

# Sudoku SAT solver

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# Presentation video

<https://youtu.be/tk7kIJBqUiQ>

# Statement

- Does the performance of the SAT solver improve when we enrich the encoding of the sudoku?

# Methodology

- CNF encoding
- SAT solver
- Hypothesis evaluation

# Dataset

- Source

- 20 hard instances
- <https://arxiv.org/pdf/1208.0370.pdf>



<https://github.com/attractivechaos/plb/blob/master/sudoku/sudoku>

- Quality

- Hard instances
- 17 givens
- 9x9 puzzles
- uniquely completable

# Demo

## Dataset demo

# CNF encoding

- Constraints
  - Uniqueness constraint: Every cell must have at most one number, 1-9
  - Definedness constraint: Every cell must have at least one number, 1-9
- Field
  - Cell
  - Row
  - Column
  - Block
- Optimization
  - Eliminate literals
  - Eliminate clauses



# Demo

Converter and CNF demo

# SAT Statistics

- minisat
- Useful statistics during DPLL runtime
  - Restarts
  - Conflicts
  - Propagations
  - Decisions
  - Conflict literals

# Demo

minisat demo

# Conflicts

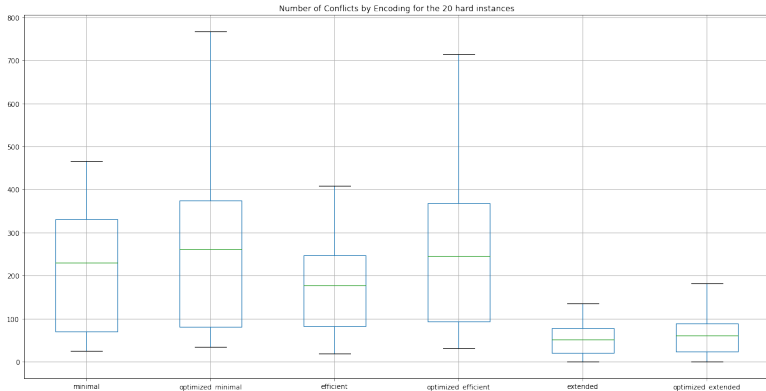


Figure: Graph of the conflicts

# Restarts

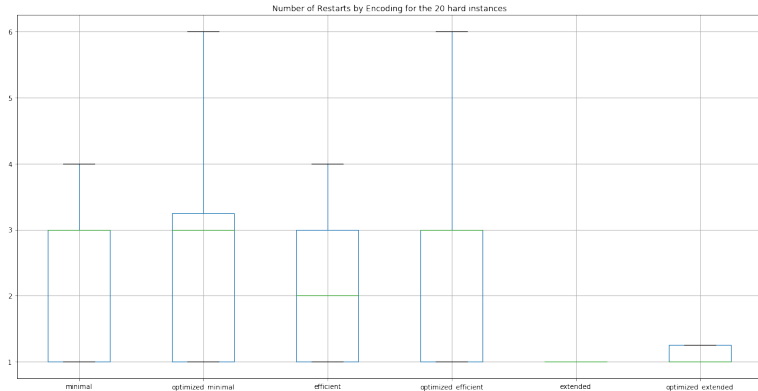


Figure: Graph of the restarts

# Decisions

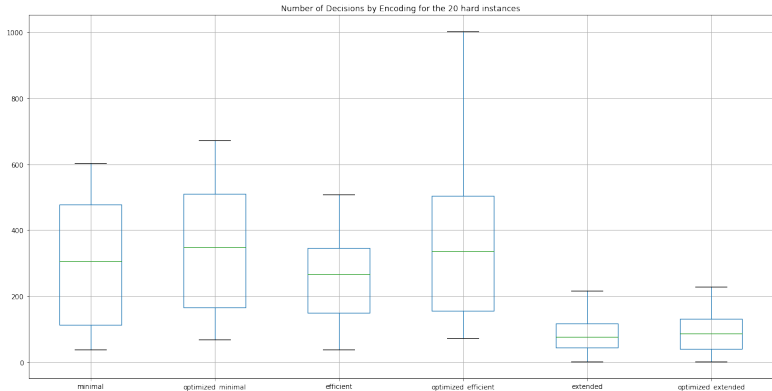


Figure: Graph of the decisions

# Propagations

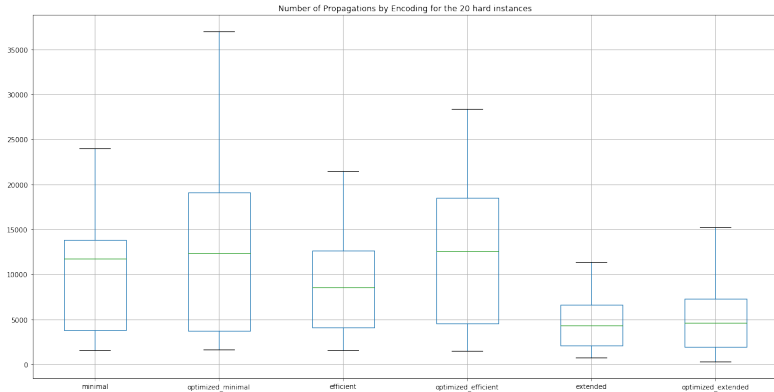


Figure: Graph of the propagations

# Conflict Literals

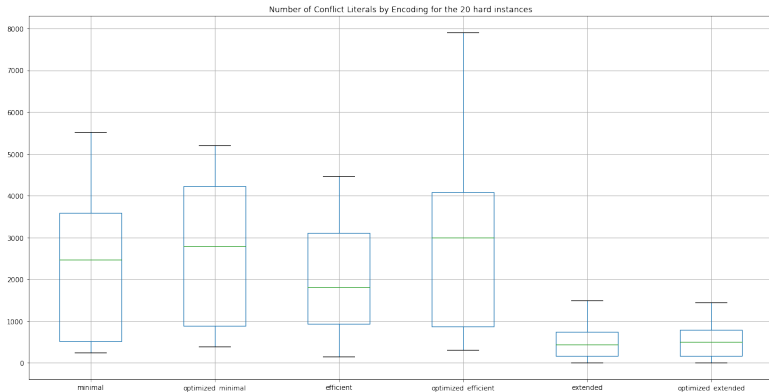


Figure: Graph of the conflict literals