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Hot Topics

Scientific Reports

Eusflat Life

World Echoes

Message from the Editor-in-Chief (June 2015)

HUMBERTO BUSTINCE

Dear EUSFLAT members,

we are arriving to the end of this year which has been so special for our community, since we have marked fifty years since the introduction of fuzzy theory by Lofti Zadeh. And, with the end of such a relevant year, another issue of our Mathware&Soft Computing online magazine is arriving at your computers.

This issue opens with a talk between two of the most relevant representatives of our EUSFLAT family. Gaspar Mayor and Tomasa Calvo bring to our pages their views, opinions and experiences in some pages which I am sure will be of great interest for all of us. Many thanks to both of them for their interesting work.

Moreover, an for the sake of opening ourselves to all those fields with common points with us, we also include in this issue a report on the Spanish Association for the Progress of Artificial Intelligence (AEPIA). I would also like to thank Amparo Alonso for the effort she has put to make the society that she presides known to all our readers. And I also take advantage of this occasion to open the pages of our magazine to every society or group whose work can be of interest for us.

Last June the IFSA-EUSFLAT conference was held in Gijon. And in that conference, the EUSFLAT Assembly took place. As usual, we include the minutes of the Assembly in the present issue. And, of course, also a report on the conference, which was an absolute success.

But IFSA-EUSFLAT conference has not been the only conference along this year. So several other reports on conferences and workshops appear in this issue. Including one on the first European Summer School on Fuzzy Logic and Applications, which was held at Como last September, and which I hope is the beginning of a very positive and fruitful activity for our community. As I also hope will be the case of the newly launched EUSFLAT Research Center, which is also presented in this issue and which I call all of you to support.

But talking about research centers, I cannot leave aside the very bad news that the last months of the year have brought us: the closure of the European Center for Soft Computing at Mieres. Unfortunately, money has the last word nowadays, but science in Europe will be much poorer once the Center has disappeared. In any case, let this lines express our whole support to all the people who have been involved in this project, and who have shown along the years their exceptional human and scientific quality. And, since this is time for wishes for the next year, let me express one: Let the New Year bring politicians the capacity of realizing where excellent research lays, so that never again something like this happens.

So, now, it's time to enjoy this new issue. Happy New Year to all of you.

Humberto Bustince
Editor-in-chief

Message from the President (December 2015)

GABRIELLA PASI

Dear EUSFLAT members,

another year is coming to an end, and several events have happened since the last letter I addressed to all of you last June.

I open this letter with a sad event of 2015: our estimated colleague Sigfried Gottwald passed away last September. Sigfried was one of the pioneers of fuzzy logic; he gave important contributions to both theoretical issues related to formal logic and mathematics and to applications, such as fuzzy control and data analysis. This is witnessed by his numerous publications, which include the books "Fuzzy Sets, Fuzzy Logic, Fuzzy Methods with Applications" (co-authored with Hans Bandemer and published by John Wiley & Sons in 1995), and "A Treatise on Many-Valued Logics. Studies in Logic and Computation" (vol. 9, Research Studies Press, England, 2001). He was a friendly and enthusiastic person, who, besides his important contributions, leaves to our community a beautiful memory.

From June 30th to July 3rd 2015, the joint 16th World Congress of the International Fuzzy Systems Association (IFSA) and 9th EUSFLAT Conference took place in Gijón, Asturias, Spain. The event has been successful with a high number of participants. During the conference the elections of the new EUSFLAT board have taken place, and they confirmed my role of President for a new term. I am very grateful to the members of the Society for supporting the election of the new Board, which is composed by all members of the previous Board except Edurne Barrenechea, who has to attend to other duties, after being an active member of the Board of our Society for several years. I want to acknowledge the generous and excellent work that Edurne Barrenechea did within the EUSFLAT board in last years; she has left the role of secretary to Susana Montes. My warmest thanks to Edurne, and my warm welcome to Susana. Most members of the new board still cover the roles they played in the previous board; two of them are covering new roles: Martin Štěpnička is now appointed for the Organization/Promotion of Scientific Events, while José María Alonso plays now the role of Secretary. The new Board members with their associated roles can be found at the related page of the EUSFLAT Web site. The experience that I shared with the Board members during the first term, as well as the initiatives we started together in last two years will be for sure of help for the work we have to undertake; I am very thankful to all of them for keeping their support to the Society.

Another very important event that took place during the joint IFSA-EUSFLAT Conference was that Javier Montero became the President Elect of IFSA: many congratulations to Javier, who for sure will give a great contribution to the Society! The maintenance of his role in the EUSFLAT board will certainly benefit the relations between the two Societies and will improve their collaboration.

Now some figures related to our Society in 2015: in 2015 EUSFLAT has been composed of 290 members, and it maintains a scientific network with 8 scientific societies and 30 conferences that are directly linked to EUSFLAT.

One of the most important outcomes of the first term of the board has been the conception of the First Summer School on Fuzzy Logic and its Applications. This initiative has been launched to offer to both PhD student and young researcher an opportunity to learn both the theoretical basis and some of the applications related to Fuzzy Logic; this learning experience is based on several lectures held by experienced and renowned researchers who have given important contributions to our scientific domain. Moreover, such an initiative is a way to set up collaborations and to increase mobility in our scientific network, by making it alive and dynamic. The First Summer School took place on 7-11 September 2015 in the beautiful context of Villa del Grumello, in Como, Italy. You will find in this issue of our magazine a short report on this event. This Summer School has been conceived as an annual event, which will be organized each time in a different European country, by different organisers. It is my pleasure to announce that in 2016 the School will be organized by the Institute for Research and Applications of Fuzzy Modeling, University of Ostrava (Czech Republic), and it will take place in the Beskydy mountains near Ostrava to provide participants with picturesque surroundings. I encourage PhD students to participate numerous to this event, which will allow them both to share their research experience and to learn from experienced researchers.

In relation to the scientific activities promoted by EUSFLAT, I would like to outline the valuable role played by the EUSFLAT Working Groups (many thanks to Slawomir Zadrozny who in the Board is well supporting them). The activities of Working Groups are extremely important to promote the research and the collaborations within our scientific community. I am happy to announce that in 2015 a new working group has been founded and an existing group has been re-organised. The EUSFLAT Working Group on Intuitionistic Fuzzy Sets: Theory, Applications and Related Topics coordinated by Sotir Sotirov ("Prof. Asen Zlatarov" University, Burgas, Bulgaria), a close collaborator of Krassimir Atanassov, the pioneer of Intuitionistic Fuzzy Sets, has been established in 2015 by the EUSFLAT Assembly during the Joint Conference in Gijón. Moreover, since 2014, in accordance with both the previous coordinators and the EUSFLAT Board, the EUSFLAT Working Group on Soft Computing in Image Processing is coordinated by Humberto Bustince (Universidad Pública de Navarra, Spain), Etienne E. Kerre (Ghent University, Gent, Belgium), Javier Montero (Univer-

sidad Complutense de Madrid, Spain), and Irina Perfilieva (University of Ostrava, Czech Republic). The new coordinators launched a number of interesting initiatives that have been welcomed by our scientific community. Please check the list of Working Groups on the EUSFLAT Website, and join those within which you could contribute (`http://www.eusflat.org/research_workinggroups.php`).

I close this letter with an announcement and a wish: as you well know, an organization that in past years has provided several valuable initiatives to the fuzzy community, and which has contributed to the formation of numerous qualified researchers is the European Center for Soft Computing in Mieres, Spain. The Center is unfortunately in the phase of addressing problems related to economic issues of the foundation supporting it. We hope this situation can be recovered, and that the ECSC can still play its important role in 2016.

Last but not least, I wish all of you and your families a Merry Christmas and a Joyful and Healthy new year, in which our Society can expand and offer more and more opportunities to collaborate.

Gabriella Pasi
President of EUSFLAT

INTERVIEW

Dialogue between Gaspar Mayor and Tomasa Calvo

Gaspar Mayor and Tomasa Calvo at the "Residencia de Estudiantes" in Madrid.

Why, when and how did you start doing research into fuzzy sets theory?

GASPAR MAYOR: I finished my studies of mathematics at the University of Barcelona in 1971 and immediately I started teaching mathematics at the Basic General Education Universitary School that was located in Palma (Mallorca). This center, which was devoted to the training of primary school teachers, began at that time to prepare its integration into the University.

The University of Palma de Mallorca was created in 1978, and the mathematician Nadal Batle, disciple and friend of Enric Trillas, was elected Rector of the same in 1982. In 1885 it was renamed University of the Balearic Islands (UIB).

At that time it was very difficult to carry out research in mathematics in our community because there was no basic infrastructure for it. The situation improved considerably when Dr. Batle came to our university. Then, in a meeting with him and discussing about possible research topics so that I could make a PhD thesis, he told me about a recent research area called fuzzy sets theory. At first I did not quite understand what it was, but what was clear is that I had already a support for doing research tasks in our own University. By then Enric Trillas came frequently to Palma and during one of his trips I had the opportunity to talk to him about fuzzy sets. In this occasion we spoke extensively about fuzzy sets and explained to me why he thought were important, and what were the most important milestones of that theory. The enthusiasm that showed Enric by that "new theory" impressed me decisively.

TOMASA CALVO: I finished my studies of mathematics in 1977 and I also started working at the Basic General Education Universitary School of Palma in October of the same year.

I remember that Nadal Batle invited to Enric Trillas and other researchers as Claudi Alsina to give some seminars on Fuzzy Sets theory at our University. I liked the idea that the membership of an element to a set was a matter of degree. I also remember very well when I went to the Polytechnic University of Barcelona to suggest to Enric to became the supervisor of my thesis. Surprisingly, he asked me about what I wanted to work on, but I didn't know. Suddenly, he gave me several books and journals to look for a topic for working, and suggested me to spend part of the night looking for an attractive idea. After that experience, I told him: "I would like to work on the entropy of fuzzy sets". Gaspar, as you can imagine, at that moment, I did not know very well what I was saying, but it was enough to get that Professor Trillas started to explain me the concept of the entropy of a fuzzy set, and how to express it in terms of the entropy of their singletons, and other things. Then, I started to work on this topic whose results were published in a Memorandum of his Department.

Gaspar Mayor and Enric Trillas in Oviedo (ESTYLF2008).

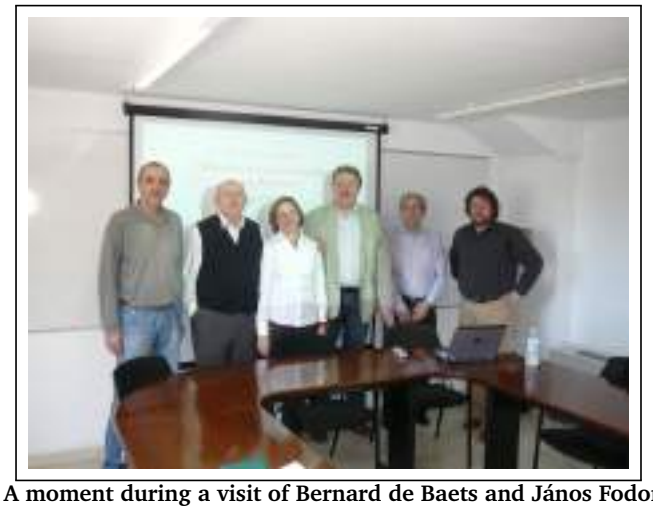
However, at that time, E. Trillas was named President of CSIC what forced him to move to Madrid. This circumstance made that Claudi Alsina was the first supervisor of my thesis. I liked a lot his seminars on functional equations, very often he advised me that he hadn't any solution in a hat, and that, in my case, I had to think and to spend more time looking

at the equations with fondly, etc. After you got the PhD degree you started to be my second supervisor due to we were working at the same Universitary School. Of course I have also learnt many things from you, we have worked together from the beginning until now.

