of Françesc Esteva (**FE**) of the Institut d'Investigació en Intelligència Artificial in Bellaterra, Spain, who served as its first president for two years. He was followed by Luis Magdalena (**LM**) of the Universidad Politécnica de Madrid, Spain, who led the organisation for four years. From 2005 to 2009, Ulrich Bodenhofer (**UB**) from the Johannes Kepler University in Linz, Austria, served as president and brought his vision to the society. He was succeeded by Javier Montero (**JM**) from the Universidad Complutense de Madrid, who led EUSFLAT until 2013. In a milestone for the Society, Gabriella Pasi **(GP**) of the Università degli Studi di Milano Bicocca, Italy, became its first female president, serving from 2013 to 2017. The baton was then passed to Martin Stepnicka (**MS**) of the University of Ostrava, Czech Republic, who will lead the organisation from 2017 to 2021.

In this interview, we aim to gather the insights of these six prominent individuals who have made a significant contribution to our Society, addressing key issues of interest to its members. Let's learn from their experience!


**EUROFUSE-SIC'99 conference: Françesc Esteva presenting EUSFLAT to Hans-Jürgen Zimmermann. To his left on the table are Christer Carlsson and Mark Roubens.**

**1. What motivated you to take on the role of president, and how would you describe your overall experience leading EUSFLAT?**

**FE:** I was president of FLAT, the Spanish association for fuzzy logic and technology, during the period 1996-97 and as President I be member of the IFSA council. In this period IFSA decided to change the by-laws and to became a society of societies (no individual members are allowed) and many European researchers in fuzzy sets has not a society and thus they are excluded of IFSA. Moreover, the majority of researchers do not like a country representation but a unique European representation in IFSA. Then, as a President of FLAT, the most important country association in Europe by number of members and activities, was in a better position to lead the initiative to build a European association that both brought together European researchers in fuzzy logic and technology and assumed their representation at IFSA. I have the support of Enric Trillas (President of the Spanish Research council and that moment) and the European contacts that my research activity and my position as director of the AI Research Institute provided me. Many of my European friends ask me to lead the initiative and I did the job and after some months of hard work EUSFLAT is born and celebrate his first conference at Palma de Mallorca in summer 1999 and this is the history that how I became the first president of EUSFLAT.

**LM:** In 1997, the Assembly of ESTYLF (Spanish Society for Fuzzy Logic and Technologies), meeting at ESTYLF'97 in Tarragona, decided to transform the Society into EUSFLAT. This transition was led by Françesc Esteva (last ESTYLF's President and Founding EUSFLAT's President), and it was somehow formalized with the first EUSFLAT Conference in Palma de Mallorca (1999).

After that conference, there was the idea of renewing the Board through an election process to be held at EUSFLAT 2001 in Leicester. At that time, I was strongly involved in the organization of IPMU Conference to be held in Madrid in July 2000, simultaneously playing the roles of Program Committee co-chair and Organizing Committee co-chair. After a quite successful conference, with almost 350 attendees including a large part of EUSFLAT community, some "friends" asked me why not being candidate in the elections for EUSFLAT President. And I finally decided to do so.

**Gala dinner of the EUSFLAT'99 conference. From left to right: Lofti A. Zadeh, Gaspar Mayor, Enric Trillas, Janusz Kacprzyk., and László T. Kóczy.**

I have to say that I am more than happy with this decision that gave me the opportunity to establish a strong and maintained relation with many people in our community. In addition, that first volunteering position opened to me the world of volunteering in Scientific Societies (beyond EUSFLAT), giving to me the opportunity to serve as IFSA board member in different positions (EUSFLAT representative, Secretary, Treasurer, Vice-president), and as IEEE Computational Intelligence Society officer (Vice-president and now President-elect).

**IFSA 2003 in Istambul after a "working breakfast" meeting of the EUSFLAT board. From left to right: Bernard De Baets (Grants and prizes), Radko Mesiar (Working groups), Luis Magdalena (President), Rudolf Kruse (Vice-president) and Ulrich Bodenhofer (Web).**

**UB:** I became EUSFLAT president on the occasion of the 2005 board meeting at the EUSFLAT/LFA 2005 conference in Barcelona. I was still quite young then (33), so I would never have thought of being president.

**IFSA-EUSFLAT board meeting. Ulrich Bodenhofer (President) congratulated former EUSFLAT President Françesc Esteva for becoming the first EUSFLAT Honorary Member.**

It was actually my predecessor, Luis Magdalena, who very much motivated me to put together a list of board members and run for president. I had been a board member since 2001 and, as the board member responsible for the EUSFLAT Web page, I had launched a new Web page in 2002. I guess that my activities during that period were the reason why Luis thought I would be a good president. I can only describe my time as president as great. Both the support by the other board members and the positive feedback from the members were a unique experience.

**JM:** I was President of EUSFLAT during two terms, from July 21, 2009, to September 12, 2013, and first at all I should express my gratitude to all those colleagues that worked with my within each EUSFLAT boards: Gabriella Pasi (the first female becoming President of EUSFLAT), Dragan Radojevic, Martin Štěpnička (who also became President of EUSFLAT), Jorge Casillas and Edurne Barrenechea plus Valentina Balas, Bernard de Baets, Ulrich Bodenhofer (who had been the previous EUSFLAT President), Humberto Bustince (currently President of IFSA), Juan Luis Castro, Asli Çelikyilmaz, Oscar Cordón, Marcin Detyniecki, Eyke Hüllermeier, Luis Martínez, Radko Mesiar, Da Ruan (who unexpectedly passed away in 2011) and Eulalia Szmidt. I think the most important duty of the President of any scientific association is to promote the association by means of joint activities between the members of the association and other researchers somehow connected with the field of interest of the association. This implies the promotion of scientific collaborations, supporting initiatives and activities, and launching acknowledgements that should help researchers and practitioners to increase the impact of the association in Science, Technology and Society. This requires in the first place an effort to rightly apply membership fees, seeking for synergies that link research within every field of knowledge, which should attract more scientists and practitioners to the field, particularly if they are young promises. As a consequence, some of them will hopefully join the association, if they realize the potential benefits of participating within an active and helpful community, both for their own research and for their research groups and the whole Society. Everybody in my two boards devoted a lot of time to accomplish this view and continue the work of past boards in order to make EUSFLAT a live association. We all thought it was our turn to serve our community, helping from the EUSFLAT board to continue growing up and pass an improved baton to the next team. I am proud of my EUSFLAT membership, and being elected as its President has been a great great honor for me.

**GP:** My tenure as president of EUSFLAT has been a valuable journey of personal growth and a chance to contribute collaboratively to the community while engaging with it. I believe that within a scientific association, personal commitment –understood as a service-oriented activity– is essential for growing alongside the community and actively fostering the advancement of a field through collaboration and participation.

**MS:** First of all, it is important to mention that I was asked by the at that time current President Gabriella Pasi whether I would take up this glove and dare to build a candidature that would apply for a support of the Assembly in the elections. This is an important point that, as you can imagine, gives a strong motivation to even think about such a challenge and I am very thankful to Gabriella for that step. Then the motivating and demotivating thoughts and questions in my heads were probably similar to any person facing a challenge. Will

I help the Society? Will I keep things moving on? Am I the right one to push the dynamics of the Society? Will I help the Society by takin up the glove or will I keep a Presidency chair instead of giving a chance to somebody else? Now it is clear that though one never gets rid of one's doubts, the final decision was not to show the Society my backside but vice-versa, to suppress my doubts by hopefully still healthy courage and to ask the Society for expressing its support to the candidature of the Board I built for the elections.

So, the motivation was to help, not to get hidden. Of course, this may sound too general and before making the decision, I made a SWOT analysis of the Society and a consecutive detailed strategic development plan. But the unexpected circumstances showed how foolish I was. At some moments, it was rather a mixture of crisis management and a daily operative than a clear long-term strategic plan management. Anyhow, after the elections in Warsaw during my thanksgiving speech I said: "I will do my best so that you will not regret your votes". My overall experience was a struggle to keep my promise. But I am happy I could gain that experience, I enjoyed it. On the other hand, my experience is not important. The important thing is the experience of the Society with my leadership. And that is not a question for me.

**2. What were the main challenges you faced during your presidency, and what do you consider your most significant accomplishments?**

**FE:** The main task of my Presidency with the board have been to consolidate the association both from the point of view of trying to get European researchers to become active members of the association and organize working groups. Take into account that in this period the Spanish members are the majority and we decided to build the board by a small number of persons to perform the basics tasks and a representative of the different geographical regions which major task are to inform about the activities of the society and to invite researchers to participate in the activities of the association. I thing that we have consolidate the association with the bi-annual EUSFLAT conferences, an special relation with the journals "Fuzzy sets and systems" and "Mathware and soft computing" (Joan Jacas have done a very valuable task) that publish special issues dedicated to papers presented in the biannual conferences and organizing the working groups. We also stablished some agreements with societies related to our research enlarging the ones already stablished by the Spanish society.

**LM:** Previous Board was the result of the transient process from the former ESTYLF association to EUSFLAT. In fact, the Executive Board (President, Secretary and Treasurer) was maintained from last ESTYLF board. Consequently, one of the first questions to consider was opening this Executive Board to other European countries making EUSFLAT actually European. With this idea in mind I added the figure of a Vice-president (not considered in previous board) and asked a well recognized European researcher (Rudolf Kruse) to take that role. And I was extremely lucky, since he accepted and did an excellent job. The idea was not only opening the Board to other nationalities but also to people quite involved in applications, as Rudolf was. The internationalization of the Board was completed when a non-Spanish President was elected to replace me in 2005.

A significant challenge (probably the first) was succeeding to navigate Spanish bureaucracy to register the new Executive Board including non-national members in an association that was (and still is) registered in Spain. It is important to remember that we were in the time of paper documents and in person administration, when every interaction with the administration was a real burden. In addition, with the new Spanish Law of Associations approved in 2002, there was the need for adapting the Bylaws of the Society representing additional bureaucracy. This adaptation process was completed in 2003.

Some other actions taking place during my period as President were:

- Creating an Electronic Newsletter, launched in 2002 and leaded by Francisco Herrera.
- Creating a new and completely transformed Webpage, leaded by Ulrich Bodenhofer and again launched in 2002 after registering our internet domain eusflat.org in 2001, shortly after my election as new President.
- Starting the Student Grants program leaded by Bernard De Baets and first running for EUSFLAT 2003 in Zittau (Germany), and AGOP 2003 in Alcalá de Henares (Spain).

**UB:** After the hype of fuzzy technologies in the 1990s, it became evident in the 2000s that the field was not that "fashionable" anymore. To counteract this fade was probably the biggest challenge of our field –not only for me during my presidency– and I think it still is. I guess there were two main accomplishments: (1) that we could stabilize the membership numbers on a good level (which was in part because we improved communication with the members and provided easier online payment of membership fees); (2) that we succeeded to organize the EUSFLAT conference jointly with IFSA –the Joint 2009 IFSA World Congress and EUSFLAT Conference in Lisbon.


**Screenshot of the former EUSFLAT homepage that it was initiated by President Ulrich Bodenhofer (status as of 2005 after the EUSFLAT/LFA conference).**

**JM:** After so many years it is hard to remember all the things we did during that period. I think the revision we made of the EUSFLAT bylaws was extremely relevant, to solve certain problems we detected in those times, and to allow an easier future development of EUSFLAT. Of course supporting the two EUSFLAT conferences during that period (Aix-les-Bains 2011 and Milan 2013) were two main activities in that period, but we also put a lot of effort in pushing our conference network and increase recruiting, among other things by reaching to a number of agreements with close scientific associations, particularly within IFSA, hoping to create the framework of a future unique association in Europe (I think we did so good job, that I became President Elect of IFSA in 2015). We also stressed the connection with Lofti Zadeh's BISC seminar at Berkeley (Asli Çelikyilmaz), and we reached to a good agreement with the International Journal of Computational Intelligence Systems (Da Ruan and Luis Martínez), addressing also the problem of a dying Mathware & Soft Computing journal, by transforming it into a magazine that, thanks to Humberto Bustince and his team, has become a reference within the IFSA community. We also increased the number and relevance of EUSFLAT Working Groups (Eyke Hüllermeier), the number of EUSFLAT awards (Eulalia Szmidt), and the number of student grants (Bernard de Baets). We also improved the EUSFLAT management of documents, by means of a EUSFLAT repository (Jorge Casillas). I indeed had a great time as president of EUSFLAT, and that I always felt the support from the two boards and from the whole EUSFLAT community, that over time has been able to maintain the original kind, innovative and collaborative spirit of Lotfi A. Zadeh.

