

# Learning Multi-linear Representations of Distributions for Efficient Inference<sup>\*</sup>

Dan Roth and Rajhans Samdani

Department of Computer Science  
University of Illinois at Urbana-Champaign  
{danr,rsamdan2}@illinois.edu

**Abstract.** We examine the class of multi-linear polynomial representations (MLR) for expressing probability distributions over discrete variables. Recently, MLR have been considered as intermediate representations that facilitate inference in distributions represented as graphical models.

We show that MLR is an expressive representation of discrete distributions and can be used to concisely represent classes of distributions which have exponential size in other commonly used representations, while supporting probabilistic inference in time linear in the size of the representation.

Our key contribution is presenting techniques for learning bounded-size distributions represented using MLR, which support efficient probabilistic inference. We propose algorithms for exact and approximate learning for MLR and, through a comparison with Bayes Net representations, demonstrate experimentally that MLR representations provide faster inference without sacrificing inference accuracy.

**Keywords:** Learning Distributions, Multi-linear Polynomials, Probabilistic Inference, Graphical Models.

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## Reference

1. Roth, D., Samdani, R.: Learning Multi-linear Representations of Distributions for Efficient Inference. *Machine Learning* (2009) DOI: 10.1007/s10994-009-5130-X

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