

PROJECT SUMMARY AND CONTRIBUTIONS

- aimed at arithmetic circuits - **adders and multipliers**
- error metric - worst case arithmetic error
- integration of two existing methods into one process
 - cartesian genetic programming
 - approximate circuit evaluation using **SAT solvers**
- unique evolutionary strategy** - candidates with faster evaluation are preferred

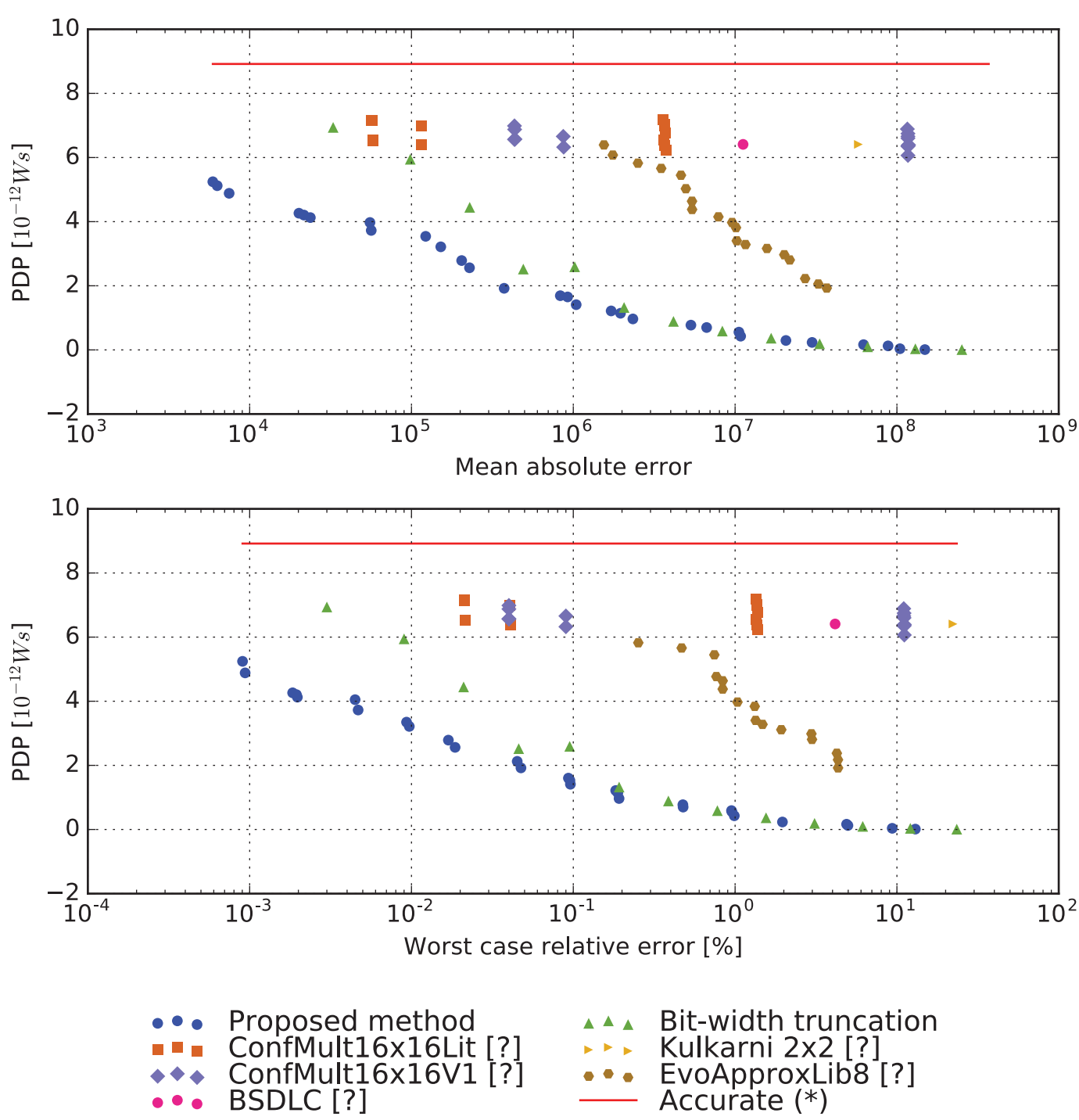
USAGE - ERROR RESILIENT APPLICATIONS

- signal and image processing
- data mining
- neural networks
- machine learning
- scientific computing

