Post doc subject: Elicitation and learning of predictive belief functions

Post doc Advisor:
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Context of the study:
The post doctoral fellowship is part of the project activities of the Laboratory of Excellence (LABEX) at the Université de Technologie de Compiègne (UTC) in France on the Control of Technological Systems of Systems (MS2T) (www.utc.fr/labexms2t).
This postdoc position is opened for 12 months, starting from September 2014.
The project is part of Field 2: Uncertainty Management, Theme 2.1: Modeling uncertainties.

Post doc description:
Different types of uncertainties are present at all stages of modeling a complex system. For systems of systems, changing the scale of complexity increasingly raises the problem of modeling uncertainties and their propagation within information processing, from perception to decision-making. Mathematical tools should be developed that make it possible to model uncertainties and propagate them into the calculations and reasoning while keeping control of computational complexity. The user should be provided with understandable information on the reliability of the results in order to help with decision-making.

Belief function theory constitutes a very promising framework, because it extends both Bayesian and set-based approaches (such as interval analysis), while offering great flexibility in the fusion of information. However, some of the main obstacles for a generalized use of this theory to model large complex systems particularly concern (1) automatically learning belief function models from data and (2) defining rigorous methodologies for eliciting human expertise (opinions of one or more experts) while guaranteeing the repeatability and consistency of the results.

The successful candidate will tackle these two issues, with emphasis on prediction, i.e., estimating quantities of interest at some specified future date. Prediction is a crucial task in the design and management of complex systems of systems, for instance: predicting climate change for adapting infrastructures, energy networks and urban planning; predicting the mechanical properties of new materials; predicting the toxicity of new molecules, etc. The candidate will develop method to quantify predictive uncertainty base on statistical data and expert opinions, in the belief function framework.

Candidate's profile :
The candidate is expected to have a good background in statistics or econometrics, with a first experience on forecasting and belief functions. Knowledge of Matlab or R is a plus. Good level in English for oral and written communication is required.

Documents required to apply :
Send a CV (with complete list of publication) and motivation letter by email to Prof. Thierry Denoeux (Thierry.Denoeux@hds.utc.fr).
Deadline for applications**: 20 April 2014.**

Location:
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