**GP:** The greatest challenge was encouraging community members to actively engage with the association and feel like a vital part of it. In particular, I focused on involving and inspiring young people to join an active community and benefit from meaningful learning opportunities. With this vision in mind, I proposed the establishment of the European Summer School of Fuzzy Logic and Applications, which I consider my most significant achievement.

**MS:** There were two major challenges. The conference organization and the world pandemic of COVID19.

To highlight one of them, it would be the merged challenge of the conference organization during the world pandemic. It sounds I am joking but it was really tough. Take into account, that I was elected in Warsaw 2017 where I also presented our candidature for the organization of EUSFLAT 2019. However, as EUSFLAT conference took place in Ostrava 2007 was in Ostrava, we knew that another city had to host the event. So, we decided to organize it in Prague. It was not easy to do it as Prague is more than 3 hours from Ostrava and we had no own facilities there. Although I can say that we had excellent partners for the organization in Prague which led, hopefully, to a nice and memorable event, behind the curtain, there was a tremendous job. And what happened after, one can imagine or even recall. We managed to organize maybe the only EUSFLAT-endorsed winter event, that was FSTA 2020, and then everything got closed. No events. Not even small seminars. The world got literally frozen.

Due to preventive university measures, our friends in Ghent had to stop preparing their organization of IFSA-EUSFLAT 2021 in Belgium and I got desperate. I did not want to be the first and only President who did not manage to organize the major Society conference. It was summer 2020 when I took a car and travelled to Bratislava to meet Radko Mesiar and also Ladislav Šipeky, who does the amazing job with the organization of FSTA events.

I travelled there to discuss whether we take the risk as the only fools in the World. I was the only guest in the intended conference hotel located next to the Presidential palace in Bratislava (how symbolic ), the breakfast was served behind the door just by placing the platen on carpet to avoid the interaction between the hotel staff and the hotel guests. So crazy it was (have not we forgot it too quickly?). The three of us, we sat into a pub (the only three guests there) and after one or two beers we made a decision: if EUSFLAT, IFSA and local providers (hotel etc.) give us a sort of guarantee that would prevent a potential financial tragedy, we would show our courage and give it a try. And it happened for which I am thankful to the whole EUSFLAT Board, IFSA Council and Marek reformat as the IFSA President. And of course, mainly to Radko Mesiar and "Laci" Šipeky. Finally, we managed to get this unreal dream become true in September 2021. A really crazy event. The world was closed and we had even a theatre event with music and dance performance, with a talk-show with several special guests, and also the award ceremony with even some awardees being connected online to the theatre hall. And then the measures related to the world pandemic weakened significantly in winter so that, we managed to again, in the same team, organize FSTA in

January/February 2022. Finally, there was no time gap in EUSFLAT conferences, nor in FSTA conferences.

Looking back, it was just an insane plan. Totally unreal. So many people invested so much efforts in preparing events that never got organized. So much sadness, so many desperate colleagues. It was never in their hands, always a higher power or authority stopped them. I still do not believe it, we had so much luck and such a lack of rationality.

So, after all, my biggest challenge was to suppress my rationality and boost my foolish irrationality. The rest was a huge luck and group of absolutely amazing people around of me.

**3. What do you see as the main differences between research in fuzzy logic during your presidency and today?**

**FE:** The period of my presidency coincide with the period where Mathematical fuzzy logic starts. The important step was the Cost Action "many-valued logic for computer sciences application" (1995-1998) where many excellent researchers in logic from near all the European countries work in the following objectives as explained in the web page of the Cost Action: "The overall objective of this particular COST Action is to co-ordinate research, leading to computer science applications, in many-valued logics. Among the numerous possible applications, a special emphasis is put on the specification and representation of uncertain and/or incomplete knowledge. A clearly indispensable prerequisite is to provide the theoretical basis for developing tools to process and manipulate such knowledge. The scientific work comprises all types of logics that use more than two truth values: three-valued logics for AI reasoning with incomplete knowledge, as is required, for example, in expert systems ; three-valued logics for modelling non-terminating behaviour in software verification, and three-valued logics needed in the investigation of the formal semantics of logic programs; many-valued logics with a large number of truth values as used, for example, in hardware verification and in information logics that model the behaviour of co-operating intelligent agents as real-valued logics that refers mainly to fuzzy logic with applications, for example, in fuzzy control, but as well to Lukasiewicz logic as required, for example, in adaptive coding".

The results of this Cost Action was basic in the birth of Mathematical fuzzy logic that is related with the foundational book of Petr Hájek untitled "Mathematical Fuzzy Logic" in 1998 (the name of the field came from the title of Pertr's book). From then a very extensive and intensive work was done in the field. Many of the essential subjects are well developed in such a way that the new results are more in the logic formalization of new theories like the "Logic tensor Networks" that are new fuzzy logics related to Machine Learning.

**LM:** Research has strongly evolved since the beginning of the century, when I was the President of EUSFLAT. This evolution is particularly affecting publications, both in journals and conferences. This applies not only to research in fuzzy logic, but to almost any field of research. This situation is conditioned by significant technological changes in the editorial field, but it is mainly a consequence of the strong pressure for publishing imposed by the different scientific evaluation criteria applied today. The effect has been an evolution from publishing to make results and advancements available for other researchers and society in general, to publishing for "increasing the records, citations and h-index". In other words, from submitting those results you consider are interesting and useful enough to deserve publication, to submitting those results you think would be accepted for publication (the sooner the better).

**UB:** Well, the Deep Learning Hype of the last years has changed the AI community drastically. Fuzzy technologies have to compete for being considered as an indispensable component of AI stronger than ever!

**JM:** I think that by 2009-2013 the fuzzy community was a growing community thanks to the leadership of Lotfi Zadeh at the University of California at Berkeley and great fuzzy pioneers. Now we have to adapt our fuzzy approaches to a completely different "Engineered Artificial Intelligence" framework, where concept modelling quite often seems to be less considered than the result, to be measured in terms of some "statistical" comparison, somehow leaving aside the deep understanding of the problem we need to face new circumstances. I hope that the explanatory needs will claim with energy the key role that fuzziness should play in managing natural language and information in order to create a more "humanistic" Artificial Intelligence.

**GP:** Today, fuzzy logic is increasingly integrated with other algorithmic approaches in AI and a wide range of applications. It is even common to find papers that incorporate aspects of fuzzy set theory and/or fuzzy logic presented at events not specifically focused on fuzzy-related topics.

**Gabriella Passi at the 1st EUSFLAT Summer School on Fuzzy Logic and Applications in Como, Italy, in September 2015.**

**MS:** Actually, I do not see a huge difference. Of course, things are evolving, topics are being developed, but this is a nature of science. If it were not so, it would not be science. Indeed, the influence of machine learning (and especially deep learning) can be detected on a daily basis but still, the things, we do, are basically the same. We, I mean the whole community, move on the borders of our knowledge and still, as we are only humans, after all, we keep gaps behind of us and these gaps wait for the other researchers to get investigated by them. What's new on that principle? Nothing. But indeed, interdisciplinarity plays more significant role.

**4. What advice would you give to future presidents of EUSFLAT to ensure its continued success and relevance in the field?**

**FE:** I have not many ideas. Perhaps one advice is to keep EUSFLAT activities and conferences as a place where the researchers in fuzzy logic and applications can discuss the advances from the fuzzy point of view of formalizations and tools of different new topics even if the contents of their research are already presented in some more specialized conferences of different topics as Knowledge representation, machine learning, etc.

**UB:** Strive for opening to the community to other communities and fields! I still consider it a weakness of the fuzzy community that it is too much isolated. That probably stems from earlier times when anything "fuzzy" was not taken seriously by other scientists. However, this is not the way our community can survive. We have been working hard to decades to establish methods that have proven useful in many fields of applications. These fields need to know about that! As one arbitrary example (you may exchange computer vision to any other application domain), fuzzy methods for computer vision (also) need to be published in computer vision journals and conferences. They must not remain within the boundaries of the fuzzy community.

**JM:** I am afraid that each time is different, but anyway the most important thing in any organization is the people joining that organization. As I said above, the most important objective of a President of a scientific association is to keep alive and grow the association, taking particular care in assuring attractive conferences and activities that promote willingness to collaborate and opportunities for launching new joint projects, opening also the community to other close (or not so close) scientific, technological or social communities. In my opinion, all the Presidents of EUSFLAT have achieved this objective, always walking the path from the things done by the previous board and opening new possibilities for the next board. But as also said above, the greater the number of members in the association, the greater the number of possibilities to be launched and developed by the association.

**GP:** Perhaps to increase contacts and active collaborations of the association with other associations in various fields.

**MS:** I dislike to give advices of this type –Susana Montes knows it very well. Giving such advice is like when an old mentor gives a promise to keep supervising eye on a young successor. But the reality is not of such a type. The successor can be often much smarter, experienced and wiser than the ancestor. So, when Susana I were passing the baton, my only advice to her was to keep trusting herself. And I promised her that if I get asked, I will never answer as a an "emeritus President" but I can formulate my opinion of what "Martin" would probably do or, alternatively, I could recall what I did in a similar situation. However, with explicitly mentioning, that maybe it was not the best option to do and so, reconsideration and revision is highly recommended. I really do not think that future presidents need my advice. Let us give them trust and support.

**5. What do you think are the most exciting opportunities and pressing challenges for EUSFLAT in the coming years? And for the fuzzy logic community?**

**FE:** Now a days AI is the most prominent Technology and so, I think that fuzzy researchers need to follow its development. Fuzzy Logic already can give formalization and tools for building AI Systems.

**LM:** I think that in the preset age of Artificial Intelligence, the main challenge for our community is positioning ourselves as a recognized player in the field of AI, and more specifically in the field of Explainable AI, that is gaining presence today, and where fuzzy logic can offer quite interesting properties and characteristics. At the same time, it is important for our society to get institutional recognition at the level of research and education policy makers in order to gain presence in research/education programs.

**UB:** See the two answers above.

**Radko Mesiar receiving the IFSA Fellowship by hands of Javier Montero and Janusz Kacprzyk at the 7th EUSFLAT Conference**

**JM:** In my opinion EUSFLAT is a wonderful and lively community that should find a way to strengthen relationship with other scientific communities, particularly within IFSA (but not only IFSA), to all together assure that fuzzy logic plays a key role in Artificial Intelligence and any tool focused on information and knowledge management, and also decision making aid as a consequence. The whole fuzzy community should explore all possible opportunities that the current volatile status of Artificial Intelligence (in the most wide sense) is opening.

**GP:** I think this is closely connected to what I mentioned in the previous point.

**MS:** For EUSFLAT as well as for the community: to keep promoting and supporting its events, we cannot dare to lose the major one(s). That is, the main product, let us accept it as the reality, it is. We do not act as a certifying authority unlike, e.g., some profession chambers. We give our stamp on the main events. It has to keep its value. And so, the events have to keep their value. And so, let us invest all we have into them. And them, in parallel, with not lower importance, let us invest into younger colleagues. Let us speak their language, let us use their communication channels, let us present them. For some of our members, even Facebook is a sort of newspeak notion while for younger colleagues, Facebook is a tool for dinosaurs like me, they use other tools. But we need to speak to younger colleagues. We need to learn from them. We need to organize summer schools. Maybe also webinars, mentorship programs, etc. It is great to show them idols on one side, but we need to take them into the circle. For instance, each conference is significantly refreshed if (at least) one of the plenary speakers is a sort of "raising star" speaker. We have so great young talents among us. We cannot afford to make them wait 25 years till they become stars. Let us give them a chance. If we want to innovate the way we do things we cannot do it ourselves. But we can easily do it by inviting younger colleagues to do it their way with us. Let youngsters become the significant part of the power. Experience is important, but experience cannot be left alone. The other things such as scientific challenges for the fuzzy community are, maybe surprisingly for the readers, of a secondary importance for me. The well-established and (co)working community will overcome all obstacles.

