

# Sébastien Destercke

CNRS Researcher

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## Career

### CNRS researcher

Oct. 2011 - **Joint research unit Heudiasyc (7053)**, *Université de technologie de Compiègne, France.*  
Now

Interests Information modelling and treatment under severe uncertainty.

Team Decision et Image. Head: Yves Grandvalet, CNRS researcher

### CIRAD research engineer

Feb. 2009 - **Joint research unit IATE**, *Montpellier SupAgro, France.*

Oct. 2011

Interests Uncertainty modelling and aid-decision applied to agronomical production chains.

Team Knowledge Engineering group. Head: Patrice Buche, research engineer

### Teaching and research assistant

Sept. 2008 - **Mathematic and computer science department**, *Université Toulouse le mirail, France.*

Feb. 2009

Interests Information modelling and treatment under severe uncertainty.

Team Raisonnements Plausibles, Décision et Méthodes de preuve. Head: Didier Dubois, CNRS researcher

## Education

2005-2008 **PhD in Computer Science**, *Université Paul-Sabatier, Toulouse.*

Thesis prepared at Toulouse Institute of Computer Science Research and funded by the French Institute for Radiological Protection and Nuclear Safety.

### *Dissertation*

*Title* Uncertainty representation and combination: new results with application to nuclear safety issues

*Supervisor* Didier Dubois, CNRS researcher, IRIT

*Co-supervisor* Eric Chojnacki, research engineer, IRSN

*Reviewers* Thierry Denoeux, professor, Université technologique de Compiègne

Serafin Moral, professor, Universidad de Granada

Olivier Strauss, Lecturer, Université de science de Montpellier

*Examiners* Gert de Cooman, professor, Ghent University

Philippe Fortemps, professor, Faculté polytechnique de Mons

Monique Pontier, professor, Université Toulouse Paul Sabatier

1998-2004 **Engineer Degree**, *Faculté polytechnique*, Mons (Belgium).  
Engineer degree in computer science and applied mathematics

## Languages

French **Mother tongue**  
English **Fluent**  
Spanish **Conversant**  
Dutch **Basic knowledge**

## Awards, grants and fellowships

2012 3 month visit grant at Universidad de Oviedo, Statistic department  
2009 Best Ph.D. (gold prize) awarded by the International Society for Imprecise Probabilities: Theories and Applications  
2008 Best paper award,  $\lambda\mu$  conference, category "new industrial challenges"

## Projects

### RECIF

Details 3 years (2014-2017), member, ANR national grant (~150K Euros)  
Topic Uncertainty modelling by belief functions for railway systems reliability assessment  
Partners Heudiasyc/CNRS (France), LAMIH (France), CRAN (France)

### ORUs

Details 1 years (2013-2014), **PI**, Labex Grant (~8K Euros)  
Topic Optimisation under uncertainty of complex system reliability  
Partners Heudiasyc/CNRS (France)

### EVEREST

Details 3 years (2013-2016), member, ANR grant (~ 200K Euros)  
Topic Learning High Level Representations of Large Sparse Tensors  
Partners Heudiasyc/CNRS (France) & Xerox Research Center Europe (France).

### ECOBIOCAP

Details 4 years (2011-2015), member, FP7 European grant (~ 4M Euros)  
Topic Ecoefficient Biodegradable Composite Advanced Packagings  
Partners IVV (Germany), UCC (Ireland), SIK (Sweden), NBM (Spain), CSIC (Spain), INRA (France), FUERST-PLAST (France), FEDOU (France), ALTERBIO (France), UMINHO (Portugal), IBET (Portugal), UNIROMA (Italy), NOVAMONT (Italy), UNIBO (Italy), CBHU (Hungary)

## Scientific activities

### Reviewing

Journal **Editorial Board: IJAR**

**Regular (min. 1 reviews/year):** IJAR, FSS, INS, IEEE SMC, IJUFKS, SOCO

**Occasional (less than 1 reviews/year):** JSTP, AI, MSS, IJRS, ANOR, Hydrology and Earth System Sciences, CAD, JRR, AIJ, IEEE TFS, IEEE TKDE, Environmental Modelling & Software, CSDA, JSPI, TOMACS, MACHS, Ecography, IEEE TR, Pattern Recognition.