The first time, that I heard an explanation on fuzzy logic I felt attracted because when I was a secondary school student I enjoyed doing exercises based on the classical rules of inference. I thought that chance put me back in touch with the world of logic.

What were your first contributions to fuzzy set theory theory?

GM: The first time I presented a paper was in the Segon Congrés Català de Lògica Matemàtica held in Barcelona in the winter of 1983. The title of the contribution was "The lattice of the Galois connexions" and was a work of several authors. I remember that the content was very naive and right now, can not remember why we presented that paper at that Congress. You see that my first contribution can not be described exactly as something historic.



A moment during a visit of Bernard de Baets and János Fodor to the University of the Balearic Islands.

It was in the autumn of the same year when I presented a paper at the first FISAL (Fall International Seminar on Applied Logic), held in Porto Colom (Mallorca), entitled "On a class of operators for fuzzy sets". This was certainly my first contribution to the study of fuzzy sets in which some results that were arising in the development of my PhD thesis were exposed. Let me say that the references for this work were the papers: "On non distributive logical connectives for fuzzy sets theory" (1980) by C. Alsina, E. Trillas and L. Valverde; "Negaciones en la teoría de conjuntos difusos" (1981) by F. Esteva; "An axiomatic theory of operations on fuzzy sets" (1981) by EP. Klement; and "On fuzzy complements" (1978) by R. Lowen.

In 1984 I presented a contribution at the third edition of the Congrés Català entitled "On a class of operations between fuzzy sets (aggregation operations)". It can be considered my first contribution to the field of aggregation functions. I studied there operations between fuzzy sets defined from operations of the type convex linear combination of a t-norm and a t-conorm type. This work was inspired by the seminal paper by Zimmermann and Zysno (1980) entitled "Latent connectives in human decision making". I think this paper is one of the first in which it appears the name of "aggregation operation". The study of aggregate functions is up to now a field of research that continues providing nice results and many applications.

Gaspar Mayor during the gala dinner of ESTYLF-EUSFLAT 1999, in Palma (Mallorca).

Undoubtedly those Conferences and Seminars held in Barcelona and Mallorca were the starting point of what would be the study and research of fuzzy sets and related issues in Spain.

TC: My first contribution was at the fourth Congrés Català de Lògica Matemàtica (1985), although I had already attended several FISAL Seminars. But my first international contribution was in the IFSA Conference held in Japan in 1987, where I presented the paper "Automorphisms of De Morgan triples". In that Conference I met, among others, L. Zadeh, M. Sugeno, M. Mukaidono who caused me a great impression. That contribution contained some results of my thesis, what was based on the study of different types of De Morgan triples. My thesis was really my first contribution to the theory of fuzzy sets and some results were collected in several papers and published in the Fuzzy Sets and Systems Journal. The support of Claudi and you was very important in that period.

Tomasa Calvo at the nomination of Lofti Zadeh as "Doctor Honoris Causa" by the Universidad Politécnica de Madrid.

Gaspar Mayor and Tomasa Calvo in a recent time of work.

What have been your favourite research topics throughout your career?

GM: Throughout my life I have been interested in many research issues, some of the world of fuzzy sets and many other more or less close to it.

Among the former could include: operations between fuzzy sets (axiomatic and functionally expressible operations); triangular norms (t-norms); aggregation functions; functional equations with t-norms. I was also interested in developing a theory of t-norms on discrete domains (discrete t-norms) thinking that, in view of applications, it was necessary to discretize the real interval [0,1], so you can work with sets valued on a finite or countable scale. The results on discrete t-norms were obtained from a close collaboration with J. Torrens who included them in his PhD thesis (1990). This was the second PhD thesis I supervised. The first was yours (1989) that was co-directed with C. Alsina. I hope to attend the reading of my "latest PhD thesis" in the next year 2016.

One issue that has always liked is the multidimensional aggregation functions. It is a subject that I started and where you actively worked. Remember that we made the international presentation of our "extended aggregation functions" at the IFSA'97 Congress in Prague. I think this is an issue on which many things can still be said.

Later, as a result of some contacts with experts in copulas (C. Alsina, R. Mesiar and R. Nelsen), I became interested in this type of functions and, in collaboration with several colleagues, we develop a general theory of discrete copulas (2005). Another exciting topic was, at that time, the study of "discrete additive generators of conjunctive operations (especially t-norms)". My PhD student J. Monreal and myself devoted some years to this topic.

After this long "discrete phase", I started working in collaboration with J. Martin in a very different field: multidistances or multi-argument distances. As a new area, we think there are still aspects to be studied that are going to get interesting applications.

Finally, now I am working with some colleagues in "decision making support systems based on qualitative judgments" and for that we study strict preference structures on a set of alternatives.

TC: As you know, my first research topics were based on the study of different classes of De Morgan triplets. I was immediately attracted by the intuitive concept of what is a fuzzy set and the methods to solve some functional equations associated with my first problems on fuzzy sets and some others throughout my research. I think that maybe by chance or by proximity we have several overlapping favourite topics: Fuzzy operators, functional equations, multi-distances, multicriteria decision making, and in particular the theory of aggregation functions. One of my first contributions in this topic was a chapter of a book entitled "Aggregation functions defined by t-norms and t-conorms", In: Aggregation of evidence under fuzziness (1998), where the T-S aggregation functions were studied to generalize the binary aggregation functions introduced by you some years ago. I have also some other papers related to the T-S aggregation functions, one of them "A general class of triangular norm-based aggregation operators: quasi-linear T-S operators" co-authored with A. Pradera and E. Trillas.

This field has been very successful for us from the beginning until now. I keep in my mind very nice memories during the organization of the first Eusflat Conference in Palma (1999), it was a great opportunity for meeting relevant researchers. Fruit of this event, we got to edit our first book entitled "Aggregation Operators. New Trends and Applications". In some sense, due to working on aggregation functions I have had the opportunity to work with many other researchers such as J. Fodor, B. De Baets, R. Mesiar, G. Beliakov and of course with H. Bustince, who has proposed this talk for Mathware journal. With some of them we have tried to drive the aggregation theory. Maybe, the efforts for that have been sucessfull, thus I can point out two different monographs writen with some of them. The first one provides an overview on Aggregation Functions written by G. Beliakov, A. Pradera and T. Calvo and the second one is based on Averaging Functions, written by G. Beliakov, H. Bustince and T. Calvo. Functional equations is another topic on which I have worked in. Remember our joint paper "Convex Linear T-S Functions: A Generalization of Frank's Equation".

Since 2000 I am working in the University of Alcalá however we have maintained our professional relationship. We have worked on some other topics as fuzzy preference structures and qualitative judgements based on smooth t-conorms, multidistances, and so on. I think that we have been able to find always points of interests for both, we have also found time to share social and cultural events that helped us to keep our friendship.

G. Mayor and T. Calvo in the nomination of Enric Trillas as "Doctor Honoris Causa" by the Public University of Navarra.

LOBFI research group.

You have been one of the founders of LOBFI. What has been the role played by this research group?

GM: The LOBFI (Fuzzy Logic and Information Fusion) research group was created in the early nineties and it is right now one of the groups of our university with best international impact. At first the group was small but over time have been incorporated young and senior researchers. Currently the group consists of eighteen members of which three are in training predoctoral period. Without neglecting research done individually, I think working in a research group has many advantages, research within a group is much more challenging and probably has more impact. Our group has also played an important role in the training of young researchers.

TC: I was working at the University of the Balearic Islands when LOBFI was created, and you has been its leader from the beginning. This allows us to have more institutional support that it has been a basic reason to get an international significance. Although, I am not working now in this University, I maintain, thanks to you, my research relationship with most of the members of the group. Working within a research group is a helpful way to discover new ideas, get successful results and maintain the illusion to follow researching. I think that nowadays our group is very well-known and most of its members have got an international projection.

You are mainly a researcher working on theoretical topics. Have you ever worked in any application?

GM: Although most of my research time has been devoted to work on theoretical topics, I always wanted, when possible, to find some practical application of what he was doing. I think that theoretical and applied research are mutually reinforcing and that is enriching for the two ways of understanding our work. In terms of applications, our research group is mainly working on two issues: on one hand, analysis and image processing and, on the other hand, methodologies to assist decision making processes. Right now, some members of LOBFI and myself are working on the use (by a decision maker) of discrete smooth t-conorms as aggregators of qualitative judgements.

TC: I am in a similar situation, most of my contributions deal with theoretical topics, but we have always been looking for applications. I have cooperated with other colleagues as H. Bustince and others in some papers closer to applications, for instance: "Two methods for image compression/reconstruction using OWA operators".

In any case, our joint research is now closer to applications especially in our works on multicriteria decision making.

G. Mayor and E. Trillas at the Gala dinner of AGOP 2009, in Miramar (Mallorca).

You've spent nine years of your life to teaching at high schools. Do you think it would be good for the training of students at this level to have some knowledge of the theory of fuzzy sets?

GM: You're right, just finished my studies I started as a teacher of mathematics at several high schools for nine years. I have always enjoyed teaching, and have worked at this level has taught me many things about my job as a teacher which have helped me when I started working at the University. In answer to your question, I think it would be interesting for students at this level have some knowledge of the fundamentals of fuzzy logic and fuzzy sets. Knowing that besides classical logic there is another logic that can be used to represent and describe a reality very close to the real world is, in my opinion, highly recommended.
TC: I agree with you. I think that the basic concepts of fuzzy logic and fuzzy sets should be explained in primary or secondary school, because this theory is closer to natural language and it can help students to understand the real world and some simple applications based on fuzzy control.

This is your last course at the University, how do you face your future especially in relation to your research?

GM: Yes, I will retire next year of my teaching duties but I will not stop researching. I think if you feel the task of researching how something exciting, it's hard not to follow it. While I'm in good health I will continue to do so, and I hope to still be able to work with my colleagues for many years. Another thing I plan to do is to spend much more time with my big family. It is a debt that I have with it.
TC: When I stop working I would like to maintain some research tasks because I enjoy with them. Of course, I would wish to continue doing some research with you and the members of Lobfi group, and some other well-known researchers during many years, but it depends on my health as you have said. Now, I am thinking that I had liked to have fulfilled the dream of having spent a period of research in Berkeley.

How do you see the future of fuzzy sets theory?

GM: I think the future of our area is to be an increasingly effective tool in the field of the Soft Computing. This means that we need more multidisciplinary research groups able to get results and applications that contribute to the major objectives of this field.
TC: I would like that the applications of fuzzy theory should help to people to have a better life, mainly to overcome the different types of difficulties, especially in prevention of natural disasters, or to improve the life of disabled people, etc. It mainly depends on the researchers, especially the younger but also on the responsible for research policies. Nowadays, there are many consolidated national and international research groups that can ensure the progress of the area.

Recognition for 25 years in the fuzzy sets community.

Gaspar Mayor
obtained his Master degree in Sciences (Mathematics) from the University of Barcelona (1971) and the PhD in Sciences (Mathematics) from the University of the Balearic Island (1985). He started his professional life as a teacher at the Basic General Education Universitary School in Palma (Mallorca) that was part of our University since its foundation in 1978. Since 1995 he is a full professor of the Mathematics and Computer Science Department at the University of the Balearic Islands, and he is the head of the LOBFI research group in the same University. He has focused his research on several topics like: operations on fuzzy sets, aggregation functions, t-norms, copulas, functional equations, discrete t-norms, discrete copulas, multidimensional aggregation functions, ordinal means, multi-argument distances, aggregation of multi-valued binary relations, qualitative decision making, etc. He is an area editor of the International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, and he has published around 150 contributions in international journals, conferences and book chapters.