RESULTS COMPARISON

- previous work results:
 - up to 8-bit multipliers with error guarantees (full simulation)
 - up to 16-bit multipliers without error guarantees (random simulation)
- achieved results:
 - up to 32-bit multipliers
 - up to 128-bit adders
 - with error guarantees

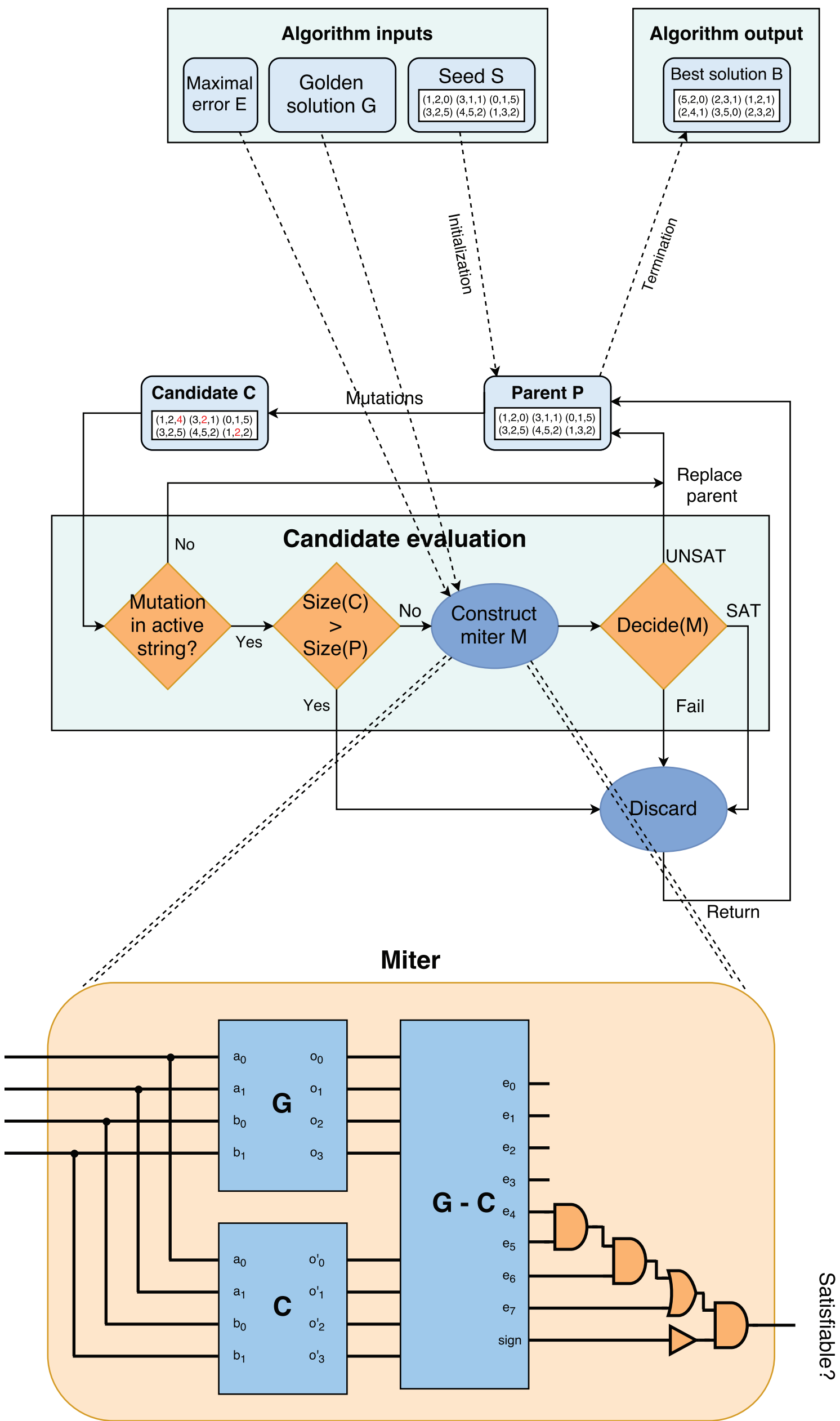
16-BIT MULTIPLIER COMPARISON



APPROXIMATE CIRCUITS

- circuits that do not always perform correct computations
- work within a certain error in comparison to golden solution
- error traded for various circuit metrics
 - area
 - delay
 - power consumption
- motivation:** circuit working with 1 % maximal arithmetic error can save up to 90 % of energy

CORE OF THE EVOLUTIONARY LOOP



COMPLEX MULTIPLIERS SYNTHESIS RESULTS

