

BELIEF 2014

3rd International Conference on Belief Functions

Final Report



Pushing the Boundaries

BELIEF 2014, the third edition of the series of conferences on the theory and application of belief functions is over, and it is time to sum up the outcomes of this exciting experience and draw some lessons for the future of the conference and the community at large.

BELIEF 2014 was held in beautiful St. Hugh's college, Oxford. Defying all stereotypes the weather was rather clement, allowing our attendees to appreciate the beauty of the historical city of Oxford!

An extended Program Committee

As part of an ongoing effort to expand the boundaries of the belief functions community we invited new established researchers in the field, but also in sister communities such as imprecise probability and statistics, to join the Program Committee, which has reached a new high of 45 members.

Best Practice

To ensure the quality of the selection process and of the final proceedings, we introduced a number of 'best practices' in this edition of the conference.

Papers were peer-reviewed by three experts, which were required by the Chair to produce detailed, constructive reviews. While a number of papers were accepted straight away (conditional on following the reviewers' suggestions to improve their camera ready), 14 others went through a rebuttal stage in which authors were allowed to respond to critical reviews. As a result the quality of

the final published papers is objectively high, and the reviewing process at the level of more established venues.

Sponsorships were invited on the basis of a clear three-tier system (bronze, silver and gold) based on the level of the sponsor's contribution. As a result four sponsors (ISIF, Oxford Brookes, Onera and Elsevier) supported BELIEF 2014.

The Program Chair did not submit any paper to this edition of the conference, a policy which is followed in other well-established venues. Authors of papers shortlisted for awards were not involved in the voting process.



New Friends

The organisers worked hard to compile a significant list of authors of belief function papers published during the last 3-4 years. We only partly succeeded in doing so before the submission deadline, and the work is still under way. Each author of past related paper(s) received a personal invitation to submit a paper/attend the conference by the Program Chair. Some 20 people positively responded to this invitation, some of which have indeed presented their work in Oxford and/or joined the TPC.

In a continuation of this work, the PC is working to extend the list of practitioners and merge it with the current list of BFAS members, in the perspective of kickstarting a moderated mailing list managed by BFAS.

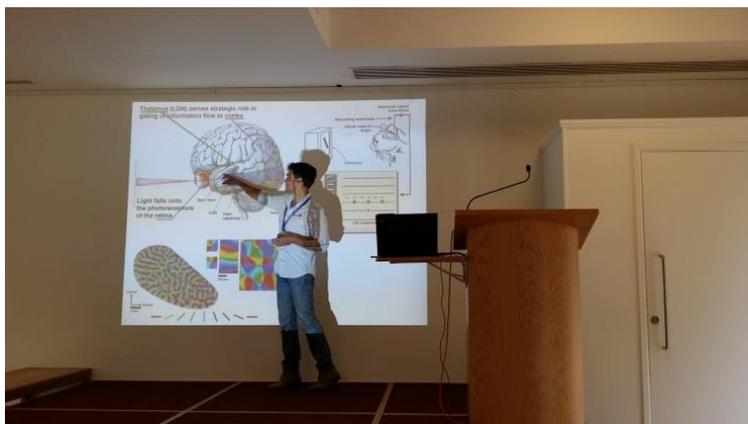
Some statistics

It can be interesting to glance at some statistics on participation. We had 54 submissions, of which 47 were accepted, in 14 cases after a rebuttal process.

161 reviews were compiled by the TPC members and 10 additional reviewers. 108 authors have submitted papers to BELIEF 2014, coming from 18 countries, most notably France (39), Tunisia (14), China (10), United States and Thailand (8 each), the UK (6), Germany (5), Eastern Europe (8) and India (2).

We had 58 participants registering for the conference - unfortunately several of them could not attend to due unexpected visa problems.

Invited Talks



The two invited speakers, both Professors at Oxford University's Computer Science department, presented contributions which were much appreciated.

Prof Nando de Freitas talked at length about novel deep learning approaches and the impact they are having in the wider AI and Machine Learning. Prof Thomas Lukasiewicz reported about his work on uncertainty in the Semantic Web: it was noted that the logic-based approaches used in the field could find a natural generalisation within the framework of belief functions logic.

Springer LNCS-LNAI Proceedings

BELIEF 2014's proceedings were published by Springer's Lecture Notes in Artificial Intelligence/LNCS series, Volume 8764.

The proceedings are downloadable online from:

<http://www.springer.com/computer/ai/book/978-3-319-11190-2>

and are already being advertised on Amazon and other booksellers' sites. Authors and attendees can download the full book in PDF using the link provided in a previous email by the PC.



Awards

For the first time we introduced awards at the conference, with the aim of providing recognition to the authors of pieces of work able to generate significant advances in the theory of belief functions, and a sense of identity and common purpose to the community as a whole. A shortlist of 9 candidate papers, two of which student papers, was prepared by the Program Chair on the basis of the reviewers' scores and assessments. This list was later submitted to the Board of Directors of BFAS for the selection of a Best Paper and a Best Student Paper awards.

