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Heather D. Wilber

EDUCATION

Cornell University, Ithaca, NY — PhD, Applied Mathematics — May 2021
Advisor: Prof. Alex Townsend
DISSERTATION: *Computing numerically with rational functions.*
(Awarded AWM Dissertation Prize 2022, Householder Prize 2022)

Boise State Univ., Boise, ID — M.S., Mathematics — Aug 2016
Advisor: Prof. Grady Wright
THESIS: *Numerical computing with functions on the sphere and disk.*
(Selected as Distinguished Thesis in STEM for 2016-2017)

Boise State Univ., Boise, ID — B.S., Mathematics — Dec 2007
Boise State Univ., Boise, ID — B.A., English-Linguistics — Dec 2007

PREVIOUS POSITION

Oden Institute, University of Texas at Austin: NSF postdoctoral fellow, July 2021-July 2023

CURRENT POSITION

Dept. of Applied Mathematics, University of Washington: Assistant Professor, July 2023-present

MANUSCRIPTS IN PROGRESS

9. Epperly, E.N., Barnett, A., Wilber, H. *A superfast direct inversion method for the nonuniform discrete Fourier transform*
8. Chen, K., Martinsson, G., Wilber, H. *A fast, high-accuracy method for solving the fractional Poisson equation in complex geometries.*
7. Beckermann, B., Kressner, D., Wilber, H. *Compression properties in rank-structured solvers for Toeplitz-like linear systems*

JOURNAL PUBLICATIONS

6. Wilber, H., Damle, A., Townsend, A. *Data-driven algorithms for signal processing with trigonometric rational functions. SIAM J. Sci. Comput., 44-3, C185-C209 (2022).*
5. Rubin, D., Townsend, A., Wilber, H. *Bounding Zolotarev numbers using Faber rational functions. Constructive Approx., 56, 1-26. (2022)*
4. Quinn, K., Wilber, H., Townsend, A., Sethna, J.P. *Chebyshev approximation and the global geometry of model predictions. Phy. Rev. Let., 122(15), 158302 (2019).*
3. Townsend, A., Wilber, H. *On the singular values of matrices with high displacement rank. Linear Alg. Appl., V. 548, 19-41 (2018).*
2. Wilber, H., Townsend, A., Wright, G. *Computing with functions in spherical ands polar geometries II. The disk. SIAM J. Sci. Comput., 39-3, C238-C262 (2017).*
1. Townsend, A., Wilber, H., Wright, G. *Computing with functions in spherical and polar geometries I. The sphere. SIAM J. Sci. Comput., 38-4, C403-C425 (2016).*

INVITED TALKS

15. DOMAIN DECOMPOSITION 28 (KAUST, Saudi Arabia)
    Plenary talk: Superfast inversion methods for highly structured matrices (Feb. 2024)
14. APPLIED MATH SEMINAR (University of Washington, Seattle, WA)
    Talk: Adventures in structured matrix approximation methods (Nov. 2023)
13. 4TH BIENNIAL MEETING OF SIAM PACIFIC NORTHWEST (Western Washington Univ., Bellingham, WA)
    Plenary Talk: Three big ideas in rational approximation (Oct. 2023)
12. NUMERICAL ANALYSIS IN THE 21st CENTURY (University of Oxford, Oxford, UK)
    Plenary Talk: What can the square root approximation teach us? (Aug. 2023)
11. FLUID MECHANICS AND WAVES SEMINAR (New Jersey Institute of Technology, Newark, NJ)

Talk: Hierarchical solvers for special linear systems (April 2023)