RECOGNITION

# Consuni Approves the Awarding of Honorary Titles

https://www.ufrn.br/imprensa/noticias/86113/consuni-aprova-concessoes-de-titulos-honorificos

**Humberto Bustince**

The University Council (Consuni) of the Federal University of Rio Grande do Norte (UFRN) approved, in an ordinary session on Monday, the 9th, proposals for awarding honorary titles of honoris causa and professor emeritus. Professors Humberto Bustince and Karl Statteger will receive the title of honoris causa professor, while retired journalist Afonso Laurentino Ramos will be awarded the title of doctor honoris causa. The professor emeritus honor will be granted to professors Rasiah Ladchumananandasivam, Virgínia Maria Dantas de Araújo, Djalma Ribeiro da Silva (posthumously), and Eudenilson Lins de Albuquerque.

Professors Humberto Bustince and Karl Statteger, from the Public University of Navarra (Spain) and the University of Kiel (Germany), respectively, have provided significant contributions to UFRN through collaborations that resulted in research and extension projects, student exchange programs, joint scientific publications, and other initiatives. Similarly, the professor from the University of São Paulo (USP), Sílvio Roberto Salinas, also had his honoris causa professor title approved in the Consuni meeting held on November 18. Meanwhile, journalist Afonso Laurentino Ramos has carried out work in support of education, culture, and history, as well as making important contributions to UFRN in his professional field.

The UFRN professors will receive the title of professor emeritus in recognition of their outstanding work in teaching, research, and extension, as well as their contributions to institutional development. The honorees are affiliated with the Department of Textile Engineering (DET/CT); Department of Architecture (Darq/CT); Institute of Chemistry (IQ/CCET); and the Department of Biophysics and Pharmacology (DBF/CB).

**Consuni Meeting – Photo: Tábatta Lima**

MEMORIAL

# Remembering Professor Alexander Šostak: A Life Dedicated to Knowledge and Inspiration

September 13th marked a profoundly sad day for the academic community, as we lost an exceptional scholar and beloved colleague, Professor Alexander Šostak. His untimely passing, caused by a sudden and tragic incident, has left a void in our hearts and in the field of mathematics and fuzzy logic, where his contributions will be remembered for generations to come.

Alexander Šostak was born in 1948 in Riga. He obtained his higher education in mathematics at the Latvian State University in 1971. In 1974, he completed postgraduate studies at the Latvian State University, and in 1975, he was awarded the title of Candidate (Doctor) of Physical and Mathematical Sciences after defending his dissertation at the Peoples' Friendship University in Moscow. In 1992, he received his habilitation in mathematics from the University of Latvia, and in 1993, he was granted the academic title of professor.

Alexander Šostak has dedicated a significant part of his career to the University of Latvia. During his studies, he began working at the Faculty of Physics and Mathematics in 1971, initially as a senior laboratory assistant and later as an assistant, associate professor, and professor. He actively participated in the faculty's activities, at various times leading the Department of Mathematical Analysis and the professional study program "Mathematician-Statistician," as well as representing the Mathematics Department on the faculty council.

His research work was connected to two scientific institutes: The Institute of Mathematics of the Latvian Academy of Sciences and the University of Latvia from 1991 to 2006, and the Institute of Mathematics and Informatics of the University of Latvia, where he worked as a leading researcher from 2006 until the last day of his life.

His scientific research focused on topology, category theory, fuzzy logic, multivalued mathematical structures, and their applications. He is author to approximately 200 scientific publications. Under his supervision, 10 doctoral dissertations were successfully completed and defended (6 in Latvia, 1 in Spain, 1 in Germany, 1 in Moscow, and 1 in Kyrgyzstan). Two more dissertations by his students are nearly finished. Last year, two new doctoral students began their research under Professor Šostak's guidance, excelling in their studies and earning awards for their scientific publications at international conferences during their first year of study.

The professor is author to 12 teaching materials and has taught over 20 lecture courses. He lectured not only at the University of Latvia but also, at various times, at the University of Liepāja, RISEBA University, and the Transport and Telecommunication Institute in Latvia. He also taught abroad, including at Rhodes University in South Africa in 1993 and in the York University in Canada in 2006. While teaching at York University in 2006, he simultaneously conducted research at the Fields Institute. From 1978 to 1979, he worked as a research scientist at the University of Zagreb in Croatia.

Professor Alexander Šostak was a renowned scientist both in Latvia and internationally, with a wide network of collaborators in countries such as the Czech Republic, Slovakia, Spain, Canada, Germany, Estonia, China, South Korea, and Turkey. He was a member of the editorial boards of several international scientific journals and a regular member of program committees for numerous international conferences, including EUSFLAT, IFSA, ESCIM, FSTA, and others. Under his leadership, many fundamental research projects funded by the Latvian Science Council and co-financed by European Union structural funds were successfully accomplished.

He was one of the founders of the Latvian Mathematical Society in 1993, a member of its board since its establishment, and served as its chairman from 1996 to 2001.

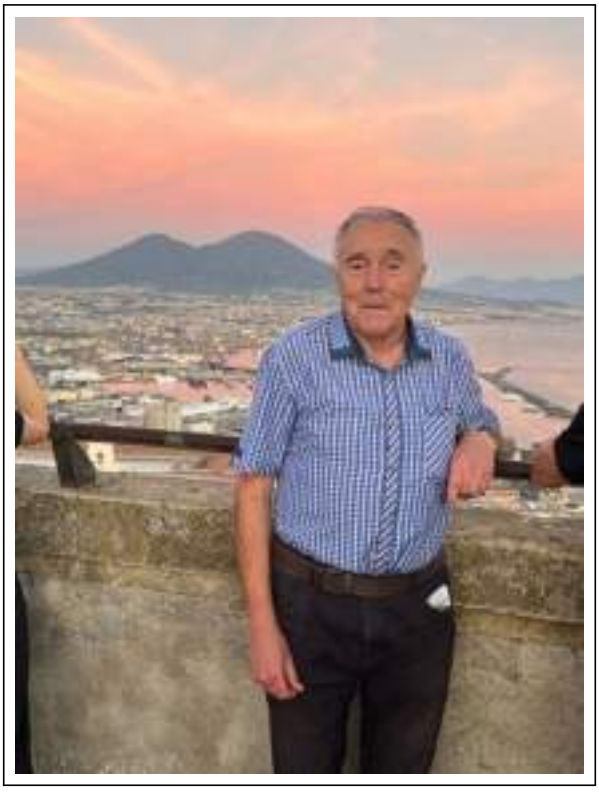
In 2004, Alexander Šostak was elected as Corresponding Member of the Latvian Academy of Sciences, and in 2017, he became a Full Member. That same year, he was awarded the title of Emeritus Scientist of Latvia and in the Latvian Academy of Sciences he received the Piers Bohl Prize. In 2018, he was honored with the University of Latvia Award for establishing a scientific school.


**At the University of Latvia**

# Memories

## Ulrich Hohle

For the first time I met Alexander Šostak at the International Conference on Topology in Lecce (Italy) Summer 1990. At that time, we had interesting and stimulating discussions on the axioms of Fuzzy Topology. Since this meeting took place at a holiday resort close to Lecce, we spend much time together at the Adria beach. In the next year 1991 we met again in Prague (Czech Republic) and started a cooperation on Fuzzy Topology. So in the first half of 1990s we had an intensive exchange of ideas on the axiomatization of this new theory. Around 1992 I invited him to Wuppertal for 4 weeks, and vice versa I visited him in Riga, March 1995. The result of this cooperation was Chapter 3 in Mathematics of Fuzzy Sets, Logic, Topology and Measure Theory, Kluwer Academic Publishers 1999. From a today's perspective this chapter still shows how the axiomatic foundation of fuzzy topology was varying and not basically fixed at the end of 1990s. Alexander's axioms appear as L-fuzzy topological spaces and attain a further development as enriched L-fuzzy topological spaces, while the axioms of L-topological spaces having their origin in C.L. Chang's concept of fuzzy topologies were strengthened as stratified L-topological spaces. For more details, I would like to refer to our chapter. In the following years, for several times we met at the International Seminar on Fuzzy Sets in Linz (Austria), and it was always stimulating to talk to him. I do not forget his nice article on M-approximate systems on the occasion of my 65th birthday in FSS161. I'm deeply touched that Alexander is no longer among us.



**Alexander in Naples during ESCIM'22, 02-05.10-2022**

## Irina Perfileva

It is very difficult for me to write about Alexander in the past, as I still cannot come to terms with it. However, this is an unchangeable reality, and we must pay tribute to his memory and remember the moments in the life of our community associated with him.

Alexander (for me, just Sasha) was the ideal embodiment of a scientist, researcher and, of course, a mathematician - smart, punctual in details and responsible for his work. For him, mathematics was not an abstract subject that lives only in university laboratories, but a living being that grows under our hands, like Pygmalion's Galatea. I remember our walks along the Baltic coast in Jurmala with endless discussions of his and his students' current developments, plans and dreams to make the existing results stronger and more perfect. He always resisted my criticism regarding the assignment of degrees of fuzziness to almost all existing mathematical concepts, consistently developing mathematical constructions in accordance with his intuition and knowledge.

Our first meeting took place in Moscow in 1993, where he stayed after one of the International Conferences on Fuzzy Logic. I remember his seminar at the Russian Academy of Sciences, where he spoke with great enthusiasm about a new scientific direction that we believed would revolutionize traditional science. He maintained this enthusiasm throughout his long scientific life.

After that we had many meetings in Riga, where he organized one of the most influential seminars devoted to theoretical problems of fuzzy topology, fuzzy metric spaces and fuzzy categories. He was always open to new directions in abstract mathematical theories based on fuzzy structures, attracting young people who now continue what he developed together with them. He left his name in the history of fuzzy mathematics, and I believe it will be preserved forever.

## Vilém Novák

For the first time, I met Alexander in the former Czechoslovakia. He arrived with a group of people from Latvia to take part at the International Symposium on Fuzzy Approach to Reasoning and Decision-Making that we organized in a small town Bechyně in June 25-29, 1990, just after the fall of communism. Since then we have been meeting each other regularly almost every year on various places in Europe, and also in Latvia which I visited several times to meet him and his group. He was a very good scientist with many original ideas and we had a lot of discussions. He was one of the most generous and friendly people whom I met. In fact, I can hardly name somebody else who is so nice as was Alexander. He was very positive and had also a good sense of humor. And he was always ready to help people around him. Therefore, everybody who knew him was very fond of him. His unexpected departure hit us very deeply. We will never forget him. God bless him.

### Štěpnička Martin

At the beginning of this fall, our fuzzy community was shaken by the sad news of the unexpected passing of our friend, colleague, mentor, teacher, and an amazing companion, Professor Alexander Šostak. We may all recall our many meetings with him, the friendly discussions, the numerous papers we read, and the lectures we listened to. His scientific legacy is impressive and deeply appreciated. Yet, it's not this legacy that we will primarily carry in our hearts, nor the image we will hold in our minds.

I understand the etiquette that guides us to speak formally about Professor Šostak, as is customary in Latvia. But for those of us who knew him well, it was his warm, joyful spirit —expressed through the twinkle in his eyes— that led us naturally, and perhaps inappropriately, to call him "Sasha." He was a professor of profound respect and achievements, yet his friendly character invited familiarity and warmth.

It is difficult to share all my memories of Sasha, but I will share one that has stayed with me. In the spring of 2019, we visited Riga for a small yet exceptional conference celebrating his 70th birthday. From an organizational point of view, it was perhaps the most splendid event I have ever attended. But beyond this, I saw Sasha's passion to enjoy every single moment, even after the conference was over. Together with Michal Holčapek, we were invited by Sasha to a local, cozy inn for beer. "I like it here, and you are my friends. I wanted to bring you here," he said. And the rest was in his eyes —a depth of warmth and sincerity that needed no further words.

Sasha loved research and mathematics and built a remarkable scientific reputation. But it was his soul —playful and open, with a hint of childlike wonder— that created a circle of dear friends around him. For us, the enduring image of Sasha will be of him enjoying life's small moments, surrounded by friends, and spreading joy and kindness. That is the Sasha who will remain forever in our hearts, the Sasha we will remember, the Sasha who lives on in us.

### Jesús Medina Moreno

Alexander Šostak (Alejandro, as he signed his letters when he wrote to me) has been a very active man, being an excellent researcher and person. He has written very good papers with excellent mathematical developments. For example, I found his approaches from category theory very instructive. Regarding his humanity, he was an exceptional person and friend (amigo, as he said to me in Spanish). He always had a smile on his face. Come to mind the wonderful after-dinner moments, when we talked over a beer or a glass of one of his favorite liquors, Riga Black Balsam.

