# BFTA School 2019

## 5th School on Belief Functions and Their Applications



*La Certosa di Pontignano, Siena, Italy*
*October 27-31, 2019*

The 5th school on Belief Functions and Their Applications was held at the Certosa di Pontignano, in the vicinity of Sienna, in the province of Tuscany in Italy, between the 27th and 31st of October 2019.
bfasociety.org/BFTA2019

This document reports on the main aspects of the organisation and outcomes of the school.

## Programme

Over five days, ten lecturers provided a rich programme with thirteen lectures covering different topics related to belief functions, some classical, others new. The programme is displayed in Table 1 while the list of lectures is provided below:

1. *Introduction to belief functions* (T. Denoeux, Heudiasyc, Université de technologie de Compiègne (UTC), France)
2. *Belief functions and Boolean inference: basics, computational challenges and applications* (S. Destercke, UTC, France)
3. *Positioning belief functions among uncertainty theories* (D. Dubois, IRIT, Toulouse, France)
4. *Rough sets and belief functions* (D. Ciucci, Università degli Studi di Milano-Bicocca, Italy)
5. *Methods for building belief functions* (T. Denoeux, UTC, France)
6. *Information correction and fusion using belief functions* (F. Pichon, University Artois, France)

7. *Classification and clustering using belief functions* (T. Denoeux, UTC, France)
8. *On the implementation of belief functions* (A. Martin, University Rennes 1, France)
9. *Prejudiced information fusion using belief functions* (D. Dubois, IRIT, Toulouse, France)
10. *Graphical models for belief functions* (P. Shenoy, U. Kansas, USA)
11. *Distances and conflict between belief functions* (A.-L. Jousselme, NATO STO CMRE, Italy)
12. *Belief functions in decision theory* (B. Vantaggi, Sapienza Università di Roma, Italy)
13. *Multi-criteria decision-making support with belief functions* (J. Dezert, ONERA, France)

**Table 1: Programme of the 5th school on Belief Functions and Their Applications**

| | Sunday, 27th | Monday, 28th | Tuesday, 29th | Wednesday, 30th | Thursday, 31st |
|---|---|---|---|---|---|
| 7:30 | | Breakfast | Breakfast | Breakfast | Breakfast |
| 8:00 | | | | | |
| 8:30 | | | | | |
| 9:00 | | Belief functions and uncertainty theories *Didier Dubois* | Classification and Clustering using belief functions *Thierry Denoeux* | Graphical models for belief functions *Prakash Shenoy* | Belief functions in decision theory *Barbara Vantaggi* |
| 9:30 | | | | | |
| 10:00 | | | | | |
| 10:30 | | | Coffee break | Coffee break | Coffee break |
| 11:00 | | Coffee break | On the implementation of belief functions *Arnaud Martin* | Distances and conflict between belief functions *Anne-Laure Jousselme* | Multi-criteria decision-making support with belief functions *Jean Dezert* |
| 11:30 | | Rough sets and belief functions *Davide Ciucci* | | | |
| 12:00 | Registration | | | | |
| 12:30 | | | Lunch | Lunch | Lunch |
| 13:00 | Lunch | Lunch | | | |
| 13:30 | | | Social event | Prejudiced information fusion using belief functions *Didier Dubois* | Exam and closure |
| 14:00 | Introduction to belief functions *Thierry Denoeux* | Methods for building belief functions *Thierry Denoeux* | | | |
| 14:30 | | | | Coffee break | |
| 15:00 | | Coffee break | | Panel discussion | |
| 15:30 | Coffee break | | | | |
| 16:00 | Belief functions and Boolean inference: basics, computational challenges and applications *Sébastien Destercke* | Information correction and fusion using belief functions *Frédéric Pichon* | | Posters | |
| 16:30 | | | | | |
| 17:00 | | | | BFAS general assembly | |
| 17:30 | | Posters | | | |
| 18:00 | | | | | |
| 18:30 | | | | | |
| 19:00 | | | | | |
| 19:30 | Dinner | Dinner | Dinner | Dinner | |

Following the pattern of previous editions, the programme highly focused on lectures of one hour and a half (to one exception), with two poster sessions and a panel session. The second day closed with a poster session during which students had the opportunity to present their work (possibly at preliminary stage) and exchange with other school participants and lecturers. The posters were kept displayed until the end of the school, which stimulated discussions outside specific poster sessions during the dedicated sessions (Day 2 and Day 4) but also during breaks and free time.

The social event took place on the afternoon of Day 3. The group first walked to a vineyard farm close by the school venue for a short visit of the facility and caves, followed by a degustation. The remaining of the afternoon was dedicated to a free visit of the city of Siena.

The panel session was held on Day 4 as an open discussion during which the tutees had the chance to ask specific questions, share their thoughts about their experience at the school and provide suggestions for future editions. An interesting proposal was to post videos solving exercises and basic computations, and a group has been built which implements this idea. The BFAS assembly directly followed the panel session. Outcomes of this panel and the BFAS general assembly are reported in the minutes available to BFAS members at https://bfasociety.org/#members .

