William DeMeo

Curriculum Vitæ

Contact Information

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Research Interests

Universal algebra, lattice theory, logic, computational complexity, category theory, type theory, programming languages.

Applications: Computer-aided theorem proving with Lean and Coq, Big Data analysis with Scala/Spark, Blockchain technologies and functional programming.

Education

Doctor of Philosophy in Mathematics, University of Hawai'i at Mānoa — 2012
Thesis: *Congruence lattices of finite algebras*. Advisor: Ralph Freese

Master of Science in Mathematics, New York University Courant Institute — 1998
Thesis: *Approximating eigenvalues of large stochastic matrices*. Advisor: Jonathan Goodman

Bachelor of Arts in Economics, University of Virginia — 1994

Academic Appointments

Burnett Meyer Instructor, University of Colorado, Boulder — 2017–2019
Visiting Assistant Professor, University of Hawaii, Honolulu — 2016–2017
Post-doctoral Associate, Iowa State University, Ames — 2014–2016
Visiting Assistant Professor, University of South Carolina, Columbia — 2012–2014

Professional Experience

Senior Research Scientist, Textron Systems Corporation — 2001–2006
Role: image processing and dsp research; algorithm design and complexity analysis

Grants & Awards

NSF Research Grant (grant no. 1500218) — 2015–2018
Project Title: *Algebras and algorithms, structure and complexity theory*
Role: postdoctoral fellow on a team with 6 senior scientists and 3 postdocs
Description: 3-yr collaborative research on algebraic approaches to constraint satisfaction problems

Magellan Scholar Grant — 2013–2014
Project Title: *What does a nonabelian group sound like?*
Role: faculty mentor for undergraduate research
Description: available at soundmath.github.io/GroupSound/GroupSound

ARCS Sarah Ann Martin Award for Outstanding Research in Mathematics — 2011

Best Paper Award, International Symposium on Musical Acoustics — 2004

Publications

Journal Articles

1. *Polynomial-time tests for difference terms in idempotent varieties*, with Freese and Valeriote; to appear in *IJAC*; preprint link: github.com/UniversalAlgebra/term-conditions
2. *Universal algebraic methods for constraint satisfaction problems*, with Clifford Bergman; submitted to *IJAC*; preprint link: arXiv [cs.LO]
3. *Isotopic algebras with nonisomorphic congruence lattices*, Algebra Universalis **72**:295–298, 2014; preprint link: github.com/williamdemeo/Isotopy
4. *Expansions of finite algebras and their congruence lattices*, Algebra Universalis **69**:257–278, 2013; preprint link: github.com/williamdemeo/Overalgebras

Refereed Conference Proceedings

5. *Proceedings of Algebras and Lattices in Hawaii 2018*, editor with K. Adaricheva, J. Hyndman.
6. *Topics in nonabelian harmonic analysis and DSP applications*, Proceedings of the International Symposium on Musical Acoustics, Nara, Japan 2004 (best paper award).
7. *Characterizing musical signals with Wigner-Ville interferences*, Proceedings of the International Computer Music Conference, Göteborg, Sweden 2002.
8. *Approximating eigenvalues of large stochastic matrices*, Proceedings of the 8th Copper Mt. Conference on Iterative Methods, Colorado, USA 1998.

Papers in Progress

A new characterization of fiber products of lattices, with P. Mayr and N. Ruskuc.
Draft available at github.com/UniversalAlgebra/fg-fin-lat

Representing finite lattices as congruence lattices of finite algebras, with R. Freese and P. Jipsen.
Draft available at github.com/UniversalAlgebra/fin-lat-rep

Books in Progress

Algebras, Categories and Types: with computer-aided proofs, with Hyeyoung Shin.

A Concise Course in Category Theory, with Charlotte Aten and Venanzio Capretta.

Problems in Real and Complex Analysis.

Problems in Groups and Rings.

