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# swMATH

## The Publication-based Approach to Software

Wolfgang Dalitz  
Zuse Institute Berlin (ZIB)

Open Science Days 2019  
5./6. February 2019





## **The Zuse Institute Berlin (ZIB)**

is an interdisciplinary research institute for applied mathematics and data-intensive high-performance computing. Its research focuses on modeling, simulation and optimization with scientific cooperation partners from academia and industry.

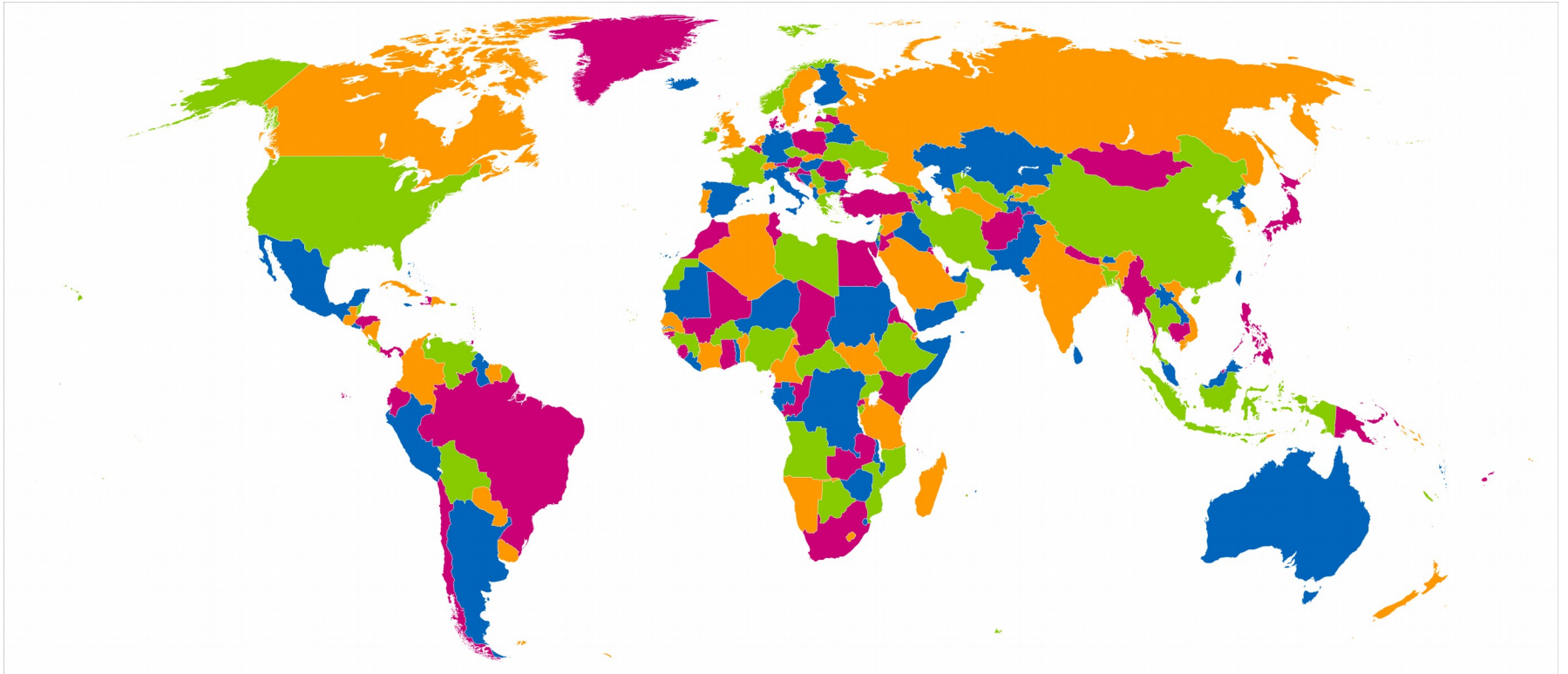
# Scientific Software in Mathematics

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- Increasing role of scientific software
- Less credit for software developer
- An established infrastructure is missing
  - Standards
  - Information Services
  - „Reinvent the wheel“
  - Verification
  - Reproducibility

# Famous Example: Four Color Theorem

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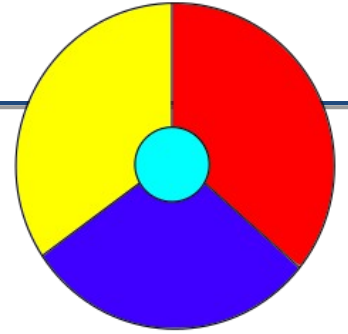


„Every planar map can be colored with at most four colors“

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# Verifiability and Reproducibility

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Have you ever tried to verify the four color theorem?

„Every planar map can be colored with at most four colors“

[en.wikipedia.org/wiki/Four\\_color\\_theorem](https://en.wikipedia.org/wiki/Four_color_theorem):

- proved in 1976 by K. Appel & W. Haken using a computer
  - their proof were not accepted at all (infeasible for a human to check by hand)
  - in 1997 was published a simpler proof by Robertson, Sanders, Seymour, and Thomas
  - in 2005 the theorem was proved by Benjamin Werner and Georges Gonthier with Coq, a theorem-proving software
-

# Four Color Theorem: The Article

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## Illinois Journal of Mathematics

Info Current issue All issues Search

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Illinois J. Math.  
Volume 21, Issue 3 (1977), 429-490.

### Every planar map is four colorable. Part I: Discharging

K. Appel and W. Haken

Full-text: Open access

PDF File (4817 KB)

## Illinois Journal of Mathematics

Info Current issue All issues Search

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Illinois J. Math.  
Volume 21, Issue 3 (1977), 491-567.

### Every planar map is four colorable. Part II: Reducibility

K. Appel, W. Haken, and J. Koch

Full-text: Open access

PDF File (3811 KB)

## 2. The computer programs runs over 1,200 hours on IBM /370

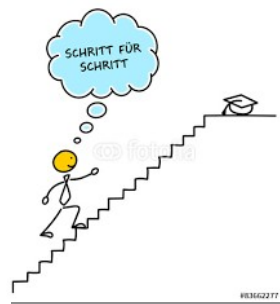
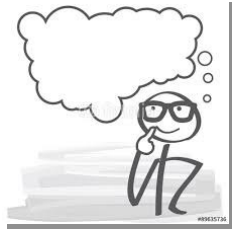
*D*-reduction was done dynamically (see [2]) in the sense that once a coloration was proved good, its goodness was immediately available for use in the testing of other colorations. The programs for *D*-reduction are extensions and modifications of those in [20].

The computer programs were greatly influenced by the facilities available. We had access to IBM computers (a 360-75 at Urbana-Champaign, a 370-158 at the University's Chicago Circle Campus, and later a 370-168 of the University of Illinois administrative data processing unit). For this reason the programs were written in IBM assembler language to attempt to maximize efficiency. When we inquired, the operations staff suggested that we use less computer time at the expense of larger amounts of core storage. Therefore, to save steps we chose to use large tables. The core storage requirements were as follows: for twelve-rings, 220,000 bytes; for thirteen-rings, 600,000 bytes; for fourteen-rings, 1,700,000 bytes.