Conferences **Program committee:** UAI (2010-2013), BELIEF (2012), ECSQARU (2011,2013), IHMSC (2011), ISIPTA (2009,2011,2013-chair), SMPS (2012), SOCPAR (2010), LFA (2012,2013), KSE (2013), EUROFUSE (2013), IPMU (2014), ECAI (2014)

**Reviewer:** LFA (2009), SMPS (2008, 2010), EUSFLAT (2009), IPMU (2010, 2012)

### Organization

Committee LFA (2006, 2012), SMPS (2008), ISIPTA (2013)

Special Sessions ERCIM (2011,2012), SMPS (2012), IPMU (2014)

### Responsibilities

SIPTA Society for Imprecise Probability: Theories and Applications (Executive Editor 2011-2013, Secretary 2013-2015)

BFAS Secretary for the Belief Functions and Applications Society (2011-2013)

### Invited talks

SUM 2012 Invited tutorial: "Uncertainty handling and modelling: an introduction"

ECSQARU 2013 Invited tutorial: "Uncertainty handling and modelling: an introduction"

### PhD supervision

2012-2015 Gen Yang, co-supervisor: Mylène Masson)

"Machine learning problems with severe uncertainty and structured data"

2010-2014 Nicolas-Sutton Charani, co-supervisor: Thierry Denoeux

"Learning from uncertain data: application to rubber quality prediction"

## Publications

### Edited journals, proceedings, books

- [1] F. Cozman, T. Denœux, S. Destercke, and T. Seidenfeld, editors. *ISIPTA'13: Proceedings of the Seventh International Symposium on Imprecise Probability: Theories and Applications*, Compiègne, 2013. SIPTA.
- [2] Sébastien Destercke, Mylène Masson, and Benjamin Quost. Belief 2012 conference special issue. *Int. J. of Approximate Reasoning*, 55, 2014.
- [3] Cozman Fabio, Sébastien Destercke, and Seidenfeld Teddy. Isipta 2013 conference special issue. *Int. J. of Approximate Reasoning*, 56, 2015.

### Books and book chapters

- [4] Sébastien Destercke and Didier Dubois. *An introduction to Imprecise Probabilities*, chapter Special cases. Wiley, 2014.
- [5] Sébastien Destercke and Didier Dubois. *An introduction to Imprecise Probabilities*, chapter Other uncertainty theories based on capacities. Wiley, 2014.
- [6] Patrice Buche, Sébastien Destercke, Valérie Guillard, Ollivier Haemmerlé, Rallou Thomopoulos, et al. Springer series 'studies in computational intelligence. 497, 2014.

