Zev Woodstock

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Background

2024 –	**Assistant Professor**, *James Madison University*, Department of Mathematics and Statistics, Harrisonburg, VA, USA.
2022 – 2024	**Postdoctoral Staff Scientist (Wissenschaftlicher Mitarbeiter)**, *Interactive Optimization and Learning (IOL) Lab* ↗ , *Technische Universität Berlin (TU Berlin) & Zuse Institute Berlin (ZIB)*, Berlin, DE.
	- Advisor: Sebastian Pokutta
2021	**Ph.D., Mathematics**, *North Carolina State University*, Raleigh, NC, USA.
	- Thesis: **Construction of Functions from Nonlinear Transformations**
	- Advisor: Patrick L. Combettes
2018	**M.Sc., Applied Mathematics**, *North Carolina State University*, Raleigh, NC, USA.
2016	**B.Sc., Mathematics** (Summa cum Laude), *James Madison University*, Harrisonburg, VA, USA.

Awards, Honors, & Recognitions

2025 – 2027	**Principal Investigator (NSF DMS-2532423)**, *National Science Foundation.*
	"LEAPS-MPS: Modernizing Frank-Wolfe splitting algorithms" ↗
2023 – 2025	**Principal Investigator (EF1-23)**, *Berlin Mathematics Research Center MATH+ Grant.*
	"On a Frank-Wolfe Approach for Abs-smooth Optimization" ↗ , PIs with S. Pokutta and A. Walther.
2022 – 2024	**Research Group Lead (Continuous Optimization)**, *IOL Lab*, TU Berlin & ZIB.
2022	**MATH+ Travel Grant**, *Berlin Mathematics Research Center.*
2022 & 2023	**REU Advisor**, *Zuse Institute Berlin.*
	Advising on research, acquiring visas and funding, general organization
2022 – 2024	**MATH+ Postdoctoral Member**, *Berlin Mathematics Research Center.*
2018 – 2021	**Graduate Research Fellowship (NSF-GRFP DGE-1746939)**, *National Science Foundation*, at NC State University, "Convolutive Methods for Data Science" .
2016	**University Graduate Fellowship**, *NC State University.*
2016	**Ikenberry Prize**, *James Madison University*, Department of Mathematics & Statistics.
	Presented to the outstanding member of the senior class
2015	**Joan and Ernest Droms Memorial Scholarship in Mathematics**, *James Madison University*, .
2014 & 2016	**COMAP International Mathematical Contest in Modeling (MCM)**.
	2016: *Meritorious* (top 8%); 2014: *Honorable Mention*
2014	**Jeffrey E. Tickle Scholarship in Mathematics**, *James Madison University.*
2013 & 2014	**Lisa Persson-Helms Scholarship in Mathematics**, *James Madison University.*
2014	**Putnam Exam**, *James Madison University*, Score: 9.

Research

Current research topics.
(1) Split and block-iterative first-order optimization algorithms, (2) Numerical analysis of asynchronous algorithms for nonsmooth optimization, (3) Developing algorithms for use in signal recovery/synthesis and biological applications, and (4) Nonlinear analysis and fixed-point relaxations of optimization problems.

Projects

2025 –	**Optimization & Algorithmic Theory (OAT) Lab**, *James Madison University (Dept. of Math & Stats).*
	Undergraduate optimization lab with focus on the development, theoretical analysis, and applications of first-order continuous optimization algorithms
2022 – 2024	**Interactive Optimization and Learning (IOL) Lab**, *TU Berlin (Math Dept.) & Zuse Institute Berlin (AI in Society, Science, and Technology Dept.)*, Advisor: Sebastian Pokutta.
	Research on continuous optimization with applications in machine learning and data science.
2017 – 2021	**Construction of Functions from Nonlinear Transformations**, *NCSU*, Advisor: Patrick L. Combettes.
	PhD Thesis: modeling, analysis, and algorithm development for solving nonlinear problems in signal/image/audio processing, data science, and large-scale optimization.