Tomasa Calvo
obtained her Master degree in Sciences (Mathematics) from the University of Valencia (1977) and the PhD in Computer Science from the Polytechnic University of Madrid (1989). She started her professional life as a teacher at the University of Balearic Islands (1977-2000), and since 2000 she is a Professor at the University of Alcalá, Madrid. Her major research interests are in the area of uncertainty modelling, including the mathematical fuzzy logic, several types of aggregation techniques, non-additive measure and integral theory, preference structures, multi-distances and functional equations. She is author/co-author of more than 160 publications in international journals, conferences and chapters in edited volumes. She has organized and co-organized three conferences and several special sessions in some other conferences. She has served in the Scientific Committee of numerous national and international fuzzy logic-oriented conferences (EUSFLAT, FUZZ-IEEE, IFSA, IPMU, MDAI, WCCI AGOP, ESTYLF). She has been guest editor of several special issues on aggregation functions of international journals and edited volumes. She is currently Area Editor of the Chinese Journal of Mathematics (Hindawi, Publ. Corp.) and she is member of the editorial board of the journal Fuzzy Sets and Systems (Elsevier). She is a member of EUSFLAT (European Association for Fuzzy Logic and Technology) and she is a faithful collaborator of the LOBFI research group.

ACTIVITY REPORT

AEPIA- Spanish Association for Artificial Intelligence

1. Board of Directors of AEPIA 2015-2017

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2. A brief description

AEPIA is the acronym of the Spanish Association of Artificial Intelligence (in Spanish, Asociación Española para la Inteligencia Artificial) [1]. AEPIA was funded as a nonprofit organization in 1983 with the goals of fostering and promoting Artificial Intelligence in Spain and the Iberoamerican countries. At present, AEPIA has around 450 full and student members and several institutional members, such as Tecnalia, Isoco and the Universidad Pontificia de Comillas. The members have the following distribution teaching and research universitary personnel (92.75%), public and private reserach entities (1.81%), companies and other organizations (5.44%). AEPIA has a President, a Secretary and a Board of Directors with 15 members. In Section 1 the current members of the Board of Directors are displayed. Regarding its relation with other institutions, AEPIA is a founder member of the Spanish Confederation of Scientific Associations (COSCE)[2], Iberamia (Iberoamerican Society of Artificial Intelligence [3]) and SCIE (Sociedad Científica Informática de Espaã) [4], as well as a member of the European Coordinating Comittee for Artificial Intelligence (ECCAI) [5]. Since its origins, AEPIA interests are centred on creating and coordinating working groups, supporting several scientific activies on the field of Artificial Intelligence, supporting entities (such as universities, R&D centers, institutions, companies, etc.) interest in innovation and the application of artificial intelligence techniques, student activities support, discussion forum, etc. in all aspects of technologic and scientific research, development, application and teaching.

AEPIA also has regular established activities, such a biennial Conference (CAEPIA), a summer school (EVIA), publications in two journals (Iberoamerical Journal of Artificial Intelligence and Progress in Artificial Intelligence), and also a project on an on-line master in Artificial Intelligence, that with the support of AEPIA will be imparted through the Universidad Internacional MenÃĺndez Pelayo (UIMP), and that is scheduled to start in the 2016/2017 course.

3. The Journals

AEPIA members have access to the following journals:

- AEPIA publishes since 2012 in collaboration with Springer, and the Portuguese Association for Artificial Inteligence (APPIA), the scientific Journal Progress in Artificial Intelligence (PRAI). Figure 1 shows the cover page of this journal. The Journal publishes top-level research results in all aspects of artificial intelligence, with a particular emphasis on the following topics: data mining; soft computing and computational intelligence; knowledge, complexity, logic, planning, reasoning and search; agents and multiagent systems; artificial vision and robotics; and natural language and Web intelligence. PRAI Editorial Board includes leading international figures in all related research topics. The Editor and Coeditor-in-Chief of the journal are Francisco Herrera and Salvador García, both from the University of Granada (Spain).

- As a member of ECCAI, AEPIA members are entitled to recieve AI Communications. This journal covers the whole AI community, both academic and industrial, publishing high quality refereed articles and surveys.

- Finally, AEPIA members can access Iberoamerican Journal of Artificial Intelligence, currently a biyearly journal promoted and sponsored by the Latin American Society Artificial Intelligence. The journal publishes high-quality original research papers reporting theoretical or applied advances in all branches of Artificial Intelligence. In addition to rapid publication and dissemination of unsolicited contributions, the journal is also committed to producing monographs and special issues on topics of special relevance to the AI community.

Figure 1. Progress in Artificial Intelligence Journal, an Elsevier journal in colaboration with APPIA, the Portuguese Association for Artificial Intelligence.

4. The conference: CAEPIA

AEPIA organizes each two years CAEPIA, the Spanish Conference on Artificial Intelligence (CAEPIA: Conferencia de la Asociación Española de Inteligencia Artificial), which selecetd papers are published by Springer in its series on Lecture Notes on Artificial Intelligence, while all papers are published as a electronic proceedings, including all the workshop an the Doctoral Consortium papers. Last CAEPIA conference was held in Albacete (http://caepia15.aepia.org), and the next will take place in Salamanca, Spain in September 13-15th , 2016, together with CEDI, the Spanish conference on Computing [6], which is a forum for all the professionals devoted to research, development, innovation and universitary teaching. CEDI is structured as a multi-conference, aglutinating several other conferences that are held periodically. Figures 2 and 3 shows some pictures of the former conference.

Figure 2. Opening ceremony en CAEPIA 2015 in Albacete.

Figure 3. One of the conferences in CAEPIA2015.

AEPIA also collaborates supporting mainly two other conferences: Iberamia, also a bianual event where the Ibero-American AI community comes together to share research results and experiences with researchers in Artificial Intelligence from all over the world; and as member of the European Society for AI, also supports ECAI, the biennial European Conference on Artificial Intelligence (ECAI), and IJCAI, the International Joint Conference on Artificial Intelligence, which is the main international gathering of researchers in AI. IJCAI has been held biennially in odd-numbered years from 1969 until 2015, but since this last will be held anually. Next ECAI will take place in The Hague from August 29-September 2nd (http://www.ecai2016.org), and next IJCAI will be held in New York, USA, from July 9 to July 15, 2016 (http://ijcai-16.org).

5. Summer School: EVIA

Figure 4. EVIA 2016 will take place in Carmona (Sevilla) in June.

EVIA, the Summer School of AEPIA (EVIA-Escuela de Verano en Inteligencia Artificial) is an event of special interest for doctoral and master students, and also postdoctoral students, that are interested in completing their professional training, offering conferences, seminars tutorials and practical workshops on different areas of AI. The event tries to attract young resarchers that may establish new contacts with both senior and junior researchers that work in similar areas, and also benificiate from a rich interdisciplinar ambience, that can be useful to confront hybrid solutions and joint research between different groups and aspects of AI. First EVIA took place in 2014 in A Coruña, and the next EVIA 2016 will be located at Carmona (Sevilla) from 15-17 June, organized by Alicia Troncoso, Antonio Bahamonde and Amparo Alonso. Figure 5 contains a picture of some of the participants of the last EVIA and Figure 4 contains some of the information available on the web page of AEPIA for the mext summer school (http://www.aepia.org/aepia/index.php/menu-evia).

Figure 5. Some of the students and speakers at EVIA 2014.

5. Ongoing projects: Research Master on Artificial Intelligence

One of the most challenging ongoing projects of AEPIA is the creation of an on-line Research Master in Artificial Intelligence. The aim of the master is to provide the students with knowledge in the most important and interesting paradigms of Artificial Intelligence, and their applications to problem solving. The Master will be hosted by the UIMP (Universidad Internacional Menéndez Pelayo), and it has a board devoted to the organization and the design of contents:

- President

  Antonio Bahamonde Rionda (University of Oviedo)

- Members

  Eva Onaindía (Polytechnic University of Valencia)

  Alberto Bugarín (Univ. of Santiago de Compostela)

  Óscar Corcho (Polytechnic University of Madrid)

  Alicia Troncoso (University Pablo Olavide)

  Enrique Alba (University of Malaga)

The students will need to complete 60 ECTS in one academic year (expected starting in the course 2016/17), includying 12 credits in the Final project. There will be 3 main especialities: Learning and Data Science, Web Intelligence, and Reasoning and Planning. These are the courses by topic of the master:

- BASIC AND TRANSVERSAL SUBJECTS
  - Advances techniques for knowledge representation and reasoning (4.5 credits)
  - Problem solving using metaheuristics (4.5 credits)
  - Data Science and Machine Learning (4.5 credits)
  - Natural Language Processing (4.5 credits)
  - Multiagent systems (4.5 credits)
  - Introduction to Research (3 credits)
  - **Total (25.5 credits)**
- LEARNING AND DATA SCIENCE
  - Supervised methods (4.5 credits)
  - Non-supervised methods and anomaly detection (4.5 credits)
  - Temporal and complex data (4.5 credits)
  - Big Data: tools for processing masive data (4.5 credits)
  - **Total (18 credits)**
- WEB INTELLIGENCE
  - Semantic Web and linked data (4.5 credits)
  - Advanced Semantic Technologies (4.5 credits)
  - Recommendation systems (4.5 credits)
  - Information recovery and extraction, graphs and social networks (4.5 credits)
  - **Total (18 credits)**
- REASONING AND PLANNING
  - Automatic reasoning (4.5 credits)
  - Automatic Planning (4.5 credits)
  - Advanced heuristic search (4.5 credits)
  - Constraint Reasoning (4.5 credits)
  - **Total (18 credits)**

References

[1] Web page of AEPIA:Asociación Espańola para la Inteligencia Artificial, `http://www.aepia.org`.

[2] Web page of Confederation od Spain Scientific Associations, `http://www.cosce.org`.

[3] Web page of IBERAMIA: Iberoamerican Society of Artificial Intelligence, `http://www.iberamia.org`.

[4] Web page of Scientific Spanish Association for Computation, `http://www.scie.es`.

[5] Web page of European Coordinating Committee for Artificial Intelligence, `http://www.eccai.org`.

[6] Web page of CEDI: Spanish Conference on Computing, `http://www.congresocedi.es/`.

ACTIVITY REPORT

EUSFLAT Research Centre

Dear friends,

as many of you participated on EUSFLAT 2015 Assembly, you might know that a new concept - the concept of so called **EUSFLAT Research Centre (RC)**- has been launched. This concept has been introduced as a sort of proactive step of the EUSFLAT Board in order to initiate and motivate research teams to a higher engagement in EUSFLAT activities and, in parallel, to provide the engaged teams with a sort of institutional non-financial support. The status of the RC is meant to be a prestigious appreciation - an analogy of a culinary Michelin star in fuzzy logic and related applications. However, besides the scientific quality of the team, as it is entitled EUSFLAT RC, the engagement of the teams in EUSFLAT activities (organization of conferences, endorsed events, special sessions etc.) will play a significant role as well. Compared to working groups, which is an old, established and well functional concept, the main connecting element in the RC is not a single topic or subarea of interest, but the institutional base of the research group. In other words, the intended awardee of this prestigious label (or seal) is always a particular team at some university or a research institute, or, alternatively, a sort of "association" of such teams at several universities or similar organizations. We believe that we will motivate teams to collaborate in both - scientific activities as well engagement in EUSFLAT (e.g. organization) activities and that the prestigious seal may help to build continuously the reputation of the awarded research centres or even to obtain (possibly collaborative) projects and grants. Of course, the RC seal is accompanied by a unified graphical style.

For technical details, please, visit `http://eusflat.org/research_research_centre.php`.

SCIENTIFIC REPORT

Study of n-dimensional overlap functions in Fuzzy Rule-Based Classification Systems

Mikel Elkano, Mikel Galar, Jose Sanz, Humberto Bustince
Universidad Publica de Navarra

In our previous work, we proposed to apply decomposition strategies to improve the performance of FARC-HD fuzzy classifier in multi-class problems. We showed that the outputs provided by FARC-HD are not suitable for the aggregation process carried out in decomposition techniques, due to the usage of the product to model the conjunction. The reason is that, when aggregating small values, the values returned by the product have a low variation and tend quickly to zero. This effect is even more accentuated when the number of arguments increases, penalizing those rules with more antecedents.