## Journal papers

- [7] Enrique Miranda, Matthias CM Troffaes, and Sébastien Destercke. A geometric and game-theoretic study of the conjunction of possibility measures. *Information Sciences*, 298:373–389, 2015.
- [8] Marie-Hélène Masson, Sébastien Destercke, and Thierry Denoeux. Modelling and predicting partial orders from pairwise belief functions. *Soft Computing*, 2015, in press.
- [9] Frédéric Pichon, Sébastien Destercke, and Thomas Burger. A consistency-specificity trade-off to select source behavior in information fusion. *IEEE Trans. on Syst. ,Men and Cyb.*, 2015, in press.
- [10] Sébastien Destercke and Inés Couso. Ranking of fuzzy intervals seen through the imprecise probabilistic lens. *Fuzzy Sets and Systems*, 2015, in press.
- [11] Enrique Miranda and Sébastien Destercke. Extreme points of the credal sets generated by comparative probabilities. *Journal of Mathematical Psychology*, 64:44–57, 2015.
- [12] F. Aguirre, S. Destercke, D. Dubois, M. Sallak, and C. Jacob. Inclusion-exclusion principle for belief functions. *International Journal of Approximate Reasoning*, 55(8):1708 – 1727, 2014.
- [13] S. Destercke. Comments on "learning from imprecise and fuzzy observations: Data disambiguation through generalized loss minimization" by eyke hüllermeier. *International Journal of Approximate Reasoning*, 55(7):1588 – 1590, 2014.
- [14] S. Destercke. Comments on "a distance-based statistical analysis of fuzzy number-valued data" by the {SMIRE} research group. *International Journal of Approximate Reasoning*, 55(7):1575 – 1577, 2014.
- [15] Rallou Thomopoulos, Sébastien Destercke, Brigitte Charnomordic, Iyan Johnson, and Joël Abécassis. An iterative approach to build relevant ontology-aware data-driven models. *Information Sciences*, 221:452–472, 2013.
- [16] Matthias Troffaes, Enrique Miranda, and Sébastien Destercke. On the connection between probability boxes and possibility measures. *Information Sciences*, 224:88–108, 2013.
- [17] Sébastien Destercke, Patrice Buche, and Brigitte Charnomordic. Evaluating Data Reliability: An Evidential Answer with Application to a Web-Enabled Data Warehouse. *IEEE Transactions on Knowledge and Data Engineering*, 25(1):92–105, 2013.
- [18] Sébastien Destercke and Mohamed Sallak. An extension of Universal Generating Function in Multi-State Systems considering epistemic uncertainties. *IEEE Transactions on Reliability*, 62:504–514, 2013.
- [19] Thomas Burger and Sébastien Destercke. How to randomly generate mass functions. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, 21:645–673, 2013.
- [20] Sébastien Destercke. Independence and 2-Monotonicity: Nice to Have, Hard to Keep. *International Journal of Approximate Reasoning*, 54(4):478–490, 2013.
- [21] Sébastien Destercke and Thomas Burger. Toward an Axiomatic Definition of Conflict Between Belief Functions. *IEEE trans. on systems, man, and cybernetics. Part B*, 43:585–596, 2013.
- [22] Sébastien Destercke and Olivier Strauss. Filtering with clouds. *Soft Computing*, 16(5):821–831, 2012.
- [23] Sébastien Destercke. A K-nearest neighbours method based on imprecise probabilities. *Soft Computing*, 16(5):833–844, 2012.
- [24] Valérie Guillard, C. Guillaume, and Sébastien Destercke. Parameter uncertainties and error propagation in modified atmosphere packaging modelling. *Postharvest Biology and Technology*, 67:154–166, 2012.
- [25] Matthias Troffaes and Sébastien Destercke. Probability boxes on totally preordered spaces for multivariate modelling. *International Journal of Approximate Reasoning*, 52(6):767–791, 2011.
- [26] Sébastien Destercke and Valerie Guillard. Interval analysis on non-linear monotonic systems as an efficient tool to optimise fresh food packaging. *Computers and Electronics in Agriculture*, 79(2):116–124, 2011.

- [27] Sébastien Destercke and Didier Dubois. Idempotent conjunctive combination of belief functions: Extending the minimum rule of possibility theory. *Information Sciences*, 181(18):3925–3945, 2011.
- [28] Sébastien Destercke. Handling bipolar knowledge with imprecise probabilities. *International Journal of Intelligent Systems*, 26(5):426–443, 2011.
- [29] Sébastien Destercke, Patrice Buche, and Valérie Guillard. A flexible bipolar querying approach with imprecise data and guaranteed results. *Fuzzy Sets and Systems*, 169(1):51–64, 2011.
- [30] E. Chojnacki, J. Baccou, and S. Destercke. Numerical sensitivity and efficiency in the treatment of epistemic and aleatory uncertainty. *Int. J. of General Systems*, 39(7):683–704, 2010.
- [31] Lev Utkin and Sébastien Destercke. Computing expectations with continuous p-boxes: Univariate case. *International Journal of Approximate Reasoning*, 50(5):778–798, 2009.
- [32] Sébastien Destercke, Didier Dubois, and Eric Chojnacki. A consonant approximation of the product of independent consonant random sets. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, 17(6):773, 2009.
- [33] S. Destercke, D. Dubois, and E. Chojnacki. Unifying practical uncertainty representations: I generalized p-boxes. *Int. J. of Approximate Reasoning*, 49(3):649–663, 2008.
- [34] S. Destercke, D. Dubois, and E. Chojnacki. Unifying practical uncertainty representations: II clouds. *Int. J. of Approximate Reasoning*, 49(3):664–677, 2008.
- [35] S. Destercke, D. Dubois, and E. Chojnacki. Possibilistic information fusion using maximal coherent subsets. *IEEE Trans. on Fuzzy Systems*, 17(1):79–92, 2008.
- [36] Sébastien Destercke and Eric Chojnacki. Methods for the evaluation and synthesis of multiple sources of information applied to nuclear computer codes. *Nuclear Engineering and Design*, 238(9):2484–2493, 2008.
- [37] Sébastien Destercke, Serge Guillaume, and Brigitte Charnomordic. Building an interpretable fuzzy rule base from data using Orthogonal Least Squares: Application to a depollution problem. *Fuzzy Sets and Systems*, 158(18):2078–2094, 2007.