Summer Schools Attended

Oregon Programming Languages Summer School Topics: parallelism and concurrency	University of Oregon July 3–21, 2018
Computer-aided Mathematical Proof Topics: bringing proof technology into mainstream mathematics	Cambridge University July 10–14, 2017
Midlands Graduate School in the Foundations of Computing Science Topics: type theory, denotational semantics, category theory	University of Birmingham April 11–15, 2016
Oregon Programming Languages Summer School Topics: type theory, logic, semantics, verification	University of Oregon June 16–28, 2014
Midlands Graduate School in the Foundations of Computing Science Topics: simply typed lambda calculus, domain theory, category theory	University of Nottingham April 22–26, 2014
LMS/EPSRC Short Course in Computational Group Theory Topics: permutation & finitely presented groups, constructive recognition	University of St. Andrews Jul 29–Aug 2, 2013
NATO ASI on Computational Noncommutative Algebra	Il Ciocco, Italy, 2003

Data Science Credentials

Big Data Analysis with Scala and Spark 4-week Coursera course; grade: 93.4%	École Polytechnique Fédérale de Lausanne Verified Certificate earned 24 Nov 2017
Functional Programming Principles in Scala 6-week Coursera course; grade: 100%	École Polytechnique Fédérale de Lausanne Verified Certificate earned 17 Nov 2016
Functional Program Design in Scala 4-week Coursera course; grade: 100%	École Polytechnique Fédérale de Lausanne Verified Certificate earned 6 Aug 2016
Parallel Programming in Scala 4-week Coursera course; grade: 100%	École Polytechnique Fédérale de Lausanne Verified Certificate earned 27 Jun 2016
Startup Engineering 12-week Coursera course; grade: 99.3%	Stanford University Verified Certificate earned 23 Sep 2013

Synergistic Activities

Organizer: *Algebras and Lattices in Hawai'i Conf. to honor Freese, Lampe & Nation*	Honolulu 2018
Organizer: *Workshop on Computational Universal Algebra*	Louisville 2013
Guest editor for math journal: *Algebra Universalis*	2018–present
Referee for math journals: *Algebra Universalis*, *Order*, and *J. Logic & Analysis*	2012–present
Founder/editor: universalalgebra.org	2013–present

University of Colorado, Boulder
Ph.D. Preliminary Exam Committee for Jordan DuBeau, Ali Latfi, Athena Sparks, Michael Wheeler
Ph.D. Thesis Defense Committee for Jeffrey Shriner
Honors Thesis Defense Committee for Zetong Xue

Iowa State University
REU mentor for Charlotte Aten (mathematics major, University of Rochester)
Honors thesis advisor for Joshua Thompson (mathematics major, honors program)
Putnam Exam mentor at weekly exam practice meetings
Undergraduate Tea cohost of weekly undergraduate student gatherings
Iowa 4-H Youth Conference volunteer mentor (link)

University of South Carolina
Honors thesis mentor for Matthew Corley (computer science major, honors program)
South Carolina High School Math Contest exam design committee
Faculty mentor for Pi Mu Epsilon (math honors society)

Teaching Experience

University of Colorado, Boulder (as Burnett Meyer Instructor)

Math 2001: Discrete Mathematics	Spring 2019
Math 2001: Discrete Mathematics	Fall 2018
Math 3140: Abstract Algebra	Fall 2018
Math 6000: Model Theory (graduate course)	Spring 2018
Math 2130: Linear Algebra	Spring 2018
Math 2130: Linear Algebra	Fall 2017

University of Hawaii (as Visiting Assistant Professor)

Math 215: Applied Calculus	Spring 2017
Math 480: Senior Seminar	Spring 2017
Math 244: Calculus IV	Fall 2016
Math 321: Introduction to Advanced Math	Fall 2016

Iowa State University (as Postdoctoral Associate)

Math 317: Linear Algebra	Spring 2016
Math 317: Linear Algebra	Fall 2015
Math 160: Survey of Calculus	Fall 2015
Math 207: Elementary Linear Algebra	Spring 2015
Math 165: Calculus I	Spring 2015
Math 301: Abstract Algebra	Fall 2014
Math 165: Calculus I	Fall 2014

University of South Carolina (as Visiting Assistant Professor)

Math 700: Linear Algebra (graduate course)	Spring 2014
Math 141: Calculus I	Spring 2014
Math 374: Discrete Structures	Fall 2013
Math 122: Calculus for Business and Social Sciences	Fall 2013
Math 374: Discrete Structures	Spring 2013
Math 122: Calculus for Business and Social Sciences	Spring 2013
Math 241: Vector Calculus	Fall 2012
Math 122: Calculus for Business and Social Sciences	Fall 2012