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# Scientific Workflow

## Scientist



## Software Developer





# Scientific Software in Mathematics

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## Scientific Software

- plays an important role within the scientific workflow
- produces new scientific results
- is (sometimes/often) the base of a proof
  - e.g. four color problem/Vierfarbenproblem

## Scientific Software Developer

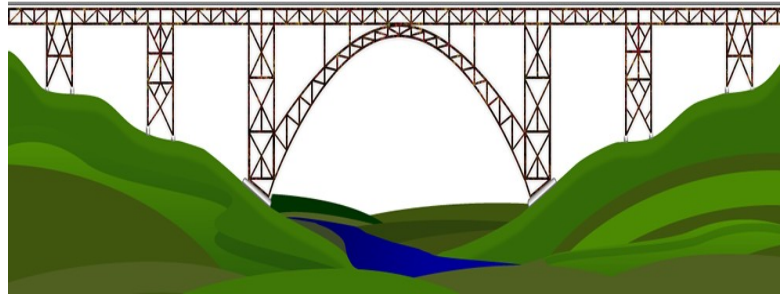
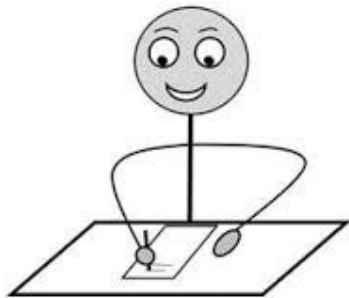
- receives little or no scientific recognition
  - gets no or less academic reputation
  - gets no credit points in his academic career
-



# Bridging the Gap: [www.swmath.org](http://www.swmath.org)

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- makes important software visible
- findable (unique and persistent identifier)
- accessible



#10584136

- main idea: publication-based approach
  - general: machine-based analysis of the content of publications
  - cooperation with Zentralblatt MATH (zbMATH)
-

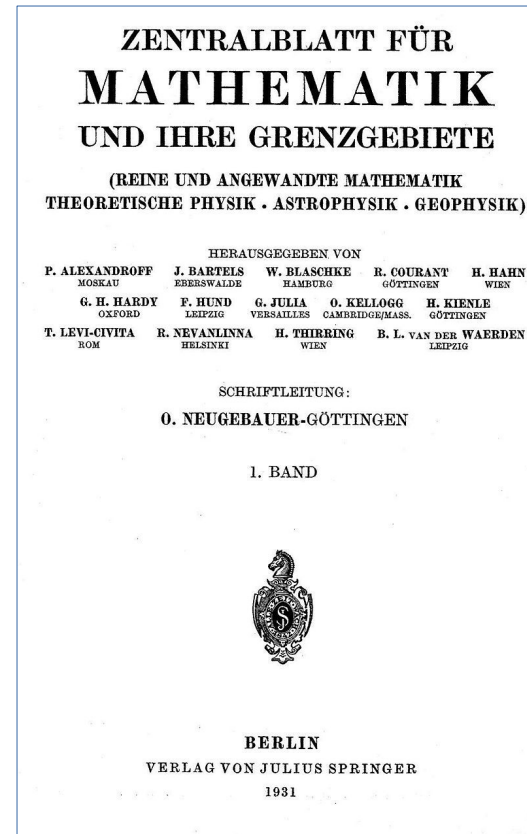
# What is zbMATH (zbMATH.org)?

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zbMATH is an abstracting and reviewing service in pure and applied mathematics



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since 1931

# Mathematical Reviews

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## Mathematical Reviews® (MathSciNet®)

Since 1940, Mathematical Reviews® (MR) has served researchers and scholars in the mathematical sciences by providing timely information on peer-reviewed articles and books. **MathSciNet®**, the electronic version of MR, presents a fully searchable database with many tools designed to help navigate the mathematical sciences literature, including:

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since 1940


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# zbMATH in Numbers


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- zbMATH covers all available published and peer-reviewed articles, books, conference proceedings as well as other publication formats
  - zbMATH database contains
    - 4 million bibliographic entries with reviews and abstracts
    - drawn from about 3,000 journals and serials and from
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  - about 7,000 active reviewers from all over the world contribute reviews to zbMATH
  - all entries are classified according to the Mathematics Subject Classification Scheme (MSC2010)
-


# zbMATH Entry

zbMATH 

Documents Authors Journals Classification Software Formulæ

Structured Search 

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## Achterberg, Tobias

### SCIP: solving constraint integer programs. (English) Zbl 1171.90476

**Math. Program. Comput. 1, No. 1, 1-41 (2009).**

Summary: Constraint integer programming (CIP) is a novel paradigm which integrates constraint programming (CP), mixed integer programming (MIP), and satisfiability (SAT) modeling and solving techniques. In this paper we discuss the software framework and solver SCIP (Solving Constraint Integer Programs), which is free for academic and non-commercial use and can be downloaded in source code. This paper gives an overview of the main design concepts of SCIP and how it can be used to solve constraint integer programs. To illustrate the performance and flexibility of SCIP, we apply it to two different problem classes. First, we consider mixed integer programming and show by computational experiments that SCIP is almost competitive to specialized commercial MIP solvers, even though SCIP supports the more general constraint integer programming paradigm. We develop new ingredients that improve current MIP solving technology. As a second application, we employ SCIP to solve chip design verification problems as they arise in the logic design of integrated circuits. This application goes far beyond traditional MIP solving, as it includes several highly non-linear constraints, which can be handled nicely within the constraint integer programming framework. We show anecdotally how the different solving techniques from MIP, CP, and SAT work together inside SCIP to deal with such constraint classes. Finally, experimental results show that our approach outperforms current state-of-the-art techniques for proving the validity of properties on circuits containing arithmetic.

**MSC:**

- 90C11 Mixed integer programming
- 68T20 AI problem solving (heuristics, search strategies, etc.)
- 90C27 Combinatorial optimization
- 90-04 Machine computation, programs (optimization)
- 90-08 Computational methods (optimization)

**Keywords:**  
constraint programming; integer programming; SAT

**Software:**  
Decision tree for optimization software; MIPLIB; Chaff; Valse-XT; SoPlex; Mosek; SCIL; SIMPL; CPLEX; MiniSat; Siege; ABACUS; MIPLIB2003; CLP; Zimpl; FEASPUMP; SCIP; Benchmarks for Optimization Software; COIN-OR; Tabu search; XPRESS

PDF BibTeX XML Cite Full Text: DOI

Cited in **144** Documents

# zbMATH Entry (cont.)

## Software:

Decision tree for optimization software; MIPLIB; Chaff; Valse-XT; SoPlex; Mosek; SCIL; SIMPL; CPLEX; MiniSat; Siege; ABACUS; MIPLIB2003; CLP; Zimpl; FEASPUMP; SCIP; Benchmarks for Optimization Software; COIN-OR; Tabu search; XPRESS

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Full Text:

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## References:

- [1] Achterberg T.: Conflict analysis in mixed integer programming. *Discret. Optim.* 4(1), 4--20 (2007) (special issue: Mixed Integer Programming) · [Zbl 1169.90414](#) · [doi:10.1016/j.disopt.2006.10.006](#)
- [2] Achterberg, T.: Constraint Integer Programming. Ph.D. Thesis, Technische Universität Berlin (2007). <http://opus.kobv.de/tuberlin/volltexte/2007/1611/>
- [3] Achterberg T., Berthold T.: Improving the feasibility pump. *Discret. Optim.* 4(1), 77--86 (2007) (special issue: Mixed Integer Programming) · [Zbl 1170.90443](#) · [doi:10.1016/j.disopt.2006.10.004](#)
- [4] Achterberg, T., Berthold, T., Koch, T., Wolter, K.: Constraint integer programming: a new approach to integrate CP and MIP. In: Perron, L., Trick, M.A. (eds.) *Integration of AI and OR techniques in constraint programming for combinatorial optimization problems*, 5th international conference, CPAIOR 2008. *Lecture Notes in Computer Science*, vol. 5015, pp. 6--20. Springer, Heidelberg (2008) · [Zbl 1142.68504](#)
- [5] Achterberg, T., Brinkmann, R., Wedler, M.: Property checking with constraint integer programming. Technical Report 07-37, Zuse Institute Berlin (2007). <http://opus.kobv.de/zib/volltexte/2007/1065/>
- [6] Achterberg T., Grötschel M., Koch T.: Teaching MIP modeling and solving. *ORMS Today* 33(6), 14--15 (2006)
- [7] Achterberg T., Koch T., Martin A.: Branching rules revisited. *Oper. Res. Lett.* 33, 42--54 (2005) · [Zbl 1076.90037](#) · [doi:10.1016/j.orl.2004.04.002](#)
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- [10] Althaus, E., Bockmayr, A., Elf, M., Jünger, M., Kasper, T., Mehlhorn, K.: SCIL--symbolic constraints in integer linear programming. Technical Report ALCOMFT-TR-02-133, MPI Saarbrücken, May (2002) · [Zbl 1019.90515](#)
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- [12] Andreello G., Caprara A., Fischetti M.: Embedding cuts in a branch&cut framework: a computational study with  $\{0, \frac{1}{2}\}$ -cuts. *INFORMS J. Comput.* 19(2), 229--238 (2007) · [Zbl 1241.90181](#) · [doi:10.1287/ijoc.1050.0162](#)

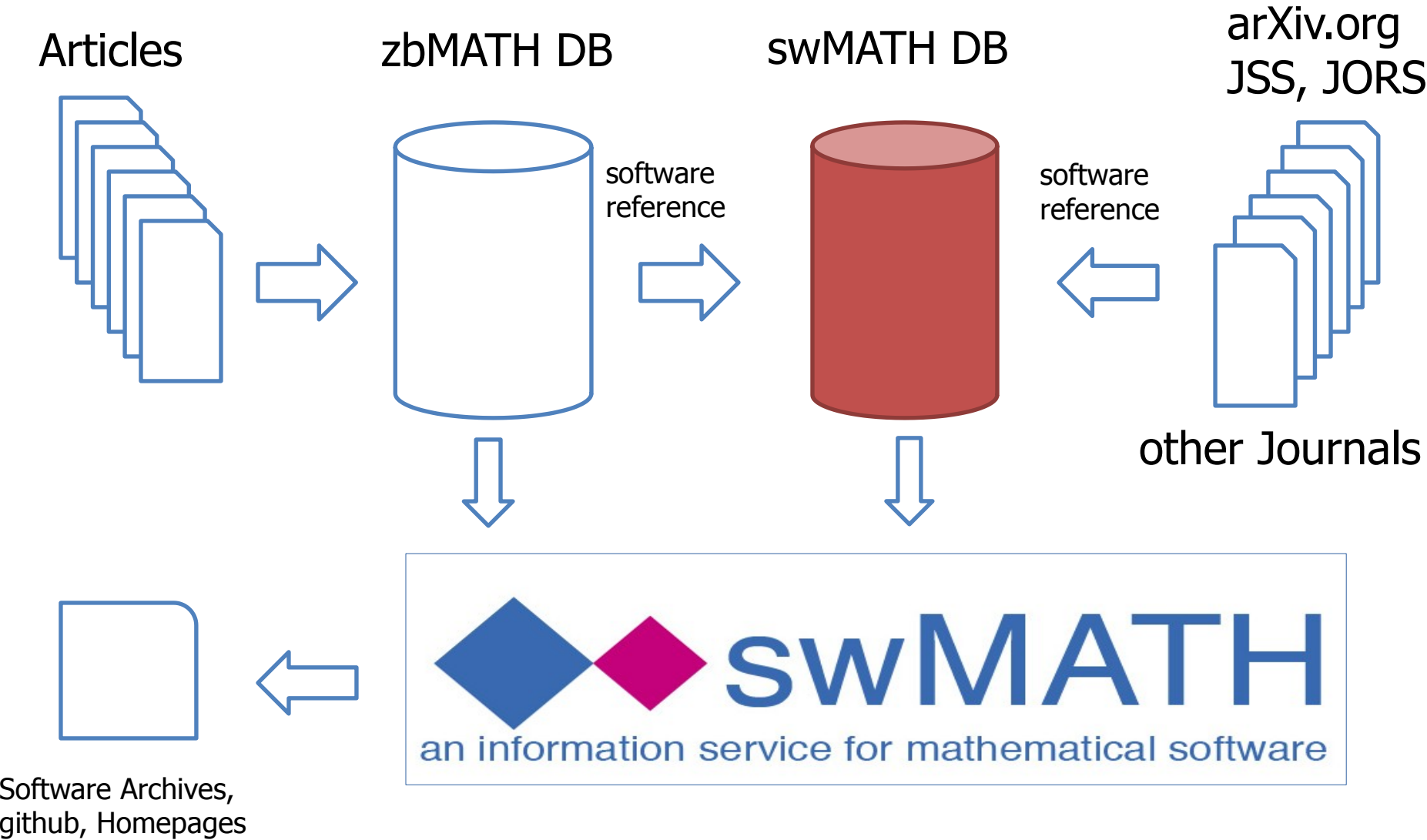
# Main Idea: Publication-based Approach

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- identification and analysis of software references in publications
    - which articles refer/review software in zbMATH?
    - store the result (publication/software) into a database
  - swMATH offers a list of all publications and articles listed in Zentralblatt MATH (zbMATH) that refer to software
  - swMATH includes also articles which describe the background and technical details of a program, as well as those publications in which a piece of software is applied or used for research
-