#### International conferences with peer reviewing

- [38] Nicolas Sutton-Charani, Sébastien Destercke, and Thierry Denœux. Application of e2m decision trees to rubber quality prediction. In *IPMU*, pages 107–116, 2014.
- [39] Sébastien Destercke and Olivier Strauss. Kolmogorov-smirnov test for interval data. In *IPMU*, pages 416–425, 2014.
- [40] Sébastien Destercke. Multilabel prediction with probability sets: The hamming loss case. In *IPMU*, pages 496–505, 2014.
- [41] Matthias C. M. Troffaes, Frank P. A. Coolen, and Sébastien Destercke. A note on learning dependence under severe uncertainty. In *IPMU*, pages 498–507, 2014.
- [42] Gen Yang, Sébastien Destercke, and Marie-Hélène Masson. Nested dichotomies with probability sets for multi-class classification. In *Proceedings of ECAI 2014*, pages 363–368, 2014.
- [43] Sébastien Destercke, Mohamed Sallak, and Michaël Poss. Reliability analysis with ill-known probabilities and dependencies. In *Proceedings of ICVRAM 2014*, pages 1–10, 2014.
- [44] Felipe Aguirre, Christelle Jacob, Sébastien Destercke, Didier Dubois, and Mohamed Sallak. Inclusion/exclusion principle for belief functions. In F. Cozman, T. Denœux, S. Destercke, and T. Seidenfeld, editors, *ISIPTA'13: Proceedings of the Seventh International Symposium on Imprecise Probability: Theories and Applications*, pages 3–11, Compiègne, 2013. SIPTA.
- [45] Matthieu Hourbracq, Cédric Baudrit, Pierre-Henri Wuillemin, and Sébastien Destercke. Dynamic credal networks: introduction and use in robustness analysis. In F. Cozman, T. Denœux, S. Destercke, and T. Seidenfeld, editors, *ISIPTA'13: Proceedings of the Seventh International Symposium on Imprecise Probability: Theories and Applications*, pages 159–168, Compiègne, 2013. SIPTA.
- [46] Frédéric Pichon, Sébastien Destercke, and Thomas Burger. Selecting source behavior in information fusion on the basis of consistency and specificity. In *ECSQARU*, pages 473–484, 2013.
- [47] Enrique Miranda and Sébastien Destercke. Extreme points of the credal sets generated by elementary comparative probabilities. In *ECSQARU*, pages 424–435, 2013.