He has participated in many conferences and organized many events. In particular, I can say as co-chair of ESCIM, that he has been a usual participant of the different editions of ESCIM, and he also was the main local organizer of ESCIM2018 (escim2018.uca.es), which has been one of the most wonderful editions. The different moments I shared with him for the organization of that event will be unforgettable, in particular the bowling night after the gala dinner. This event will always remain engraved in the memory of the participants thanks to him. My friend, my amigo Alejandro, a toast to you with a glass of Riga Black Balsam, thank you for everything.

### Óscar Valero Sierra

In 2019, Professor Alexander Šostak visited Mallorca to work with the members of MOTIBO research group at University of Balearic Islands. The purpose of such a visit was promoting a close and solid future formal collaboration relationship, which has been consolidated over time. Such a visit lasted two months, in which we discovered his great initiative and intellectual ability as a mathematician. In addition to his mathematical prowess, we had the surprising pleasure of discovering his pleasant personality. Alexander quickly integrated into our university and society as if he had been with us all his life. At all times he stood out for his correctness, kindness and greatness of heart, sharing both his knowledge and everything that was in his power to help anyone who needed it. Since then, we have been fortunate to be able to count on his presence many times in different short working visits and in different meetings at congresses, maintaining not only a work colleagues' relationship with him but also of friendship. His loss has left us with a void that will never be filled again. Dear friend, we wish you all the best wherever you are.

### Şuara Onbaşıoğlu Altuhovs

**Şuara and Alexander**

Last semester, when I came to the University of Latvia as Prof. Šostak 's Master's trainee student, I knew it would be

a wonderful experience. Prof. Šostak was always kind and warm-hearted toward me. Even in a short time, we formed a beautiful bond.

Prof. Šostak was a good listener and a wonderful friend. I feel incredibly fortunate to have met him and to have learned so much from him. He had plans to visit Turkey, and I was eagerly awaiting his arrival here. Many things have remained unfinished... I will never forget the light in his office which shone late into the night, the inspiration Prof. Šostak gave me with his hard work and the warmth he showed me with his hospitality. A truly remarkable person has left this world... I will miss Dear Prof. Alexander Šostak.

With my deepest respect, love, and gratitude...

### Bernard De Baets

I was shocked to learn about the unexpected passing of Alexander Šostak. I am filled with sadness. We seem to have known each other for so long that I cannot even recall our first encounter. It was probably at one of the legendary Linz seminars, where, early in my career, I had the chance to engage with some of the top mathematicians in our field. I realized then that, despite their status, these great women and men were warm, kind individuals. Alexander definitely stood out.

He always interacted thoughtfully, whether approving or disagreeing, yet he never raised his voice and was always constructive. Moreover, he was eager to familiarize himself with the latest results and encouraged his students to do the same. I recall his efforts to bring them along to another conference where we often met-FSTA in the Tatra Mountains.

I hope his former students, some of whom are now professors, treasure Alexander's values and continue to uphold Riga as one of the major hubs for fuzzy logic in Europe and beyond. In this way, we will always remember him.

### Banu Pazar Varol

I had the privilege of meeting Professor Šostak in person in 2010. During my Ph.D. thesis period, I spent six months in Riga through the Erasmus exchange program, where I had the opportunity to work with him. Throughout my master's and doctoral studies, I had read many articles by Professor Šostak. Meeting him was both gratifying and exciting. He was always kind and warm towards me. I learned so much from him, both academically and personally. I am grateful for everything he taught me. After completing my phD, he saw me as a colleague, but Professor Šostak will always remain my professor. I feel incredibly fortunate to have met him and to have learned so much from him.

The wonderful bond we formed in 2010 continued. On September 2023, my master's student, Şuara, went to the University of Latvia as a master's intern under Prof. Šostak through the Erasmus mobility program. I knew this would be a wonderful experience for Şuara as well.

In January 2024, I traveled to Riga to visit both Professor Šostak and Şuara. He was a wonderful host, and we both worked and enjoyed our time together. Now I say to myself, I am so glad I made this visit. In September, I had planned to host him here in Kocaeli, Türkiye. He was scheduled to give a seminar to our graduate students, work with us, and explore the city. However, some things were left unfinished. While eagerly awaiting his arrival in Kocaeli, receiving the news of his passing was a profound tragedy for me. He was a helpful person, kind to everyone, positive, good friend and an extraordinary pure mathematician. I will miss him dearly.

### Māris Krastiņš

It was in the middle of the 90-ies of the 20th century when I had an opportunity to attend professor's course in topology. I still admire his presentation style and clear formulas written by chalk on the blackboard. And suddenly it was very clear to understand the essence of some definitions of mathematical analysis when professor admitted that continuous function maps close points to close points.

Afterwards we did not meet up until 2016 when an accidental coincidence and search for a practical solution in my professional work took me back to the University of Latvia where professor was interested in supporting my efforts in the fuzzy logic. Although I was somehow convinced that professor was very demanding and strong in his attitude to all students, he managed to inspire me in not only doing some research on simple applications of fuzzy logic, but also proceed with PhD studies. This collaboration resulted in many memorable moments of attractive journey where we carried out joint research in aggregation operators, concept lattices and rough set theory. In parallel, it was always interesting to touch some other areas of our joint interests in architecture and astronomy. Now it is difficult to admit that we did not manage to fully materialize our plans in the area of multi adjoint triples. But it was a really unforgettable time, and professor was always ready to support me in order to complete our joint papers, prepare for the conferences notwithstanding that sometimes we had to talk during late evening hours or on the weekends. His empathy, intelligence and assurance skills will be never forgotten.

### Ingrīda Uļjane

Professor Alexander Šostak was my Teacher. I write the word "Teacher" with a capital letter, because otherwise it would be inappropriate. I met the professor when I started my studies at the University of Latvia, in the first semester, when he gave lectures on mathematical analysis. In this and later on other study courses, he gave lectures practically without notes, writing theorems, proofs, illustrative examples with chalk on the blackboard. In his lectures, abstract mathematics became alive, inviting the audience to perceive not only the facts, but to feel the essence of mathematics. He showed by his example how to treat students, colleagues, people in general with true respect, benevolence and generosity, how to live life.

**With Olga at the EUSFLAT 2021 conference**

### Olga Grigorenko

I met Alexander Šostak during my third year at the University of Latvia, where he was a professor of Topology. To be honest, it was a course that made me fall in love with mathematics —or perhaps it was the professor himself who sparked that love. His lectures were filled with profound thinking and, at the same time, a friendly and welcoming atmosphere. Since then, the professor has been a unique figure in mathematics for me —a person with whom we could always discuss mathematical and philosophical questions, the culture of different countries, and so much more. He was someone who tirelessly supported his students and people in general, someone who advanced science in Latvia with gentle determination —true humanity and a true friend.

**Alexander with friends and colleagues during the FARMS2029 conference on behalf of his 75th jubilee**

CONFERENCE REPORT

# 16th +FuzzyMAD meeting

November 17, 2023
Faculty of Mathematics, Complutense University, Madrid, Spain
https://eventos.ucm.es/105243/detail/fuzzymad-2023.html


*Sponsored by:*
*Faculty of Mathematics, Complutense University of Madrid*
*Interdisciplinary Mathematics Institute, Complutense University of Madrid (IMI Data Science Club)*
*Ph.D. Program on Mathematical Engineering, Statistics and Operational Research (IMEIO)*
*Project PID2021-122905NB-C21 of the Government of Spain (FORAid)*

The 16th edition of the FuzzyMAD meeting, +FuzzyMAD since 2018, was held last November 17, fulfilling the objective of allowing soft computing researchers in the region of Madrid to interchange ideas, problems and results, and to explore joint future projects. These kind of friendly meetings should be encouraged among young researchers particularly after COVID-19, to assure they capture the fruitful collaborative and interdisciplinary component of Science, besides those specific achievements they barely need for their personal promotion.

70 participants joined this 16th edition of +FuzzyMAD, following the traditional structure of past +FuzzyMAD meetings, organized in three parts: a course mainly oriented for Ph.D students, the presentations of young researches, and the poster session to increase visibility of all research groups with presence at +FuzzyMAD.

+FuzzyMAD


In +FuzzyMAD 2023 first part, we enjoyed three suggesting plenary speakers, each one followed by a live discussion:

- Prof. Vanesa Guerrero, from Carlos III University of Madrid, gave a talk on "*Constrained smoothing and feature selection in additive models: a mathematical optimization approach".*
- Prof. Isabel Molina, from Complutense University of Madrid, gave a talk entitled "*An introduction to small area estimation, with application to poverty mapping".*
- And Prof. Carlos Lopez Molina, from the Public University of Navarra, talked about *"A naturalistic approach to imprecision in image processing".*

In the second part of +FuzzyMAD 2023, six young researchers presented the current state of their Ph.D. thesis:

1. "*Interpretable methods for multivariate regression tasks*", by Carlos Giner.
2. "*Fuzzy clustering methods with Rényi's entropy*", by Javier Bonilla.
3. "*Robust methods for reliability analysis*", by María Jaenada.
4. "*Development of intelligent models for mechanical and energy-related anomaly detection in wind turbines*", by Dennys Coronel.
5. *"Characterization measures for weighted graphs"*, by Carlos Ignacio Pérez.
6. *"An optimization model for fire lanes and burn-off location in wildfires prevention"*, by Elena Ballesteros.

The last part of +FuzzyMAD, perhaps the most important one, was the poster session around a buffet, where attendants could explore potential collaborations with all colleagues, after learning from their posters their very last results, projects and objectives, with this aim presented by each research group.

This edition of +FuzzyMAD has been possible thanks to the support of the Faculty of Mathematics at Complutense University of Madrid, the Interdisciplinary Mathematics Institute (particularly its Data Science Club program), the Ph.D. Program on Mathematical Engineering, Statistics and Operational Research (IMEIO, a joint program between Complutense University and the Technical University of Madrid), plus the Spanish research groups led by profs. Tinguaro Rodríguez, Daniel Gómez and Begoña Vitoriano, which together conform the FORaid team.


The members of +FuzzyMAD 2023 Scientific Committee this time were Profs. Javier Montero, Daniel Gómez, Tinguaro Rodríguez and Pablo Flores-Vidal, plus Prof. Teresa Ortuño as coordinator of the IMEIO Ph.D. program, and it was possible thanks also to the dedication of the Ph.D. students María Jaenada, Bibiana Granda, Carlos Giner and Javier Bonilla.

Now, before thinking in +FuzzyMAD 2024, we have to focus our work towards the success of the FLINS-ISKE 2024, to be organized by our group, please visit https://eventos.ucm.es/go/detail/flins-iske24.

Javier Montero, Daniel Gómez, Tinguaro Rodríguez and Pablo Flores
Complutense University
Madrid, Spain

CONFERENCE REPORT

# IPMU2024

## 20th Information Processing and Management of Uncertainty Conference

The 20th IPMU (Information Processing and Management of Uncertainty) conference was organized from 22nd to 26th July 2024 in Lisbon (Portugal), by João Paulo Carvalho (INESC-ID / Instituto Superior Técnico, Universidade de Lisboa, Portugal), with three program co-chairs, Marie-Jeanne Lesot (Sorbonne Université, France), Marek Reformat (University of Alberta, Canada) and Susana Vieira (Instituto Superior Técnico, Universidade de Lisboa, Portugal), and Fernando Batista (INESC-ID / ISCTE, Instituto Universitário de Lisboa, Portugal) as Publication Chair. Around 200 researchers from 31 countries of the five continents participated in the event.

Plenary lectures were given by renowned invited speakers: Keeley Crockett (Manchester Metropolitan University, UK) gave a lecture on "*People Powered AI - Challenges and opportunities in Responsible and Trustworthy AI Development*", Mário Figueiredo (Instituto Superior Técnico, Universidade de Lisboa, Portugal) on "*Causal Discovery from Observations: Overview and Some Recent Advances*". Ruth Byrne (Trinity College, Dublin, Ireland) explained "*How people understand counterfactual explanations for decisions by AI systems*" and Thierry Marie Guerra (Université Polytechnique Hauts-de-France, France) presented "*A brief history of Fuzzy Control, few examples and a tribute to Michio Sugeno*".