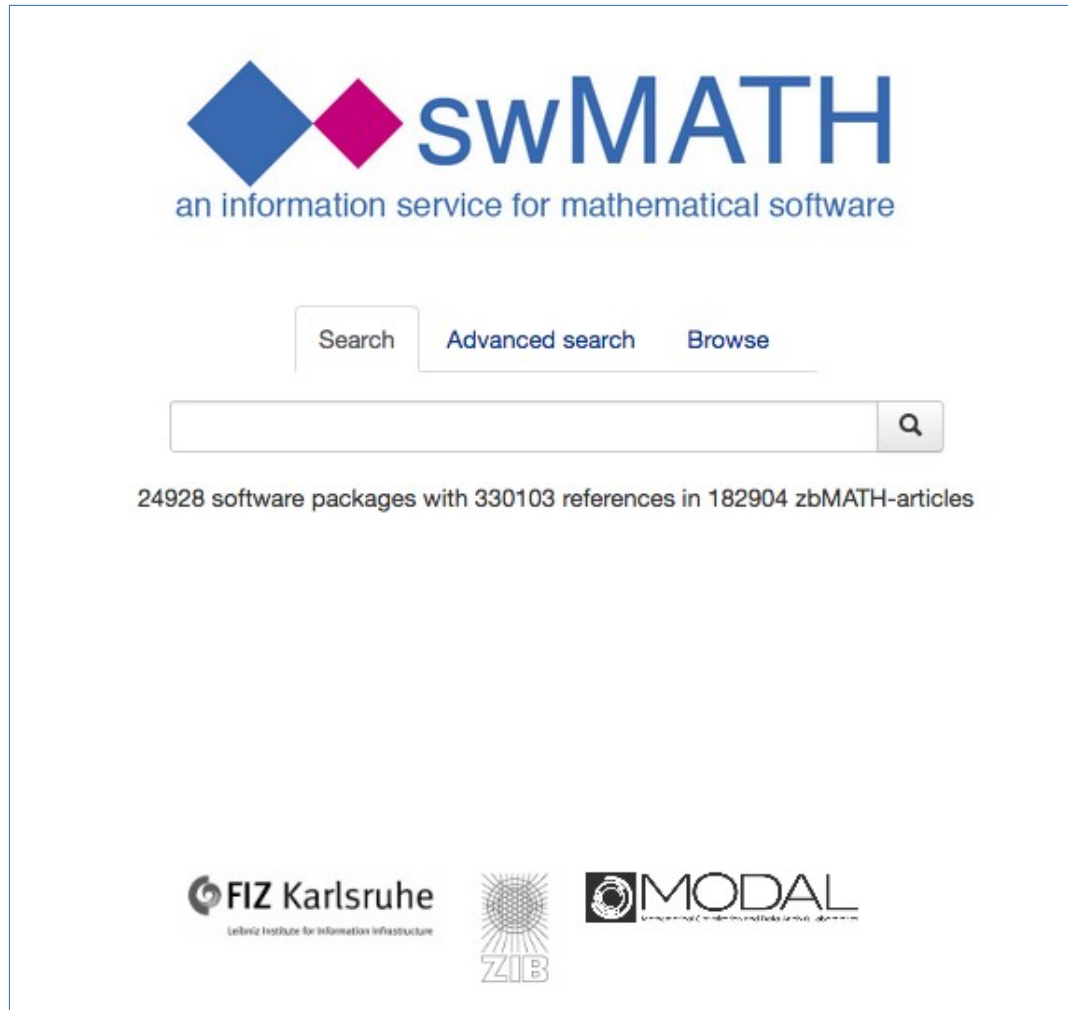


# Building swMATH




# Quick Overview: [www.swmath.org](http://www.swmath.org)


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The screenshot shows the homepage of the swMATH website. At the top, there is a logo consisting of two diamonds (one blue, one pink) followed by the text "swMATH" in a large, blue, sans-serif font. Below the logo, the tagline "an information service for mathematical software" is written in a smaller, blue, sans-serif font. In the center, there are three navigation buttons: "Search", "Advanced search", and "Browse". Below these buttons is a search input field with a magnifying glass icon on the right. Underneath the search field, the text "24928 software packages with 330103 references in 182904 zbMATH-articles" is displayed. At the bottom of the page, there are three logos: "FIZ Karlsruhe" (Leibniz Institute for Information Infrastructure), "ZIB" (Zentrum für Informationstechnik Berlin), and "MODAL" (Mathematical Modelling and Simulation).

  
an information service for mathematical software

Search   Advanced search   Browse




24928 software packages with 330103 references in 182904 zbMATH-articles

# Example: Searching for SCIP

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## SCIP


SCIP is currently one of the fastest non-commercial solvers for mixed integer programming (MIP) and mixed integer nonlinear programming (MINLP). It is also a framework for constraint integer programming and branch-cut-and-price. It allows for total control of the solution process and the access of detailed information down to the guts of the solver. SCIP is part of the SCIP Optimization Suite, which also contains the LP solver SoPlex, the modelling language ZIMPL, the parallelization framework UG and the generic column generation solver GCG.

This software is also **peer reviewed** by journal MPC.

### Keywords for this software



The word cloud contains the following terms: integer programming, constraint programming, global optimization, branch-and-bound, quadratic programming, combinatorial optimization, mixed integer nonlinear programming, mixed integer programming, column generation, integer linear programming, mixed-integer programming, non-convex optimization, polyhedral combinatorics, SAT, heuristics, branch-and-cut, and SCIP.

**URL:** [scip.zib.de/](http://scip.zib.de/)  
**InternetArchive**  
**Versions:** -Info  
**Authors:** Gerald Gamrath, Ambros Gleixner, Gregor Hendel, Stephen J. Maher, Matthias Miltenberger, Benjamin Müller, Marc Pfetsch, Felipe Serrano, Dieter Weninger, Jakob Witzig  
**Platforms:** Linux, Windows, Mac OS  
**Licence:** ZIB academic license  
**Current version:** 3.2  
**Dependencies:** LP-solver, e.g. SoPlex, CPLEX, XPress, ...

[Add information on this software.](#)

**Related software:**

- CPLEX
- MIPLIB
- MIPLIB2003
- SoPlex
- Gurobi
- XPRESS
- MINLPlib
- LINDO
- Benchmarks for Optimization...
- FEASPUMP

[Show more...](#)

# Example cont.

## References in zbMATH (referenced in 237 articles , 4 standard articles )

Showing results 1 to 20 of 237.