- [48] Sébastien Destercke. A pairwise label ranking method with imprecise scores and partial predictions. In *ECML/PKDD*, pages 112–127, 2013.
- [49] Nicolas Sutton-charani, Sébastien Destercke, and T. Denoeux. Classification trees based on belief functions. In *BELIEF 2012*, pages 77–84, 2012.
- [50] Thomas Burger and Sébastien Destercke. Random generation of mass functions : A short howto. In *BELIEF 2012*, pages 145–152, 2012.
- [51] Sébastien Destercke and Thomas Burger. Revisiting the notion of conflicting belief functions. In Thierry Denoeux and Marie-Hélène Masson, editors, *BELIEF 2012*, volume 164, pages 153–160, 2012.
- [52] Sébastien Destercke and Benjamin Quost. Correcting Binary Imprecise Classifiers: Local vs Global Approach. In Eyke Hüllermeier, Sebastian Link, Thomas Fober, and Bernhard Seeger, editors, *Scalable Uncertainty Management*, volume 7520 of *Lecture Notes in Computer Science*, pages 299–310, Berlin, Heidelberg, 2012. Springer Berlin Heidelberg.
- [53] Yosra Mazigh, Boutheina Ben Yaghlane, and Sébastien Destercke. Evaluation of the naive evidential classifier (nec): A comparison between its two variants based on a real agronomic application. In *SUM*, pages 619–624, 2012.
- [54] Sébastien Destercke and Violaine Antoine. Combining Imprecise Probability Masses with Maximal Coherent Subsets: Application to Ensemble Classification. In *Synergies of Soft Computing and Statistics for Intelligent Data Analysis*, volume 190 of *Advances in Intelligent Systems and Computing*, pages 1–8, Berlin, Heidelberg, 2012. Springer Berlin Heidelberg.
- [55] Matthias C M Troffaes and Sebastien Destercke. A Nested Approach to Multivariate Modelling Using Lower Previsions. In *Proceedings of PSAM 11 & ESREL*, 2012.
- [56] Iyan Johnson, Joel Abécassis, Brigitte Charnomordic, Sébastien Destercke, and Rallou Thomopoulos. Making ontology-based knowledge and decision trees interact: an approach to enrich knowledge and increase expert confidence in data-driven models. In *Knowledge Science, Engineering and Management*, pages 304–316. Springer, 2011.
- [57] Sébastien Destercke. Independence and 2-monotonicity: nice to have, hard to keep. In *Symbolic and Quantitative Approaches to Reasoning with Uncertainty*, pages 263–274. Springer, 2011.
- [58] Olivier Strauss and Sébastien Destercke. F-boxes for filtering. In *European Society for Fuzzy Logic and Technology - EUSFLAT*, 2011.
- [59] Matthias Troffaes, Enrique Miranda, and Sébastien Destercke. On the connection between probability boxes and possibility measures. In *Proceedings of the 7th conference of the European Society for Fuzzy Logic and Technology (EUSFLAT-2011)*. Atlantis Press, 2011.
- [60] Matthias Troffaes and Sébastien Destercke. Probability boxes on totally preordered spaces for multivariate modelling. In *ISIPTA'11: Proceedings of the Seventh International Symposium on Imprecise Probability: Theories and Applications*, 2011.
- [61] Sébastien Destercke, Patrice Buche, and Brigitte Charnomordic. Data reliability assessment in a data warehouse opened on the Web. In *Flexible Query Answering*, 2011.
- [62] Sébastien Destercke and Benjamin Quost. Combining binary classifiers with imprecise probabilities. In *Integrated Uncertainty in Knowledge Modelling and Decision Making*, pages 219–230. Springer, 2011.
- [63] Sébastien Destercke. A k-nearest neighbours method based on lower previsions. In *Computational Intelligence for Knowledge-Based Systems Design*, pages 129–138. Springer, 2010.
- [64] Sébastien Destercke. A new contextual discounting rule for lower probabilities. In *Information Processing and Management of Uncertainty in Knowledge-Based Systems. Applications*, pages 198–207. Springer, 2010.
- [65] Sébastien Destercke and Olivier Strauss. Using Cloudy Kernels for Imprecise Linear Filtering. In Eyke Hüllermeier, Rudolf Kruse, and Frank Hoffmann, editors, *Computational Intelligence for Knowledge-Based Systems Design*, volume 6178 of *Lecture Notes in Computer Science*, pages 198–207, Berlin, Heidelberg, 2010. Springer Berlin Heidelberg.