**Keeley Crockett**

The 2024 Kampé de Fériet Award medal was presented virtually to Judea Pearl by Bernadette Bouchon-Meunier on behalf of the IPMU Executive Committee. Judea Pearl is currently Chancellor professor of computer science and statistics at the University of California, Los Angeles, USA, where he directs the Cognitive Systems Laboratory and conducts research in artificial intelligence, human cognition, and philosophy of science. The award was bestowed to him "*for his seminal work on probabilistic reasoning in artificial intelligence, including Bayesian networks, and causality*". On this occasion, he gave a lecture online entitled "*From the Management of Uncertainty to the Management of its Causes*".


**Mário Figueiredo**

**Bernadette Bouchon-Meunier**

Moreover, 164 long and short papers were presented in the regular track and 21 special sessions on "*Logic-based Decision Making*", "*Theoretical and Applied Aspects of Imprecise Probabilities*", "*Data Aggregation*", "*Information fusion techniques based on aggregation functions, preaggregation functions and their generalizations*", "*Representing and Managing Uncertainty*", "*Fuzzy Implication Functions*", "*Soft Methods in Statistical Inference and Data Analysis*", "*Linguistic Expressions and Generalized Quantifiers*", "*Flexible Advanced Mining Methods for Data, Text and Social Networks*", "*Logic-based Decision*

*Making*", "*Soft Computing, Uncertainty, Imprecision and Image Processing*", "*Fuzzy Modelling and Control*", "*Aggregation Operators*", "*Fuzzy Logic-Based Decision Modeling in Economics and Social Sciences*", "*Intuitionistic Fuzzy Sets: Theory, Applications and Related Topics*", "*Mathematical Fuzzy Logic*", "*Philosophical Foundations*", "*Soft Computing in Database Management and Information Retrieval*". The proceedings are published by Springer in three volumes of the series Lecture Notes in Networks and Systems.

An enjoyable welcome reception was held on July 22nd in the garden of the Congress Center of the Instituto Superior Técnico where the conference was held, in the heart of Lisbon. The banquet was a memorable moment on July 24th, as a part of a 4 hour cruise on the Tagus River, with an exceptional view of the city of Lisbon at sunset and in the night with illuminations. Good food and music contributed to a very friendly evening. Best paper and best student paper awards were bestowed at the end of the dinner, respectively to Didier Dubois, Romain Guillaume, Christophe Marsala and Agnès Rico for "*Interpreting Fuzzy Decision Trees with Probability-Possibility Mixtures*" and Stanislav Basarik and Lenka Halčinová for "*Extended permutations dependent Choquet-like operator and application*".

The EUSFLAT General Assembly was held on Tuesday, July 23rd. Four EUSFLAT student grants were offered by the EUSFLAT board to Emīls Kalugins, David Nieto-Barba, Akhilesh Nanavati Kavit and José Antonio Torné Zambrano.

The closing session on July 26th ended the 20th IPMU conference.

More information at https://ipmu2024.inesc-id.pt/

CONFERENCE REPORT

# SMPS 2024

## Soft Methods in Probability and Statistics

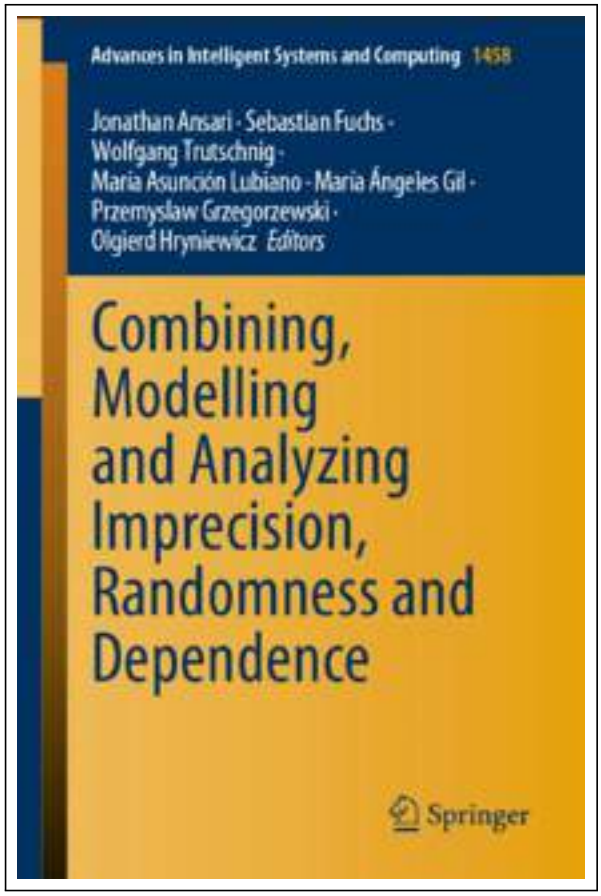
The 11th International Conference on Soft Methods in Probability and Statistics (SMPS 2024) took place in Salzburg (Austria), on September 3-6, 2024. The conference website: https://www.smps2024.com

The SMPS conference is a scientific event organized every two years that gathers experts representing existing approaches used in soft modeling in probability, statistical reasoning, and data analysis. Past editions: SMPS 2002 – Warsaw (Poland), SMPS 2004 – Oviedo (Spain), SMPS 2006 – Bristol (United Kingdom), SMPS 2008 – Toulouse (France), SMPS 2010 – Oviedo and Mieres (Spain), SMPS 2012 – Konstanz (Germany), SMPS 2014 – Warsaw (Poland), SMPS 2016 – Rome (Italy), SMPS 2018 – Compiègne (France), and SMPS 2022 – Valladolid (Spain).

SMPS 2024 was organized by the Dependence Modeling working group of the Department for Artificial Intelligence and Human Interfaces (AIHI), Faculty of Digital and Analytical Sciences, at the Paris Lodron Universität Salzburg, with General Chairs: Jonathan Ansari, Sebastian Fuchs, Wolfgang Trutschnig and their collaborators. Thanks to them, we could spend a wonderful three days in Salzburg, listening to interesting lectures and presentations, participating in engaging discussions, and in some exciting social events.

Ninety-two registered participants took part in the conference (which means quite a large group in comparison with past editions). We listened to 75 presentations and 5 plenary lectures given by Siegfried Hörmann (Graz University of Technology), Susanne Saminger-Platz (Johannes Kepler University Linz), Steven Vanduffel (Vrije Universiteit Brussel), Ingrid Van Keilegom (KU Leuven) and Christian Wagner (University of Nottingham). Moreover, during the conference, a traditional competition was held for the best paper given by Ph.D. students.

As was the case during previous conferences, the proceedings were published by Springer in the following volume: Jonathan Ansari, Sebastian Fuchs, Wolfgang Trutschnig, María Asunción Lubiano, María Ángeles Gil, Przemyslaw Grzegorzewski and Olgierd Hryniewicz (Eds.), Combining, Modelling and Analyzing Imprecision, Randomness and Dependence, Springer, 2024, https://doi.org/10.1007/978-3-031-65993-5.




The volume covers a broad variety of topics ranging from classification, clustering, decision theory, dependence modeling, functional data analysis, optimal transport, robust statistics via core SMPS competencies like fuzzy sets, imprecise and generalized probabilities, random sets, and T-norms to machine learning and industrial applications. The approximately 70 papers in this volume were carefully selected through a peer-review process by international experts.

The next edition of the SMPS conference will take place in September 2026 in Lecce (Italy) and will be organized by Fabrizio Durante (Università del Salento) and his team.

Przemyslaw Grzegorzewski
(Warsaw)

**Panoramic view of Salzburg**

**Attendees at SMPS 2024**

CONFERENCE REPORT

# SFLA 2024

## Fifth European Summer School on Fuzzy Logic and Applications

The V European Summer School on Fuzzy Logic and Applications (SFLA 2024[1]) took place in Toledo, Spain, from 2nd to 6th September, 2024. SFLA is one of the main activities promoted by the EUropean Society for Fuzzy Logic And Technology (EUSFLAT4[2]), which encourages scientific communication and collaboration between its members and the scientific community at large. SFLA has been organised by the Oreto Group[3] of the Departament of Technologies and Information Systems[4] of the University of Castilla-La Mancha[5]. SFLA'24 was supported, EUSFLAT, IFSA (International Fuzzy Systems Association), and also five institutional partners related to the University of Castilla-La Mancha and the province of Toledo[6].

Traditionally, all the editions of SFLA offered several courses held by relevant experts in the field of Fuzzy Logic. PhD students and young researchers represent the ideal audience for the School which aims at introducing the core aspects and the recent developments of Fuzzy Logic and related applications. The 2024 edition of SFLA is the fifth after those held in Como (Italy), Celadna (Czech Republic), Santiago de Compostela (Spain) and Bari (Italy). The School proposed several courses delivered by world-leading experts in the field. A key aspect of the School was the focus on communication and collaboration among participants and lecturers, ensuring time for discussions so that a fruitful ground for exchanging knowledge can be established. The students and young researchers attending the school also had the opportunity to give short presentations of their activities.

### SFLA 2024

SFLA 2024 was attended by 19 participants (mostly PhD students, but also young researchers) from all over Europe. In addition, presentations were given by 16 invited speakers who explained the basics of fuzzy logic, tools for working with fuzzy logic, fuzzy models and their applications, and other current topics related to fuzzy logic, such as machine learning, artificial intelligence, Large Language Models, Trustworthy systems, etc. In addition, it is worth mentioning the presentation on how to achieve an effective publication of the research carried out in impact journals. Finally, there were also two round tables entitled "Generative AI: present, future and the role of fuzzy logic" and "The current state of fuzzy logic research and its future: How to promote its research and application in current lines of research?". The social activities included an exciting guided tour of the city of Toledo and a gala dinner.

In summary, SFLA2024 consisted of a total of fifteen lectures or workshops, two round tables and three presentation sessions of the work of the students and young researchers participating in the summer school. This comprehensive programme kicked off on Monday 2 September. After the opening ceremony, the first lessons began. This first day was dedicated to the mathematical foundations of fuzzy logic and fuzzy modelling, in order to serve as a basis for the rest of the workshops of the summer school. To this end, Martin Štěpnička from the University of Ostrava and Manuel Ojeda from the University of Malaga presented the mathematical foundations of fuzzy logic and the analysis of formal concepts, respectively. The first day would end with the first presentations of the students' work and the workshop by Jesús Medina, from the University of Cádiz, on Galois connections in fuzzy logic. Figure **Monday** shows some images of the day.

The second day allowed participants to get an overview of current work in the field of fuzzy logic. Juan Moreno-García and David Muñoz-Valero from the University of Castilla la Mancha presented a workspace for inference in fuzzy environments. Then, Chris Cornelis from the University of Ghent presented an introduction to rough sets, Luis Magdalena (Universidad Politécnica de Madrid) gave an overview of the generation of fuzzy knowledge from data and, finally, José Ángel Olivas (University of Castilla la Mancha) spoke about approximate reasoning and computing with words. During this second day, there was also time for a second session of presentation of students' work and feedback from the speakers. Figure **Tuesday** shows some images of the day.

The third day of SFLA2024 had two clearly differentiated parts. During the morning, trustworthy artificial intelligence systems were the main thematic thread. Around this topic, José Alonso (University of Santiago de Compostela) and Francisco Herrera (University of Granada) defined and described the foundations of fuzzy trustworthy systems as well as the current regulatory frameworks for trusted artificial intelligence systems. The morning ended with the first round table about the role of fuzzy logic in generative artificial intelligence systems. The speakers were Francisco Herrera, Jesús Medina, Luis Martínez (University of Jaén) and Susana Montes (president of EUSFLAT). This round table was moderated by Manuel Ojeda. After lunch, the student paper

[1] https://eventos.uclm.es/111541/detail/v-european-summer-school-on-fuzzy-logic-and-applications-sfla2024.html
[2] https://eusflat.org/
[3] https://www.uclm.es/es/toledo/EIIA/Investigacion/Oreto
[4] https://www.uclm.es/departamentos/dtsi?sc_lang=en
[5] https://www.uclm.es/
[6] Diputación de Toledo, Escuela de Ingeniería Industrial y Aeroespacial de Toledo, Departamento de Tecnologías y Sistemas de Información, Instituto de Tecnologías y Sistemas de Información, Aula SMACT (CGI).

presentation session was replaced by the workshop given by Rosa Rodríguez (University of Jaén) who shared with the students her experience as a reviewer and editor of important journals and showed methodologies, tools and strategies to publish a scientific article in a high impact journal. The day ended with a guided tour of the city of Toledo and the SFLA2024 gala dinner. Figure **Wednesday** shows some images of the day.

