Lecture Notes in Artificial Intelligence 13506

Subseries of Lecture Notes in Computer Science

More information about this subseries at https://link.springer.com/bookseries/1244

Sylvie Le Hégarat-Mascle · Isabelle Bloch ·
Emanuel Aldea (Eds.)

Belief Functions: Theory and Applications

7th International Conference, BELIEF 2022
Paris, France, October 26–28, 2022
Proceedings

Springer

Editors
Sylvie Le Hégarat-Mascle
University of Paris-Saclay
Gif sur Yvette, France

Isabelle Bloch
Sorbonne University
Paris, France

Emanuel Aldea
University of Paris-Saclay
Gif sur Yvette, France

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Artificial Intelligence
ISBN 978-3-031-17800-9 ISBN 978-3-031-17801-6 (eBook)
https://doi.org/10.1007/978-3-031-17801-6

LNCS Sublibrary: SL7 – Artificial Intelligence

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The theory of belief functions, also referred to as evidence theory or Dempster-Shafer theory, was first introduced by Arthur P. Dempster in the context of statistical inference, and was later developed by Glenn Shafer as a general framework for modeling epistemic uncertainty. These early contributions have been the starting points of many important developments not only in statistics but also in computer science and engineering. The theory of belief functions is now well established as a general framework for reasoning with uncertainty, and has well understood connections to other frameworks such as probability, possibility, and imprecise probability theories. It has been applied in diverse areas such as machine learning, information fusion, and pattern recognition.

The series of biennial International Conferences on Belief Functions (BELIEF), sponsored by the Belief Functions and Applications Society (BFAS), is dedicated to the confrontation of ideas, the reporting of recent achievements, and the presentation of the wide range of applications of this theory. The first edition of this conference series was held in Brest, France, in 2010. Later editions were held in Compiègne, France, in 2012, Oxford, UK, in 2014, Prague, Czech Republic, in 2016, again in Compiègne, France, in 2018, and in Shanghai, China, in 2021 together with the 1st International Conference on Cognitive Analytics, Granular Computing, and Three-way Decisions (CCGT 2021).

The 7th International Conference on Belief Functions (BELIEF 2022) was held in Paris, France, during October 26–28, 2022. It was held both onsite and online due to the COVID-19 situation. This volume represents the proceedings of BELIEF 2022, and it contains 29 accepted submissions, each reviewed by either two or three peers in a single-blind review process. Original contributions were solicited on theoretical aspects (including, for example, mathematical foundations, links with other uncertainty theories) as well as on methods for various problems including classification, clustering, data fusion, and on applications in various areas including medical data processing, environmental studies, and so on.

We would like to thank all the people who made this volume and this conference possible: all contributing authors, the organizers, and the Program Committee members who helped to build such an attractive program. We are especially grateful to our four invited speakers, Stéphane Canu (INSA Rouen Normandie, France) for his talk "Robustness of neural networks and adversarial attacks", Rémi Bardenet (CNRS and Lille University, France) for his talk "Topics in Monte Carlo computation and Bayesian learning", Ozgur Erdinc (Raytheon Technologies Research Center, USA) for his talk "Challenges in Automating Mission-Critical Decision Making Systems: A Practitioner's Perspective", and Philippe Xu (Université de Technologie de Compiègne, France) for his talk "Fusion of heterogeneous deep neural networks with belief functions". We would also like to thank all our generous sponsors: the Belief Functions and Applications Society (BFAS), the DATAIA Institute, the SATIE Laboratory, the Sorbonne Center of Artificial Intelligence (SCAI), the International Journal of Approximate Reasoning, and Elsevier. Furthermore, we would like to thank the editors of the Springer series Lecture

Notes in Artificial Intelligence (LNCS/LNAI) and Springer for their dedication to the production of this volume.

August 2022

Sylvie Le Hégarat-Mascle
Isabelle Bloch
Emanuel Aldea

Organization

General Chair

Sylvie Le Hégarat-Mascle	Paris-Saclay University, France

Program Committee Chairs

Isabelle Bloch	Sorbonne Université, France
Emanuel Aldea	Paris-Saclay University, France

Steering Committee

Thierry Denœux	Université de Technologie de Compiègne, France
Sylvie Le Hégarat-Mascle	Paris-Saclay University, France
Isabelle Bloch	Sorbonne Université, France
Emanuel Aldea	Paris-Saclay University, France
Frédéric Pichon	Université d'Artois, France

Program Committee

Emanuel Aldea	Paris-Saclay University, France
Alessandro Antonucci	Dalle Molle Institute for Artificial Intelligence, Switzerland
Isabelle Bloch	Sorbonne Université, France
Ines Couso	University of Oviedo, Spain
Fabio Cuzzolin	Oxford Brookes University, UK
Thierry Denœux	Université de Technologie de Compiègne, France
Sébastien Destercke	Université de Technologie de Compiègne, France
Jean Dezert	ONERA, France
Didier Dubois	Toulouse Institute of Computer Science Research, France
Zied Elouedi	Institut Supérieur de Gestion de Tunis, Tunisia
Sabine Frittella	Université d'Orléans, France
Radim Jiroušek	Prague University of Economics and Business, Czech Republic
Anne-Laure Jousselme	Centre for Maritime Research and Experimentation, Italy
John Klein	Université de Lille, France

Václav Kratochvíl	Institute of Information Theory and Automation, CAS, Czech Republic
Sylvie Le Hégarat-Mascle	Paris-Saclay University, France
Éric Lefèvre	Université d'Artois, France
Xinde Li	Southeast University, China
Zhunga Liu	Northwestern Polytechnical University, China
Arnaud Martin	Université de Rennes 1, France
Ryan Martin	North Carolina State University, USA
David Mercier	Université d'Artois, France
Enrique Miranda	University of Oviedo, Spain
Serafín Moral	University of Granada, Spain
Frédéric Pichon	Université d'Artois, France
Benjamin Quost	Université de Technologie de Compiègne, France
Emmanuel Ramasso	École nationale supérieure de mécanique et des microtechniques, France
Roger Reynaud	Paris-Saclay University, France
Johan Schubert	Swedish Defence Research Agency, Sweden
Prakash P. Shenoy	University of Kansas, USA

Additional Reviewers

Constance Thierry
Sajad Nazari

Contents

Algorithms and Evidential Operators

Data and Information Fusion

Statistical Inference - Graphical Models

Links with Other Uncertainty Theories

Applications