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Alex Hof

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Education

University of Wisconsin-Madison, Madison, WI
Ph.D. – Mathematics **December 2023 (expected)**
Advisor: Laurenţiu Maxim
Thesis: Milnor Fiber Consistency via Flatness

Pomona College, Claremont, CA
Bachelor of Arts, Magna Cum Laude – Double Major in Mathematics and Computer Science **May 2018**
Advisor: Shahriar Shahriari
Thesis: Chain Partitions of the Boolean Lattice

Research Interests

I study the behavior of multivariate holomorphic functions near critical points, as described by the Milnor fibration — in particular, my work investigates the relationship between local changes in the topology of a function's level sets and the algebro-geometric invariants of the germ of its critical locus at a given point. This provides a way to address topological questions using machinery from complex-analytic geometry, algebraic geometry, and commutative algebra, in the vein of Morse theory or Picard-Lefschetz theory.

Papers and Preprints

- A. Hof, *Milnor Fiber Consistency via Flatness*, arXiv:2212.12807.
- A. Hof, J. Shade, W. Whiting, *Solvable Leibniz algebras with quasi-filiform split Lie nilradical*, Uzbek Mathematical Journal No. 3 (2017) 159-168.

Awards and Honors

- **Excellence in Mathematical Research Award** (UW-Madison Math. Dept.) **Fall 2022**
  An award for graduate students who make "significant and substantial contributions to research in pure or applied mathematics as part of their thesis work towards a PhD."
- **Math Department TA Award** (UW-Madison Math. Dept.) **Spring 2021**
  An award for graduate students "who have demonstrated excellence in the classroom."
- **Hugh J. Hamilton Prize** (Pomona College Math. Dept.) **Spring 2018**
  A prize "awarded annually to the outstanding senior majoring in Mathematics."
- **Distinction in Senior Exercise** (Pomona College Computer Science Dept.) **Spring 2018**
  Given for a survey paper I wrote on analogues of deterministic finite automata in quantum computing as a senior project.
- **Bruce Jay Levy Prize in Mathematics** (Pomona College Math. Dept.) **Fall 2017**
  A prize "awarded annually to a student chosen by the Mathematics Department faculty for excellence in the field of mathematics."
- **Other Pomona Honors:** Phi Beta Kappa Membership (Fall 2017), Mudge Latin Prize (Fall 2017), Llewellyn Bixby Mathematics Prize (Fall 2016), Tileston Physics Prize (Fall 2015), Pomona College Scholar Status (Fall 2014 – Spring 2016, Spring 2017).

Outreach and Service

- **Graduate Program Committee** Member (UW-Madison Math. Dept.) **Fall 2020 – Spring 2022**
- **Committee for TA Policies and Procedures** Member (UW-Madison Math. Dept.) **Fall 2020 – Spring 2022**
- **Mega Math Meet** Problem Developer (UW-Madison Math. Dept.) **Spring 2022**
- **Mega Math Meet** Grader (UW-Madison Math. Dept.) **Spring 2019, Spring 2022**
- **Math Department Pedagogy Reading Group** Organizer **Summer 2021**
- **Math Department Virtual Ice Cream Social** Organizer **Fall 2020 – Spring 2021**
- **Graduate Peer Mentor Program** Organizer (UW-Madison Math. Dept.) **Summer 2020**
- **Graduate Peer Mentor Program** Mentor (UW-Madison Math. Dept.) **Fall 2019 – Fall 2022**
- **Graduate Representative Association for Mathematics Students** Organizer **2019**

Teaching Experience

- **Linear Algebra and Differential Equations** Teaching Assistant (UW-Madison) **Spring 2023**
- **College Algebra** Instructor of Record (UW-Madison) **Fall 2022**
- **Undergraduate Directed Reading Program (Tropical Geometry)** Mentor (UW-Madison) **Spring 2022**

- **Mega Math Meet** Problem Developer (UW-Madison) **Spring 2022**
- **Mega Math Meet** Grader (UW-Madison) **Spring 2019, Spring 2022**
- **Geometry/Topology SEP (Qual Prep Course)** Teacher (UW-Madison) **Summer 2021**
- **Math Department Pedagogy Reading Group** Organizer **Summer 2021**
- **Graduate Peer Mentor Program** Organizer (UW-Madison) **Summer 2020**
- **Graduate Peer Mentor Program** Mentor (UW-Madison) **Fall 2019 – Fall 2022**
- **Calculus III** Teaching Assistant (UW-Madison) **Spring 2019 – Spring 2021**
- **Calculus II** Teaching Assistant (UW-Madison) **Fall 2018**
- **Discrete Mathematics and Functional Programming** Teaching Assistant (Pomona College) **Spring 2018**
- **Discrete Mathematics** Head Teaching Assistant (Pomona College) **Spring 2017**