2014 – 2016	**Independent Study: Aeroacoustics of Turbulent Coanda Wall Jets**, *JMU*, Advisor: Caroline Lubert.
2015	**NSF-REU** (Algebraic methods in computational biology), *Texas A&M University*, Advisor: Anne Shiu.
2014	**NSF-REU** (Inverse scattering problems), *James Madison University*, Advisor: Hala Nelson.

Refereeing

2026	**Journal of Optimization Theory and Applications**.
2025	**Mathematical Programming**.
2024	**Journal of Machine Learning Research (JMLR)**.
2024	**Conference on Neural Information Processing Systems (NeurIPS)**.
2024	**Mathematical Programming**.
2023	**Journal of Machine Learning Research (JMLR)**.
2023	**International Conference on Learning Representations (ICLR)**.
2023	**Conference on Neural Information Processing Systems (NeurIPS)**.
2023	**International Conference on Machine Learning (ICML)**.
2023	**Advances in Computational Mathematics (ACOM)**.
2022	**Conference on Neural Information Processing Systems (NeurIPS)**.
2020 & 2021	**Journal of Mathematical Analysis and Applications (JMAA)**.
2020	**Journal of Approximation Theory (JAT)**.

Technical

High-level languages,
- `MATLAB/Octave` (10+ years)
- `Python 3` (2 years) packages: numpy, scipy, tensorflow, keras, matplotlib, and jupyter notebook
- `Julia` (3 years) and `FORTRAN` ($\leq$ 1 year)

Markup languages, *LaTeX, Beamer, Microsoft Office, and HTML.*

Tools, *Linux/Mac/Windows, bash, vim, meld, git, docker, slurm, Maple, Mathematica, and Moodle.*

Programming Experience.
Coded projects for classification, image recognition, encoder/decoder models, computational geometry, finite element methods, numerical integration/differentiation, control theory, sparse interpolation, fixed point equations, optimization (convex, nonconvex, asynchronous, parallelized, block-iterative, nonsmooth, . . .), and signal/image/audio processing. Numerical work in articles 3 – 13; new algorithms in articles 5, 6, and 9–12.

▄▄▄ Peer-Reviewed Articles   (Undergraduate advisees indicated by *)

14. *A note on asynchronous Projective Splitting in Julia* ↗ , Utkarsh Sharma*, Kashish Goel*, Aryan Dua*, Sebastian Pokutta, and Z.W., submitted (2025).

13. *Flexible block-iterative analysis for the Frank-Wolfe algorithm* ↗ , G. Braun, J. Halbey, S. Pokutta, and Z.W., submitted (2025).

12. *High-precision linear minimization is no slower than projection* ↗ , Z.W., **Optimization Letters**, (2026).

11. *Splitting the conditional gradient algorithm* ↗ , Z. W. and S. Pokutta, **SIAM Journal on Optimization**, vol. 35, iss. 1, pp. 347--368, (2025).

10. *On a Frank-Wolfe approach for abs-smooth functions* ↗ , T. Kreimeier, S. Pokutta, A. Walther, and Z. W., **Optimization Methods and Software**, pp. 1–27, (2024).

9. *Signal recovery from inconsistent nonlinear observations* ↗ , P. L. Combettes, and Z. W., **Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)**, pp. 5872–5876. Singapore, May 22–27, (2022).

8. *Block-activated algorithms for multicomponent fully nonsmooth minimization* ↗ , M. N. Bùi, P. L. Combettes, and Z. W., **Proceedings of the 2022 IEEE ICASSP**, pp. 5428–5432. Singapore, May 22–27, (2022).

7. *A variational inequality model for the construction of signals from inconsistent nonlinear equations* ↗ , P. L. Combettes and Z. W., **SIAM Journal on Imaging Sciences**, vol. 15, pp. 84–109 (2022).

6. *Reconstruction of functions from prescribed proximal points* ↗ , P. L. Combettes and Z. W., **Journal of Approximation Theory**, vol. 268, art. 105606, (2021).

5. *A fixed point framework for recovering signals from nonlinear transformations* ↗ , P. L. Combettes and Z. W., **Proceedings of the European Signal Processing Conference**, pp. 2120–2124. Amsterdam, NL, January 18–22, (2021).