In order to solve these problems, the concept of n-dimensional overlap function was introduced aiming at modeling the conjunction in the fuzzy rules of FARC-HD. These functions produce outputs with a higher variation and without depending on the number of arguments, providing a significant improvement when applying decomposition strategies.

In this work, we extend this methodology to another state-of-the-art fuzzy classifier such as FURIA, since it is one of the most accurate fuzzy classifiers in the literature and its rule structure is clearly different from that of FARC-HD. In this manner, we study the behavior of n-dimensional overlap functions when using FURIA algorithm. To do so, we have adapted the Fuzzy Reasoning Method (FRM) of FURIA to apply these functions. We have tested this adaptation when facing directly multi-class problems as well as when it is applied as base classifier in OVO and OVA schemes.

We have shown that FURIA is not able to take advantage of the benefits provided by n-dimensional overlap functions. Contrary to FARC-HD, although FURIA preserves the classification accuracy when applying overlap functions, the highly adjusted fuzzy intervals return membership degrees that are likely to be 0 or close to 1. This implies that the differences among the values returned by different overlap functions are smaller, and hence the behavior of all overlap functions is similar in FURIA.

Besides the performance, we have analyzed the effect of n-dimensional overlap functions on the rule base of FURIA. We have shown that the rule base of this FRBCS is not affected by the usage of these functions, since they are not involved in its learning process.

CONFERENCE REPORT

First European Summer School on Fuzzy Logic and Applications

The First EUSFLAT Summer School on Fuzzy Logic and Applications took place in Como, Italy, in the beautiful venue of Villa del Grumello on 7-11 September 2015.

The school is addressed to PhD students and young researchers, to the aim of introducing the core aspects and recent developments of Fuzzy Logic and related applications. At this first edition, 27 Students attended from Czech Republic, Finland, Germany, Italy, Serbia and Spain. Thirteen courses were held, covering both theoretical and application topics: Introduction to Fuzzy Set Theory (Brunella Gerla), Possibility Theory (Didier Dubois), Fuzzy Logic (Lluís Godo), Fuzzy Rule based Systems (Martin Štěpnička, Fuzzy Clustering (Francesco Masulli), Fuzzy Data Bases (Guy De Tré), Fuzzy Relations (Bernard De Baets), Software for Fuzzy Logic (José María Alonso), Image Processing (Isabelle Bloch), Interval-valued Fuzzy Sets (Humberto Bustince), Robotics (Andrea Bonarini) and finally Information Retrieval in Social Media (Gabriella Pasi). A special student session was also organized, in which some of the students had the opportunity to present a a synthesis of their research to a very interested and qualified audience.

Besides listening lectures, the students enjoyed the possibility to interact with the lecturers by acquiring new points of view on several different topics, so as to broaden their knowledge and to exchange opinions with more expert researchers.

This successful experience will have its second edition in the Czech Republic on September 2016. The school will be organised by the University of Ostrava, and it will take place in the Beskydy mountains near Ostrava.

Here are some pictures of moments at the school.

CONFERENCE REPORT

Revisiting the IFSA-EUSFLAT 2015 conference

The 16th World Congress of the International Fuzzy Systems Association (IFSA) and the 9th Conference of the European Society for Fuzzy Logic and Technology (EUSFLAT) were jointly held from June 30th to July 3rd (2015) in Gijón (Spain), organized by the European Centre for Soft Computing (ECSC).

It was the second time this joint conference took place in Europe. Moreover, this was a quite special occasion since we all jointly celebrated 50 years of fuzzy sets and systems. Fifty years of history, but also of present and future of a theory and a technology changing our world.

The IFSA-EUSFLAT2015 program included 232 contributed papers (from 283 submissions) authored by researchers from 47 countries. Those papers were distributed in the regular track plus 28 special sessions. All papers (no matter if they belonged to the regular track or one of the special sessions) were peerreviewed, by at least two reviewers, following a rigorous reviewing process. Proceedings were published by Atlantis Press and they can be found online at: http://www.atlantis-press.com/php/pub.php?publication=ifsa-eusflat-15.

The Welcome Reception (*Pueblo de Asturias*).

In addition, the scientific program was enriched with four plenary talks which were given by distinguished researchers:

- "How I would like to Foresee the Future of Theoretic Fuzzy Logic?" by Enric Trillas (ECSC, Spain).
- "A tour on Big Data Classification: Selected Computational Intelligence approaches" by Francisco Herrera (University of Granada, Spain).
- "Being a Dataologist: From Data to Networks to Personalized Healthcare" by Nitesh Chawla (University of Notre Dame, USA).
- "Evolutionary Optimization of Complex Systems in Uncertain Environments" by Yaochu Jin (University of Surrey, UK).

Networking.

The conference took place in the exhibition and conference centre of Gijón where around 300 attendants (scientists, students, and professionals) exchanged ideas, fostered interaction between industry and academy, and disseminated the most recent advancements in the field. Moreover, it gave all participants the oportunity to celebrate, to meet old friends, to discover young researchers and new ideas, to work together and, for sure, to enjoy the vibrant city of Gijón.

The minutes of the Assembly of the Society are reported in this issue of the journal. Notice that, the new EUSFLAT board was elected during the Assembly. Gabriella Pasi and Bernard de Baets repeated as President and Vice-president, respectively. Susana Montes was appointed as new Treasurer in substitution of Edurne Barrenechea. Jose Maria Alonso substituted Martin Stepnicka in the role of Secretary. In addition, the assembly congratulated Javier Montero who was elected as the new IFSA President for the period 2017-2019. Moreover, two new initiatives were announced:

- The first EUSFLAT European Summer School on Fuzzy Logic and Applications (Lake Como School of Advanced Studies, 7-11 September 2015), presented by Gabriella Pasi.
- The concept of EUSFLAT Research Center introduced by Martin Stepnicka.

The Gala Dinner.

The Family Picture (*Laboral Ciudad de la Cultura*).

The social program included a typical Asturian *espicha* as welcome reception and a tourist visit to *Laboral Ciudad de la Cultura* in which theatre we enjoyed a warm Gala Dinner.

During the award ceremony, in the Gala Dinner, the best EUSFLAT Student Paper was given to Salatiel Ezennaya-Gómez (ECSC, Spain) for the paper entitled "Mining Frequent Synchronous Patterns with a Graded Notion of Synchrony" (coauthored by Christian Borgelt). The other two nominated students were Laura de Miguel (Universidad Pública de Navarra, Spain) and Raúl Pérez (University of Oviedo, Spain). In addition, the following PhD dissertations were distinguished by the best PhD Thesis EUSFLAT Award: "Soft-Computing Based Visual Control for Unmanned Vehicles" authored by Miguel Ángel Olivares Méndez (supervised by Pascual Campoy Cervera, Technical University of Madrid, Spain, 2013); and "Semilinear and semiquadratic conjunctive aggregation functions" authored by Tarad Jwaid (supervised by Bernard De Baets and Hans De Meyer, Ghent University, Belgium, 2014). Moreover, nine students (Patryk Zywica, Carely Guada, Angélica I. Avilés, Sonia Fernández, Pelayo Quirós, Borja Rodríguez-Cuenca, Pavle Milosevic, Mikel Elkano, and Joaquim Viegas) were acknowledged because of they were awarded with EUSFLAT Student Grants aimed at attending the conference and presenting their works.

On the other hand, it was announced that next IFSA 2017 will be held at Kyoto (Japan) and the following researchers were recognized as IFSA fellows: Rafik Aliev, Humberto Bustince, Oscar Castillo, Maria Angeles Gil, Luis Magdalena, and Kazuo Tanaka.

The Best EUSFLAT Student Paper Award (Gabriella Pasi along with the three nominated students: Raúl Pérez, Salatiel Ezennaya-Gómez, and Laura de Miguel).

The Best EUSFLAT Thesis Award: Ángel Olivares Méndez (2013) and Tarad Jwaid (2014).

Furthermore, the ECSC gave two best paper awards:

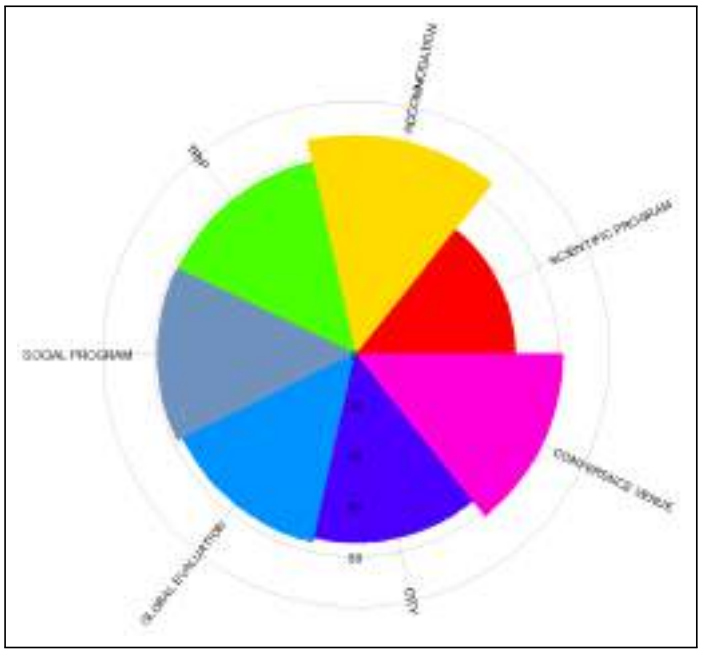
- The Best IFSA-EUSFLAT 2015 Theory Paper Award was for "Residual Implications Derived from Uninorms satisfying Modus Ponens" by Margarita Mas, Miquel Monserrat, Daniel Ruiz-Aguilera, and Joan Torrens.
- The Best IFSA-EUSFLAT 2015 Application Paper Award was for "An Interval Valued K-Nearest Neighbors Classifier" by Joaquín Derrac, Francisco Chiclana, Salvador García, and Francisco Herrera.

The ECSC Medals were awarded to recognize the work of the next old members of the ECSC Scientific Committee: Janusz Kacprzyk, Enric Trillas, Christer Carlsson, Rudolf Kruse, Maria Angeles Gil, and Henri Prade.

The Best IFSA-EUSFLAT 2015 Theory Paper (Given by Marek Reformat to Daniel Ruiz Aguilera and Joan Torrens).

The Best IFSA-EUSFLAT 2015 Application Paper (Given by Humberto Bustince to Salvador García and Francisco Herrera).

After the conference we made an online survey in which we asked conference attendants to give their "fuzzy" evaluation about the whole conference (regarding both scientific and social programs). The main results are summarized in the following figure.



Fuzzy survey about IFSA-EUSFLAT 2015.

Finally, it is worthy to note the fact that this conference was the result of the hard work and dedication of a large number of people, and the collaboration of several institutions. We want to acknowledge the support of the sponsors and the help of the different organizations that in any way were involved in making possible the conference. We also sincerely thank the help of different people for their outstanding cooperation: the Chairs, the members of the International Program Committee, the reviewers of papers, the organizers of Special Sessions, and the Local Organizing Committee. But at the end, the most important ingredients for the success of a conference, like this one, are authors and participants who made it happen. Thus, we would like to extend our gratitude to all participants in IFSA-EUSFLAT2015. We hope that everyone enjoyed the conference as well as the social program along with the staying in Gijón.

Dr. Luis Magdalena (General Chair)
Dr. Jose M. Alonso (Local Arrangements Chair)
Dr. Gabriella Pasi (EUSFLAT President)
Dr. Christer Carlsson (IFSA President)

CONFERENCE REPORT

8^{th} International Summer School on Aggregation Operators AGOP 2015

July 7-10, 2015, University of Silesia, Katowice, Poland

The 8th International Summer School on Aggregation Operators took place in Katowice, Poland, from July 7th to July 10th, 2015 (`http://agop.math.us.edu.pl/`).

