SAT Solving with Conflict Driven Clause Learning

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Overview and Project Goals

- Satisfiability is the canonical NP-complete problem.
- Much work has been devoted to building efficient SAT solvers over last decades.
- **Project Goal:** Implement a basic SAT solver based on CDCL (conflict driven clause learning), which is the dominant core technique used by most modern SAT solvers.
  - Gain a deeper understanding of the DPLL and CDCL based algorithms for SAT solving
  - Compare a naive implementation with state of the art solver performance

DPLL

Basic idea of DPLL algorithm is to do a depth first, brute force search with backtracking and some basic optimizations included.

Unit Propagation

Core resolution rule employed in DPLL, and also in CDCL as we will see later.

Conflict Driven Clause Learning

Idea: when you encounter a conflict in the search tree, *learn* a clause that prevents you from making the same mistake again.

SAT Solver Implementation

Resolution

Resolution proofs.