

Solving Non-Linear Pseudo-Boolean Optimization Problems by Constraint Integer Programming

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Pseudo-Boolean Optimization is a generalization of Binary Programming that also allows terms involving products of binary variables. These nonlinear constraints can be handled by methods from Satisfiability Solving, Constraint Programming, and Integer Programming: one can either solve them by linearization, by propagation, or combine both approaches. We describe a Constraint Integer Programming (CIP) approach that can be advantageous compared to a standard Mixed Integer Programming formulation. Furthermore, we introduce specialized presolving techniques for non-linear constraints that can be used to shrink the problem or even to transform non-linear to linear problems. These techniques have been implemented within the CIP framework SCIP, which is used for computational results.