4. *Obstructions to convexity in neural codes* ↗ , C. Lienkaemper*, A. Shiu, and Z. W.*, **Advances in Applied Mathematics**, vol. 85, pp. 31–59 (2017).

3. *Rocket launch noise and the Coanda effect* ↗ , C. P. Lubert, J. N. Romero*, J. S. Sochacki, and Z. W.* **AIAA Space**, art. 2016-5625, (2016).

2. *Analyzing multistationarity in chemical reaction networks using the determinant optimization method* ↗ , B. Félix*, A. Shiu and Z. W.*, **Applied Mathematics and Computation**, vol. 287–288, pp. 60–73 (2016).

1. *Architectural acoustical oddities.* ↗ Z. W.* and C. P. Lubert, **Proceedings of Meetings on Acoustics**, vol. 22, art. 025002, (2015).

TEACHING

2024 –   **Instructor of Record**, *James Madison University*, Harrisonburg, VA, USA.
F24: Calculus I (Math 235); Sp25: Calculus II (Math 236); F25: Calculus III (Math 237);
Sp26: Computers & Numerical Algorithms (Math 248)

2018 – 2024   **Mentor**, *IOL Lab (2022 – 2024) and NC State U∪G (2018 – 2021).*
Advising on PhD/MS/BS research projects; applying for grants; organizing seminars; reviewing applications; coaching students on curriculum, jobs, and conference presentations.

STUDENT STATISTICS:

Gender	M/F/Nonbinary	4/4/1
Degree	PhD/MS/BS	2/2/5
Nationality	FR/DE/USA/India	1/2/2/4

2022 – 2024   **ZIB Tutorial Lecture Series Organizer**, *Zuse Institute Berlin*, Berlin, DE.
Organizing and presenting expository lectures on useful topics which are not found in "standard" coursework.

2016 – 2018   **Recitation Leader and Teaching Assistant**, *NC State University*.
Calculus I for business and life science, Calculus I for math majors and engineers, and Calculus III

Question (1-5 scale)	Class Mean	Dept. Mean
The instructor explained material well	4.7	4.2
The instructor was prepared for class	4.7	4.5
The instructor was enthusiastic about teaching the course	4.8	4.4
The instructor consistently treated students with respect	4.8	4.5
Overall, the instructor was an effective teacher	4.7	4.3

2016 – 2018   **Math Tutor**, *NCSU Multimedia Center (2017–2018); JMU Science & Math Learning Center (2016).*

2015 – 2016   **Math 167**, *James Madison University*.
Proposed, developed, and co-taught a seminar on higher-level topics in math, accessible to first-year undergraduates.

HIGHLIGHTED COURSEWORK

Proximal Optimization in Data Science	Nonlinear programming
Representations of High-Dimensional Data (MSRI Summer School ↗)	Convex Analysis
Semidefinite and Second-Order Conic Programming	Advanced Functional Analysis
Real Algebraic Geometry and Convex Optimization	Dynamical Systems and Control Theory*
Nonlinear Equations and Optimization	Analysis*
Vector Space Methods in System Optimization	Numerical Analysis*

* indicates a year-long sequence for which a Ph.D. Qualifying Examination was passed.

EXTRACURRICULARS

LEADERSHIP

2022 – 2024   **Organizer**, *AI in Society, Science, and Technology (AIS^2T) Seminar*, Zuse Institute Berlin, Berlin, DE.

2022 – 2024   **Curator**, *Award Repository*, IOL Lab, Berlin, DE.
- Maintaining a list of awards, reminding/nominating students, and assisting with applications.

2023   **Volunteer Organizer**, *Lange Nacht der Wissenschaften ("Long night of science")* ↗ , ZIB, Berlin, DE.
- Outreach event for the Berlin science community to exhibit discoveries for the public (accessible for all ages).

2022   **Session Chair**, *Nonsmooth Optimization and Machine Learning*, INFORMS Annual Meeting, Indianapolis, IN, USA.

2018 – 2020   **Vice President**, *American Mathematical Society Graduate Student Chapter at NC State University*.
- Organized the Triangle Area Graduate Mathematics Conference for Spring 2019 ↗ .
- Organized recruitment and social events for the NC State mathematical community.

