

Algebraic Approximations of the Probability of Monotone Boolean Functions

Wolfgang Gatterbauer

Khoury College of Computer Sciences
Northeastern University
Boston, MA 02115
w.gatterbauer@northeastern.edu

Abstract

A general approach for efficient algorithms is to approximate a function that is hard to evaluate by a simpler function. Finding such fast approximations is especially important for probabilistic inference, which is widely used yet notoriously hard. We discuss a recent algebraic approach for approximating the probability of Boolean functions with upper and lower bounds. We give the intuition for these bounds and illustrate their use with two applications: (i) anytime approximations of monotone Boolean formulas, and (ii) approximate lifted inference with relational databases.

References

Li Chou, Wolfgang Gatterbauer, Vibhav Gogate. *Dissociation-based Oblivious Bounds for Weighted Model Counting*. In UAI 2018.

<http://auai.org/uai2018/proceedings/papers/312.pdf>

Wolfgang Gatterbauer, Dan Suciu. *Oblivious bounds on the probability of Boolean functions*. *TODS* 39(1), 2014. <https://doi.org/10.1145/2532641>

Wolfgang Gatterbauer, Dan Suciu. *Dissociation and propagation for approximate lifted inference with standard relational database management systems*. *VLDBJ* 26(5), 2017. <https://doi.org/10.1007/s00778-016-0434-5>

Maarten Van den Heuvel, Peter Ivanov, Wolfgang Gatterbauer, Floris Geerts, Martin Theobald. *Anytime Approximation in Probabilistic Databases via Scaled Dissociations*. In *SIGMOD* 2019. <https://doi.org/10.1145/3299869.3319900>