10. MATHEMATICS COLLOQUIUM (Temple University, Philadelphia, PA)
    Talk: Designing low rank methods via rational functions (Dec. 2022)
9. APPLIED MATHEMATICS COLLOQUIUM (Univ. Colorado at Boulder, Boulder, CO)
    Talk: Rational functions in computational mathematics (Nov. 2022)
8. MATHEMATICS COLLOQUIUM (Baylor University, Waco, TX)
    Talk: Zolotarev rational functions in computational mathematics (Oct. 2022)
7. BABUŠKA FORUM SERIES (Univ. Texas at Austin, Austin, TX)
    Talk: Computing with rational approximations to the square root (Oct. 2022)
6. HOUSEHOLDER XXI: HOUSEHOLDER PRIZE PLENARY LECTURE (Bari, Italy)
    Plenary Talk: The low rank properties of structured matrices: a rational explanation (June 2022)
5. CAVID:COMPLEX ANALYSIS VIDEO SEMINAR SERIES (virtual)
    Talk: Low rank numerical methods via rational function approximation (June 2022)
4. UNIV. DELAWARE NUMERICAL ANALYSIS AND PDE SEMINAR (virtual)
    Talk: Low rank methods for structured matrices. (May 2022)
3. UNIV. TEXAS LIBRARIES NATIONAL POETRY MONTH EVENT (virtual)
    Talk: The poetry of math and the math of poems (April 2022)
1. BOISE STATE UNIV. MATHEMATICS COLLOQUIUM (Boise State Univ., Boise, ID)
    Talk: Low rank methods for structured matrices. (Feb. 2022)
1. CCM SEMINAR SERIES, FLATIRON INSTITUTE (virtual)
    Talk: Designing low rank methods for matrices with displacement structure. (May 2021)

SELECTED PRESENTATIONS

19. 4TH BIENNIAL MEETING OF SIAM PACIFIC NORTHWEST (Western Washington Univ., Bellingham, WA)
    Talk: A fast direct method for the nonuniform discrete Fourier transform (Oct. 2023)
18. COMPLEX ANALYSIS: TECHNIQUES, APPLICATIONS, AND COMPUTATIONS (Cambridge University, Cambride UK)
    Talk: Zolotarev numbers and inverse nonuniform discrete Fourier transforms. (July 2023)
17. SIAM ANNUAL MEETING 2022 (Pittsburgh, PA)
    Poster: Data-driven computing with trigonometric rational functions (July 2022)
16. RISING STARS 2022 (Sandia Labs, Albuquerque, NM)
    Talk: Data-driven computing with trigonometric rational functions (April 2022)
15. 2021 CONFERENCE ON FAST DIRECT SOLVERS (virtual)
    Talk: Designing low rank methods for matrices with displacement structure. (Oct. 2021)
14. GAMM 2021 (virtual)
    Talk: Compression properties and rank-structured solvers for Toeplitz, Vandermonde and related linear systems (March 2021)
13. SIAM ANNUAL MEETING (virtual)
    Talk: Computing with rational approximations with applications in signal processing (July 2020)
12. 27th BIENNIAL NUMERICAL ANALYSIS CONFERENCE (Univ. of Strathclyde, Strathclyde, UK)
    Talk: Compression properties in rank-structured solvers for Toeplitz linear systems (June 2019)
    awarded SIAM UKIE prize: Best student presentation
11. APPROXIMATION THEORY 16 (Vanderbilt University, Nashville, TN)
    Talk: Rational approximation in superfast rank-structured solvers (May 2019)
10. EPFL Numerical Analysis Group (EPFL, Lausanne, Switzerland)
    Talk: Numerical computing in polar and spherical geometries (Dec. 2018)
9. EPFL Numerical Analysis Group (EPFL, Lausanne, Switzerland)
    Talk: On the singular values of matrices with high displacement rank (Nov. 2018)
8. ICOSAHOM (Imperial College London, UK)
    Talk: A low rank and spectrally accurate elliptic PDE solver (July 2018)
7. SIAM CONF. ON COMPUTATIONAL SCIENCE AND ENGINEERING (Atlanta, GA)
    Talk: A factored ADI method for Sylvester equations with high-rank right-hand sides (Feb. 2017)
6. SIAM CONF. ON COMPUTATIONAL SCIENCE AND ENGINEERING (Atlanta, GA)
    Poster: Numerical computing with functions in spherical and polar geometries (Feb. 2017)
5. WORKSHOP ON FAST DIRECT SOLVERS (Purdue Univ., Lafayette, IN)

