Title: Current research directions for hybrid Bayesian networks
Speaker: Helge Langseth
Date & Time: Monday 26th of July, 1200 – 1300
Location: Sala de Grados, Edificio Cite-3, Universidad de Almería

Abstract:

Although the framework of Bayesian networks (BNs) is frequently used as a tool for decision-making under uncertainty, it is hampered by representational constraints in order to allow for efficient and exact inference. One can, for instance, not make a model where a continuous variable (following, e.g., a Gaussian distribution) directly influences a discrete variable (modeled, e.g., by a logistic distribution). To alleviate this problem, much research has been put into exploring specific distributional families like Mixtures of Truncated Exponentials (MTEs) and Mixtures of Polynomial models (MoPs). Both MTEs and MoPs can be used in connection with Bayesian networks so that any joint distribution can be approximated arbitrarily well, and a BN using either of these two distributional families can perform exact inference using standard algorithms – even when the traditional constraints in the Bayesian network framework are violated. Thus, MTEs (or MoPs) can be seen as a step forward to support unconstrained BN models, where the anticipated approach consists in 1) making the model with "classical" distributions like Gaussians and logistic variables (and without observing the constraints of the traditional BN regime); 2) translating the model into a BN consisting of MTEs (or MoPs); 3) making the required inferences in the MTE model. The bottleneck of this approach is the second step: How should one define the MTE approximations to the "standard" distributions?

In this talk I will discuss ongoing research on Mixtures of Truncated Basis Functions (MoTBFs), a framework incorporating both MTEs and MoPs as special cases, and discuss how MoTBFs can be defined to approximate "classical" distributions, also when keeping the trade-off between model complexity and approximation quality in mind. This work is done in collaboration with Antonio Fernández, Thomas D. Nielsen, Rafael Rumí and Antonio Salmerón.

About the speaker:

Helge Langseth is a Professor of Computer Science at the Norwegian University of Science and Technology (http://www.idi.ntnu.no/~helgel/). He is visiting the University of Almería this summer, funded by a grant from Iceland, Liechtenstein, and Norway through the EEA Financial Mechanism. Supported and Coordinated by Universidad Complutense de Madrid. He is also partly funded by the Spanish Ministry of Science and Innovation, through project TIN2007-67418-C03-02, and by EFDR funds.