Thursday was a very practical day dedicated to fuzzy logic applications. Thus, Luis Martínez (University of Jaén) focused on its application to the resolution of decision support problems, Katarzyna Kaczmarek (Polish Academy of Sciences) showed how it is possible to explain machine learning models using linguistic summaries, while José Alonso and Javier González (University of Santiago de Compostela) gave a practical lesson on hallucination detection and mitigation in large language models. During the afternoon, the last session about student paper presentation took place. Figure **Thursday** shows some images of the day.

The last day of SFLA2024 served to continue explaining to the students novel applications of fuzzy logic. Thus, Karel Gutiérrez and Óscar Cordón, from the University of Granada, spoke about the potential of fuzzy logic in natural language processing tasks for social network analysis and human forensic identification, respectively. To close the event, the second round table about the future of fuzzy logic and its research took place. This round table was moderated by José Alonso and Óscar Cordón, Katarzyna Kaczmarek, Rosa Rodríguez and Martin Štěpnička participated. It was a pleasure that during the round table there were many comments from the speakers and the students, which made the session much more enriching. Figure **Friday** shows some images of the day.

Once again, SFLA is coming to an end. This year, it has done so with a high level of presentations by our speakers and active participation by students, who have tried to inspire the importance and passion for fuzzy logic and its applications. We will see you at SFLA2025.


**Monday**

**Tuesday**

**Wednesday**


**Thursday**

**Friday**

CONFERENCE REPORT

# UPC Seminar

## Hybridizing fuzzy sets with other AI techniques

The Master of Artificial Intelligence (given by Universitat Politècnica de Catalunya, Universitat Rovira i Virgili and University of Barcelona) organizes each year a Seminar of 20 hours on a different topic of interest. This year the seminar had the title "Hybridizing fuzzy sets with other AI techniques". Lectures took place at UPC campus in Barcelona in mid-April, 2024.

Several members of EUSFLAT have participated as lecturers. First session was devoted to introducing the history of fuzzy logic and its research lines. Prof. Bustince, president of IFSA made an online short presentation about the societies. Dr. Aida Valls and Dr. Jordi Pascual (Universitat Rovira i Virgili) talked about the use of fuzzy logic in machine learning and explainability. Dr. Jose Manuel Soto (University of Granada) presented the work of the IEEE-CIS FSTC Task Force on fuzzy logic software tools and the IEEE standard for Fuzzy Markup Language. Prof. Núria Agell, together with the PhD students Walaa Abuasaker and Nil Agell (ESADE-University Ramon Llull), presented a model for reasoning with hesitant linguistic terms sets and several applications in group decision making. Dr. Karel Gutiérrez (University of Granada) showed how fuzzy logic can be used in natural language processing tasks, focusing on social networks analysis. Finally, the last day, we had two online lectures. First one by Dr. Pedro Bibiloni (University of Balearic Islands) was about fuzzy logic in image analysis, specially on mathematical morphology operations and their applications for segmentation. The second one was given by Iosu Rodríguez (Public University of Navarra), who focused on the use of neurofuzzy systems for information fusion in deep learning models. Students discovered the variety of research lines in fuzzy logic and AI and could solve practical illustrative exercises during the different sessions. It has been a profitable occasion to highlight the importance of the use of fuzzy techniques in the current developments made in the Artificial Intelligence arena. As organizer, I acknowledge the participation of all the lecturers and the involvement of EUSFLAT members

Dr. Aida Valls
Organizer of the AI seminar


**Teachers participating in the seminar.**

NEWS

# The Kampé de Fériet Award 2020 presented to Barbara Tversky

Bernadette Bouchon-Meunier
Christophe Marsala
Sorbonne Université, CNRS, LIP6, F-75005 Paris, France

The **Kampé de Fériet Award** is given on the occasion of each IPMU Conference[1] for the recognition of works which bring an exceptional contribution to the fields of information processing in automated and humanistic systems and management of uncertainty. The late Professor Joseph Kampé de Fériet was a famous scientist in France. His works range from pure mathematics, fluide mechanics, theory of turbulence, statistical mechanics to information theory. He was a professor at the University of Science and Technology of Lille and a correspondant of the French Academy of Sciences. He was also a member of the Spanish Academy of Sciences. To pay homage to his memory, the Kampé de Fériet Award is awarded every 2 years, during each IPMU conference for the recognition of significant works in this spirit[2].

In 2020, the award was presented to **Barbara Tversky** (Professor Emerita of Psychology at Stanford University and Professor of Psychology and Education at Teachers College, Columbia University) **for her contributions to cognitive psychology, and in particular her work on memory, thought, spatial mental models and event perception.**

**Barbara Tversky**

Her research has spanned memory, categorization, spatial thinking and language, event perception and cognition, diagrammatic reasoning, gesture, design, and creativity. She has enjoyed collaborations with linguists, philosophers, computer scientists, domain scientists, designers, and artists. She has served on numerous boards of journals and international associations, and was president of the Association for Psychological Science. She is a fellow of several societies, including the American Academy of Arts and Sciences.

Unfortunately, due to COVID 19, the IPMU 2020 conference[3] was held on line and Barbara Tversky received the Kampé de Fériet medal virtually. On this occasion, she gave a plenary lecture entitled "*How Action Shapes Thought*"[4] , referring to her book "Mind in motion: How action shapes thought" (Hachette UK, 2019).

After four years, she was finally able to receive the medal in person in Paris, at a meeting organized by the team Learning, Fuzzy and Intelligent Systems of the LIP6 Laboratory, at Sorbonne Université on January 31, 2025. During this event, she gave a lecture entitled "*Mind in Motion*", and she had a long discussion with the participants.

After Barbara's talk, Bernadette Bouchon-Meunier presented the Kampé de Fériet Award to her on behalf of the IPMU Executive Committee.

[1] http://ipmu.lip6.fr/
[2] The list of awardees since 1992 can be found here: http://ipmu.lip6.fr/?KampeDeFerietAward
[3] https://ipmu2020.inesc-id.pt/
[4] https://ipmu2020.inesc-id.pt/?page_id=776

NEWS

# Ph.D. Thesis defended by Mikel Ferrero-Jaurrieta

Public University of Navarra, Pamplona, Spain

Mikel Ferrero-Jaurrieta defended his PhD Thesis, entitled "Multivalued and non-symmetric operators for sequential information processing". His supervisors are Carlos López-Molina (Public University of Navarra, Spain) and Zdenko Takáč (Slovak University of Technology, Slovak Republic). The thesis was defended on March 15, 2024 at Public University of Navarra (UPNA), with the following jury:

- Alberto José Bugarín Diz (University of Santiago de Compostela, Spain)
- Nora Millor Muruzabal (Public University of Navarra, Spain)
- Jana Špirková (Matej Bel University in Banská Bystrica, Slovak Republic)

The PhD dissertation consists of two parts: on the one hand multivalued information operators and on the other hand the use of non-symmetric aggregation operators, both for sequential information processing.

Multivalued data structures are recurrent tools for organizing data, often enabling the representation of information that encompasses multiple attributes, variables, dimensions or coordinates. Their basic management and processing is reliant on basic operations such as equality, comparison and order. On top of these operations, more complex operations (as the aggregation of information) can be defined. Among the different uses of multivalued data structures, one of particular relevance is the representation of sequential information, a type of data in which the individual elements have temporal, spatial or orderly dependency on each other. Examples of sequential data are natural language and time series.

In this thesis, we present a new framework for multivalued information processing. We present new methods for aggregating multivalued information. We extend functions that take into account the possible relation between the data. Since these functions require the ability to sort their arguments, two different approaches are presented: componentwisely and by proposing a new ordering method. These functions are applied in the fusion of sequential information in recurrent neural networks. In the multivalued context, a new method for the comparison of multivalued structures is also presented.

Complementarily, an additional topic in sequential information processing is considered: the symmetry of the information processing operators. In the aggregation of sequential information, the order of the arguments is a matter of great relevance, and therefore the use of symmetric functions does not make sense, since we may be breaking the temporal correlation. Therefore, new methods for constructing non-symmetric aggregation functions are presented, with application to the aggregation of sequentially dependent information such as in text-based convolutional neural networks, as well as in the combination of time series prediction models.

The thesis has been prepared in the format known as a compendium, i.e., it includes all the works on the subject addressed in the thesis that have already been published by the author. The articles that make up the doctoral thesis are the following:

1. M. Ferrero-Jaurrieta, Z. Takáč, J. Fernández, L. Horanská, G. P. Dimuro, S. Montes, I. Díaz, H. Bustince, "VCI-LSTM: Vector Choquet Integral-Based Long Short-Term Memory", IEEE Transactions on Fuzzy Systems, 31 (7), 2238–2250, 2023, DOI: 10.1109/TFUZZ.2022.3222035

2. M. Ferrero-Jaurrieta, L. Horanská, J. Lafuente, R. Mesiar, G.P. Dimuro, Z. Takáč, M. Gómez, J. Fernández, H. Bustince, "Degree of totalness: How to choose the best admissible permutation for vector fuzzy integration", Fuzzy Sets and Systems, 466 (108461), 2023, DOI: 10.1016/j.fss.2022.12.017

3. M. Ferrero-Jaurrieta, Z. Takáč, I. Rodriguez-Martinez, C. Marco-Detchart, A. Bernardini, J. Fernández, C. López-Molina, H. Bustince, "From Restricted Equivalence Functions on $L^n$ to Similarity measures between fuzzy multisets", IEEE Transactions on Fuzzy Systems, 31 (8), 2709–2721, 2023, DOI: 10.1109/TFUZZ.2023.3235405

4. M. Ferrero-Jaurrieta, R. Paiva, A. Cruz, B. Bedregal, L. De Miguel, Z. Takáč, C. López-Molina, H. Bustince, “Non-symmetric over-time pooling using pseudo-grouping functions for convolutional neural networks”, Engineering Applications of Artificial Intelligence, 133 (Part E), 108470, 2024, DOI: 10.1016/j.engappai.2024.108470

5. M. Ferrero-Jaurrieta, R. Paiva, A. Cruz, B. Bedregal, X. Zhang, Z. Takáč, C. López-Molina, H. Bustince, “Reduction of complexity from generators of pseudo-overlap and pseudo-grouping functions”, Fuzzy Sets and Systems., 490, 109205, 2024, DOI: 10.1016/j.fss.2024.109025

NEWS

# Ph.D. Thesis defended by Iosu Rodríguez Martínez

Public University of Navarra, Pamplona, Spain

Iosu Rodríguez defended his Ph.D. thesis titled "*Modification of information reduction processes in Convolutional Neural Networks*" as part of the Doctoral Program in Sciences and Industrial Technologies at Public University of Navarre (UPNA) on October 11th, 2024. The thesis was supervised by Humberto Bustince Sola from the Public University of Navarre, Zdenko Takáč from the Slovak University of Technology in Bratislava and Francisco Herrera Triguero from the University of Granada.

The thesis committee was composed of:

- **José María Alonso Moral**, University of Santiago de Compostela, Spain.
- **Francesco Bardozzo**, University of Salerno, Italy.
- **Nora Millor Muruzabal**, University of Navarre, Spain.

This thesis focuses on the replacement of Information Fusion processes in Convolutional Neural Networks, with the aim of improving their performance on image classification tasks. Specifically, it explores the modification of the pooling and global pooling operators of this kind of Neural Network, making use of some ideas from the fusion and aggregation functions fields of research.

The main contributions of this research can be summarized as follows:

- **The introduction of CombPool Layers**, which allows to replace classic simple pooling operators by combinations of different increasing functions. Fuzzy integrals can be introduced as terms of the combination to consider the coalition among local subsets of activation values. The work also shows the importance of monotonicity in feature fusion processes, studying the conditions for the remaining combinations to preserve monotonicity.
- **The use of (a, b)-grouping functions** to find an effective replacement for classic max-pooling. In this work we show that high activation values lead to more informative intermediate features, and that other grouping functions can improve upon the behaviour of max-pooling, leading to a more efficient optimization of the network.
- **The evaluation of the previous results in a COVID-19 detection pipeline**. Chest X-ray images were preprocessed, segmented and classified using CNNs which replaced their pooling and Global Pooling layers by the previous strategies. Empirical evaluation proved that the alternatives were effective, but that the best overall alternative is problem and model dependent.