Talk: Numerical computing with functions on the sphere and disk (Nov. 2016)

4. SCIENTIFIC COMPUTING AND NUM. ANALY. SEMINAR (Cornell University, Ithaca, NY)
   Talk: Numerical computing with functions on the sphere and disk (Sept. 2016)
3. SIAM ANNUAL MEETING (Boston, MA)
   Talk: Numerical computing in polar and spherical geometries (July 2016)
2. OXFORD NUM. ANALYS. GROUP SEMINAR (University of Oxford, Oxford, UK)
   Talk: Computing with functions on the sphere and disk (July 2016)
1. PACIFIC NORTHWEST NUMERICAL ANALYSIS SEMINAR
   Poster: Computing with functions on the sphere and disk (Oct. 2015)

SOFTWARE DEVELOPMENT

- Structmats

Open-source code for computing with structured matrices

- REfit

Open-source code for computing with trigonometric rational functions and exponential sums

- freeLyap Iterative solvers package

Open-source code for solving Sylvester and Lyapunov matrix equations

- CHEBFUN PROJECT

Spherefun and *Diskfun* in the open-source project *Chebfun*

SELECTED FELLOWSHIPS AND AWARDS

- Householder Prize (2022)
- AWM Dissertation Prize (2022)
- National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship (2021)
- SIAM UKIE prize: Best student presentation, 27th Biennial Numerical Analysis conference (2019)
- National Science Foundation Graduate Research Fellowship (NSF GRF) (2016)
- Distinguished Thesis Award (2017)
- National Aeronautics and Space Administration (NASA) Fellowship Award (2015-2016)

PROFESSIONAL ACTIVITIES

- Referee: SIAM J. Scientific Computing, J. Comp. Physics, IMA J. of Num. Analysis, Arkiv der Mathematik, BIT numerical methods, Amer. Math. Soc., Adv. in Comp. Math., Electr. Trans. on Num. Analysis
- Department of Applied Mathematics DEI committee member 2023-present
- AWM faculty advisor for UW applied math AWM student chapter 2023-present
- Lead Organizer: Banff International Research Institute 2025 proposal for workshop titled “Challenges, opportunities, and new horizons in rational approximation”
- Minisymposium organizer/co-chair: SIAM LA24, (Paris, France) May 2024
- Minisymposium organizer/co-chair: 4th BIENNIEL MTG SIAM PNW, (Bellingham, WA) July 2022
- Minisymposium organizer/co-chair: SIAM AN2022, (Pittsburgh, PA) July 2022
- Consultant: X-prize Carbon removal competition with Ecorestoration Alliance team 2022
- Minisymposium organizer and co-chair: SIAM AN2020, (Virtual) July 2020
- AWM outreach mentor 2019
- Rural schools outreach volunteer with NASA STEM Mathematics Initiative 2015-2016

TEACHING EXPERIENCE

University of Washington **Seattle, WA** **Sept 2023-current**

Instructor

- Autumn 2023: Amath 584, Applied Linear Algebra and Introductory Numerical Analysis

University of Texas at Austin **Austin, TX** **August 2022-May 2023**

Instructor

- Spring 2023: Sequences, Series and Multivariable Calculus
- Fall 2022: Advanced Calculus with Applications, II

Cornell University **Ithaca, NY** **August 2020-Dec. 2020**

Teaching assistant

- Spring 2021: Teaching Assistant for Prof. Steven Strogatz, Mathematical Explorations

- Fall 2020: Teaching Assistant for Prof. Alex Townsend, Linear Algebra for Engineers

Boise State University **Boise, Idaho** **August 2014-May 2015**
Instructor

- Spring 2015: Analytic Trigonometry
- Spring 2015: Trigonometry project and assessment design team member
- Fall 2014: Analytic Trigonometry, College Algebra.

Rimrock Jr. Sr. High School **Bruneau, Idaho** **August 2013-May 2014**
High School Math Teacher

- pre-algebra, algebra II, geometry, trigonometry, pre-calculus and Title-I interventionist