CONTACT INFORMATION

E-mail: wleeb@umn.edu
Address: Vincent Hall, Office 536
              206 Church St. SE
              Minneapolis, MN 55455
Website: `http://www-users.math.umn.edu/~wleeb/`

EDUCATION

Ph.D in Mathematics
Yale University, 2015

B.S. in Mathematics, *with honors*
University of Chicago, 2010

ACADEMIC POSITIONS

Associate Professor
University of Minnesota, Twin Cities, 2024 – present

Assistant Professor
University of Minnesota, Twin Cities, 2018 – 2024

Postdoctoral Research Associate
Princeton University, 2015 – 2018

PUBLICATIONS

1. Matan Gavish, William Leeb and Elad Romanov. Matrix Denoising with Partial Noise Statistics: Optimal Singular Value Shrinkage of Spiked F-Matrices. *Information and Inference: A Journal of the IMA* 12, no. 3 (2023): 2020-2065.

2. Tamir Bendory, Nicolas Boumal, William Leeb, Eitan Levin and Amit Singer. Toward single-particle reconstruction without particle picking: Breaking the detection limit. *SIAM Journal on Imaging Sciences* 16, no. 2 (2023): 886-910.

3. William Leeb. Optimal singular value shrinkage for operator norm loss: Extending to non-square matrices. *Statistics and Probability Letters* 186 (2022): 109472.

4. Tamir Bendory, Dan Edidin, William Leeb and Nir Sharon. Dihedral multi-reference alignment. *IEEE Transactions on Information Theory* 68, no. 5 (2022): 3489-3499.

5. Tamir Bendory, Ariel Jaffe, William Leeb, Nir Sharon and Amit Singer. Super-resolution multi-reference alignment. *Information and Inference: A Journal of the IMA* 11, no. 2 (2022): 533-555.

6. William Leeb. Rapid evaluation of the spectral signal detection threshold and Stieltjes transform. *Advances in Computational Mathematics* 47, no. 60 (2021).

7. William Leeb. Matrix denoising for weighted loss functions and heterogeneous signals. *SIAM Journal on Mathematics of Data Science* 3, no. 3 (2021): 987-1012.

8. William Leeb. A note on identifiability conditions in confirmatory factor analysis. *Statistics and Probability Letters* 178 (2021): 10919.

9. William Leeb and Elad Romanov. Optimal spectral shrinkage and PCA with heteroscedastic noise. *IEEE Transactions on Information Theory* 67, no. 5 (2021): 3009-3037.

10. Edgar Dobriban, William Leeb and Amit Singer. Optimal prediction in the linearly transformed spiked model. *Annals of Statistics* 48, no. 1 (2020): 491-513.

11. William Leeb and Vladimir Rokhlin. On the numerical solution of fourth-order linear two-point boundary value problems. *SIAM Journal on Scientific Computation* 42, no. 3, (2020): A1789-A1808.

12. Emmanuel Abbe, Tamir Bendory, William Leeb, João Pereira, Nir Sharon and Amit Singer. Multireference alignment is easier with an aperiodic translation distribution. *IEEE Transactions on Information Theory* 65, no. 6, (2019): 3565-3584.

13. Tamir Bendory, Nicolas Boumal, William Leeb, Eitan Levin and Amit Singer. Multi-target detection with application to cryo-electron microscopy. *Inverse Problems* 35, no. 10 (2019): 104003.

14. Jerrod Ankenman and William Leeb. Mixed Hölder matrix discovery via wavelet shrinkage and Calderón-Zygmund decompositions. *Applied and Computational Harmonic Analysis* 45, no. 3, (2018): 551-596.

15. William Leeb. Approximating snowflake metrics by trees. *Applied and Computational Harmonic Analysis* 45, no. 2, (2018): 405-424.

16. William Leeb. The mixed Lipschitz space and its dual for tree metrics. *Applied and Computational Harmonic Analysis* 44, no. 3, (2018): 584-610.

17. William Leeb and Ronald Coifman. Hölder-Lipschitz norms and their duals on spaces with semigroups, with applications to Earth Mover's Distance. *Journal of Fourier Analysis and Applications* 22, no. 4, (2016): 910-953.

PRE-PRINTS / TECHNICAL REPORTS

1. William Leeb. On metrics robust to noise and deformations. arXiv 2101.10867v3 (2024).

2. William Leeb. Properties of Laplacian Pyramids for Extension and Denoising. arXiv 1909.07974 (2019).

TALKS / PRESENTATIONS

- Signal recovery in the high-noise, high-dimensional regime. Probability Seminar, University of Wisconsin-Madison. April 24, 2025.

- Fast and Robust Metrics. Applied Math/PDE Seminar, University of California, Santa Barbara. November 8, 2024.

- Metrics Robust to Deformations and Noise. Computational Harmonic Analysis and Data Science Workshop, BIRS. Oaxaca, Mexico. September 19, 2024.

- Signal recovery in the high-noise, high-dimensional regime. Computer Science Colloquium, Rensselaer Polytechnic Institute. April 17, 2024.

- Signal recovery in the high-noise regime. Mathematics Colloquium, University of Minnesota, Twin Cities. October 12, 2023.

- Group-robust Metrics. International Congress on Industrial and Applied Mathematics (ICIAM), Minisymposium on Estimation problems over groups. Tokyo, Japan. August 25, 2023.

- New Methods for Low-Rank Matrix Denoising. Applied Math Colloquium, Tel Aviv University. November 22, 2022.

- Robust Metrics by Integration. SIAM Conference on Mathematics of Data Science (MDS22), Minisymposium on Geometric Distances and Robust Data Analysis. September 28, 2022.