The extensive growth of the theory and applications of aggregation functions at the end of the 20th century has led to the creation of the working group AGOP in the EUSFLAT society, and subsequently to the organization of a summer school on aggregation operators held in Oviedo, Spain, July 2001. After 14 years, following the past editions of AGOP in Oviedo (2001), Alcalá de Henares (2003), Lugano (2005), Ghent (2007), Palma de Mallorca (2009), Benevento (2011) and Pamplona (2013), its 8th edition was organized by the Institute of Mathematics of the University of Silesia in Katowice, in cooperation with the EUSFLAT working group AGOP and the Centre for Scientic and Academic Library (Polish acronym: CINiBA) in Katowice.

From the beginning the working group AGOP has been devoted to facilitate the exchange and discussion on the latest trends and results on aggregation operators. Nowadays, these operators are a powerful tool in many fields like multicriteria decision making, fuzzy control, expert systems, approximate reasoning, neural networks, fuzzy system modelling and measure theory, to name just a few.

The official opening of thi 8th summer school on July 7th was attended by the Vice-Rector of the University of Silesia for Internationalisation, Institutional Affairs and Public Relations, Prof. Mirosław Nakonieczny and the Dean of the Faculty of Mathematics, Physics and Chemistry, Prof. Alicja Ratuszna.

This summer school's program was planned in one plenary section. AGOP 2015 received a total of 37 submissions. Papers were reviewed by at least two reviewers. Based on the outcome of the review process and recommendations of the members of the program committee, 34 papers were accepted for inclusion in the conference program and exactly this number of standard 20 minutes talks took place. AGOP 2015 had three distinguished plenary speakers:

- Balasubramaniam Jayaram (Indian Institute of Technology Hyderabad, India) - "Fuzzy implications: some algebraic perspectives",
- József Dombi (University of Szeged, Hungary) - "On consistent operator systems",
- Maciej Sablik (University of Silesia, Poland) - "A converse to Fubini theorem and a description of means".

The conference program was also enriched by the following three 2 hours tutorials

- Bernard De Baets (Ghent University, Belgium) - "The role of aggregation functions in the fuzzy relational calculus",
- Jean-Luc Marichal (University of Luxembourg, Luxembourg) - "Generalizations and variants of associativity for aggregation functions",
- Radko Mesiar (Slovak University of Technology, Slovakia) - "Aggregation functions based on integrals with respect to monotone measures".

AGOP 2015 had more than 50 participants from 5 continents and 16 countries: Algeria, Australia, Belgium, Brazil, Chile, China, Czech Republic, Hungary, India, Italy, Luxembourg, Poland, Slovakia, Spain, Turkey and the United States.

Two EUSFLAT Student Grants have been given to PhD students (Laura De Miguel from Spain and Wanda Niemyska from Poland) who applied to attend the AGOP 2015 Summer School and to present their papers.

Proceedings were published by the University of Silesia and can be found online at `http://agop.math.us.edu.pl/`. Several of the contributions will appear in a forthcoming special issue of the journal Fuzzy Sets and Systems, together with works presented at the IFSA-EUSFLAT 2015 conference in Gijon, Spain.

In order to promote the city of Katowice and the Silesia region, conference participants took part in a trip to Nikiszowiec estate and Prince's Brewery in Tychy, culminating in a gala dinner in Hunting Lodge Promnice, 30 km from Katowice. In between presentations, the participants visited the new building of Scientific Information Centre and Academic Library (CINiBA) and a new seat of National Polish Radio Symphonic Orchestra (Polish acronym: NOSPR).

It has been a pleasure to be involved in the organization of this conference, to prepare its technical program and the proceedings and to welcome in Katowice all the participants. We are grateful to all persons having contributed to the success of AGOP 2015, especially to all reviewers and all authors of submitted papers. We would like to thank all the employees of the Institute of Mathematics of University of Silesia for their help in preparing this summer school. We also thank Scientific Information Centre and Academic Library (CINiBA) for providing a classroom for presentations. It is our pleasant duty to acknowledge the financial support from BPSC. Finally, we also express our sincere thanks to EUSFLAT for their support and student grants. We hope that everyone enjoyed this summer rschool as well as the social programme and the staying in Silesia region.

MichałBaczyński
Bernard De Baets
Radko Mesiar

We would like to thank Ewa Kurzeja and József Dombi for supplying the pictures that illustrate this conference report.

CONFERENCE REPORT

The 2nd International Symposium on Fuzzy Sets (ISFS 2015) "Golden Jubilee of Fuzzy Sets"

This scientific meeting took place at December 3-4. The symposium was organized by Faculty of Mathematics and Natural Sciences at University of Rzeszów and Polish Mathematical Society branch in Rzeszów on the occasion of the 50th anniversary of fuzzy sets.

The topic of symposium was fuzzy sets theory, its extensions and applications as well as related topics. The symposium was dedicated to Professor Józef Drewniak who celebrated this year his 70th anniversary. Professor Józef Drewniak is the one who gave rise and care to the group dealing with fuzzy sets and related topics at University of Rzeszów.

Celebrating 70th anniversary of Professor Drewniak.

The venue of the symposium was the University of Rzeszów which is the biggest academic institution in Podkarpackie voivodeship situated in southeastern Poland. The first edition of the symposium took place in 2014, November 25th with the subtitle "On the Eve of Golden Jubilee of Fuzzy Sets".

During the symposium we had 2 plenary lectures by Bernard De Baets and Radko Mesiar and 10 presentations. We had 17 registered participants (Bernard De Baets Radko Mesiar, Józef Drewniak, Michał Baczyński, Vladimir Janiš, Martin Kalina, Jana Špirková, Krzysztof Dyczkowski, Zofia Matusiewicz, Jolanta Sobera, Pavol Král, Gül Deniz Çayli, Ewa Rak, Paweł Drygaś, Barbara Pękala, Anna Król, Urszula Bentkowska) and also other participants from the University of Rzeszów.

A moment during presentations.

The members of the Scientific Committee who agreed to patronize the symposium were: Michał Baczyński, Humberto Bustince, Bernard De Baets, Józef Drewniak, Przemysław Grzegorzewski, Vladimír Janiš, Janusz Kacprzyk, Martin Kalina, Radko Mesiar, Susanne Saminger-Platz, Eulalia Szmidt, Maciej Wygralak, Sławomir Zadrożny, Lemnaouar Zedam.

We had fruitful and interesting discussions on the topic of symposium and we also were sightseeing the city including the Underground Tourist Route at the Rzeszów Market Square.

We are planning the next edition of symposium in May 2017.

Some participants at Rzeszów market square.

The Organising Committe of ISFS 2015:
Urszula Bentkowska
Paweł Drygaś
Anna Król
Barbara Pękala
Ewa Rak

GENERAL ASSEMBLY

Minutes of the EUSFLAT General Assembly 2015

Gijón, July 1, 2015

The assembly starts at 18:50, fifty minutes later than as scheduled due to the overall shift in the whole conference programme.

Agenda:

1. EUSFLAT Board report
2. Agreements with other associations and related conferences
3. EUSFLAT grants
4. EUSFLAT awards
5. Working Groups *
6. Mathware and Soft Computing
7. IJCIS
8. Treasury report *
9. EUSFLAT Research Centres
10. European Summer School on Fuzzy Logic and Applications
11. New Board Elections *
12. Other matters

* Requires a decision

1.- EUSFLAT Board Report.

President: Gabriella PASI, Italy
Vice President: Bernard DE BAETS, Belgium
Secretary: Martin ŠTĚPNIČKA, Czech Republic
Treasurer: Edurne BARRENECHEA, Spain
Societes and conferences: Javier MONTERO, Spain
Connections with ECSC: José María ALONSO, Spain
Connections with IJCIS: Jie LU, Australia
EUSFLAT Magazine: Humberto BUSTINCE, Spain
Link to European projects: Vicenc TORRA, Spain
Link to industry: Rudolf KRUSE, Germany
Recruiting: Marie-Jeanne LESOT, France
Web Coordination: Jorge CASILLAS, Spain
Grants: Brunella GERLA, Italy
Working Groups: Slawomir ZADROZNY, Poland
Awards: Eulalia SZMIDT, Poland

EUSFLAT membership stats were reported. The main number Ű the current number of members Ű equals to 252 (June 2015). The membership is distributed over 29 countries with leading Spain (118), followed by the Czech Republic (20), France (15), Poland (14) and Italy (12). New initiatives help to keep the membership situation stable.

Gabriella Pasi, the President of EUSFLAT announces, that today Javier Montero, current EUSFLAT Board member and the former EUSFLAT president, has been elected as the new IFSA PRESIDENT (for the period 2017-2019). Congratulations! **Javier Montero** expresses his thanks to the society.

2.- Agreements with Other Associations and Related Conferences.

Javier Montero recalls the existing agreements with other associations that provide EUSFLAT members with the benefit of membership fees or conference fees discounts, namely HFA, NAFIPS, NSAIS, RAFSSoftCom, SIGEF, ACIA, SBA, IRSS.

Exhaustive list of supported and endorsed conference is provided as well.

3.- EUSFLAT Grants.

Gabriella Pasi provides the society with a short report on student grants. From eight to twelve grants per each year are being awarded as a general society strategy with a support of the EUSFLAT conference in odd years and a support of other conferences in even years. In 2014, the society has assigned 7 grants (2 for LFA, 5 for IPMU). In 2015, there 21 grants planned to be awarded or already awarded (2 awarded to AGOP, 9 awarded to EUSFLAT and 10 planned to be awarded to EUSFLAT Summer School).

The formal rules including the process of an application and instructions for applicants are published on the society web page `http://eusflat.org`. The rules for conference organizers are being specified as well, the main one that has to be emphasized, is the necessity to offer reduced conference fees to our society members.

The student grant awardees are newly asked to contribute to the Mathware & SC magazine.

4.- EUSFLAT Awards.

Gabriella Pasi recalls the existing EUSFLAT awards and the related rules.

Gabriella Pasi announces that the **EUSFLAT Best PhD Thesis Awards 2013** is awarded to:

Miguel Ángel Olivares Méndez for his PhD thesis entitled "Soft-Computing Based Visual Control of Unmanned Vehicles".

The **EUSFLAT Best PhD Thesis Awards 2014** is awarded to:

Tarad Jwaid for his PhD thesis entitled "Semilinear and semiquadratic conjunctive aggregation functions".

Congratulations to the awardees!

The **2015 EUSFLAT Best student paper Award** will be

awarded on the upcoming Gala dinner on July 2 to one of the following nominees:

- Laura De Miguel: "Construction of admissible linear orders of pairs of intervals"
- Raúl Pérez-Fernández: "Adding feasibility constraints to a ranking rule under a monotonicity constraint"
- Salatiel Ezennaya-Gomez: "Mining Frequent Synchronous Patterns with a Graded Notion of Synchrony".

All details are also published on `http://eusflat.org/awards.php`.

5.- Working Groups.

Slawomir Zadrozny provides the society with a report on Working group activities. Firstly, he mentions the main features and goals of a working group, secondly he recalls the most typical activities of working groups.

Furthermore, **Slawomir Zadrozny** provides a review of each working group activity.

Finally, the proposal to establish a new *Working Group on Intuitionistic Fuzzy Sets: Theory, Applications and Related Topics* (IFSTART) is provided.

The new Working Group IFSTART was approved by the vast majority of the Assembly.

6.- Mathware & SC Magazine.

Short report on Mathware & SC magazine is provided by **Humberto Bustince**.

Call for contributions, namely scientific reports, summaries of forums, panels, news and calls (PhD thesis, books, comments, events) is emphasized!

Contributions may be submitted using the editor-in-chief email address *bustince@unavarra.es*.

7.- IJCIS.