T. Denoeux (BFAS president) presented the location of the next BELIEF conference, which will be Shanghai, China, from 23-25 October 2020. The event will be collocated with the 1st International Conference on

Cognitive Analytics, Granular Computing, and Three-Way Decisions and co-sponsored by the Int. Rough Set Society. https://www.lgi2a.univ-artois.fr/events/belief2020/



***Certosa di Pontignano facility: Lunch time (left), Prof. T. Denoeux presenting the first lecture on Introduction to Belief Functions (right)***

## Participation



***School participants during the social event, after the visit of the Azienda Agricola Losi Querciavalle, and the wine tasting.***

Thirty four (34) people attended the school among which 10 lecturers, 17 students, 5 senior researchers and 2 guests (see Table 2).

Most tutees were students, including one local student who did not stay at the Certosa during nights and benefited from reduced fees. France was the most represented country with 11 tutees, followed by Italy (5), Tunisia (2) and USA (2). Other countries with one representative: India, UK, Germany, Morocco.

**Table 2: School attendance**

| | |
|---|---|
| Regular | 5 |
| Student | 17 |
| Speaker | 10 |
| Guest | 2 |
| **TOTAL** | **34** |

**Table 3: Statistics of attendance – Affiliation and country of tutees only**

| Affiliation | Country | Tutees |
|---|---|---|
| George Masson University | USA | 1 |
| Indian Statistical Institute | India | 1 |
| NATO STO Centre for Maritime Research and Experimentation | Italy | *4* (including 1 double affiliation) |
| Netflix | USA | 1 |
| Perugia Università | Italy | 1 |
| Université Artois | France | *5* (including 2 double affiliations) |
| Université Clermont Auvergne | France | 1 |
| Université de Rennes 1 | France | 1 |
| Université de Tarbes | France | 1 |
| Université de Technologie de Compiègne | France | 2 |
| Université de Toulon - C.-S. | France | 1 |
| Université de Tunis | Tunisia | 2 (double affiliations) |
| University Bristol | UK | 1 (double affiliation) |
| University Hassan I | Morocco | 1 |
| University of Oldenburg | Germany | 1 |

## BFAS grants

Eleven (11) grant requests were received, including one invalid from a university professor. Seven (7) grants were awarded by the BFAS board of directors to students from India, USA, Tunisia, Morocco and France.

Visas were required for two students (from India and from Morocco). While the student from India, after several interactions with the Italian consulate in Calcutta (invitation letters, translations, etc), succeeded to get his visa and attended the school, the student from Morocco failed to get his visa, due to lack of responsiveness of the consulate authorities.

## Exercises and final exam

Originally meant to be a final exam on the last day, a series of exercises was accompanying each lecture and was made available to the participants prior to each lecture. Tutees were encouraged to complete the exercises during the school, to ask questions to the lecturers, to do the exercises in groups, and to send back their answers to the organisation committee at the end of the event for a validation and certificate if needed. Although tutees found the exercise series interesting and valuable to get deeper understanding of the concepts taught during lectures, they lacked time to focus on the exercises and to actually do them.

## Social event

On the Tuesday 28th afternoon, the group walked to the close by *Azienda Agricola Losi Querciavalle*, for one hour of visit and wine tasting. The Losi family is wine producer of *Chianti Classico* since 1870 and is exporting wine across the world. The group then joined Siena by city bus for a free visit of the city.



*Visit of the Azienda Agricola Losi Querciavalle*

***Palazzo Pubblico* (City Hall) in *Piazza del Campo*, Siena**

# Feedback

A questionnaire was provided to the participants to gather their experience about the school in the aim of improving future editions. Just a few of them (8) filled it out and kindly provided their feedback. However, other feedbacks were gathered during the event while freely exchanging with the participants. Below is a summary of all comments received (questionnaire and free discussions).

## The quality of the lectures

- The lectures were greatly appreciated and their high quality (content and presentation) acknowledged
- The level was too high to some, not adapted to beginners

## The exercises and the format

- Exercises were good but time was missing to actually do them and to exchange with colleagues
- The agenda of the school was dense and tutees did not have enough time to self-study

## The poster sessions

- The poster session was interesting for students to present their work and get feedback from lecturers and other participants
- Maybe not enough posters

## The accommodation and catering

- The accommodation was excellent, as was the food and the location

## The social event

- The social event was very well received, people enjoyed Siena and were interested in learning about the vinery

- ○ Provide basic material and references before the event so beginners can get basic knowledge prior to the school
- ○ Include more examples in slides, spending more time to explain basic computations
- ○ Dedicated exercise sessions where to ask questions, and more time for exercises in general
- ○ Pairing students (beginner/advanced) to learn together
- ○ Dedicated lecture(s) for beginners at first
- ○ A two week school to have time to "digest" the dense programme
- ○ Video recording the lectures and make them available

## Sponsors

We would like to thank the sponsors of this event, all speakers and participants who made this event a success.



## Organising committee

**Anne-Laure Jousselme** – NATO STO Centre for Maritime Research and Experimentation, La Spezia, Italy

**Thierry Denoeux** -- Heudiasyc, Université de technologie de Compiègne, France

**Nadia Ben Abdallah** – NATO STO Centre for Maritime Research and Experimentation, La Spezia, Italy

**David Mercier** -- LGI2A, Université d'Artois, France

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**Alessandro De Gloria** -- UNIGE - Università degli Studi di Genova, Italy

**Roberto Sacile** --DIBRIS, Università degli Studi di Genova, Italy