2018 – 2020   **President**, *Undergrads Union Grads (U∪G)*, NC State University.
- Coordinated the mentoring program for undergraduate math majors.

2018 – 2020   **Organizer**, *Nonlinear Analysis Graduate Student Workshop*, NC State University.

Mathematical Foundations of Artificial Intelligence Seminar at Umeå University. Umeå, Sweden (online), Sept., 2025
- Invited Lecture: *Flexible block-iterative analysis for the Frank-Wolfe algorithm*

International Conference on Continuous Optimization (ICCOPT). Los Angeles, CA, USA. July, 2025
- *Which is faster: Linear minimization or Projection?*

INFORMS Annual Meeting. Seattle, WA, USA. October, 2024
- Invited Lecture: *Deterministic block-iterative analysis for the Frank-Wolfe algorithm*

International Symposium on Mathematical Programming (ISMP). Montreal, QC, CA. July 24, 2024
- Invited Lecture: *Deterministic block-iterative analysis for the Frank-Wolfe algorithm* ↗

INFORMS Annual Meeting. Phoenix, AZ, USA. October 18, 2023
- Invited Lecture: *Splitting the Conditional Gradient Algorithm* ↗

Imaging Inverse Problems - Regularization, low dimensional models and applications
(Mathématiques de l'Imagerie et de ses Applications CNRS workshop). Bordeaux, FR. March 23, 2023
- *Signal recovery from inconsistent nonlinear observations* ↗

MATH+ Spotlight Series. Berlin, DE. November 2, 2022
- *A Frank-Wolfe approach for abs-smooth optimization*

INFORMS Annual Meeting. Indianapolis, IN, USA. October 16, 2022
- Invited lecture: *A Frank-Wolfe approach for abs-smooth optimization*

ZIB Tutorial Lecture Series. Berlin, DE. March 16, 2022
- *Proximity operators and nonsmooth optimization* (online)

European Signal Processing Conference (EUSIPCO) 2020. Amsterdam, NL. January 21, 2021
- *A fixed point framework for recovering signals from nonlinear transformations* (online)

Nonlinear Analysis Graduate Student Workshop. NC State, Raleigh, NC, USA. Fall 2020
- *Signal recovery from nonlinear transformations*

Triangle Area Graduate Math Conference. UNC, Chapel Hill, NC, USA. Fall 2019
- *The Gospel of Proximal Calculus: Optimization for non-differentiable problems*

SIAM Graduate Student Tutorial. NC State, Raleigh, NC, USA. March 21, 2019
- *Proximal methods for optimization*

Operator Splitting Workshop. SAMSI, Research Triangle Park, NC, USA. March 21–23, 2018
- Invited lecture: *Composite Infimal Convolutions*

Applied Math Graduate Student Seminar NCSU, Raleigh, NC, USA. Fall 2016
- *Analyzing Multistationarity in Chemical Reaction Networks*

Graduate Student Algebra Seminar NCSU, Raleigh, NC, USA. Fall 2016
- *Obstructions to Convexity and Neural Codes*

Joint Mathematics Meetings Seattle, WA, USA. January 6, 2016
- *Analyzing Multistationarity in Chemical Reaction Networks*

Texas A&M University Research Symposium College Station, TX. July 23rd, 2015
- *An Infinite Family of Networks with Non-Degenerate Equilibria* : Undergraduate lecture.

M.A.A. MD-DC-VA Section Meeting Salem, VA, USA. April 24–25, 2015
- *Architectural Acoustic Oddities & The Asymptotic Behavior of Repetition Pitch*

Acoustical Society of America Conference Indianapolis, IN. Oct. 28, 2014
- *Architectural Acoustic Oddities* (poster)

Shenandoah Undergraduate Mathematics Conference (SUMS), JMU, Harrisonburg, VA, USA.
- 2016 and 2018: Graduate Student Panelist
- 2015: *Obstructions to Convexity in neural Codes*: Undergraduate lecture
- 2014: *Architectural Acoustic Oddities* (poster): First place prize winner