

Boolean Tensor Factorizations – and Beyond

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Abstract. Boolean matrix factorization (BMF) has become a popular method in data mining, with applications ranging from bioinformatics to lifted inference and multi-label classification. Tensor factorizations (over the standard algebra) have gained increasing interest in data analysis community in the recent years, and they have been applied to network analysis, dynamic networks, and to simplify deep neural networks, among others. Boolean tensor factorization (BTF) – a natural combination of BMF and tensors – can be seen as a generalization of BMF, where instead of a single binary relation (i.e. a matrix), we factorize a higher-arity relation (or a collection of binary relations over the same entities). In this talk I will cover what will happen when we merge ideas from standard tensor factorizations with Boolean algebra, discussing the computational complexity, possible algorithmic ideas, and potential applications. I will also cover some hybrid approaches that merge continuous and Boolean decompositions.