The results of this thesis, which has been published as a compendium of published articles, can be found in high-impact journals such as Neural Networks, Information Fusion and Expert Systems with Applications.

NEWS

# Ph.D. Thesis defended by Jonata Wieczynski

Public University of Navarra, Pamplona, Spain

Jonata Wieczynski defended his PhD thesis "Discrete Fuzzy Integrals and their Applications" in the Doctorate Program in Science and Industrial Technologies at the Public University of Navarre (UPNA) on January 31st, 2025. His work was supervised by Dr. Carlos López-Molina (UPNA) and Dr. Graçaliz Pereira Dimuro (Federal University of Rio Grande - FURG/Brazil).

The jury that evaluated the thesis was composed of::

- Dr. Juan Vicente Riera Clapés from the University of the Balearic Islands,
- María Jesús Campión Arrastia from the Public University of Navarre, and
- Dr. Antonio Francisco Roldán López de Hierro from the University of Granada.

The doctoral thesis presented a comprehensive study on new generalizations of discrete fuzzy integrals and their applications across multiple domains. Completed as a compendium of published works, it introduced four novel families of discrete fuzzy integrals: the d-XChoquet integral, the dCF-integrals, and extended families of both discrete Choquet and Sugeno integrals. These new mathematical tools were developed to provide greater flexibility and improved performance in handling uncertainty and imprecision in real-world applications.

The doctoral thesis made significant theoretical contributions by analyzing the properties of these new generalizations, such as monotonicity, increasingness, and averagingness. The practical value of these developments was demonstrated through extensive experimentation across three distinct application areas: classification problems using fuzzy rule-based classification systems (FRBCS), multi-criteria decision-making (MCDM), and brain signal processing in brain-computer interfaces (BCI). The results consistently showed that the proposed generalizations performed better than existing discrete fuzzy integrals in most applications.

A notable aspect of the work is its balanced approach between theoretical advancement and practical application. The thesis began with an investigation of the Sugeno integral's performance in classification tasks, which led to the development of more sophisticated generalizations like the d-XChoquet integral and dCF-integrals. The research then introduced two new families of discrete integrals based on pseudo-grouping and pseudo-overlap functions, which not only expanded the theoretical scope of fuzzy integrals but also demonstrated improved performance in group decision-making problems. Through this doctoral thesis, valuable contributions were made to both the theoretical foundations of fuzzy integrals and their practical applications in handling real-world uncertainty and imprecision.

NEWS

# Ph.D. Thesis defended by Erika Bombarová

University of Economics in Bratislava, Bratislava, Slovak Republic
January 2025

PhD thesis, "***Modeling and adapting aggregation functions for data classification using computational intelligence***", demonstrates the suitability of ordinal sums for three-class classification under conditions of uncertainty. The framework accommodates pessimistic and optimistic inclinations toward classification targets, offering both theoretical advancements and practical applications.

## Theoretical Contributions

The thesis introduces a generalized approach to classification using ordinal sums, ensuring that similar data records are consistently evaluated. For classification tasks:

- The class *Maybe* is covered by averaging functions. Averaging functions without annihilators (0 and 1) are proposed to address uncertainty, exemplified by the convex combination of the geometric mean and its dual.
- The class *No* employs conjunctive functions, specifically the Schweizer-Sklar family of t-norms.
- The class *Yes* utilizes disjunctive functions, modeled as the dual of Schweizer-Sklar t-conorms.

## Practical Contributions

As an practical contribution, the demonstration of learning parameters and the interactive classification space for further adaptation by domain experts is explored. The application on toy datasets validated the theoretical observations and highlighted the capabilities of ordinal sums when adapted with generalized functions. By examining the dynamic interplay between input parameters and output variations, valuable insights were gained into the nuanced behavior of the model. This demonstration underscored not only the flexibility of ordinal sums but also their responsiveness to parameter adjustments. Such insights are pivotal for refining the model's performance and optimizing its applicability across a wide spectrum of classification tasks. To enhance interpretability and explainability, the results could be presented graphically or through linguistic summaries wherever possible.

Additional examples focused on learning parameters for the ordinal sums data classification model using real-world datasets. These cases involved assessing the model's performance through standard statistical methods and linguistic summaries, as well as comparing the results with those from conventional classification techniques such as logistic regression, random forest, and Naive Bayes. Unlike traditional methods, the model provided insights into class inclinations, offering nuanced and informative results. The results indicate that regression metrics perform better with ordinal sums, while classification metrics excel with other approaches. This can be attributed to the choice of the fitness function used in the genetic algorithm. In future work, exploring alternative fitness functions would be beneficial for further enhancing performance. By demonstrating competitive performance across various metrics and datasets, the model showed its ability to treat similar records consistently, a crucial feature for classification tasks.

Overall, the model's ability to provide inclination results enhances its utility, solidifying its efficacy and applicability in real-world scenarios where understanding class inclinations and maintaining consistency in data evaluation are essential for informed decision-making.

## Limitations and Future Work

Despite its strengths, ordinal sums face challenges related to parameter complexity, which can slow learning processes and reduce robustness. Additionally, the lack of associativity in conjunctive and disjunctive ordinal sums limits scalability.

Future research will focus on addressing these limitations by exploring alternative fitness functions, expanding the model to handle more classes, and applying it to diverse real-world scenarios. Future work should be also devoted to the theoretical improvements required for solving particularities of the tasks like considering the other aggregation functions, e.g., recently developed overlap and grouping functions.

## Conclusion

The theoretical foundations in classification by ordinal sums of conjunctive and disjunctive functions are explored for the future benefit of explainable artificial intelligence. These results contribute to the ongoing debate between artificial intelligence, machine learning, fuzzy rule-based systems, and aggregation function communities to assess these concepts.

# EUSFLAT 2025


## About The Conference

The aim of the 14th Conference of the European Society for Fuzzy Logic and Technology, EUSFLAT 2025, which will take place in **Riga, Latvia** is to bring together researchers dealing with the theory and applications of computational intelligence, fuzzy logic, fuzzy systems, soft computing and related areas:

- Approximate reasoning
- Data aggregation and fusion
- Theory and applications of decision-making
- Fuzzy control
- Theoretical foundations of fuzzy logic and fuzzy set theory
- Imprecise probabilities and fuzzy methods in statistics
- Image processing and computer vision
- Knowledge representation and knowledge engineering
- Machine learning and neuro-fuzzy systems
- Natural language processing, generation and understanding
- Stochastic and fuzzy optimization
- Rough sets theory


# Special Sessions

List of accepted sessions:

- SS01 - Interval Uncertainty
- SS02 - Representing and Managing Uncertainty: different scenarios, different tools
- SS03 - Mathematical Fuzzy Logic
- SS04 - Soft Methods in Statistical Inference and Data Analysis
- SS05 - Fuzzy Implication Functions
- SS06 - Information fusion techniques based on aggregation functions, preaggregation functions and their generalizations
- SS07 - Fuzzy metric spaces and their generalizations: theory and applications
- SS08 - New contexts in aggregation theory
- SS09 - Modeling Complex Dynamics: Adapting Analytical Tools for Diverse Scenarios
- SS10 - Soft computing, uncertainty and imprecision in image processing
- SS11 - Fuzzy Relations and Applications
- SS12 - The Role and Value of Information in Decision Making
- SS13 - Generalized quantifiers, logical syllogisms and applications
- SS14 - Advancements and Applications of Fuzzy Theory and Fuzzy Control


# Plenary Speakers

**Bernard De Baets**

Senior Full Professor and Head of Department of Data Analysis and Mathematical Modelling, Ghent University, Belgium

**Humberto Bustince**

Professor of Computer Science, Universidad Pública de Navarra, Spain

**Oscar Cordón**

Professor at the University of Granada, Spain

**Katarzyna Kaczmarek-Majer**

Associate Professor at the Department of Stochastic Methods, Systems Research Institute, Polish Academy of Sciences Warsaw, Poland

**Ulrich Bodenhofer**

Professor for Artificial Intelligence at University of Applied Sciences Upper Austria, Hagenberg, Austria

**Andris Ambainis**

Professor at the University of Latvia, Riga, Latvia

# ISFS 2025

## 6th International Symposium on Fuzzy Sets, Katowice, Poland, May 23-24, 2025


This Conference is organized by the Polish Society for Fuzzy Sets (POLFUZZ) and the University of Silesia in Katowice, Poland, in cooperation with EUSFLAT (European Society for Fuzzy Logic and Technology) and PTM (Polish Mathematical Society).

https://isfspolfuzz.us.edu.pl/

ISFS 2025 is the 6th event in a successful series of international conferences connected with fuzzy sets, fuzzy logic, and related topics. The Conference ISFS will provide an excellent international forum for sharing knowledge and results in theory, methodology, and applications of fuzzy sets and systems. The symposium became a regular forum for exchanging scientific ideas among communities from Rzeszow, Warsaw, Poznan, Katowice, and Bratislava, although the participants extended beyond Europe. Since 2017, the Conference has been organized in cooperation with the Slovak University of Technology in Bratislava, where the series of seminars is known as Uncertainty Modelling.

Research presentations are of interest in the following topics:

- Theoretical foundations of fuzzy logic and fuzzy set theory;
- Imprecise information modeling with fuzzy, rough, and other methods;
- Federated learning;
- Image processing and computer vision;
- Information retrieval;
- Knowledge representation and engineering;
- Decision-making models;
- Expert systems;
- Intelligent data analysis and data mining;
- Approximate reasoning.

Potential areas of application, among others, include:

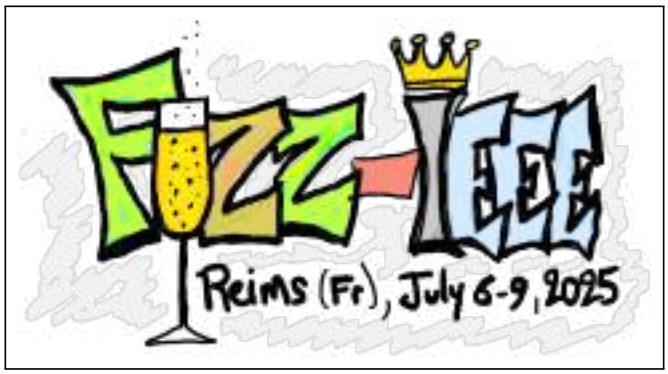
- Medical and Healthcare systems;
- Business Process Modeling;
- Social and economic models.

We are waiting for your abstract, and we look forward to meeting you in Katowice next year!

Michal Baczynski, Krzysztof Dyczkowski, Przemyslaw Grzegorzewski, Katarzyna Mis and Barbara Pekala
Steering Committee

# 2025 IEEE International Conference on Fuzzy Systems

– 60 years of Fuzzy sets ! –




## FUZZ-IEEE 2025,

Reims, France, July 6-9, 2025
https://2025.fuzzieee.org/

The Annual IEEE International Conference on Fuzzy Systems (FUZZ-IEEE) is one of the premier international conference in the field of fuzzy sets and systems and related areas. Its 2025 edition will be held in the City of Reims, France, the city of the French Kings and Champagne!

### TOPICS OF INTEREST

FUZZ-IEEE 2025 will represent a unique meeting point for scientists and engineers, both from academia and industry, to interact and discuss the latest enhancements and innovations in the field. The topic of the conference will cover all the aspects of theory and applications in fuzzy sets theory and hybridizations with other artificial and computational intelligence techniques. In particular, FUZZ-IEEE 2025 topics include, but are not limited to:

- Mathematical and theoretical foundations of fuzzy sets, measures and integrals,
- Fuzzy control, robotics, sensors, fuzzy hardware and architectures,
- Fuzzy data analysis, fuzzy clustering, classification and pattern recognition,
- Type-2 fuzzy sets, computing with words and granular computing,
- Fuzzy systems with big data and cloud computing, fuzzy analytics and visualization,
- Fuzzy systems design and optimization,
- Fuzzy decision analysis, multi-criteria, decision making and decision support,
- Fuzzy modelling, identification and fault detection,
- Fuzzy information processing, information extraction and fusion,
- Fuzzy web engineering, information retrieval, text mining and social network analysis,
- Knowledge discovery, learning, reasoning and knowledge representation,
- Fuzzy image, speech and signal processing, vision and multimedia data,
- Fuzzy databases and information retrieval,
- Rough sets, imprecise probabilities, possibilities approaches,
- Fuzzy logic and its Industrial, financial, biological and medical applications,
- Fuzzy logic in civil engineering and geographical information systems,
- Fuzzy sets and soft computing in social sciences, linguistic summarization, natural language processing,
- Computational intelligence in environmental sciences,
- Computational Intelligence in safety of critical systems, cyber-physical systems and cyber-security,
- Hardware/Software for fuzzy systems,
- Fuzzy Markup Language and standard technologies for fuzzy systems,
- Adaptive, hierarchical and hybrid (neuro- and evolutionary-) fuzzy systems,
- Emerging related topics...

