Zev Woodstock

Postdoctoral Researcher
Interactive Optimization and Learning Lab
Technische Universität Berlin / Zuse Institute Berlin
✉ *woodstock@zib.de*

Education

2021 **Ph.D., Mathematics**, *North Carolina State University*, Raleigh, NC.
- Thesis: **Construction of Functions from Nonlinear Transformations**
- Advisor: Patrick L. Combettes

2018 **M.Sc., Applied Mathematics**, *North Carolina State University*, Raleigh, NC, USA.
- 4.0/4.0 GPA

2016 **B.Sc., Mathematics**, *James Madison University*, Harrisonburg, VA, USA.
- 3.93/4.0 GPA (Summa Cum Laude)

Awards, Honors, & Recognitions

2022 **MATH+ Postdoctoral Member**, *Berlin Mathematics Research Center*.

2018 – 2021 **National Science Foundation Graduate Research Fellowship (NSF-GRFP)**, *NC State University*.
Three-Year full time research grant ($138,000)

2016 **University Graduate Fellowship**, *NC State University*, ($4,000).

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*, ($4,000).

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*, ($4,000).

2013 & 2014 **Lisa Persson-Helms Scholarship in Mathematics**, *James Madison University*, ($1,000 both years).

Research

Projects

2022 – **Interactive Optimization and Learning Lab**, *TU Berlin / Zuse Institute Berlin*, Advisor: Sebastian Pokutta.
Research on conditional gradient algorithms and their applications in machine learning.

2017 – 2021 **Construction of Functions from Nonlinear Transformations**, *NCSU*, Advisor: Patrick L. Combettes.
Ph.D. Thesis: developing and applying tools in convex analysis, fixed-point theory, approximation theory, splitting algorithms, and monotone operator theory. 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 A. H. Shehadeh.

Refereeing

2020 **Journal of Approximation Theory (JAT)**.

2020 & 2021 **Journal of Mathematical Analysis and Applications (JMAA)**.

Technical

2013–Present **High-level languages**, `MATLAB/Octave` *(8 years);* `Python 3` *(2 years); Experience with* `FORTRAN` *&* `Julia`.
Developed a new parallel, block-iterative algorithm for efficiently solving nonlinear signal/image/audio recovery problems. Coded projects for convex optimization, finite elements, computational geometry, and differential equations.

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

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

Peer-Reviewed Articles

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)**, to appear. 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**, to appear. 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, The Netherlands, 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).

Highlighted Coursework

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

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

Teaching

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 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.

Extracurriculars

Leadership

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.

Selected Presentations

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
- *Composite Infimal Convolutions*: Invited lecture

Joint Mathematics Meetings Seattle, WA, USA. January 6^{th}, 2016

- *Analyzing Multistationarity in Chemical Reaction Networks*

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