- [66] Sébastien Destercke. Evaluating trust from past assessments with imprecise probabilities: comparing two approaches. In *Scalable Uncertainty Management*, pages 151–162. Springer, 2010.
- [67] Fathia Saïs, Rallou Thomopoulos, and Sébastien Destercke. Ontology-driven possibilistic reference fusion. In *On the Move to Meaningful Internet Systems, OTM 2010*, pages 1079–1096. Springer, 2010.
- [68] Sébastien Destercke. A Decision Rule for Imprecise Probabilities Based on Pair-Wise Comparison of Expectation Bounds. In *Combining Soft Computing and Statistical Methods in Data Analysis*, pages 189–197. Springer-Verlag Berlin, 2010.
- [69] Sébastien Destercke. Handling Bipolar Knowledge with Credal Sets. In *Combining Soft Computing and Statistical Methods in Data Analysis*, pages 199–207. Springer, 2010.
- [70] Sébastien Destercke. Fuzzy belief structures viewed as classical belief structures: A practical viewpoint. In *Fuzzy Systems (FUZZ), 2010 IEEE International Conference on*, pages 1–8. IEEE, 2010.
- [71] Sébastien Destercke and Didier Dubois. Can the Minimum Rule of Possibility Theory Be Extended to Belief Functions? In *Symbolic and Quantitative Approaches to Reasoning with Uncertainty*, pages 299–310. Springer, 2009.
- [72] Sébastien Destercke and Didier Dubois. The role of generalised p-boxes in imprecise probability models. In *Proc. of the 6th Int. Symp. on Imprecise Probability: Theories and Applications*, number 1, pages 179–188, 2009.
- [73] Sébastien Destercke, Didier Dubois, and Eric Chojnacki. Computing with generalized p-boxes: preliminary results. In *Proc. Information Processing and Management of Uncertainty*, 2008.
- [74] Enrique Miranda, Matthias Troffaes, and Sébastien Destercke. Generalised p-boxes on totally ordered spaces. In *Soft Methods for Handling Variability and Imprecision*, pages 1–8, 2008.
- [75] Sébastien Destercke and Gert de Cooman. Relating epistemic irrelevance to event trees. In *Soft Methods for Handling Variability and Imprecision*, pages 66–73. Springer, 2008.
- [76] Enrique Miranda, Matthias Troffaes, and Sébastien Destercke. Generalised p-boxes on totally ordered spaces. In *Soft Methods for Handling Variability and Imprecision*, pages 235–242. Springer, 2008.
- [77] Sébastien Destercke, Serge Guillaume, and Brigitte Charnomordic. Using the OLS algorithm to build interpretable rule bases: an application to a depollution problem. In *FUZZ-IEEE, 2007*.
- [78] Lev Utkin and Sébastien Destercke. Computing expectations with p-boxes: two views of the same problem. In *5th International Symposium on Imprecise Probability: Theories and Applications*, 2007.
- [79] Sébastien Destercke, Didier Dubois, and Eric Chojnacki. Relating practical representations of imprecise probabilities. In *Proceedings of the 5th International Symposium on Imprecise Probability: Theories and Applications*, 2007.
- [80] Sébastien Destercke, Didier Dubois, and Eric Chojnacki. Cautious conjunctive merging of belief functions. In *Symbolic and Quantitative Approaches to Reasoning with Uncertainty*, pages 332–343. Springer, 2007.
- [81] Sébastien Destercke and Eric Chojnacki. Evaluation, analysis and synthesis of multiple source information: an application to nuclear computer codes. In *European Safety and Reliability Conference*, 2007.
- [82] Sébastien Destercke and Eric Chojnacki. Handling dependencies between variables with imprecise probabilistic models. In *European Safety and Reliability Conference*, 2007.
- [83] Sébastien Destercke, Didier Dubois, and Eric Chojnacki. Transforming probability intervals into other uncertainty models. In *European Society for Fuzzy Logic and Technology - EUSFLAT*, pages 367–373, 2007.
- [84] Sébastien Destercke and Didier Dubois. A unified view of some representations of imprecise probabilities. In *Soft Methods for Integrated Uncertainty Modelling*, pages 249–257. Springer, 2006.