In addition to regular presentations, the conference will include tutorials, panel sessions, and plenary talks from several well-known leaders in the field. Submissions for regular presentations are invited from researchers, practitioners, and students worldwide. Proposals for Special Sessions are highly welcomed. Each proposal should give a description of the session topic and the names of the contributors plus their paper titles. Papers submitted to special sessions will go through the normal reviewing process. Proposals for Tutorials are also highly welcomed. An outline for each tutorial should be submitted and any pre-requisites for the intended audience.

### IMPORTANT DATES

– Tutorial / Special session proposal: November 1st, 2024

– Tutorial / Special session notification: December 1st, 2024

– Paper submission: January 24th, 2025
*If possible, you can register you paper are your earliest convenience in EDAS (https://edas.info/N33249), then submitting your pdf paper later (before the deadline or course).*

– Notification of acceptance: April 1st, 2025

– Camera-ready paper submission: May 1st, 2025

– Early/author registration: May 1st, 2025

– Conference: July 6-9, 2025

## AUTHOR INSTRUCTIONS

*see the webpage: https://fuzzieee2025.conf.lip6.fr/author-instructions/*

## KEYNOTE SPEAKERS

Fosca Giannotti

Sushmita Mitra

J.-S. Roger Jang

Steven Schockaert

## SPECIAL SESSIONS

*to see the list of accepted special sessions: https://fuzzieee2025.conf.lip6.fr/special-sessions/*

## TUTORIALS AND PANEL SESSIONS

*to see the list of accepted tutorials and panel sessions: https://fuzzieee2025.conf.lip6.fr/tutorials-and-panel-sessions/*

## ORGANIZING COMMITTEE (complete list of the organizing committee: see the webpage)

Honorary Co-Chairs

Bernadette Bouchon-Meunier, LIP6 – Sorbonne Université, Paris, France James M. Keller, University of Missouri, Columbia, MO, USA

General Co-Chairs

Kevin Guelton, CReSTIC – Université de Reims, Champagne-Ardenne, Reims, France Christophe Marsala, LIP6– Sorbonne Université, Paris, France

Program Co-Chairs

Marie-Jeanne Lesot, LIP6 – Sorbonne Université, Paris, France Gabriella Pasi, Università degli Studi di Milano Bicocca, Milano, Italy Lluis Godo, Artificial Intelligence Research Institute, Bellaterra, Spain

## CONTACT

For more information: fuzz-ieee2025@univ-reims.fr

# 7th School on Belief Functions and their Applications

Oct 19-23, 2025
University of Granada, Granada, Spain

**PRELIMINARY ANNOUNCEMENT** (more information coming soon)

The BELIEF school is a biennial event organized by the Belief Functions and Applications Society (BFAS) that offers a unique opportunity for students and researchers to learn about fundamental and advanced aspects of the theory of belief functions (also referred to as Dempster-Shafer theory, or evidence theory), a formalism for reasoning with uncertainty.

The school will be organized around a set of lectures by prominent researchers. Lectures will gradually tackle basic to more advanced theoretical concepts. They will also highlight the links with other uncertainty theories such as random sets and possibility theory, and present applications of belief functions in various domains including machine learning, information fusion, statistical inference and materials science.

## Financial Support

The Belief Functions and Applications Society (BFAS) is offering several grants that cover the school registration fees (which include the tuition fees, lunches, coffee breaks and the social event).

## Organizing committee

- Serafin Moral (Chair), University of Granada, Spain
- Inés Couso, University of Oviedo, Spain
- Enrique Miranda, University of Oviedo, Spain
- Thierry Denœux, University of Technology of Compiègne, France
- Anne-Laure Jousselme, CS Group Research Lab, France
- Frédéric Pichon, Artois University, France
- David Mercier, Artois University, France

# IJCRS 2025

## 11th International Joint Conference on Rough Sets


Dear colleagues,

The deadline for abstract and full paper submission to the **11th International Joint Conference on Rough Sets (IJCRS2025)** has been extended to **February 28** (firm deadline).

The conference will support a hybrid format, allowing both in-person and online participation and you can find all the information on its website IJCRS 2025.

Then, let me invite you to submit a paper to the special section "**Mathematical Foundations of General Rough Sets, and Their Application to the Foundations of AI and Machine Learning**".

General rough sets have rich foundations that span across algebraic, topological, logical, computational, knowledge representation, and mereological domains. Solutions to several known and unknown problems of representation, existence, correspondences, and computability (to name a few) are of natural interest. The gap between the purely computational methods of rough sets, and theoretical approaches needs to be seen as a foundational problem because it bears upon the nature of meaning in practice. The fields of artificial intelligence, in particular machine and deep learning, and generative AI large corpus based systems (frequently referred to as LLMs) have generated a wide array of problems relating to their reliability, meaningfulness, explainability (in any sense), sustainability, and generalizability, among others. Further, their application to fields such as chemistry, molecular biology, education, physics, and social media suggest newer directions of research. Interconnections between various theoretical/computational/heuristic models is essential for cleaning the existing literature. The session is additionally intended to discuss novel proposals on addressing these problems through general rough sets (of different etiologies), 3-way decision-making, approximate reasoning, and granular computing. Papers submitted to the session are expected to be substantially about foundational models, and explain their applicability in sufficient depth. The session will feature invited (with scope for detailed commentaries) and contributed talks. All researchers working on theoretical or meaningful practical applications in related areas are additionally encouraged to submit their papers and participate. A special issue of a leading journal devoted to extensions of the papers submitted to the session will be considered.

Best regards

Stefania Boffa
IJCRS 2025 publicity chair

# 7TH INTERNATIONAL CONFERENCE ON INTELLIGENT AND FUZZY SYSTEMS (INFUS 2025)

with the Theme

Artificial Intelligence in Human-Centric, Resilient & Sustainable Industries

ISTANBUL, TURKEY

July 29-31, 2025

**infus.itu.edu.tr**

INFUS is an acronym for Intelligent and Fuzzy Systems. It is a well-established international conference to advance the theory and applications of intelligent and fuzzy systems. The principal mission of INFUS is to bring together researchers working on intelligent and fuzzy sets, to pave the way for joint studies that will contribute to theory and practice, and to provide the opportunity to publish in prestigious journals and proceedings.

INFUS 2025 proceedings is published as a book by Springer under "Lecture Notes in Networks and Systems" and will be indexed in Scopus, and submitted for consideration in Web of Science. The journals with publication potential include:

- Journal of Multiple-Valued Logic and Soft Computing (SCI-E)
- Symmetry (SCI-E)
- International Journal of Structural Engineering (ESCI)
- International Journal of Risk Analysis and Crisis Response (SCOPUS)
- Artificial Intelligence Theory and Applications (SCOPUS)
- Journal of Intelligent Construction (DOAJ)
- Journal of Intelligent Systems in Current Computer Engineering

The invited speakers of INFUS 2025 are Prof. Hojjat Adeli, Prof. Janusz Kacprzyk, Prof. Krassimir Atanassov, Prof. Vicenc Torra, Prof. Wil van der Aalst, and Prof. Habib Zaidi.


**Important Dates:**

- Final date to submit full papers: **March 23, 2025**
- Notification of full papers acceptance: **April 07, 2025**
- Early registration: **March 02, 2025- April 14, 2025**
- Camera-ready paper submission: **April 25, 2025**
- Source file submission **: May 01,2025**

- Deadline of author late registration for paper publication in proceedings: **May 15, 2025**
- Conference: **July 29-31, 2025**

### INFUS 2025 Conference Awards

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| **Best Paper Award** | This award is given to the best innovative paper presented at INFUS 2022 conference and providing the highest quality and contribution to intelligent and fuzzy systems field. |
| **Prof. Lotfi A. Zadeh Memorial Award** | This award is given to the researcher for his/her outstanding contribution to fuzzy sets and fuzzy systems field in the memory of Prof. Lotfi. A. Zadeh. |
| **INFUS Award** | This award is given to the researcher for his/her outstanding contribution to intelligent and fuzzy systems field. |
| **Best Student Paper Award** | This award is given to the most promising student paper presented at INFUS 2022 conference. |
| **Outstanding Paper Award** | This award is given to the promising papers presented at INFUS 2022 conference and providing outstanding quality and contribution to intelligent and fuzzy systems field. |
| **Best Support Award** | This award is given to the researcher for his/her outstanding contribution to INFUS 2022 Conference. |
| **Best Session Chair Award** | This award is given to the conference session chair for his/her extraordinary efforts on the session organization and moderation |
| **Invited Speaker Award** | This award is given to the invited speakers who contribute to INFUS 2022 conference with his/her invaluable knowledge. |

## INFUS 2025 registration involves

- Presentation of one accepted paper at the INFUS 2025 Conference,
- Publication of one accepted paper (within 8 pages) in the Springer proceedings (guaranteed only for registration received before May 15, 2025),
- Access to remote / onsite tutorial sessions at the conference,
- Access to all remote INFUS 2025 conference scientific sessions,
- Travels to Topkapi Palace, Grand Bazaar, Spice Bazaar, and Bosphorus Cruise,
- Conference bag and gifts,
- Gala dinner, welcome cocktail, three days coffee breaks,
- Three days lunches,
- A photo album full of your memories.


NAFIPS
North American Fuzzy Information Processing Society


# IFSA World Congress
# 2025 NAFIPS Annual Meeting

## Venue

The **21st IFSA World Congress** and **44th Annual Meeting of NAFIPS** will be held together in Banff, Alberta, one of the jewel cities in Canadian Rocky Mountains with a wealth of cultural and tourist attractions. It is in a heart to Rocky Mountains and North Canada. Banff offers a lot of possibilities to learn more about geographical and cultural variety of western Canada.

## Aims and Scope

As a truly unique and international conference in the areas of fuzzy sets and soft computing, 2025 IFSA-NAFIPS Joint Congress will bring together scientists, engineers, students, and practitioners working in fuzzy logic and related areas to present their recent research accomplishments. The Congress offers a unique platform for the exchange of ideas, fostering interaction and building multidisciplinary research linkages.

## Topics

The topics cover all aspects of fuzzy systems and their applications including, but not limited to

- fuzzy sets and fuzzy logic
- mathematical foundations of fuzzy sets and fuzzy systems
- approximate reasoning, fuzzy inference models, and soft computing
- fuzzy decision analysis, decision making, optimization, and design
- fuzzy system architectures and hardware
- fuzzy methods in data analysis, statistics and imprecise probability
- fuzzy databases and information retrieval
- fuzzy pattern recognition and image processing
- fuzzy sets in management science
- fuzzy control and robotics
- possibility theory
- fuzzy sets and logic in ontology, web, and social networks
- fuzzy preference modeling
- fuzzy sets in operations research and manufacturing
- fuzzy database mining and financial forecasting
- fuzzy neural networks
- evolutionary and hybrid systems
- intelligent agents and ambient intelligence
- learning, adaptive, and evolvable fuzzy systems

## Focused Sessions

Proposals for focused sessions concentrating on fundamentals, algorithms, and innovative applications of fuzzy sets and soft computing are welcome. Submission of proposals should include a short description of the session, its relevance to the Joint Congress, and a list of potential contributors. Focused sessions will be open to all participants.

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|---|---|
| Special Sessions proposals due: | **February 17, 2025** |
| Tutorials, Workshops proposals due: | **February 24, 2025** |
| Papers due: | **April 13, 2025** |
| Notification of Acceptance: | **May 18, 2025** |
| Final Papers and Early Registration: | **June 15, 2025** |

**www.ifsa-nafips2025.org**