Luis Martínez provides the society with a report on the IJCIS journal and its activities. The number of accepted papers decreased, the impact factor increased (to 0.574 in 2015), which confirms that the recently introduced initiatives and actions were very positive. The number of top publishing countries was presented as well, publications from China dominate, followed by India, Spain and Turkey. Publications "from EUSFLAT" should be increased.

Luis Martínez announces the new decision about providing authors with the "rolling" publication of the accepted papers, i.e., no more waiting for the assignment of volume and page numbers.

Jie Lu presents the strategy of the journal for the future containing, e.g., rolling publications, awards for outstanding reviewers, outstanding area editors and the highly cited papers. Further, keeping the early rejection policy, speed review process, attracting high quality survey and position papers should be also a part of the strategy for future.

8.- Treasury Reports: 2014 Budget, 2015 Estimated Budget, 2016 Proposed Budget.

Edurne Barrenechea informed about the treasury reports. The main features were as follows.

2014 budget surplus: 2,416.79 EUR

December 31, 2014 account situation: 34,479.60 EUR

2015 expected budget surplus: -3910.88 EUR

2016 proposed budget surplus: -2180.00 EUR

December 31, 2016 proposed account situation: 28,388.72 EUR

The 2014 treasury report, the 2015 estimated budget and finally the 2016 proposed budget were approved by all EUSFLAT members participating on the Assembly.

9.- EUSFLAT Research Centres.

Martin Štěpnička, presented a few slides about the Board initiative to establish a new concept of the **EUSFLAT Research Centres Ű Centres sealed by EUSFLAT**.

The goal of such a concept is to motivate centres to obtain this prestigious label by keeping or improving their scientific quality in the connection with the EUSFLAT scientific focus and with the engagement in the EUSFLAT activities. Detailed information and guidelines will be published soon on the society web-sites.

10.- European Summer School on Fuzzy Logic and Applications.

Gabriella Pasi presents the details related to the upcoming EUSFLAT European Summer School on Fuzzy Logic and Applications organized at Lake Como, Italy, in September 7-11, 2015. The duration of the school will be 5 days and the registration fee will include also lunches. A list of recognized scholars, who will contribute as lecturers on the school, was also provided. Gabriella Pasi also named the main features of the school including the possibility to present posters or short presentations on the school in order to use the option of getting a feedback from the lecturers on their current and future research directions. **Gabriella Pasi recalls, that the school aims not only at PhD students, but also at undergraduate students, postdocs and interested professional, everybody is welcome**.

All details may be found on the school web sites: `http://sfla.lakecomoschool.org`.

11.- Board elections.

As the Secretary, **Martin Štěpnička** was in charge of the new Board elections. After a short review of the situation, legal issues and the submitted candidature, the members were asked to vote.

List of elected Board (2015-2017) members:

President

- Gabriella Pasi

  Università degli Studi di Milano Bicocca, Italy

Vice-president

- Bernard De Baets

  Ghent University, Belgium

Secretary

- José María Alonso

European Center for Soft Computing, Mieres, Spain

Treasurer

- Susana Montes

  University of Oviedo, Spain

Additional members

- Eulalia Szmidt
- Francisco Javier Montero
- Humberto Bustince
- Vicenc Torra
- Brunella Gerla
- Jie Lu
- Jorge Casillas
- Marie-Jeanne Lesot
- Rudolf Kruse
- Slawomir Zadrozny
- Martin Štěpnička

The candidature was elected by all the members at the Assembly.

Gabriella Pasi stated grateful warm words to Edurne Barrenechea for her excellent work for the society.

12.- Other Matters.

EUSFLAT conference 2015

Gabriella Pasi announced, that the society obtained one informative interest to organize EUSFLAT 2017 in Kazan, Russia, and one formal candidature to organize the event in Warsaw, Poland. This official candidature was submitted by the Polish Academy of Sciences represented by Janusz Kacprzyk, Slawek Zadrozny and Eulalia Szmidt. Gabriella Pasi announces, that the candidature submitted by the representatives of the Polish academy of sciences was supported by the whole Board and thus, was chosen, next **EUSFLAT conference in 2017 will be organized in Warsaw**!

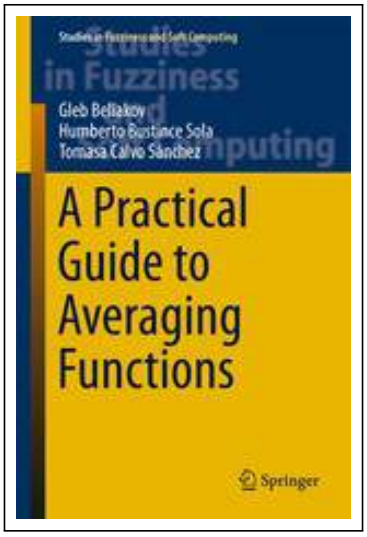
Janusz Kacprzyk presented the main features of the intended conference organization background related to the location, process, organization quality and the term of the conference. Possible sources of financial support to the organization were also listed.

With no other issue, the Assembly finished at 20:00.

NEWS

New book by Gleb Beliakov, Humberto Bustince and Tomasa Calvo

Gleb Beliakov, Humberto Bustince Sola and Tomasa Calvo Sánchez
A Practical Guide to Averaging Functions
Studies in Fuzziness and Soft Computing 329, Springer, 2016
http://www.springer.com/us/book/9783319247519

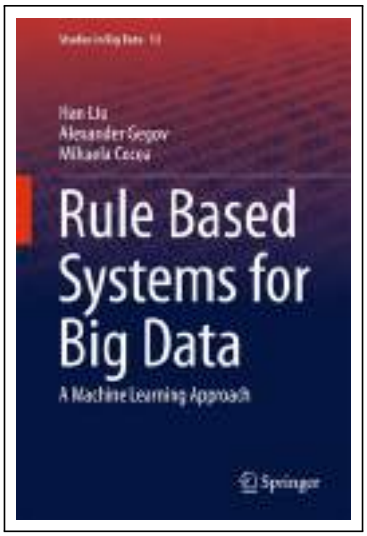


This book, authored by Gleb Beliakov, Humberto Bustince and Tomasa Calvo, offers an easy-to-use and practice-oriented reference guide to mathematical averages. It presents different ways of aggregating input values given on a numerical scale, and of choosing and/or constructing aggregating functions for specific applications. It outlines new aggregation methods developed in the interim, with a special focus on the topic of averaging aggregation functions. It examines recent advances in the field, such as aggregation on lattices, penalty-based aggregation and weakly monotone averaging, and extends many of the already existing methods, such as: ordered weighted averaging (OWA), fuzzy integrals and mixture functions. A substantial mathematical background is not called for, as all the relevant mathematical notions are explained here and reported on together with a wealth of graphical illustrations of distinct families of aggregation functions. The authors mainly focus on practical applications and give central importance to the conciseness of exposition, as well as the relevance and applicability of the reported methods, offering a valuable resource for computer scientists, IT specialists, mathematicians, system architects, knowledge engineers and programmers, as well as for anyone facing the issue of how to combine various inputs into a single output value.

NEWS

New book by Han Liu, Alexander Gegov and Mihaela Cocea

Han Liu, Alexander Gegov and Mihaela Cocea
Rule Based Systems for Big Data. A machine learning approach
Studies in Big Data 13, Springer, 2016
http://www.springer.com/us/book/9783319236957



This book presents a novel theory of rule based systems in machine learning context. In particular, this book introduces ways of big data processing by rule learning algorithms for knowledge discovery and predictive modelling in classification tasks.

Due to the vast and rapid increase in data, data mining has become an important tool for the purpose of knowledge discovery through taking advantage of rich data. Data mining tasks can be undertaken in two ways, namely, manual walkthrough of data and use of machine learning approaches. Due to the presence of big data, machine learning has thus become a powerful tool for intelligent data mining. In particular, machine learning algorithms are used to discover meaningful knowledge or build predictive models from data. The former purpose is known as knowledge discovery whereas the latter one is known as predictive modelling. However, most learning algorithms suffer from overfitting of training data. In other words, these learning algorithms can build models that perform extremely well on data used to build the models but poorly on other data in terms of accuracy. Increasing the size of training data can usually decrease the level of overfitting to some extent but this may also increase the chance for presence of noise and coincidence in the training data. In addition, large training data usually results in the generation of complex models. In the context of rule based systems, this means generating a rule set that consists of a large number of complex rules. On one hand, this lowers the interpretability of the rule based systems for knowledge discovery, but on the other hand, this increases the computational complexity of the rule based systems for predictive modelling.

This book focuses on introducing effective ways to address the issues relating to predictive accuracy, computational complexity and interpretability of rule based systems for classification. In particular, a unified framework for construction of rule based systems, which consists of rule generation, rule simplification and rule representation, is introduced to show how to generate the systems with higher accuracy and interpretability as well as lower computational complexity. Some popular methods and techniques, which can be used as components of the framework, are also described and justified in detail. In addition, two frameworks for ensemble learning are also introduced to show how different learning algorithms can be combined in order to systematically improve the overall performance of rule based systems. The ways to evaluate and improve the interpretability of rule based systems are also discussed. Overall, this book explores explicitly the connections between rule based systems and machine learning in a conceptual context. This book also provides a systematic description of rule based systems in the context of system theory.

NEWS

Ph.D. Thesis defended by Luis González Jaime

Ghent University, Belgium

Luis González Jaime defended his Ph.D. Thesis, entitled "Blind restoration of images with penalty-based decision making. A consensus approach", on June 11, 2015. His advisors were Dr. Etienne E. Kerre, from Ghent University, Dr. Santiago Aja Fernández, from Universidad de Valladolid and Dr. Mike Nachtegael, from Ghent University.

Image processing has become especially important in recent years. The irruption of smartphones and a massive use of social networks have increased the use of images, and thus their needs and applications. Moreover, improvements in technology and acquisition have also increased the use of other image types, such as magnetic resonance images, ultrasounds, computer tomography, among others

Despite of technological improvements, images still suffer from a wide range of degradations and artifacts that are unavoidable. These are mainly due to acquisition, processing or transmission, such as noise, interferences, motion blur, misfocus, or lens distortions. These degradations usually decrease the perceptual fidelity of the image, and also decrease the performance of the task for which it was created, what negatively influences in an adequate interpretation and analysis of the data, as well as other post-processing computations (e.g. image registration, segmentation). It comes therefore as no surprise that two of the most common signal processing task are *image enhancement* and *image restoration*, which are almost present in any image application.

Image restoration aims to estimate the uncorrupted image from a degraded one, what is usually achieved by modeling the system that degrades the image, and the subsequent application of a reverse procedure. Unlike image enhancement that improves the visual appearance of an image, or transforms it in a way that facilitates computerized analysis for a specific application

Unfortunately for restoration methods, the *degradation system* is not always possible to model, either because the information cannot be retrieved from the degraded image, or because the knowledge about the problem is limited and imprecise, what means that some of the parameters cannot be estimated. As a result, it may contribute in a wrong result of some restoration methods, or even be impossible to apply them.

Therefore, we propose to define a *framework* to deal with situations, where due to the lack of information, these restoration methods cannot be applied. For it, the missing information in the restoration method is substituted by a decision-making process. I.e., we model the degradation system using a *consensus methodology*, in such way that we use a set of possible solutions to select one, or a combination of them, as the solution that minimizes some error measure, and thus better approaches the degradation system.

Within decision-making methodologies, we focus on *penalty-based decision making* to conform the framework as it presents a good compromise when the best solution is not known *a priori*, several solutions can contribute positively in a better one, and the set of solutions is from a diverse nature. Moreover, this is carried out on a fuzzy environment, what means that the set of input solutions are fuzzy. Fuzzy sets add the ability to model and reason with uncertainty, providing greater flexibility to represent the uncertainty resulting from the lack of knowledge. However, unlike fuzzy restoration methods that usually use a single method to model the uncertainty of the entire problem, and fuzzy fusion methods that usually use a single criterion to aggregate the set of input solutions. Penaltybased decision making allows to use different restoration methods, as well as fusing a set of solutions using different actions according to the desirability in the problem. That in some cases cannot be done by using a single fusion criterion, and a single fuzzy restoration method.