The Best Paper Award, sponsored by Elsevier and the International Journal of Approximate Reasoning (IJAR) went to the paper “Evidential Object



Recognition based on Information Gain Maximization” by two new members of our community, Thomas Reineking and Kerstin Schill from the University of Bremen, Germany. The paper, which proposes an active object recognition framework based on belief function inference and information gain maximisation,

was signalled by the Board as an example of novelty and significant methodological contribution likely to spur further research.

The Best Student Paper Award, sponsored by the International Society for



Information Fusion (ISIF), was assigned to the paper “Evidential Logistic Regression for SVM Classifier Calibration” by Ph.D. student Philippe Xu and his advisors Franck Davoine and Thierry Denoeux, from the Université de Technologie de Compiègne, France. The paper

proposes an interesting “calibration” method to transform the output of a classifier into a belief function, a significant methodological contribution.

IJAR Special Issue

The authors of a number of selected papers published at BELIEF 2014 will be invited by the Editor in Chief Professor Thierry Denoeux to submit an extended version of their work to an upcoming Special Issue of the International Journal of Approximate Reasoning.

Dr Fabio Cuzzolin will act as Guest Editor of this special issue: the invitations will be extended to selected authors in the upcoming weeks, after consultation with the BFAS board and the EiC of IJAR.



Results of the Panel on the Future of Belief Functions

Another feature introduced at this edition of BELIEF was an open discussion session on “The future of belief functions in the context of uncertainty theory”. The discussion was fruitful. The question of how to maximise the impact and visibility of our work was raised, and proposals were brought forward to assemble a tentative action list, including:

- launching of a series of methodological challenges, following the example of similar periodic challenges organized in other fields, to bring more sense of focus to our work, increase cross-citation, and advance towards completing the missing elements of the theory;
- setting up a moderated mailing list, possibly hiring a person part-time using BFAS funds, to build a network of scientists interested in belief function theory, disseminate new results and publications, advertise future meetings, open methodological discussions;

- encouraging our community to engage with important real-world problems and bring forward evidential solutions able to compete with state of the art approaches on their own ground – BELIEF 2014's best paper award is a good example of this excellent practice;
- producing tutorials to be distributed to students and practitioners – we all know that understanding the notion of non-additive probability is a difficult hurdle to overcome at first;
- working on 'elementary' textbooks to disseminate among practitioners and to use as a basis for university courses on belief theory;
- restructuring what is currently a rather poor Wikipedia entry;
- for those of us with teaching responsibilities, proposing and designing new undergraduate and postgraduate courses on belief functions, or adding theory of evidence-related material to existing more general courses;
- inviting to our meetings companies and policy makers with strong interests in decision making under uncertainty (e.g. in the context of climatic change, infrastructure planning, etcetera) to make them aware of our methods and to get important feedback from them on how to achieve more impact;
- making code/packages/toolboxes available online;
- engaging with sister fields such as imprecise probability or fuzzy theory, and with the wider AI community to encourage the publication of belief functions papers at major conferences such as UAI, AAI or IJCAI;
- organising special issues of major international journals, such as IEEE Fuzzy Systems, to spread the awareness of our discipline.

Teaching evidential approaches to youngsters in university and spreading the awareness of our methodologies among scientists and other stakeholders, was the conclusion, are necessary steps to ensure a bright future to our field.

Lessons for the Future

BELIEF 2014 was a successful conference, which consolidated the results of the series of conferences on Belief Functions and their Applications initiated four years ago, and stimulated a profound discussion on the current state of the

field. We did succeed to some extent in contacting and involving new people in our community, but a lot more needs to be done. The existing group needs to be consolidated via more frequent and regular exchanges of ideas, and the vast reservoir of practitioners who happen to publish evidential solutions to their application of choice is still mostly untapped, a resource for the future. The community needs to be more open to avoid forming a small clique of enthusiasts, and reach out for other closely related communities and the society at large. The good practices introduced this year (awards, rebuttal process, etc) should be consolidated in the years to come.

A number of factors have limited an even greater participation: the community is still quite euro-centric, making it difficult for scientists coming from China, Thailand or the US to join our meetings; studentships were not made available to worthy students to attend the conference; last but not least, the competition of a number of small related conferences (such as ECSQARU, ISIPTA, SUM, MMPS) causes the dispersion of belief functions papers across multiple venues, while BELIEF should aim to be the focal point of all work in the field. It was disappointing to notice the absence of many established researchers, many of them members of the very TPC.

For the future then we recommend setting aside funding for around ten student scholarships/free registrations, and possibly considering organising the conference in East Asia in the near future. The moderated mailing list will be crucial to consolidate the network of belief function scientists and guarantee attendance to future meetings. Finally (and this a personal view of the PC, which is however shared by several other BFAS members), we should start to consider working towards the realisation of a Joint Uncertainty Conference (unifying first BELIEF, ISIPTA and ECSQARU to later expand to include UAI), which alone could guarantee a much wider visibility to the whole of Uncertainty Theory.