



Laboratorio di Acquisizione  
della Conoscenza e  
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Centro  
Interdipartimentale di  
Logica e  
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DIPARTIMENTO  
DI INFORMATICA

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## Dottorato di Ricerca in Informatica e Matematica

**Prof. Dr. Kristian Kersting**

Computer Science Department Data Mining Group

TU Dortmund University, Germany

**Giovedì 29 settembre, ore 15,30, Sala Consiglio, VII Piano, Dipartimento di Informatica**

### **Poisson Sum-Product Networks: A Deep Architecture for Tractable Multivariate Poisson Distributions**

Multivariate count data are pervasive in science in the form of histograms, contingency tables and others. Unfortunately, previous work on modeling this type of distributions do not allow for fast and tractable inference. In this seminar, I will present a novel Poisson graphical model, the first based on sum product networks, called PSPN, allowing for positive as well as negative dependencies. We present algorithms for learning tree PSPNs from data as well as for tractable inference via symbolic evaluation. With these, information-theoretic measures such as entropy, mutual information, and distances among count variables can be computed without resorting to approximations. Additionally, we show a connection between PSPNs and LDA, linking the structure of tree PSPNs to a hierarchy of topics. The experimental results on several synthetic and real world data-sets demonstrate that PSPN often outperform state-of-the-art while remaining tractable.

Based on joint works with Alejandro Molina, Sriraam Natarajan and Fabian Hadiji.

*Kristian Kersting is an Associate Professor for Computer Science at the TU Dortmund University, Germany. He received his PhD from the University of Freiburg, Germany, in 2006. After a PostDoc at MIT, he moved to the Fraunhofer IAIS and the University of Bonn using a Fraunhofer ATTRACT Fellowship. His main research interests are data mining, machine learning, and statistical relational AI, with applications to medicine, plant phenotyping, traffic, and collective attention. Kristian has published over 150 technical papers, and his work has been recognized by several awards, including the ECCAI Dissertation Award for the best AI dissertation in Europe.*

*He gave several tutorials at top venues and serves regularly on the PC (often at the senior level) of the top machine learning, data mining, and AI venues. Kristian co-founded the international workshop series on Statistical Relational AI and co-chaired ECML PKDD 2013, the premier European venue for Machine Learning and Data Mining, as well as the Best Paper Award Committee of ACM KDD 2015, the premier international venue for Data Mining.*

*In 2017, he will co-chair UAI, one of the premier international conferences on research related to knowledge representation, learning, and reasoning in the presence of uncertainty. Currently, he is an action editor of DAMI, MLJ, AIJ, and JAIR, the editor of JAIR's, *Da* special track on Deep Learning, Knowledge Representation, and Reasoning, as well as on the editorial boards of Information and of New Generation Computing.*