

1. Record Nr.	UNINA9910874694803321
Autore	Buzzard Kevin
Titolo	Mathematical Software - ICMS 2024 : 8th International Conference, Durham, UK, July 22-25, 2024, Proceedings
Pubbl/distr/stampa	Cham : , : Springer, , 2024 ©2024
ISBN	9783031645297
Edizione	[1st ed.]
Descrizione fisica	1 online resource (377 pages)
Collana	Lecture Notes in Computer Science Series ; ; v.14749
Altri autori (Persone)	DickensteinAlicia EickBettina LeykinAnton RenYue
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	<p>Intro -- Preface -- Organization -- Plenary Lectures -- The Reformation of Sage -- Algorithm and Abstraction in Formal Mathematics -- Polynomial System Solving with the Msolve Library -- Contents -- Plenary Lectures -- The Reformation of Sage -- 1 Introduction: What Is Sage? -- 2 The Modularization Project -- 2.1 Problem Description and Goals -- 2.2 Origins -- 2.3 The Tools -- 2.4 The Rules -- 2.5 The Blocks -- References -- Algorithm and Abstraction in Formal Mathematics -- 1 Introduction -- 2 Computation -- 2.1 Classification of Wallpaper Groups -- 2.2 The Kochen-Specker Paradox -- 2.3 Multiplication of Chebyshev Polynomials -- 3 Abstraction -- 3.1 Lax-Milgram Theorem -- 3.2 Smooth Vector Bundles -- 4 Conclusion -- References -- Number Theory and Related Areas -- Computing the Determinant of a Dense Matrix over Z -- 1 Introduction -- 1.1 Uniform Dense Matrices -- 2 Notation, Terminology, Preliminaries -- 2.1 Unimodular Matrices -- 2.2 Unimodularity Verification -- 3 Determinant Algorithms for Integer Matrices -- 3.1 Using the Modular HNF -- 4 Algorithm for Computing Determinant -- 5 Practical Tests -- 6 Conclusion -- References -- FastECPP over MPI -- 1 FastECPP and Its Complexity -- 2</p>

Implementation Choices -- 3 Details of the 86453 Digit Record -- 4
Sizes of Smooth Parts -- 5 Comparison -- References -- Attacking a
Levelled Fully Homomorphic Encryption System with Topological Data
Analysis -- 1 Introduction -- 2 Background -- 2.1 Helper Functions --
2.2 Cryptosystem -- 3 Cryptanalysis -- 3.1 Basic Idea -- 3.2
Methodology -- 4 Results and Discussion -- 5 Conclusions --
References -- Novel Formalisations of Mathematics in Lean --
Formalising Families of -adic Galois Representations in Lean 4 -- 1
Introduction -- 1.1 Mathematical Definitions -- 2 Formalisation -- 2.1
Definitions and Initial Challenges -- 2.2 Trivial Example.