University of Hawaii (as Graduate Student Instructor)

Math 371: Probability Theory	Summer 2011
Math 215: Applied Calculus I	Summer 2009
Math 100: Mathematical Reasoning	Summer 2010

Talks

Computing Difference Term Operations in Polynomial Time — Denver, CO 2018
BLAST Conference, University of Denver

Why Universal Algebra Needs Inductive, Dependent Types — Eugene, OR 2018
Oregon Programming Languages Summer School

A Tutorial Introduction to the Lean Prover — Boulder, CO 2018
University of Colorado Logic Seminar

The Lambda Calculus and Dependent Type Theory — Boulder, CO 2018
University of Colorado Logic Seminar

Representing Finite Lattices as Congruence Lattices (slides) — Fort Collins, CO 2017
Colorado State University Algebra Seminar

Algebraic Approach to Complexity of Constraint Satisfaction Problems (slides) — Honolulu, HI 2016
University of Hawaii Logic and Analysis Seminar

Universal Algebraic Methods for Constraint Satisfaction Problems — Denver, CO 2016
AMS Fall Western Sectional Meeting: Special Session in Algebraic Logic

The Rectangularity Theorem of Barto and Kozik (slides) — Boulder, CO 2016
Algebras and Algorithms: Structure and Complexity Theory

Constraint Satisfaction Problems and Universal Algebra (slides) — Birmingham, GBR 2016
Midlands Graduate School in the Foundation of Computing Science

Permutability in Diamonds — Ames, IA 2016
Iowa State Algebra and Combinatorics Seminar

Which Commutative Idempotent Binars are Tractable? (slides) — Nashville, TN 2015
Vanderbilt Shanks workshop: Open Problems in Universal Algebra

Some Small Finite Algebras Yielding Tractable CSP Templates — Ames, IA 2015
Iowa State Algebra and Combinatorics Seminar

Algebraic CSP and Tractability of Commutative Idempotent Binars (slides) — Denton, TX 2015
BLAST Conference, University of North Texas

Isotopic Algebras — Ames, IA 2015
Iowa State Algebra and Combinatorics Seminar

What Does a Nonabelian Group Sound Like? (slides) — Baltimore, MD 2014
MAA Special Session: At the Intersection of Mathematics and the Arts

Interval Enforceable Properties of Finite Groups (slides) — Louisville, KY 2013
AMS Special Session on Finite Universal Algebra

Tutorial: UACalc at the command line and in the cloud — Louisville, KY 2013
Workshop on Computational Universal Algebra

Approximating Eigenvalues of Large Stochastic Matrices — Columbia, SC 2013
University of South Carolina Combinatorics Seminar

Congruence Lattices of Finite Algebras (plenary lecture) (slides) — Orange, CA 2013
BLAST Conference, Chapman University

Transposition Principles for Subgroups and Equivalence Relations (slides) — Asheville, NC 2013
Zassenhaus Group Theory Conference

Isotopic Algebras with Nonisomorphic Congruence Lattices (slides) — Boulder, CO 2013
AMS Special Session on Algebras, Lattices, and Varieties

Synchronizing Automata and the Černý Conjecture (slides) — Boulder, CO 2013
Graduate Algebra Seminar, University of Colorado

Talks (continued)

The Finite Lattice Representation Problem in Four Parts — Columbia, SC 2012
University of South Carolina Algebra and Logic Seminar

Interval Sublattice Enforceable Properties of Finite Groups (slides) — Columbus, OH 2012
The 31st Ohio State-Denison Mathematics Conference

Expansions of Finite Algebras and their Congruence Lattices (slides) — Honolulu, HI 2012
American Mathematical Society sectional meeting

Intervals in Subgroup Lattices and Permutation Representations — Cullowhee, NC 2012
Western Carolina University Group Theory Seminar

Recent Progress on the Finite Lattice Representation Problem — Honolulu, HI 2011
Achievement Rewards for College Scientists: Scholar Presentations

The Finite Lattice Representation Problem — Seoul, KOR 2009
First Joint Meeting of the Korean and American Mathematical Societies

References

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