As there exist too many degradations that may affect an image, we focus on image restoration methods contaminated by noise. Concretely, on those methods that model the noise distribution of an image from a set of parameters. Such that we apply consensus methodology on those approaches that fail when some of these parameters are not properly estimated, or the noise type does not fit the noise distribution for which the method was developed. However, this methodology is interesting for its adaptability to a wide range of problems in image processing, both in image restoration and other fields as segmentation and image reduction, but not only. Moreover, as it also allows to use different methods as input solutions, we can work with scenarios where we do not know beforehand which method is better to use.

NEWS

Ph.D. Thesis defended by Ahmad Syafadhli Bin Abu Bakar

University of Portsmouth, United Kingdom

Ahmad Syafadhli Bin Abu Bakar defended his PhD Thesis, entitled "Intuition Based Decision Making Methodology for Ranking Fuzzy Numbers Using Centroid Point and Spread", on June 15, 2015. His advisor was Dr. Alexander Gegov, from the University of Portsmouth.

The concept of ranking fuzzy numbers has received significant attention from the research community due to its successful applications for decision making. It complements the decision maker exercise their subjective judgments under situations that are vague, imprecise, ambiguous and uncertain in nature. The literature on ranking fuzzy numbers show that numerous ranking methods for fuzzy numbers are established where all of them aim to correctly rank all sets of fuzzy numbers that mimic real decision situations such that the ranking results are consistent with human intuition. Nevertheless, fuzzy numbers are not easy to rank as they are represented by possibility distribution, which indicates that they possibly overlap with each other, having different shapes and being distinctive in nature. Most established ranking methods are capable to rank fuzzy numbers with correct ranking order such that the results are consistent with human intuition but there are certain circumstances where the ranking methods are particularly limited in ranking non-normal fuzzy numbers, non-overlapping fuzzy numbers and fuzzy numbers of different spreads.

As overcoming these limitations is important, this study develops an intuition based decision methodology for ranking fuzzy numbers using centroid point and spread approaches. The methodology consists of ranking method for type-I fuzzy numbers, type-II fuzzy numbers and Z-numbers where all of them are theoretically and empirically validated. Theoretical validation highlights the capability of the ranking methodology to satisfy all established theoretical properties of ranking fuzzy quantities. On contrary, the empirical validation examines consistency and efficiency of the ranking methodology on ranking fuzzy numbers correctly such that the results are consistent with human intuition and can rank more than two fuzzy numbers simultaneously. Results obtained in this study justify that the ranking methodology not only fulfills all established theoretical properties but also ranks consistently and efficiently the fuzzy numbers. The ranking methodology is implemented to three related established case studies found in the literature of fuzzy sets where the methodology produces consistent and efficient results on all case studies examined. Therefore, based on evidence illustrated in this study, the ranking methodology serves as a generic decision making procedure, especially when fuzzy numbers are involved in the decision process.

NEWS

Ph.D. Thesis defended by Pelayo Quirós

Department of Mathematics, University of Oviedo, Spain

Pelayo Quirós defended his PhD Thesis entitled "Mathematical tools for hesitant sets. Applications" on November, 13. This thesis was supervised by Pedro Alonso and Irene Díaz, collaborators of the UNIMODE Research Unit of the University of Oviedo.

The aim of the presented work is a study in depth of several concepts for interval-valued hesitant fuzzy sets, a type of sets of the hesitant fuzzy logic, as well as the analysis of two applications of the fuzzy logic to two different fields.

The first part of the thesis is focused on the study of the hesitant fuzzy logic. In particular, a special type of sets: the interval-valued hesitant fuzzy sets. Several concepts had not been developed for such sets, and as a consequence, the author defined and analyzed them for such environment. On one hand, ordering relations for such sets and finitely generated sets were defined, as well as the adaptation of the concepts of t-norm and t-conorm along with a particular case. These concepts were extremely useful for the other treated concepts. Firstly, an axiomatic definition of cardinality was given, which includes classical definitions of cardinality for fuzzy sets. The concept of entropy for this type of sets has been treated as well, which has been defined by three mappings, identifying each one a different type of uncertainty associated to the selected set. Finally, concepts of partitioning has been studied along with several results related to them.

The second part of the work is centered in the development of two applications of the fuzzy logic to two different fields. On one hand, it has been studied the protection of privacy in microdata. The usual procedure is to protect this kind of data by crisp partitions and measure the goodness of such partition through different criteria. The author proposes the use of fuzzy partitions instead of crisp ones in order to take advantage of the properties of fuzzy sets. As a consequence, such criteria had to be adapted. Both methods were compared experimentally with respect to real databases. On the other hand, the fuzzy logic has been applied to edge detection in grey scale images. The starting point was a method aimed to detect edges in this type of images. The proposal was to include two new steps in such initial procedure: a weight vector and a smoothing step, which has been proven experimentally to be an efficient alternative to the initial method.

NEWS

Ph.D. Thesis defended by David P. Pancho

Departamento de Informática, Universidad de Oviedo, Asturias, Spain

David P. Pancho defended his Ph.D. Thesis, entitled "Design and analysis of fuzzy systems supported by social network analysis techniques", on November 20, 2015. His advisors were Dr. José M. Alonso (European Centre for Soft Computing) and Luis Magdalena (European Centre for Soft Computing).

This doctoral dissertation proposes the creation and development of a new methodology for fuzzy system comprehensibility analysis based on fuzzy systems' inference maps, so-called fuzzy inference-grams, Fingrams in short. Fingrams show graphically fuzzy rule-based systems, presenting the interaction between rules at the inference level in terms of co-fired rules, i.e., rules fired at the same time by a given input.

Even more, Fingrams are likely to act as an effective and efficient tool in several applications regarding both design and refinement of fuzzy systems. The human centric improvement of a fuzzy rule-based system could be done after analyzing the resulting graphs manually or assisted by

well-known social network analysis techniques (such as community mining) and quality indexes (such as centrality, page rank and so on). The analysis of Fingrams offers many possibilities: measuring the comprehensibility of fuzzy systems, detecting redundancies and/or inconsistencies among fuzzy rules, finding out and analyzing instances not covered, identifying the most significant rules, and so forth.

The new methodology has been tested and validated for fuzzy association rules, fuzzy rule-based classifiers and regressors. The utility of Fingrams over fuzzy association rules was illustrated in a real-world problem dealing with qualitative assessment of industrial objects designed through cognitive engineering. FURIA algorithm was used over a real dataset to show the possibilities of Fingrams in fuzzy rule-based classifiers. And, we selected an electrical network distribution problem to present the potential of Fingrams in the context of fuzzy rule-based regressors.

Finally, it is worthy to note that Fingrams are fully integrated in different software tools thanks to the specific software implemented during the thesis period. The fuzzy modeling toolbox GUAJE, and the software suites for data mining KEEL and KNIME have been enhanced allowing the creation and analysis of Fingrams.

For additional details, the interested reader is kindly referred to: `http://sourceforge.net/projects/fingrams/`.

NEWS

Ph.D. Thesis defended by Han Liu

University of Portsmouth, United Kingdom

Han Liu defended his Ph.D. Thesis, entitled “Rule Based Systems for Classification: A Machine Learning Approach”, on November 23, 2015. His advisors was Dr. Alexander Gegov, from the University of Postmouth.

Rule based system is a special type of expert system which consists of a set of rules. In practice, rule based systems can be built by using expert knowledge or learning from real data. Due to the vast and still increasing size of data, the latter approach has become increasingly popular for building rule based systems. In particular, rule based systems can be built through use of rule learning algorithms, which could be based on statistical heuristics or on a random basis. This thesis introduces a unified framework for design of rule based systems for classification tasks, which consists of the operations of rule generation, rule simplification and rule representation. This thesis also stresses the importance of combination of different rule learning algorithms through ensemble learning approaches.

For the three operations mentioned above, novel approaches are developed and validated by comparing them with existing ones for advancing the performance of using this framework. In particular, for rule generation, Information Entropy Based Rule Generation is developed and validated through comparing its performance with Prism. For rule simplification, Jmid-pruning is developed and validated through comparing its performance with J-pruning and Jmax-pruning. For rule representation, rule based network is developed and validated through comparing its performance with decision tree and linear list. The results show that the novel approaches complement well the existing ones in terms of accuracy, efficiency and interpretability.

On the other hand, due to the fact that each single rule learning algorithm or rule based model has its own advantages and disadvantages, this thesis introduces ensemble learning approaches that involve collaborations in training stage through combination of learning algorithms or in testing stage through combination of models. In particular, the novel framework Collaborative and Competitive Random Decision Rules is created and validated through comparing its performance with Random Prisms. This thesis also introduces the other novel framework Collaborative Rule Generation which involves collaborations in training stage through combination of multiple learning algorithms. This framework is validated through comparing its performance with each individual algorithm. In addition, this thesis shows that the above two frameworks can be combined as a hybrid ensemble learning framework toward advancing overall performance of classification. This hybrid framework is validated through comparing with Random Forests.

Finally, this thesis summarizes the research contributions in terms of theoretical significance, practical importance, methodological impact and philosophical aspects. In particular, theoretical significance includes creation of the framework for design of rule based systems and development of novel approaches relating to rule based classification. Practical importance shows the usefulness in knowledge discovery and predictive modelling and the independency in application domains and platforms. Methodological impact shows the advances in generation, simplification and representation of rules. Philosophical aspects include the novel understanding of data mining and machine learning in the context of human research and learning. In addition, the research methodology introduced in this thesis is also philosophically inspired by three main theories, namely information theory, system theory and control theory. On the basis of the completed work, this thesis provides suggestions regarding further directions toward advancing this research area.

NEWS

Ph.D. Thesis defended by Amanda Vidal Wandelmer

Facultad de Matemàticas, Universitat de Barcelona

Amanda Vidal Wandelmer defended her PhD Thesis, entitled "On modal expansions of t-norm based logics with rational constants", on September 29, 2015. her advisors were Dr. Félix Bou, Dr. Frances Esteva and Dr. Lluís Godo, from IIIA-CSIC.

According to Zadeh, the term "fuzzy logic" in its narrow sense refers to a logical system which aims at the formalization of approximate reasoning and can be considered as an extension of many-valued logic. Hájek, in the preface of his foundational book Metamathematics of Fuzzy Logic, agrees with Zadeh's distinction, but stressing that formal calculi of many-valued logics are the kernel of the fuzzy logic in the narrow sense. Hájek's book undertakes the study of the so-called Basic Fuzzy logic BL, having continuous triangular norms (t-norm) and their residua as semantics for the conjunction and implication respectively, and of its most prominent extensions: Łukasiewicz, Gödel and Product logics. Moreover, since a t-norm has residuum if, and only if, it is left-continuous, the logic of the left-continuous t-norms, MTL, was soon after introduced. On the other hand, classical modal logic is an active field of mathematical logic, originally introduced at the beginning of the XXth century for philosophical purposes. More recently it has shown to be very successful in many other areas, specially in computer science, mainly due to the huge number of real-world scenarios that can be modelled using Kripke relational structures (the most well-known semantics for modal logics).

There exist several works on modal expansions of non-classical logics, and in the particular case of fuzzy logics we can find studies on modal expansions of Gödel and Łukasiewicz logics, and of modal logics based on finite residuated lattices. However, modal logics based over arbitrary infinite residuated lattices -including Product logic- are open problems that are the main goal of this doctoral dissertation.