Research Experience

- **Research Assistantship** with Laurențiu Maxim at UW-Madison, Fall 2021 – Spring 2022.
- **USA-Uzbekistan Collaborative Research in Leibniz Algebras** IRES program at the Institute of Mathematics of the Uzbekistan Academy of Sciences in partnership with CSU-Fullerton, Summer 2017.
- **Mathematics Research Circle in Combinatorics** at Pomona College, Spring 2016.
- **Pomona College Summer Undergraduate Research Program** in microwave spectroscopy at Leibniz Universität Hannover and Pomona College, Summer 2015.

Talks and Posters

- "Why Does Normalization Resolve Singularities in Codimension 1?" UW-Madison Graduate Algebraic Geometry Seminar, Madison (October 2023), 1 hr.
- "Milnor Fiber Consistency via Flatness," 10th Congress of Romanian Mathematicians, Pitești (July 2023), 25 min.
- "Milnor Fiber Consistency via Flatness," Singularities and Applications Research School, Lille (June 2023), 25 min.
- "Milnor Fiber Consistency via Flatness," 115AM: Algebraic and Topological Interplay of Algebraic Varieties, Jaca (June 2023), poster.
- "Milnor Fiber Consistency via Flatness," Singularities in the Midwest VIII, Madison (March 2023), 1 hr.
- "Normal Cones in Algebraic Geometry," UW-Madison Graduate Algebraic Geometry Seminar, Madison (February 2023), 1 hr.
- "Smooth Fibers, Critical Points, and Flatness," UA-Madrid Algebraic Geometry Seminar, Madrid (October 2022), 1 hr.
- "Milnor Fiber Consistency via Flatness," IberoSing International Workshop, Madrid (October 2022), poster.
- "Revenge of the Classical Topology," UW-Madison Graduate Algebraic Geometry Seminar, Madison (October 2022), 1 hr.
- "Milnor Fiber Consistency for Deformations of Arbitrarily-Singular Hypersurfaces," CIMPA Research School on Singularities and Applications, São Carlos (July 2022), 30 min.
- "Milnor Fiber Consistency for Non-Isolated Singularities via Flatness," Algebraic Geometry and Singularities Learning Workshop & Conference, Seattle (June 2022), 10 min.
- "Milnor Fiber Consistency via Flatness," Iberoamerican Webminar of Young Researchers in Singularity Theory, Madrid (June 2022), 1 hr.
- "Consistency of Milnor Fibers for Deformations of Arbitrary-Dimensional Hypersurface Singularities," UW-Madison Topology and Singularities Seminar, Madison (May 2022), 1 hr.
- "Geometric Intuitions for Flatness," UW-Madison Graduate Algebraic Geometry Seminar, Madison (April 2022), 1 hr.
- "An Introduction to the Deformation Theory of Complete Intersection Singularities," UW-Madison Graduate Algebraic Geometry Seminar, Madison (March 2021), 1 hr.
- "Embrace the Singularity: An Introduction to Stratified Morse Theory," UW-Madison Graduate Algebraic Geometry Seminar, Madison (April 2020), 1 hr.
- "Tropicalization Blues," UW-Madison Graduate Algebraic Geometry Seminar, Madison (November 2019), 1 hr.
- "Kindergarten GAGA," UW-Madison Graduate Algebraic Geometry Seminar, Madison (April 2019), 1 hr.
- "Classification of solvable Leibniz algebras with naturally graded, quasifiliform Lie nilradicals," special session, Amer. Math. Soc., Riverside (November 2017), 20 min.
- "Special Chain Partitions of the Normalized Matching Posets," The Algebra/Number Theory/Combinatorics Seminar of the Claremont Colleges, Claremont (November 2017), 40 min.
- "Electron Penetration and the Hyperfine Spectra of Alkali Halides & YbF," (with David Sharfi, Carson Witte, Andreas Biekert, Zachary Glassman, Richard Mawhorter, and Jens-Uwe Grabow) European Symposium on Gas-Phase Electron Diffraction, Frauenchiemsee (June 2015), poster.