Sorted by year (citations) 20

1 2 3 ... 10 11 12 next

- Andrea Callia D'Iddio, Michael Huth: Manyopt: An Extensible Tool for Mixed, Non-Linear Optimization Through SMT. Solving (2017) arXiv
2. Assarf, Benjamin; Gawrilow, Ewgenij; Herr, Katrin; Joswig, Michael; Lorenz, Benjamin; Paffenholz, Andreas; Rehn, Thomas: Computing convex hulls and counting integer points with polymake (2017)
  3. Belotti, Pietro; Berthold, Timo: Three ideas for a feasibility pump for nonconvex MINLP (2017)
  4. Brinkmann, Philip; Ziegler, Günter M.: A flag vector of a 3-sphere that is not the flag vector of a 4-polytope (2017)
  5. Cussens, James; Järvisalo, Matti; Korhonen, Janne H.; Bartlett, Mark: Bayesian network structure learning with integer programming: polytopes, facets and complexity (2017)
  6. Gleixner, Ambros M.; Berthold, Timo; Müller, Benjamin; Weltge, Stefan: Three enhancements for optimization-based bound tightening (2017)
  7. Göttlich, Simone; Potschka, Andreas; Ziegler, Ute: Partial outer convexification for traffic light optimization in road networks (2017)
  8. Haws, David; Cussens, James; Studený, Milan: Polyhedral approaches to learning Bayesian networks (2017)
  9. Humpola, Jesco; Serrano, Felipe: Sufficient pruning conditions for MINLP in gas network design (2017)
  10. Ichim, Bogdan; Katthän, Lukas; Moyano-Fernández, Julio José: How to compute the Stanley depth of a module (2017)
  11. Khan, Kamil A.; Watson, Harry A.J.; Barton, Paul I.: Differentiable McCormick relaxations (2017)
  12. Lima, Ricardo M.; Grossmann, Ignacio E.: On the solution of nonconvex cardinality Boolean quadratic programming problems: a computational study (2017)
  13. Modaresi, Sina; Vielma, Juan Pablo: Convex hull of two quadratic or a conic quadratic and a quadratic inequality (2017)
  14. Newby, Eric; Ali, M.M.: Linear transformation based solution methods for non-convex mixed integer quadratic programs (2017)
  15. Pecin, Diego; Pessoa, Artur; Poggi, Marcus; Uchoa, Eduardo: Improved branch-cut-and-price for capacitated vehicle routing (2017)
  16. Pferschy, Ulrich; Staněk, Rostislav: Generating subtour elimination constraints for the TSP from pure integer solutions (2017)
  17. Puranik, Yash; Sahinidis, Nikolaos V.: Bounds tightening based on optimality conditions for nonconvex box-constrained optimization (2017)
  18. Witzig, Jakob; Berthold, Timo; Heinz, Stefan: Experiments with conflict analysis in mixed integer programming (2017)
  19. Andreatta, G.; Casula, M.; De Francesco, C.; De Giovanni, L.: A branch-and-price based heuristic for the stochastic vehicle routing problem with hard time windows (2016)
  20. Berthold, Timo; Farmer, James; Heinz, Stefan; Perregaard, Michael: Parallelization of the FICO Xpress-Optimizer (2016)

1 2 3 ... 10 11 12 next

## Article statistics & filter:

Search for articles

Clear

### MSC classification / top

- Top MSC classes
  - 05 Combinatorics
  - 52 Convex and discrete...
  - 65 Numerical analysis
  - 68 Computer science
  - 90 Optimization
- Other MSC classes


### Publication year

- 2010 - today
- 2005 - 2009
- 2000 - 2004
- before 2000

### Chart: cumulative / absolute



# Features: Browse by Name/MSC/Types/Keyword



Search  Advanced search  Browse

- browse software by name
- browse software by keywords
- browse software by MSC
- browse software by types

Results 1 to 20 of 18961

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z all


**01poly** Referenced in 8 articles [sw14281]  
Remote computing services via e-mail. 0/1-Polytopes. By sending an e-mail to cggg@ist.tugraz.at with the following body: 01poly [OPTIONS] you get information about 01-polytopes of dimension ...

**1000Minds** Referenced in 1 article [sw16167]  
1000Minds is an online suite of tools and processes to help individuals and groups make decisions and also for understanding other people's choices. 1000Minds has ...

**13cflux2** Referenced in 2 articles [sw11825]  
Metabolic fluxes are the final endpoint of all co-operating actions in the complex cellular network of genes, transcripts, proteins and metabolites. In vivo fluxes, however, ...

## Browse software by Mathematics Subject Classification (MSC 2010)

<b>00</b> General mathematics	<b>46</b> Functional analysis
<b>01</b> History; biography	<b>47</b> Operator theory
<b>03</b> Mathematical logic	<b>49</b> Calculus of variations and optimal control; optimization
<b>05</b> Combinatorics	<b>51</b> Geometry
<b>06</b> Ordered structures	<b>52</b> Convex and discrete geometry
<b>08</b> General algebraic systems	<b>53</b> Differential geometry
<b>11</b> Number theory	<b>54</b> General topology
<b>12</b> Field theory and polynomials	<b>55</b> Algebraic topology
<b>13</b> Commutative algebra	<b>57</b> Manifolds and cell complexes
<b>14</b> Algebraic geometry	<b>58</b> Global analysis, analysis on manifolds
<b>15</b> Linear and multilinear algebra; matrix theory	<b>60</b> Probability theory and stochastic processes
<b>16</b> Associative rings and algebras	<b>62</b> Statistics
<b>17</b> Nonassociative rings and algebras	<b>65</b> Numerical analysis
<b>18</b> Category theory, homological algebra	<b>68</b> Computer science
<b>19</b> K-theory	<b>70</b> Mechanics of particles and systems
<b>20</b> Group theory and generalizations	<b>74</b> Mechanics of deformable solids
<b>22</b> Topological groups, Lie groups	<b>76</b> Fluid mechanics
<b>26</b> Real functions	<b>78</b> Optics, electromagnetic theory
<b>28</b> Measure and integration	<b>80</b> Classical thermodynamics, heat transfer
<b>30</b> Functions of a complex variable	



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- browse software by keywords
- browse software by MSC
- browse software by types

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- 2 Book Companion Software (50)
- 3 Data Collections (30)
- 4 Languages (133)
- 5 Educational (32)
- 6 Portals (16)
- 7 Services, Webservices (17)

**special collections:**

- 1 Math.Modeling and Simulation - MMS (24)
- 2 Theorem Prover Museum (22)

About & Contact

## Browse software by keywords

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

<b>A</b>	<b>G</b>	<b>P</b>
a posteriori error estimation	Galerkin method	parallel algorithms
accuracy	game theory	parallel computing
adaptive mesh refinement	Gaussian elimination	parallel processing
adaptivity	geometry	parallel programming
algebraic geometry	geophysics	parallelization
algebraic multigrid	general relativity	parameter estimation
algebraic specification	generalized eigenvalue problem	partial differential equations
algebraic topology	generic programming	PDE
algorithms	genetic algorithms	performance
analysis of variance	global analysis	periodic orbits
answer set programming	global convergence	periodic solutions
applications	global optimization	perturbation
approximation	GMRES	Petri nets
Arnoldi method	graph theory	planning
artificial intelligence	graphics	Poisson equation
astrophysics	grid computing	polynomial systems
asymptotic expansions	Gröbner bases	polynomials
asymptotic stability	group theory	porous media
automated reasoning		preconditioning
automated theorem proving	<b>H</b>	prediction
automatic differentiation	harmonic analysis	preprocessing
automorphism group		principal component analysis



# Feature: Link to InternetArchive ...

## SCIP

SCIP is currently one of the fastest non-commercial solvers for mixed integer programming (MIP) and mixed integer nonlinear programming (MINLP). It is also a framework for constraint integer programming and branch-cut-and-price. It allows for total control of the solution process and the access of detailed information down to the guts of the solver. SCIP is part of the SCIP Optimization Suite, which also contains the LP solver SoPlex, the modelling language ZIMPL, the parallelization framework UG and the generic column generation solver GCG.

This software is also **peer reviewed** by journal MPC.

