WAET-workshop of 19 December 2008

Organized by
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of the SYSTeMS Research Group of Ghent University

Location, Date & Scope

The WAET-workshop will take place on Friday 19 December 2008 at the lecture room of the SYSTeMS Research Group, Technologiepark-Zwijnaarde 914 (2nd floor), 9052 Zwijnaarde, Belgium (http://www.systems.ugent.be/contact.php). The goal of the workshop is to allow researchers of the imprecise probabilities community (and other interested researchers) to present and discuss ongoing research and topics of discussion. The workshop takes place the day after the private defense of Erik Quaeghebeur's PhD thesis. This allows the two foreign members of the jury, Thomas Augustin and Frank Coolen, both leading researchers in the area of imprecise probability theory and its applications, to give a talk at the workshop.

Format

The workshop's format is as follows: there will be six sessions of one hour, each devoted to a single topic. Each presenting researcher has half an hour to present the topic, where the focus should be on getting the important ideas *and* problematic aspects across. The second half hour of each session is devoted to open discussion, with as a goal the formulation of (potential avenues to) solutions to the problems encountered in the presented research.

Program

Barring last-minute changes, the program will be as follows, all hours given are indicative only:

8h45 Opportunity for coffee or tea before the start of the workshop.

9h00 Erik Quaeghebeur (UGent): The desirability of desirability

> Desirability – i.e., the theory of coherent sets of desirable gambles – is often used to introduce the theory of coherent lower previsions and justify its defining properties. It can be argued that sets of desirable gambles provide a conceptually simpler basic framework for modelling uncertainty than the one provided by lower previsions and credal sets. I will first illustrate this claim of conceptual simplicity. Then I will use exchangeability to show desirability can also be used for more than only creating a basic framework. After that, I will start speculating on whether desirability can also provide a fresh and enlightening look on both old and new problems in uncertainty modelling. To finish the talk and start the discussion, I will briefly touch on the following question: Can desirability be squared with non-convex credal sets?

10h00 Short break.

10h10 Frank Coolen (Durham University):
Imprecision and Inference — Ten Questions, Any Answers?

> Generalization of statistical inference by the use of lower and upper probability for uncertainty quantification raises many very challenging questions. In this presentation, I hope to ask no fewer than 10 questions which have been haunting me for various lengths of time, some for years and some only since reading Erik Quaeghebeur's PhD thesis. I hope the workshop participants will give me answers, either in the 2nd half of the session or in the weeks/months/years following the workshop. The focus of most questions will be on fundamental aspects of the way in which statistical methods using lower and upper probabilities should or can differ from classical precise methods (the latter include Bayesian methods).

11h10 Short break.

11h20 Thomas Augustin (LMU München):
Towards a Notion of Credal Maximum Likelihood — Imprecise Probability based Mixed Models and Unobserved Heterogeneity

> The talk would like to discuss some very first ideas contributing to frequentist parameter estimation under imprecise probability. We consider inference from parametric models where one parameters may vary in an interval and look at an idea to define something like credal maximum likelihood to obtain reasonable interval-valued estimators for the parameter.
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> Based on the examples of mean estimation of normal and Poisson distributions and linear regression models we illustrate basic properties of the procedure(s), suggest an interpretation as non-parametric random effects models (mixed models) handling unobserved heterogeneity, and reflect on the construction of confidence regions based on the interval-valued point estimator.

12h20 Sandwich lunch.

14h00 Gert de Cooman (UGent):
Epistemic irrelevance and independence in credal networks

> Credal networks are the imprecise probability generalisation of the better-known Bayesian networks. On the standard approach, the graphical structure of such a credal net is assumed to encode the following Markov condition: conditional on the parents, a node is strongly independent of its non-parent non-descendants. Here, strong independence of variables means that their joint lower prevision is a lower envelope of independent products of precise marginal previsions. In this talk, we describe our recent work on credal nets with a different interpretation, where the graphical structure of the network is intended to encode that conditional on the parents, the non-parent non-descendants are epistemically irrelevant to a node.
>
> I discuss various aspects of such credal nets under epistemic irrelevance: the special notion of epistemic independence (conditional on the parents) of siblings that this condition induces, and in the special case of a Markov tree, where the construction of a smallest coherent joint lower prevision, and an algorithm, of linear complexity in the number of nodes, for treating such a Markov tree as an expert system. We also discuss certain aspects of information propagation and separation in such Markov trees, along with the occurrence of a curious case of so-called dilation.

15h00 Short break.

15h10 Filip Hermans (UGent): Convergence in imprecise Markov chains

> Whenever there is uncertainty in the parameters of the initial or transition belief, the classical Markov chain can be replaced by an imprecise Markov chain. A natural question that arises is how these chains behave on the long term, do they converge and under which conditions? We give necessary and sufficient conditions for convergence and give a short overview of what happens in some special cases where these conditions are not fulfilled. As a nice side result, we show that it does not make any difference whether epistemic irrelevance or strong independence is used in the definition of the Markov condition.

16h10 Short break.

16h20 Matthias Troffaes (Durham University):
Utilityless models of uncertainty?

> In this talk, I will question the usual strong (and often unrealistic) assumptions which most theories of decision take as a prerequisite. In order to relax these assumptions, one approach is to go back to decisions in a form that is as simple as possible. Traditionally, this is taken to be a preference ordering, however I will argue that choice functions are a more suitable means for modelling decisions, especially when uncertainty is serious. I will study the minimal structure required to arrive at the modelling of decision trees, and examine necessary and sufficient conditions on choice functions under which normal form solutions can be derived by backward induction. Surprisingly, this turns out to be possible without ever invoking any concept of utility.

17h20 End of the scientific program.

19h00 Workshop dinner (details available on the day of the workshop itself).

Practical information

About attending:

- Please inform the organizers if you are attending the workshop.
- If you have special requirements (e.g., dietary), please contact the organizers.

For presenters:

- There is a computer with a beamer present at the workshop location for presenting PDF or Powerpoint slides; you can send the necessary files to the organizers if you wish.
- Personal laptops can be attached to the beamer.
- An overhead projector is available.
- A blackboard with both white and colored chalk is available.