This special issue of the International Journal of Approximate Reasoning (IJAR) grew out of the 8th International Symposium on Imprecise Probability: Theories and Applications (ISIPTA’13). The symposium was organized by the Society for Imprecise Probability: Theories and Applications (SIPTA) at the University of Compiègne (France) in July 2013 (http://www.sipta.org/isipta13). The biennial ISIPTA meetings are well established among international conferences on generalized methods for uncertainty quantification. The first ISIPTA took place in Gent in 1999, followed by meetings in Cornell, Lugano, Carnegie Mellon, Prague, Durham and Innsbruck. Compiègne proved to be a very nice location for ISIPTA 2013, offering wonderful opportunities for collaborations and discussions, as well as sightseeing places such as its Napoleonian palace.

Following a selective refereeing process, 38 papers were selected for ISIPTA’13 and presented in plenary sessions followed by poster sessions enabling deeper discussions. Following previous years tradition, 8 poster-only presentations were added to those papers. These presentations were complemented by tutorials given by Matthias C.M. Troffaes and Thierry Denoeux on imprecise probability theory and belief functions, respectively. A number of invited talks about topics related to imprecise probabilities were also given: Alessio Benavoli gave a talk on “Pushing Dynamic Estimation to the Extremes: from the Moon to Imprecise Probability”, Isaac Elishakoff on the “Recent Developments in Applied Mechanics with Uncertainties”, Christophe Labreuche on “Robustness in Multi-Criteria Decision Making and its relation with Imprecise Probabilities” and Jean-Marc Tallon on “Ambiguity and Ambiguity Attitudes in Economics”.

The biennial IJAR Young Researcher Award, generously provided by Elsevier, was awarded at the meeting. The Prize in Gold was awarded to Andrea Wiencierz (Germany) and Ignacio Montes Gutiérrez (Spain), while Rocco de Rosa (Italy) received an honorable mention.

This special issue contains the following contributions:

- ‘Coherent Updating of Non-additive Measures’ by Miranda and Montes studies the conditioning operation known as “focusing” applied to coherent non-additive measures, and characterizes in which cases this conditioning is uniquely defined. They explore the particular cases of completely monotone measures and of minitive lower previsions.

- ‘Credal Networks under Epistemic Irrelevance: the Sets of Desirable Gambles Approach’ by De Bock and de Cooman explores the problem of making inference and modelling independence in graphical models using the language of desirable gambles. In particular, they show that using desirability allows them to handle the case of epistemic irrelevance and of zero probabilities in a very elegant way.

- ‘Characterizing Coherence, Correcting Incoherence’ by Quaeghebeur explores how coherent (and avoiding sure loss) lower previsions can be efficiently characterized by a finite number of constraints, and then explores how incoherent assessments can be corrected by using these constraints and multi-objective optimization procedures.

- ‘Conceptual Issues in Regression Analysis Under Interval Data: Distinguishing and Applying Three Types of Identification Regions’ by Schollmeyer and Augustin investigates different ways to define identification regions from interval or coarsened data, and compare them to classical statistical techniques dealing with such data. The different techniques are then applied to a wine-quality prediction problem.

- ‘Robust Classification of Multivariate Time Series by Imprecise Hidden Markov Models’ by Antonucci, De Rosa, Giusti and Cuzzolin proposes a new method to
classify time series. The proposed technique consists in learning an imprecise hidden Markov model and its imprecise stationary distribution for different sequences, and then to classify new instances by using a nearest neighbour approach adapted to imprecise observations.

- ‘Credal Model Averaging for Classification: Representing Ignorance a Priori and Expert Opinions’ by Corani and Mignatti explores the application of credal model averaging using logistic regressions with different covariates to an environmental problem: predicting presence of Alpine marmot burrows. They provide learning algorithms and show that using an imprecise probabilistic allows one to better recognize instances that are difficult to classify, both under prior ignorance and when some partial expert knowledge is available.

- ‘New Prior Near-ignorance Models on the Simplex’ by Mangili and Benavoli explores different ways of defining near-ignorance models on the probability simplex, therefore discussing alternatives to the Imprecise Dirichlet Model when dealing with multinomial data. In particular, they focus on the normalized Infinitely divisible distributions and provide generic formulas for computing posterior inferences with those distributions. Based on those inferences, they discuss the properties satisfied by those models.

The papers presented in this special issue of the International Journal of Approximate Reasoning are closely related to papers presented at ISIPTA’13. We selected seven conference papers from the many excellent contributions. These papers reflect the wide range of topics at the conference and fit well with the focus of the journal. Authors of these conference papers were invited to submit a related full-length paper. All invited authors kindly accepted this invitation. Subsequently, each paper was carefully reviewed again by two or three external referees and by us. The papers in this special issue provide ample evidence of the success of ISIPTA’13 and of the progress of research and applications involving imprecise probabilities. We hope that they also motivate readers to participate in the 9th International Symposium on Imprecise Probability: Theories and Applications (ISIPTA’15), to be held in Pescara, Italy, in July 2015 (http://www.sipta.org/isipta15).

Acknowledgements

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