2.3 A Further Example -- 2.4 Compatibility -- 3 Conclusion --
References -- Formalization of the Existence of Frobenius Elements --
1 Introduction -- 2 Mathematical Background -- 2.1 leanA K L B Setup.
-- 2.2 Characteristic of Finite Fields -- 2.3 Galois Correspondence --
2.4 Integral Closure -- 3 Survey of Lean Code -- 3.1 leangalactionIdeal'
and leandecompositionsubgroupIdeal' -- 3.2 leanexistsgenerator --
3.3 [escapeinside=||]lean|| ||, || q [escapeinside=||]lean || || || mod Q
(leanpowqisconjugate) -- 4 Discussion -- References -- Formalising
Analysis in Lean: Compactness and Dimensionality -- 1 Introduction --
2 Mathematical Proof -- 3 Proof in Lean -- 4 Conclusions --
References -- Formalisation of the Category of Hopf Algebras in Lean4
-- 1 Introduction -- 2 Group Structure on the '39`42"
613A``45`47``603AHom Set -- 2.1 Mathematical Details -- 2.2
Formalisation -- 3 Affine Group Scheme -- 3.1 Mathematical Details --
3.2 Formalisation -- 4 Conclusion -- References -- Software
for the Applications of Group Theory to Combinatorics -- Computing
the Group of an Algebraic Variety over a Finite Field -- 1 Introduction
-- 2 Groups and Geometries -- 3 The Algorithm -- 4 Implementation
in Orbiter -- 5 Tactical Decompositions -- 6 Example 1: The Edge
Quartic -- 7 Comparison with Classification -- References -- Computer
Classification of Linear Codes Based on Lattice Point Enumeration -- 1
Introduction -- 2 Preliminaries -- 2.1 Geometric Representation of
Linear Codes -- 2.2 Extending Linear Codes Using Lattice Point
Enumeration -- 3 Enhancing the Algorithmic Approach via Integer
Linear Programming Computations -- 4 Computational Results --
References -- Software for Proper Vertex-Colouring Exploiting Graph
Symmetry -- 1 Introduction -- 2 Proper Vertex-Colouring and Cliques
-- 3 The Main Tools.
4 A Total Ordering of Finite Sequences of Subsets of {1,...,n} -- 5 The
Backtrack Search -- 5.1 Constraints on Partial Solutions -- 6 Examples
-- References -- Classical Algebraic Geometry and Modern Computer
Algebra: Innovative Software Design and Its Applications --
Localization in Gromov-Witten Theory of Toric Varieties in a Computer
Algebra System -- 1 Introduction -- 2 Atiyah-Bott Formula -- 3 The
Algorithm -- 3.1 Generation of the Decorated Graphs -- 3.2
Equivariant Classes -- 4 Generalization -- References -- Advancing
Computer Algebra with Massively Parallel Methods -- Massively Parallel
Methods for Free Resolutions -- 1 Introduction -- 2 Gröbner Bases and
Syzygies -- 2.1 Finitely Generated Modules and Their Syzygies -- 2.2
Induced Ordering and Schreyer's Algorithms -- 3 Singular/GPI-Space
Framework and Petri Nets -- 4 Modelling Free Resolutions --
References -- Towards Parallel Methods in Birational Geometry -- 1
Introduction -- 2 Example: Determining Images of Rational Maps -- 3
Covering a Scheme with Complete Intersection Charts -- References --
Towards Parallel Algorithms for Gromov-Witten Invariants of Elliptic
Curves -- 1 Introduction -- 2 Gromov-Witten Invariants and Feynman
Integrals -- 2.1 Theoretical Background and Elementary Algorithm --
2.2 Improvement of the Algorithm -- 3 Petri Nets and GPI-Space -- 4

Parallel Enumeration of Combinatorial Objects -- References --
Computer Algebra Applications in the Life Sciences -- A SageMath
Package for Elementary and Sign Vectors with Applications to Chemical
Reaction Networks -- 1 Elementary Vectors of a Subspace -- 2
Applications to Chemical Reaction Networks -- References -- Machine
Learning Within Computer Algebra Systems -- Symbolic Integration
Algorithm Selection with Machine Learning: LSTMs Vs Tree LSTMs -- 1
Introduction -- 2 Literature Review -- 3 Machine Learning -- 3.1 LSTM.