- New Methods for Low-Rank Matrix Denoising. Oden Institute, University of Texas at Austin. May 10, 2022.

- New Methods for Low-Rank Matrix Denoising. Yale University Applied Math Seminar. December 15, 2021.

- New Methods for Low-Rank Matrix Denoising. Duke University Applied Math and Analysis Seminar. December 14, 2021.

- Matrix Denoising with Weighted Loss. KTH Royal Institute of Technology. April 12, 2021.

- Matrix Denoising with Weighted Loss. Computational and Applied Mathematics Colloquium, University of Chicago. March 18, 2021.

- Matrix Denoising with Weighted Loss. Data Science Seminar, Institute for Mathematics and its Applications. September 22, 2020.

- Missing Data in the High Noise Regime. Virtual poster session, Workshop on Missing Data Challenges in Computation, Statistics, and Applications. Institute for Advanced Study. September 10, 2020.

- Matrix Denoising with Weighted Loss. SIAM Conference on Mathematics of Data Science (MDS20, virtual conference), Minisymposium on High-Dimensional PCA in the High-Noise Regime. June 24, 2020.

- Matrix Denoising with Weighted Loss. Mathematics of Data and Decisions Seminar, University of California, Davis. March 10, 2020.

- Matrix Estimation in the Spiked Model with Heteroscedastic Noise. Computational Harmonic Analysis and Data Science Workshop, BIRS. Oaxaca, Mexico. October 29, 2019.

- New Methods for Denoising and CTF Correction. Poster session, Computational Cryo-EM Summer Workshop. Flatiron Institute. August 8, 2019.

- Dual Norms on Product Spaces. International Congress on Industrial and Applied Mathematics (ICIAM), Minisymposium on Distance Metrics and Mass Transfer Between High Dimensional Point Clouds. Valencia, Spain. July 17, 2019.

- Matrix Denoising and PCA with Heteroscedastic Noise. Center for Computational Mathematics Seminar, Flatiron Institute. New York, NY. May 29, 2019.

- Matrix Denoising and PCA with Heteroscedastic Noise. IDeAS Seminar, Princeton University. Princeton, NJ. May 28, 2019.

- Matrix Denoising and PCA with Heteroscedastic Noise. Applied Math and Computer Science Colloquium, University of Pennsylvania. Philadelphia, PA. May 24, 2019.

- Optimal Spectral Shrinkage and PCA with Heteroscedastic Noise. Applied Math Seminar, Yale University. New Haven, CT. April 23, 2019.

- Optimal Spectral Shrinkage and PCA with Heteroscedastic Noise. Probability Seminar, University of Minnesota. Minneapolis, MN. April 19, 2019.

- Optimal Spectral Shrinkage and PCA with Heteroscedastic Noise. Analysis Seminar, University of Missouri. Columbia, MO. March 19, 2019.

- SIAM 5-Minute Faculty Research Showcase, University of Minnesota. March 6, 2019.

- The Role of the Translation Distribution in Multireference Alignment. Data Science Seminar, Institute for Mathematics and its Applications. September 17, 2018.

- Prediction in the Linearly Transformed Spiked Model. Fourth Conference of the International Society of Nonparametric Statistics (ISNPS). Salerno, Italy. June 12, 2018.

- Optimal Prediction in the Linearly Transformed Spiked Model. Data Science Seminar, Institute for Mathematics and its Applications. December 8, 2017.

- MRA is Easier with an Aperiodic Translation Distribution. Simons Foundation, New York. November 10, 2017.

- PCA from Noisy, High-Dimensional and Linearly-Corrupted Observations. Poster session, Modern Advances in Computational and Applied Mathematics Workshop, Yale University. June 9, 2017.

- PCA from Linearly Reduced Measurements: The Diagonal Case. Applied Mathematics Seminar, Yale University. December 13, 2016.

- Earth Mover's Distance and Equivalent Metrics. Machine Learning Seminar, Yale University. February 17, 2016.

- The Mixed Hölder Condition, with Applications to the Analysis of Multidimensional Databases. Simons Foundation, New York. January 29, 2016.

- The Hölder-Lipschitz Space and its Dual. International Conference on Harmonic Analysis and Applications, City University of New York. June 5, 2015.

- Earth Mover's Distance and Equivalent Metrics. IDeAS Seminar, Princeton University. March 26, 2014.

AWARDS / RECOGNITION

- **McKnight Presidential Fellow**
  University of Minnesota, Spring 2024

- **George W. Taylor Career Development Award**
  University of Minnesota, Spring 2024

- **NSF CAREER Award**
  Awarded January, 2023

- **Thank a Teacher**
  University of Minnesota, Fall 2019 and Spring 2020

- **Paul R. Cohen Prize**
  University of Chicago, 2010

- **Phi Beta Kappa**
  University of Chicago, 2009 (elected Junior year)

- **Student Marshal**
  University of Chicago, 2009

FUNDING

- PI, NSF CAREER Award 2238821, 2023 − 2028. $500,000 total.

- PI, BSF Award 2018230, 2019 − 2022. With Nir Sharon (PI, Tel Aviv University). $120,000 total/$60,000 Minnesota.

- Co-PI, NSF BIGDATA Award IIS-1837992, 2018 − 2022. With Amit Singer (PI, Princeton University) and Edgar Dobriban (Co-PI, University of Pennsylvania). $1,000,000 total/$333,333 Minnesota.

- Simons Collaboration on Algorithms and Geometry postdoctoral grant, 2015 − 2018.