Thomas Yahl

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Profile

I am a Van Vleck Visiting Assistant Professor at University of Wisconsin – Madison working in applied and computational algebraic geometry. My mathematical interests include Galois theory in enumerative geometry, numerical homotopy methods, algebraic optimization, algebraic statistics, real algebraic geometry, and their applications to understanding algebraic systems that arise in applications.

Employment

(2023-Present) University of Wisconsin – Madison
Van Vleck Visiting Assistant Professor
Postdoctoral Advisor: Jose Israel Rodriguez

Education

(2017-2023) Texas A&M University
Ph.D. Mathematical Sciences
Advisor: Frank Sottile
Thesis: "Computational Aspects of Galois Groups in Enumerative Geometry"

(2013-2017) Indiana University-Purdue University of Indianapolis
B.A. Mathematical Sciences (Honors)
Minor Computer Science

Publications & Research

- "Galois groups of purely lacunary polynomial systems", in preparation.
- "Activation thresholds and expressiveness of polynomial neural networks", arXiv:2408.04569, in preparation.
- "Completions to Discrete Probability Distributions in Log-linear Models", arXiv:2312:15154. To appear in Journal of Algebraic Statistics.
- "Computing Galois Groups of Finite Fano Problems", Journal of Symbolic Computation 119 (2023), 81-89.

- "Real Solutions to Systems of Polynomial Equations in Macaulay2", 2022. Journal of Software for Algebra and Geometry Vol. 14 (2024), 87-95.
- "Galois Groups in Enumerative Geometry and Applications", 2021. arxiv:2108.07905. Submitted for publication.
- "Polyhedral Homotopies in Cox Coordinates", Journal of Algebra and its Applications.
- "Decomposable Sparse Polynomial Systems", Journal of Software for Algebra and Geometry Vol. 11 (2021), 53-59.
- "Solving Decomposable Sparse Systems", Numerical Algorithms **88** (2021), 453-474.
- Eigenfunctions to Composition Operators of Generalized Linear Fractional Maps, 2015. Presented at Indiana Undergraduate Math Research Conference.

Event Organization

- (Ongoing) Macaulay2 Workshop: Madison 2025.
- International Congress on Mathematical Software 2024. Session: "Symbolic-Numeric Methods in Algebraic Geometry".
- AMS Spring Central Sectional 2024. Special Session "Applications of Algebra and Geometry".
- SIAM TX-LA Sectional 2022. Mini-Symposium "Applications and Computation in Algebraic Geometry".

Talks & Presentations

- AMS Fall Central Sectional Meeting 2024, "Galois groups of purely lacunary polynomial systems".
- Banff International Research Station Workshop: Computational Geometry, "Galois groups of purely lacunary polynomial systems".
- Workshop on Computational and Applied Enumerative Geometry, "Galois groups of purely lacunary polynomial systems".
- UW-Madison Applied Algebra Seminar, "The Unbalanced Procrustes Problem and Algebraic Optimization".

- Joint Mathematics Meetings 2024, “The Unbalanced Procrustes Problem and Algebraic Optimization”.
- Joint Mathematics Meetings 2023, “Computing Galois groups of Fano problems”.
- University of Wisconsin Algebra and Algebraic Geometry Seminar, “Computing Galois groups of finite Fano problems”.
- Georgia Tech Algebra Seminar, “Solving decomposable sparse polynomial systems”.
- Ohio State University Algebraic Geometry Seminar, “Computing Galois groups of finite Fano problems”.
- Texas A&M University Geometry Seminar, “Computing Galois groups of finite Fano problems”.
- Effective Methods in Algebraic Geometry 2022, “Computing Galois grouops of finite Fano problems”.
- Texas A&M University Geometry Seminar, “Solving decomposable sparse polynomial systems”.
- Joint Mathematics Meetings 2022, “Parameter Homotopies in Cox Coordinates”.
- SIAM TX-LA Section Fourth Annual Meeting, “Parameter Homotopies in Cox Coordinates”.
- SIAM Conference on Applied Algebraic Geometry, “Cox Homotopies”.
- Freie Universität, Discrete Geometry Seminar, “Solving Decomposable Sparse Polynomial Systems”.
- Max-Planck-Institut für Mathematik, Seminar on Nonlinear Algebra, “Solving Decomposable Sparse Polynomial Systems”.
- Technische Universität Braunschweig, Oberseminar Applied Algebra and Analysis, “Solving Decomposable Sparse Polynomial Systems”.
- Technische Universität Berlin, Kolloquium on algorithmic mathematics and complexity theory, “Solving Decomposable Sparse Polynomial Systems”.
- SIAM TX-LA Section Second Annual Meeting, “Galois Groups and Decomposable Branched Covers”.

Teaching & Duties (Evaluations available upon request)

University of Wisconsin - Madison:

- Instructor for Math 551:002: Elementary Topology. Fall 2024.
- Instructor for Math 213:001: Calculus and Introduction to Differential Equations. Fall 2024.
- Instructor for Math 213:001: Calculus and Introduction to Differential Equations. Spring 2024.
- Instructor for Math 320:002-003: Linear Algebra and Differential Equations. Fall 2023.

Texas A&M University:

- Instructor for Algebra Qualifying Exam Prep Course. Summer 2022.
- Instructor for Math 168: Finite Mathematics. Fall 2021.
- Instructor for Algebra Qualifying Exam Prep Course. Summer 2021.
- TA for Math 152: Calculus II for Engineering. Spring 2021.
- TA for Math 151: Calculus I for Engineering. Fall 2020.
- Instructor for Math 142: Business Calculus. Summer 2020.
- TA for Math 148: Calculus II for Chemistry and Biological Sciences. Fall 2019.
- Graduate Assistant for Texas A&M University REU. Summer 2019.
- TA for Math 152: Calculus II for Engineering. Spring 2019.
- TA for Math 148: Calculus II for Chemistry and Biological Sciences. Fall 2018.

Honors & Awards

- Recipient of TAMU AFS Merit Fellowship in Mathematics
- Supervised undergraduates in Mathematics REU programs at Texas A&M University
- Recipient of Outstanding TA Award at Texas A&M University
- Mentored in the graduate student Peer Mentoring Program at Texas A&M University

- Secretary of the Texas A&M University chapter of the AMS
- Fourth prize & Best use of additional data prize, Texas A&M University Institute of Data Science 2022 Data Science Competition