3.2 TreeLSTM -- 4 Generating Data -- 4.1 Existing Methods -- 4.2
New Methods -- 4.3 Datasets of Integrals -- 5 Experimental Results --
5.1 Experiment Setup -- 5.2 Experiment Results -- 6 Conclusion --
References -- Exploring Alternative Machine Learning Models for
Variable Ordering in Cylindrical Algebraic Decomposition -- 1
Introduction -- 2 Background -- 2.1 CAD and Variable Ordering -- 2.2
Machine Learning in CAD -- 3 Our Methodology -- 3.1 Datasets -- 3.2
Training and Features -- 3.3 Implementation of General Models -- 3.4
Implementation of GNN Models -- 3.5 Exploration of Data Pollution --
4 Results -- 5 Conclusion and Future Work -- References --
Constrained Neural Networks for Interpretable Heuristic Creation to
Optimise Computer Algebra Systems -- 1 Introduction -- 1.1 Machine
Learning Within Computer Algebra Systems -- 1.2 Gaining Additional
Mathematical Insight from Machine Learning -- 1.3 Explainable AI --
1.4 Plan of the Paper -- 2 Our Application: Variable Ordering Choice for
CAD -- 2.1 Cylindrical Algebraic Decomposition -- 2.2 CAD Variable
Ordering -- 3 Feature Generation Process -- 3.1 Formalising Brown's
Heuristic -- 3.2 Generating Similar Features -- 4 Interpreting Brown's
Heuristic as a Neural Network -- 5 Searching Through Similar
Constrained Neural Networks -- 5.1 Feature Selection -- 5.2 Weight
Tuning -- 6 Final Thoughts -- References -- Machine Learning for
Number Theory: Unsupervised Learning with L-Functions -- 1
Introduction -- 2 A Crash Course in L-Functions -- 3 Unsupervised
Learning with RStudio -- 3.1 Data Summary -- 3.2 Hierarchical
Clustering with RStudio -- 3.3 PCA with RStudio -- 4 Outlook --
References -- Numerical Software for Special Functions --
Approximation of an Inverse of the Incomplete Beta Function -- 1
Introduction -- 2 Normal Asymptotic Approximation -- 3 GST
Asymptotic Approximation -- 4 Conclusions.
References -- DLMF Standard Reference Tables on Demand -- 1
Introduction -- 2 Mpleeee -- 3 Design of DLMF Tables -- 3.1 Tabulation
-- 3.2 Comparison -- 4 Future Directions -- References --
Mathematical Research Data -- Integrating Mathematical Data and
Resources: Advancements in zbMATH Open for Enhanced Mathematical
Research Accessibility and Reproducibility -- 1 The swMATH Journey --
1.1 On the Importance of Metadata for Software -- 1.2 swMATH as an
Extension of zbMATH Open -- 2 swMATH in the EOSC -- 2.1 Protecting
Source Code and Indexing It, a Fruitful Collaboration with Software
Heritage -- 2.2 Disseminating Software Metadata for the Advancement
of Open Science -- 2.3 swMATH: Towards a Connected Resource into
the EOSC Ecosystem -- 2.4 swMATH Adopted CodeMeta as the
Standard Format to Display Software Metadata -- 3 Conclusion --
References -- A FAIR File Format for Mathematical Software -- 1 The
File Format by Example -- 2 More Examples -- 3 Format Specification
-- 4 Beyond OSCAR -- 5 Concluding Remarks -- References --
Predefined Software Environment Runtimes as a Measure for
Reproducibility -- 1 Introduction -- 1.1 Organization -- 2 MaRDI
Packaging System: An Overview -- 3 Technical Details -- 3.1
Bubblewrap -- 3.2 Libostree -- 3.3 Fuse-Overlays -- 3.4 MaPS -- 3.5
Comparison with Competing Methods -- 3.6 Compatibility -- 4

Examples -- 4.1 AccurateArithmetic.jl -- 4.2 OSCAR -- 5 Beyond Mathematical Software -- 5.1 VIBRANT -- 6 Concluding Remarks -- References -- Towards a FAIR Documentation of Workflows and Models in Applied Mathematics -- 1 Introduction -- 2 MaRDMO, MathModDB and Their Connection -- 3 A Semantic Representation of an Algebraic Modeling Workflow -- 4 Conclusion and Outlook -- References -- Symbolic-Numeric Methods in Algebraic Geometry -- Monodromy Coordinates -- 1 Introduction -- 2 Monodromy Background -- 3 Monodromy Solving.
4 Monodromy Coordinates: Compression.
