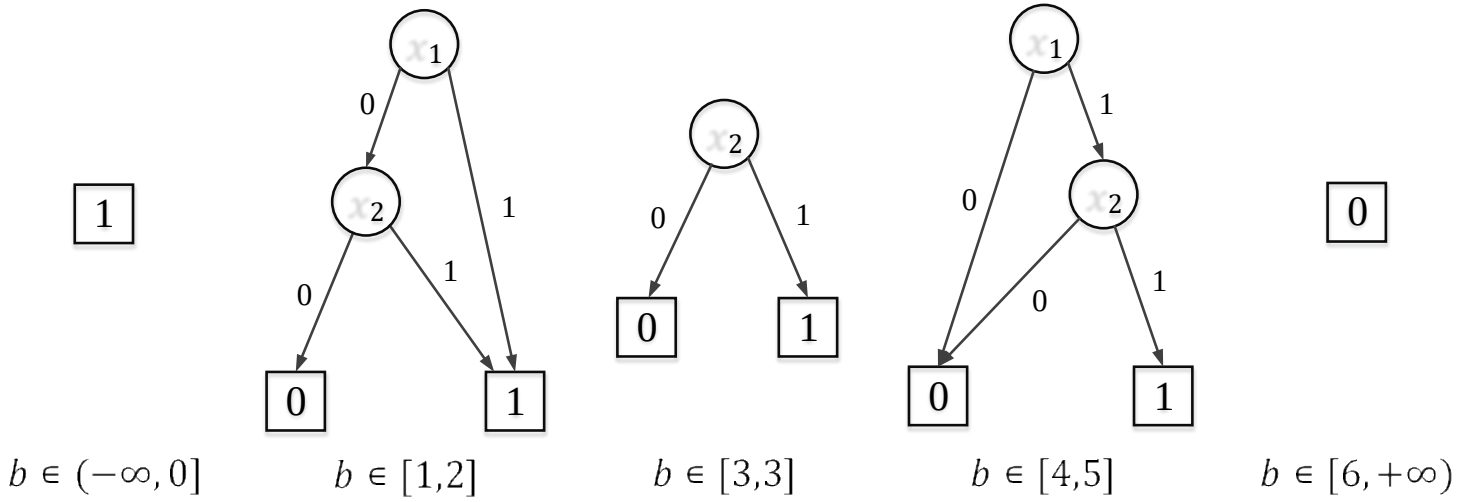
PBCounter: Weighted Model Counting on Pseudo-Boolean Formulas

Yong LAI, Zhenghang XU, Minghao YIN

Frontiers of Computer Science, DOI: 10.1007/s11704-024-3631-1

Problems & Ideas

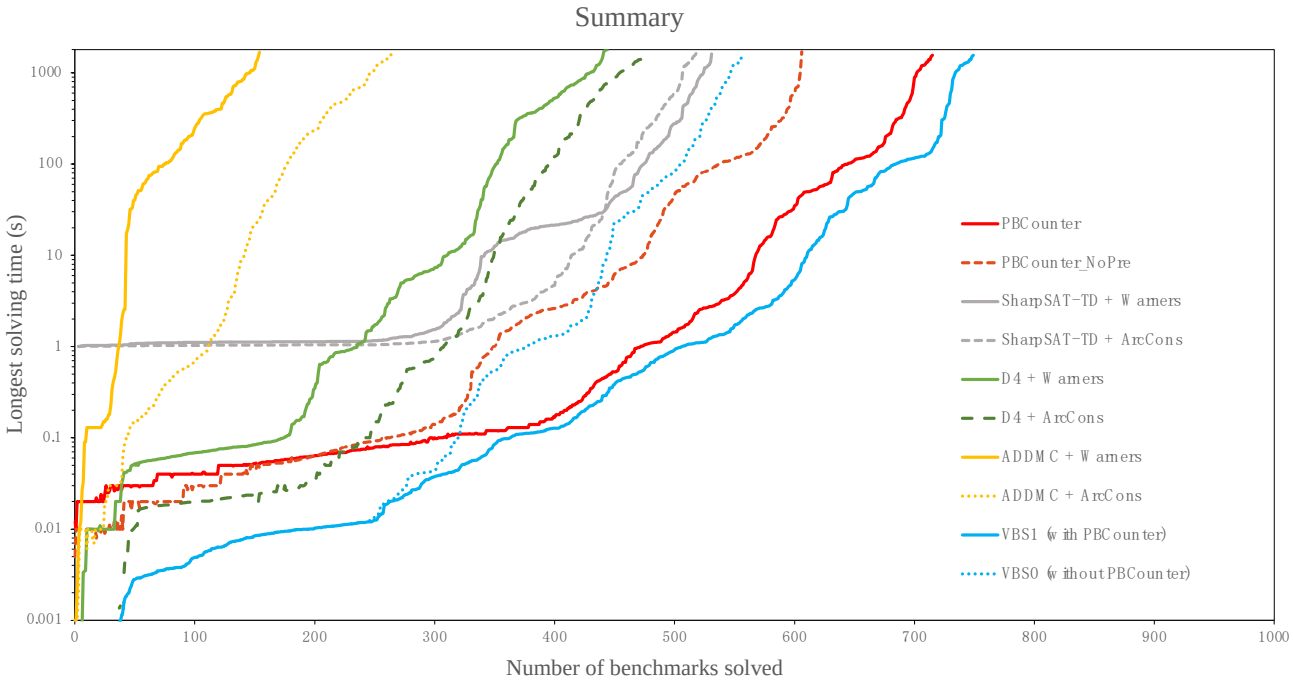
- Problem: The current Weighted Model Counting solvers work on Conjunctive Normal Form (CNF) formulas. However, CNF is not a natural representation of human-beings in many applications.
- Ideas: Motivated by the stronger expressive power of pseudo-Boolean (PB) formulas than CNF, we propose to perform WMC on PB formulas. PBCounter constructs ADD representation of PB Constraints to solve WMC by early projection.



The five possible ADDs of $2x_1 + 3x_2 \geq b$ over $x_1 \prec x_2$

Main Contributions

- Contributions:
  - Implemented the first lazy pseudo-Boolean weighted counter PBCounter. The experiments on three domains of benchmarks show that PBCounter is superior to the model counters on CNF formulas.
  - Two preprocessing methods applicable to pseudo-Boolean constraints are proposed.



A cactus plot of the numbers of benchmarks solved