### Keywords for this software



### References in zbMATH (referenced in 339 articles , 4 standard articles )

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1 2 3 ... 15 16 17 next

1. Costa, Lilia; Smith, James Q.; Nichols, Thomas: A group analysis using the multiregression dynamic models for fMRI networked time series (2019)
2. Elloumi, Sourour; Lambert, Amélie: Global solution of non-convex quadratically constrained quadratic programs (2019)
3. Altherr, Lena C.; Dörig, Bastian; Ederer, Thorsten; Pelz, Peter F.; Pfetsch, Marc E.; Wolf, Jan: A mixed-integer nonlinear program for the design of gearboxes (2018)
4. Baltean-Lugojan, Radu; Misener, Ruth: Piecewise parametric structure in the pooling problem: from sparse strongly-

URL: [scip.zib.de/](http://scip.zib.de/)

**InternetArchive**

Versions: Info

**Authors:** Tristan Gally, Gerald Gamrath, Patrick Gemander, Ambros Gleixner, Robert Gottwald, Gregor Hendel, Christopher Hojny, Stephen J. Maher, Matthias Miltenberger, Benjamin Müller, Marc Pfetsch, Franziska Schülöser, Felipe Serrano, Stefan Vigerske, Dieter Weninger, Jakob Witzig

**Platforms:** Linux, Windows, Mac OS

**Licence:** ZIB academic license

**Current version:** 6.0.0

**Dependencies:** LP-solver, e.g. SoPlex, CPLEX, XPress, ...

Add information on this software.

### Related software:

CPLEX  
MIPLIB  
MIPLIB2003  
Gurobi  
SoPlex  
BARON  
MINLPlib  
LINDO  
lpopt  
XPRESS

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### MSC classification / top

- Top MSC classes
  - 05 Combinatorics
  - 52 Convex and discrete...
  - 65 Numerical analysis
  - 68 Computer science
  - 90 Optimization

# ... leads to the WayBackMachine



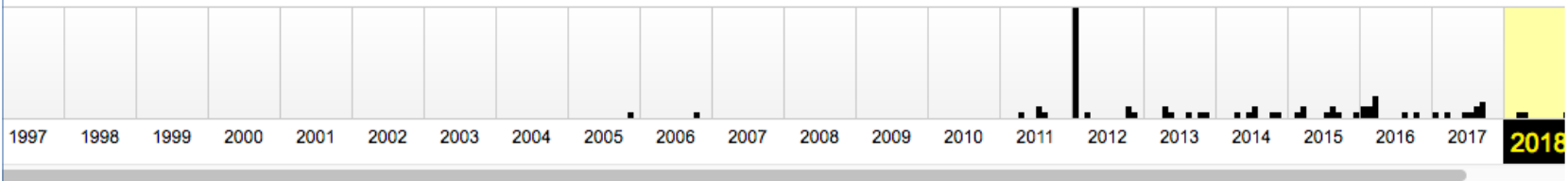
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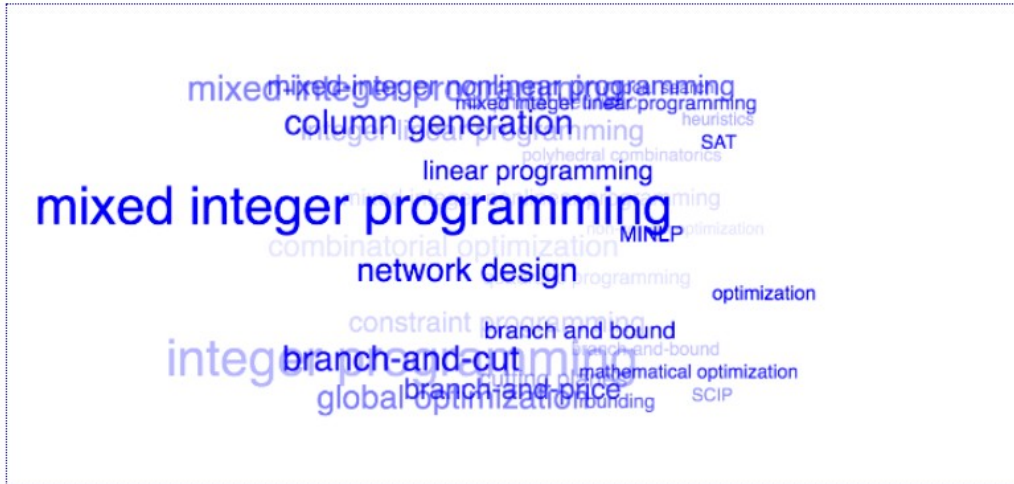
# Feature: Link to Version History ...

## SCIP

SCIP is currently one of the fastest non-commercial solvers for mixed integer programming (MIP) and mixed integer nonlinear programming (MINLP). It is also a framework for constraint integer programming and branch-cut-and-price. It allows for total control of the solution process and the access of detailed information down to the guts of the solver. SCIP is part of the SCIP Optimization Suite, which also contains the LP solver SoPlex, the modelling language ZIMPL, the parallelization framework UG and the generic column generation solver GCG.

This software is also **peer reviewed** by journal MPC.

### Keywords for this software



### References in zbMATH (referenced in 237 articles , 4 standard articles )

Showing results 1 to 4 of 4.

Sorted by: year / citations 20

1. Berthold, Timo; Heinz, Stefan; Vigerske, Stefan: Extending a CIP framework to solve MIQCPs (2012) [archived SW](#)
2. Berthold, Timo; Gleixner, Ambros M.; Heinz, Stefan; Vigerske, Stefan: Analyzing the computational impact of MIQCP solver components (2012) [archived SW](#)
3. Achterberg, Tobias: SCIP: solving constraint integer programs (2009) [archived SW](#)
4. Berthold, Timo: Heuristics of the branch-cut-and-price-framework SCIP (2008) [archived SW](#)

URL: [scip.zib.de/](http://scip.zib.de/)

**InternetArchive**

**Versions:** [Info](#)

**Authors:** Gerald Gamra, Ambros Gleixner, Gregor Hendel, Stephen J. Maher, Matthias Miltenberger, Benjamin Müller, Marc Pfetsch, Felipe Serrano, Dieter Weninger, Jakob Witzig  
**Platforms:** Linux, Windows, Mac OS

**Licence:** ZIB academic license

**Current version:** 3.2

**Dependencies:** LP-solver, e.g. SoPlex, CPLEX, XPress, ...

Add information on this software.

### Related software:

CPLEX  
MILPLIB  
MILPLIB2003  
SoPlex  
Gurobi  
XPRESS  
MINLPlib  
LINDO  
Benchmarks for Optimization...  
FEASPUMP

Show more...

### Article statistics & filter:

Search for articles

### MSC classification / top

Top MSC classes  
05 Combinatorics  
52 Convex and discrete...

# ... leads to Tempas TimePortal (L3S)

Software **SCIP** in

Berthold, Timo; Heinz, Stefan; Vigerske, Stefan: *Extending a CIP framework to solve MIQCPs (2012)*



Q Search

live  
current web

2012/03/20  
publication year

2011/04/09  
year before publ.