In more detail, we study modal expansions (with $\Box$ and $\Diamond$) of the logic of a left-continuous t-norm, defined over the language of MTL expanded with rational truth-constants and the Monteiro-Baaz Δ operator, whose intended (standard) semantics is given by Kripke models with crisp accessibility relations and taking the unit real interval $[0,1]$ as set of truth-values. It is first necessary to ensure that the underlying (propositional) fuzzy logic is strongly standard complete (i.e. complete for deductions from arbitrary sets of premises). We present an axiomatic system for the non-modal propositional logic of a left-continuous t-norm with a unique infinitary inference rule, called density rule, solving several open problems in the literature. This axiomatic system turns out to be not well-behaved when it is expanded with modal operators, so we then propose an alternative axiomatic system (with a countable number of "well behaved" infinitary rules) that coincides with the previous one for a large family of left-continuous t-norms, including the Product t-norm and all ordinal sums of Product and Łukasiewicz components. For any of these t-norms, we then propose complete axiomatic modal extensions with respect to the local and global Kripke semantics defined as above over he corresponding standard algebra, and study properties, extensions and applications of these logics. Moreover, we characterize their algebraic companion, provide some algebraic completeness results and study the relation between their Kripke and algebraic semantics. The last part of the thesis is devoted to a software application, mNiBLoS (modal Nice BL-logics Solver), that uses Satisfiability Modulo Theories in order to build an automated reasoning system to work with our fuzzy modal logics -considering, for practical reasons, finite models with no bound on the cardinality- evaluated over BL algebras. The objective of this software is bring nearer fuzzy modal logics to non specialized communities but rather interested on their applications. We exploit several theoretical results in order to get alternative characterizations that, although equivalent from the point of view of the logic, have strong differences for what concerns the design, implementation and efficiency of the application. mNiBLoS code can be downloaded from `http://www.iiia.csic.es/~amanda/publications.html`, and we encourage any interested user to contact the author with any question or advice.

NEWS

Ph.D. Thesis defended by Jenny Fajardo Calderín

Models of Decision and Optimization (MODO) Research Group, University of Granada, Spain

Jenny Fajardo Calderín defended her Ph.D. Thesis, entitled "Soft Computing in Dynamic Optimization Probelms" (supported under grant from AUIP, the Iberoamerican University Postgraduate Assocation). Her advisors were Dr. David A. Pelta, from the University of Granada and Dr. Antonio D. Masegosa, from IkerBasque.

The research done in this thesis was focused on the study, design and evaluation of algorithm portfolio schemes to deal with Dynamic Optimization Problems (DOPs). We took into account the concepts of adaptation, cooperation and learning, that we considered pivotal in this context. The objectives proposed were:

1. Perform an in-depth study in the field of Soft Computing, in order to identify the techniques used to solve DOPs, including the different possibilities of technique hybridizations.
2. Design an algorithm portfolio that integrates different adaptation, cooperation and learning techniques, in order to solve DOPs.
3. Validate the performance of the algorithm portfolio with respect to the state of the art methods for both testing and real combinatorial DOPs.
4. Propose a framework to facilitate the use and application of metaheuristics to solve static and dynamic optimization problems.

To achieve these goals, we proposed, on the one hand, an algorithm portfolio that incorporates learning mechanisms, and on the other, a battery of experiments over testing and real DOPs, to validate its performance.

The first contribution consisted on an algorithm portfolio composed by a set of metaheuristics. In each iteration, the method selects which metaheuristic apply by a credit based approach that acts as a learning scheme. The experiments were performed over five "artificial" problems. The dynamism of these problems was induced by applying XOR masks. We considered different scenarios for severity and frequency of changes. The aims of the experimentation were to evaluate the performance of the portfolio with different learning schemes; to evaluate the performance of the individual algorithms that compose the portfolio, versus the own portfolio; and finally, to compare the best learning variant of the portfolio with two algorithms of the literature that have shown a very good performance on these problems.

The results of the proposed method were significantly better in most of the problems. This fact shows that the approach of an algorithm portfolio with a simple learning scheme provides good results to solve DOPs.

The second contribution was to apply the algorithm portfolio to a dynamic variant of the Multiperiod Maximal Covering Location Problem (DMCLP). The main objective of the DMCLP is to maximize the covered demand over all time periods, by establishing which facilities open or close in each period. Based on the classical variant of the DMCLP, two new variants were defined: DMCLP-AC and DMCLP-LocF. The first one incorporated costs when a facility is opened or closed from one period to another. The second one imposed the next constraint: the location of facilities must be the same across all periods.

To solve these problems, we used a portfolio composed by three Simulated Annealing methods, because of their good performance in this problem, and by an Evolutionary Algorithm, to provide a higher diversity. In the experimentation, the portfolio was compared with the individual algorithms that composed it. In general, we concluded that the portfolio improved the individual methods in all the test instances used. It is important to highlight that the results of the algorithm portfolio for the three variants of the DMCLP show that this type of schemes are able to create synergies between the methods that compose it.

Finally, all the algorithms, methods and problems used during the development of this thesis were incorporated into a framework called BiCIAM, which includes different algorithms to solve static and dynamic optimization problems. This library is publicly available at: `http://modo.ugr.es/algorithmportfolio/index.html`.

NEWS

Ph.D. Thesis defended by Pablo J. Villacorta Iglesias

Models of Decision and Optimization (MODO) Research Group, University of Granada, Spain

Pablo J. Villacorta Iglesias defended his Ph.D. Thesis, entitled "Adversarial decision and optimization-based models" (supported under grant FPU AP-2010-4738 from the Spanish Ministry of Education). His advisors were Dr. David A. Pelta and Dr. J.L. Verdegay, from University of Granada.

Decision making is all around us. Everyone makes choices everyday, from the moment we open our eyes in the morning. Some of them do not have very important consequences in our life and these consequences are easy to take into account. However, in the business world, managers make decisions that have important consequences on the future of their own firm (in terms of revenues, market position, business policy) and their employees. In these cases, it is difficult to account for all the possible alternatives and consequences and to quantify them. Decision making tools such as Decision Analysis are required in order to determine the optimal decision.

Furthermore, when several competing agents are involved in a decision making situation and their combination of actions affect each other's revenues, the problem becomes even more complicated. The way an agent makes a decision and the tools required to determine the optimal decision change. When we are aware of someone observing and reacting to our behavior, one might occasionally prefer a suboptimal choice aimed at causing confusion on the adversary, so that it will be more difficult for him to guess our decision in future encounters, which may report us a larger benefit. This situation arises in counter-terrorist combat, terrorism prevention, military domains, homeland security, computer games, intelligent training systems, economic domains, and more.

In simple terms, we define an adversary as an entity whose aims are somehow inversely related to ours, and who may influence the profits we obtain from our decisions by taking his/her own actions. This kind of competitive interaction between two agents fits a variety of complex situations which can be analyzed with a number of techniques ranging from Knowledge Engineering and Artificial Intelligence (agent-based modeling, tree exploration, machine learning) to Operational Research, with an emphasis on Game Theory.

The objective of this thesis is the analysis and design of adversarial decision and optimization-based models which are able to represent adversarial situations. We are going to conduct theoretical studies and propose practical applications including imitation games, security games and patrolling domains. More precisely, we first study a two-agent imitation game in which one of the agents does not know the motivation of the other, and tries to predict his decisions when repeatedly engaging in a conflict situation, by observing and annotating the past decisions. We propose randomized strategies for the agents and study their performance from a theoretical and empirical point of view. Several variants of this situation are analyzed. Then we move on to practical applications. We address the problem of extracting more useful information from observations of a randomized Markovian strategy that arises when solving a patrolling model, and propose a mathematical procedure based on fuzzy sets and fuzzy numbers for which we provide a ready-to-use implementation in an R package. Finally, we develop an application of adversarial reasoning to the problem of patrolling an area using an autonomous aerial vehicle to protect it against terrestrial intruders, and solve it using a mix of game-theoretic techniques and metaheuristics.

CALLS

ESTYLF 2016. XVIII Spanish Congress on Fuzzy Logic and Technologies

Donostia-San Sebastián (Spain) 25 - 27 May 2016

The 18th Spanish Congress on Fuzzy Logic and Technologies (ESTYLF 2016) will be held on 25-27 May 2016 in Donostia-San Sebastián, the *European Capital of Culture 2016*.

Important dates:

Special Session Proposal: 27 Nov 2015
Abstract Submission: 30 Jan 2016
Acceptance Notification: 15 Feb 2016
Early registration: 05 Apr 2016

Committees:

Honorary Chair:
Enric Trillas

Local Organization:
Cristina Alcalde

Program Co-Chairs:
Javier Montero
Alberto Bugarín
Enrique Herrera-Viedma
Edurne Barrenechea
Francesc Esteva

Special Sessions:
Humberto Bustince
F. Javeir Fernández

Abstracts in both Spanish and English are welcome. After the conference, a special issue with a selection of the accepted papers in an expanded versión will be published an special issue of the journal *Fuzzy Sets and Systems*.

Invited speakers:

Enric Trillas
Manuel Ojeda-Aciego
Francisco Herrera
Bernard De Baets
Gaspar Mayor

For additional information:

`http://www.ehu.eus/es/web/estylf2016`

CALLS

17^{th} International Student Conference on Applied Mathematics and Informatics

Malenovice (Czech Republic) 12 - 15 May 2016

It is already the 17th International Student Conference on Applied Mathematics and Informatics (ISCAMI) organized jointly by the Centre of Excellence IT4Innovations - Division of the University of Ostrava - Institute for Research and Applications of Fuzzy Modeling (IRAFM) and by the Department of Mathematics of Faculty of Civil Engineering, Slovak University of Technology in Bratislava. Based on the successful experience from the previos four years, ISCAMI 2016 will be organized jointly with the 5th Summer School on Applied Mathematics and Informatics. This means that the programme will alter between sections with student contributions and blocks of tutorials given by invited leading researchers.

The conference will be organized again in Malenovice, a beautiful village situated on the root of the highest peak in Beskydy mountains near Ostrava on May 12 - 15, 2016, `http://www.malenovice.com/`.

We are happy and proud that the conference, as the only student conference, is marked as EUSFLAT endorsed event, for which we are grateful to EUSFLAT.

The main purpose of ISCAMI 2016 is to bring together young researchers and students and to give them an opportunity to present their achievements and ideas in the area of applied mathematics, informatics and various applications. Therefore, the conference is considered to be a low cost conference where the *registration fee includes: accommodation, full board, coffee breaks and a social programme*.

For further details, please visit: `http://irafm.osu.cz/iscami/` or contact the Organizing Committee:iscami@osu.cz.

CALLS

2nd European Summer School on Fuzzy Logic and Applications

Czech Republic 5 - 9 September 2016

The **2nd European Summer School on Fuzzy Logic and Applications** is coming! The school is addressed to PhD students and young researchers and the aim is to introduce the core aspects and recent developments of Fuzzy Logic and related applications. The school will consist of several courses, which will be held by world-leading experts in the field.

The 2nd European Summer School is organized by the Centre of Excellence IT4Innovations - Division of the University of Ostrava - Institute for Research and Applications of Fuzzy Modeling (IRAFM) on September 5 - 9, 2016. The school will take place in a hotel situated in Beskydy mountains near Ostrava (Czech Republic) to provide participants with manifold surroundings.

We are very grateful that the Summer School on Fuzzy Logic and Applications is an event promoted by the European Society for Fuzzy Logic and Technology. Moreover, Eusflat offers several grants covering the registration fee to PhD students that are Eusflat student members.

The key aspect of the school will be the communication and collaboration among the participants and the lecturers, by giving time for discussions to the aim of generating a fruitful ground for exchanging knowledge. Students are invited to present their current work (either the PhD thesis proposal or any other research activity) by giving a short presentation or by preparing a poster.

The school is considered to be a low cost event where the **registration fee includes: accommodation, full board, coffee breaks and a social programme**.

For further details, please visit the web pages: `http://irafm.osu.cz/sfla2016/` or contact the Organizing Committee: sfla@osu.cz.