SCIP Optimization Suite

SCIP SoPlex ZIMPL UG GCG

Documentation ▾

## SCIP

Solving Constraint Integer Programs

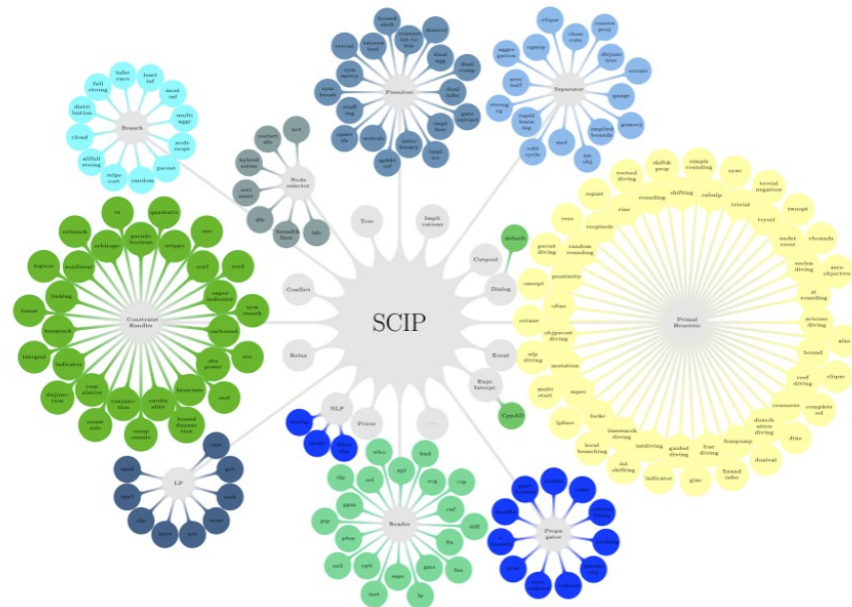


### About

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- Exact MIP
- PolySCIP
- SCIP-SDP


### About

SCIP is currently one of the fastest non-commercial solvers for mixed integer programming (MIP) and mixed integer nonlinear programming (MINLP). It is also a framework for constraint integer programming and branch-cut-and-price. It allows for total control of the solution process and the access of detailed information down to the guts of the solver.



Get in touch!

# Link to Github and to Software Heritage Archive



Search [Advanced search](#) [Browse](#)

## Agrep

AGREP - approximate GREP for fast fuzzy string searching. Files are searched for a string or regular expression, with approximate matching capabilities and user-definable records. Developed 1989-1991 by Udi Manber, Sun Wu et al. at the University of Arizona. ISC open source license since Sept. 2014.

**URL:** [github.com/Wikinaut/agrep](https://github.com/Wikinaut/agrep)

**Code**


**InternetArchive**

**Versions:** [Info](#)

**Authors:** S. Wu, U. Manber

Add information on this software.

**Keywords for this software**





The word cloud contains the following keywords: matching, insubquadratic-time algorithm, matching, single character searching methods, max-plus algebra, performance evaluation, sunday, string matching, searching compressed text, string, approximating string matching, compressed pattern matching, biological sequence alignment, four russians paradigm, natural language text compression, Clusters, regular expression matching, approximate, information retrieval, compression, system, approximate string matching, Levenshtein edit distance, indexing.

**Related software:**





- PSI-BLAST
- BLAST
- GLIMPSE






# Software Heritage

☰  **Browse archived visits for origin** <https://github.com/Wikinaut/agrep> 

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 Visits  Snapshot date: 07 March 2018, 19:03 UTC  Branches (9)  Releases (0)

## Overview

Total number of visits: 10   Last full visit:  07 March 2018, 19:03 UTC   First full visit:  06 August 2015, 13:46 UTC   Last visit:  07 March 2018, 19:03 UTC

## History

Show full visits with different snapshots    Show all full visits    Show all visits

## Calendar

◀ 2016   2017   2018

January							February							March							April						
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6					1	2	3					1	2	3	1	2	3	4	5	6	7
7	8	9	10	11	12	13	4	5	6	7	8	9	10	4	5	6	<b>7</b>	8	9	10	8	9	10	11	12	13	14
14	15	16	17	18	19	20	11	12	13	14	15	16	17	11	12	13	14	15	16	17	15	16	17	18	19	20	21
21	22	23	24	25	26	27	18	19	20	21	22	23	24	18	19	20	21	22	23	24	22	23	24	25	26	27	28
28	29	30	31				25	26	27	28				25	26	27	28	29	30	31	29	30					

# Some Statistics

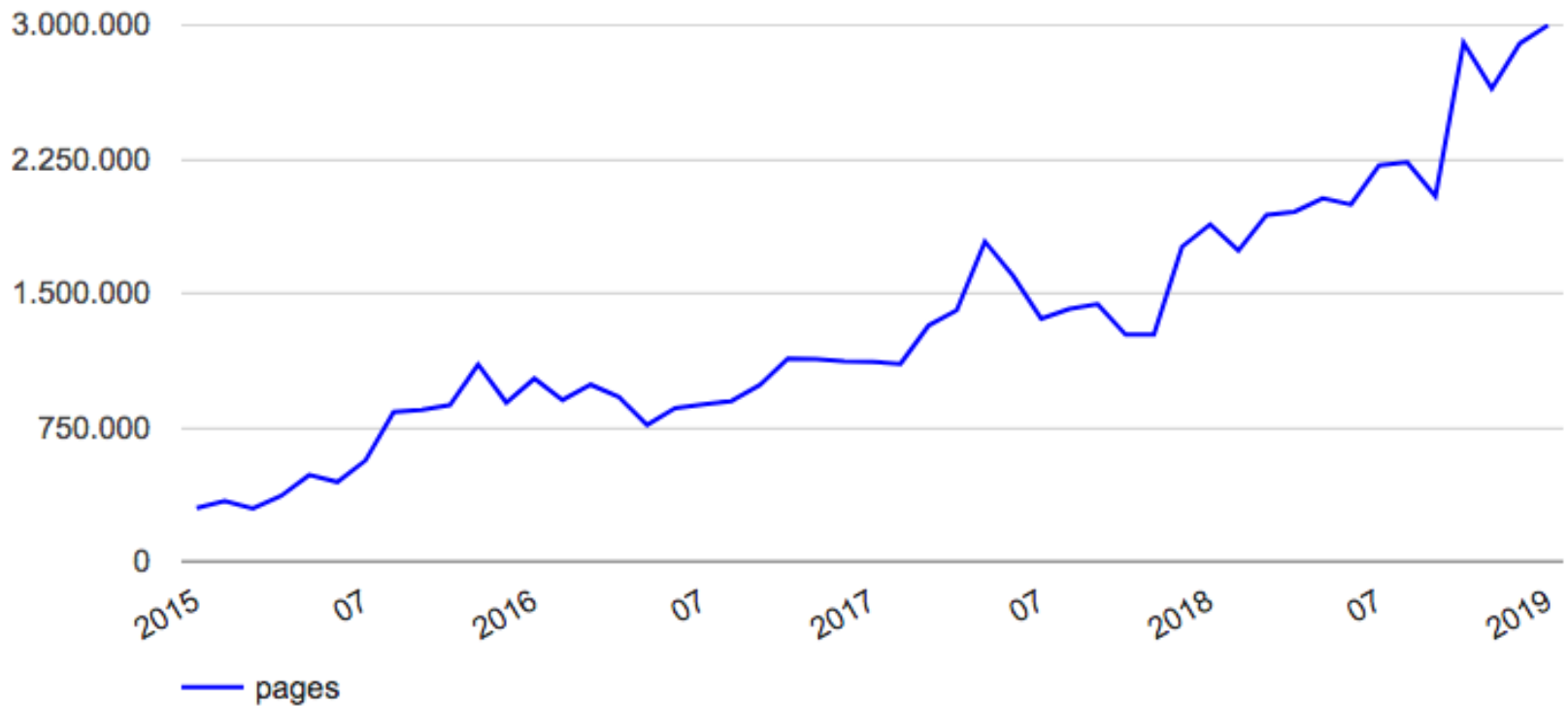
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- swMATH has been started in 2011, a joined project of Research Institute Oberwolfach (MFO) and FIZ Karlsruhe
- currently a project of the BMBF research campus MODAL with FIZ Karlsruhe/zbMATH and Zuse Institute Berlin (ZIB)
  
- ~ 25.000 Software Packages
- ~ 330.000 Software References in
- ~ 182.000 zbMATH and other Scientific Articles

# Usage of swMATH

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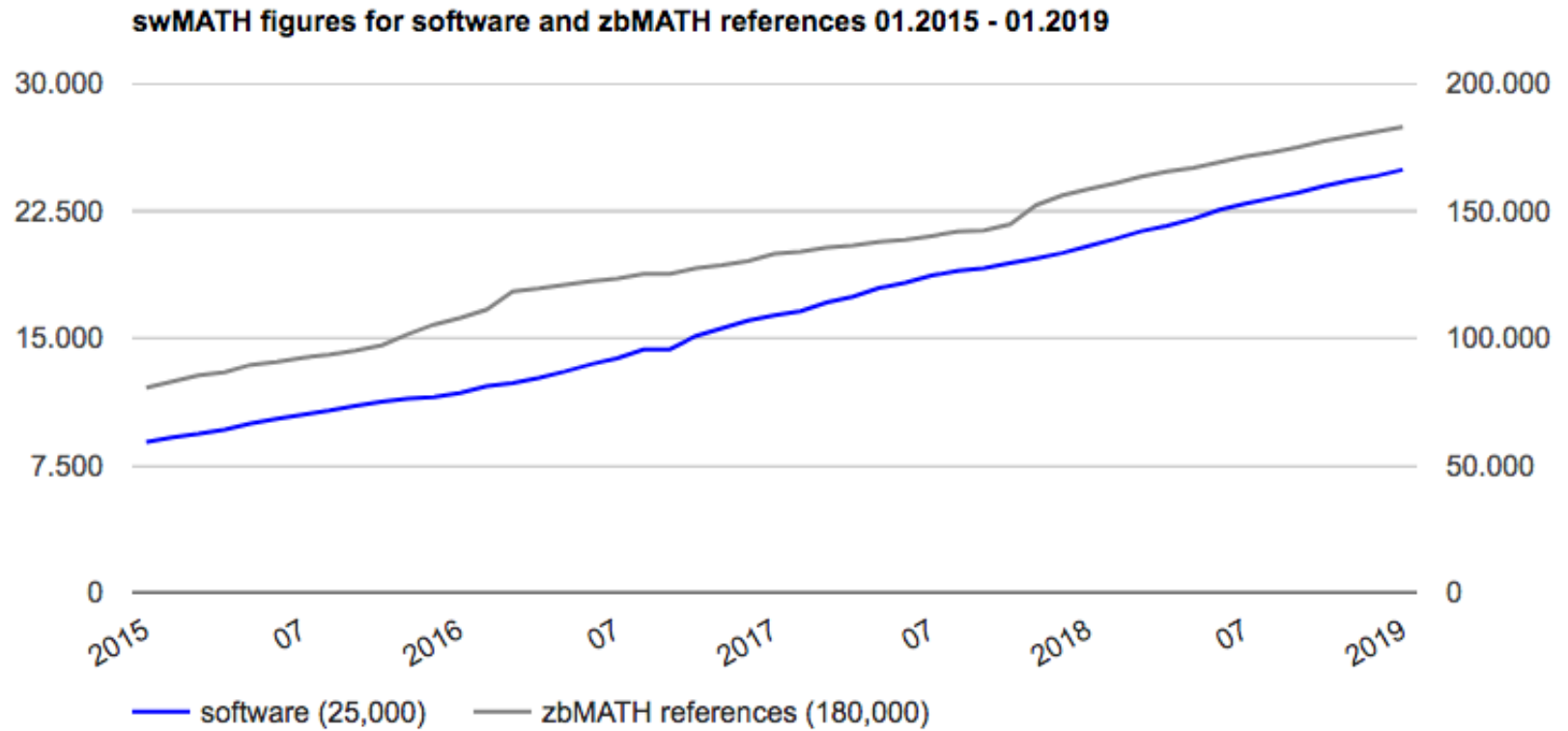
**Usage Statistics for swmath.org (Apache-Logfile, Webalizer-pages, with robots)  
01.2015 - 01.2019**





# Software and zbMATH References

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# Some Results (I)

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- swMATH provides general information about software, especially about software products (or containers): information about all software artifacts which are under a common name
  - we have extended the swMATH pages by linking to further Internet information resources if existing:
    - Websites of the software - problem: not permanent
    - Internet Archive - problem: archive not complete
    - Software Heritage - problem: SWH provides artifacts (revisions/commits, releases), but not direct versions
  - verification of scientific results needs more information about the version of the software used
-

## Some Results (II)

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swMATH makes the software container citable:

- each swMATH page gets a unique and persistent identifier
  - swMATH page are so-called „landing pages“ in the terminology of the Software Citation Principles
-

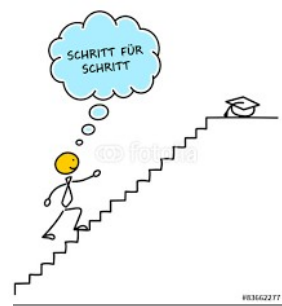
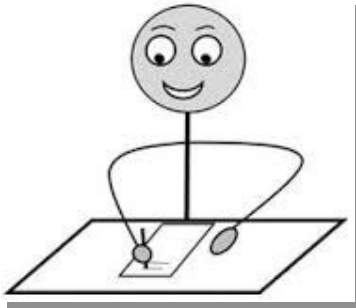
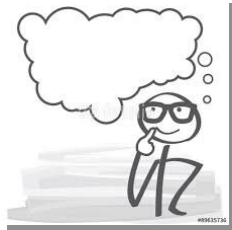
## Some Results (III)

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- the numbers of citations listed in swMATH is an indicator of acceptance, spread and quality of the software
- software developer
  - receives more scientific recognition
  - gets more academic reputation
  - gets more credit points in his academic career

# New Scientific Recognition

## Scientist



## Software Developer



# To-do

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- The overall aim: developing an efficient infrastructure for (scientific) software based on the FAIR principles
    - Findable, Accessible, Interoperable, Reusable
  - Definition and dissemination of a software citation standard: under work, especially discussed in Software Citation Implementation working group of the FORCE11 initiative
    - The definition of a software citation standard is not trivial: Software is a complex and structured object and cannot be reduced to software code
  - Developing of efficient machine-based methods for analysis of software information
  - Compatibility, interoperability, and interaction of different software information services and archives
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Thanks for your attention

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