# Robert Baraldi

University of Washington Department of Applied Mathematics Seattle, W.A. 98105 U.S.A.

email: rbaral@sandia.gov url: http://rjbaraldi.github.io

# Areas of specialization

Inverse Problems • Nonsmooth Optimization • Nonconvex Optimization • Trust Regions Methods • PDE-constrained Optimization • Uncertainty Quantification

I am interested in algorithm design and convergence analysis for nonsmooth and nonconvex problems, with applications to seismic inversion, physical/biological modeling, and data analysis.

# **Employment**

John von Neumann Postdoctoral Fellow, Sandia National Lab. **Group**: Optimization and Uncertainty Quantification.

### Education

2021

2021

2017

2016

PHD in Applied Mathematics, University of Washington. **PhD Advisor**: Aleksandr Aravkin.

MSc in Applied Mathematics, University of Washington

BS in Mathematics, NC State University. **Academic Advisor:** Alina Duca. **Research Advisor:** Harvey Thomas Banks.

# **Internship Experience**

### GRADUATE

Argonne National Lab: DOE CSGF Practicum: ADMM and Filter Methods. **Advisor:** Sven Leyffer. Lawrence Berkeley National Lab: DOE CSGF Practicum: Reduced Order Models and Implicit Sampling. **Advisor:** Matthew Zahr.

#### Undergraduate

Student Researcher, Center for Research in Scientific Computation, NC State University. **Advisor:** Harvey Thomas Banks.

Undergraduate Researcher, Cold Spring Harbor Labs. Advisor: Jesse Gillis.
Summer Student Worker, Pfizer Inc. Advisor: Cynthia Musante, Theodore Rieger.

## Grants, honors & awards

#### GRADUATE

Department of Energy Computational Science Graduate Fellowship (DOE CSGF) 2017-2021 National Science Foundation Graduate Research Fellowship (NSF-GFRP, declined) 2017

Department of Applied Math Boeing Fellowship/Top Scholar Award, UW

#### Undergraduate

Mathematical Honors Program 2014 Business and Finance Scholarship 2013 University Honors Program 2012 Goodnight Scholarship 2012 SECU Foundation Scholarship

Dean's List

2013

2021

2019

# Teaching

Teaching Assistant: MATH 126 Calculus 3, University of Washington 2016

Mathematics Tutor: MA 121 Calculus 1, MA 241 Calculus 2, NC State University

### Service

Reviewer: Inverse Problems, SIAM Journal On Scientific Computing, Mathematical Computing 2019-2016-2021

Member of UW Applied Mathematics SIAM Student Chapter

Organizer of UW Applied Mathematics Numerical Analysis Research Club 2016-2019

## Coding Languages

Matlab, Python, Julia, C++ Current

Java, R, PyTorch, Markdown, HTML, OpenMP/MPI

UW-AMO Group, Personal Repos

### Publications & talks

#### IN PREPARATION

Robert Baraldi, Aleksandr Aravkin, Dominique Orban (2021), "A Proximal Quasi-Newton Trust-2021 Region Method for Nonsmooth Regularized Optimization", Under Review - SIAM Journal of Optimization.

Christopher Liu, Donsub Rim, Robert Baraldi, Randall LeVeque (2021), "Comparison of Machine Learning Approaches for TsunamiForecasting from Sparse Observations", Pure and Applied Geophysics (to appear).

#### **PUBLISHED**

Robert Baraldi, Rajiv Kumar, Aleksandr Aravkin (2019), "Basis Pursuit Denoise with Nonsmooth Constraints", IEEE Transactions on Signal Processing 67(22): 5811-5823.

- Robert Baraldi, Carl Ulberg, Rajiv Kumar, Kenneth Creager, Aleksandr Aravkin (2019), "Relaxation Algorithms for matrix completion, with applications to seismic travel-time data interpolation", *Inverse Problems* 35(10):105009.
- Harvey Thomas Banks, Robert Baraldi, Jared Catenacci, Nicholas Myers (2016), "Parameter Estimation Using Unidentified Individual Data in Individual Based Models". *Mathematical Modeling of Natural Phenomena* 11(6):103-121.
- Harvey Thomas Banks, Robert Baraldi, Kevin Flores, Michael Stemkovski (2016), "Validation of a Mathematical Model for Green Algae (*Raphidocelis subcapitata*) Growth and Implications for a Coupled Dynamical System with *Daphnia Magna*", *Applied Sciences* 6(5): 155.
- Kaska Adoteye, Harvey Thomas Banks, Robert Baraldi, John Nardini, W Clay Thompson (2015), "Correlation of Parameter Estimators for Models Admitting Multiple Parametrizations", International Journal of Pure and Applied Mathematics 105(3): 497-522.
- Harvey Thomas Banks, Robert Baraldi, Kevin Flores (2015), "Optimal Design for Minimizing Uncertainty in Dynamic Equilibrium Systems", Eurasian Journal of Mathematical and Computer Applications 3: 20-43.
- Harvey Thomas Banks, Robert Baraldi, Karissa Cross, Christina McChesney, Laura Poag, Emma Thorpe, Kevin Flores (2015), "Uncertainty quantification in modeling HIV viral mechanics.", *Mathematical Biosciences and Engineering* 12(5): 937-964

#### Conference Proceedings

2014

Harvey Thomas Banks, Robert Baraldi, et al. (2014) Uncertainty quantification for a model of HIV-1 patient response to antiretroviral therapy interruptions. *Proceedings of the 2014 American Control* Conference, 2753-2758

#### Conference Presentations

- Robert Baraldi, Aleksandr Aravkin, Dominique Orban (2021), "A Proximal Quasi-Newton Trust-Region Method for Nonsmooth Regularized Optimization", SIOPT 2021 (virtual), July 22.
- Robert Baraldi, Stefan Wild, Sven Lyeffer (2020), "Using Filter Methods to Guide Convergence for ADMM, with Applications to Nonnegative Matrix Factorization Problems", SIAM CSE 2021 (virtual), March 1.
- "Moreau-Yoshida Regularization and First Order Methods with Firedrake", Firedrake 2020, Seattle, WA; February 22.
- "Basis Pursuit Denoise with Nonsmooth Constraints", DOE CSGF Annual Program Review, Arlington, VA; July 14-18.
- "An Acceleration Framework for Parameter Estimation using Implicit Sampling and Adaptive Reduced order Models", SIAM CSE, Spokane WA; 2/25-3/1.
- "Relaxation Algorithms for matrix completion, with applications to seismic travel-time data interpolation", DOE CSGF Annual Program Review, Arlington, VA; July 15-19.
- "Systems Modeling and Data Assimilation in Drug Development", SIAM Annual Life Sciences Conference, Boston, MA; July 11-15.

### TECHNICAL REPORTS

- Robert Baraldi, John Nardini, Emma Thorpe, and Harvey Thomas Banks (2014) The Effects of Parameterization on Inverse Problems, CRSC Technical report CRSC-TR14-07, Raleigh, NC.
- Robert Baraldi, Karissa Cross, Christina McChesney, Laura Poag, Emma Thorpe, Kevin Flores, and Harvey Thomas Banks (2013) "Mathematical Modeling of HCV Viral Kinetics". CRSC Technical

# References

Aleksandr Aravkin - University of Washington: saravkin@uw.edu Dominique Orban - Polytechnique Montréal: dominique.orban@gerad.ca Sven Leyffer - Argonne National Lab: leyffer@mcs.anl.gov Randall LeVeque - University of Washington: rjl@uw.edu

> Last updated: August 13, 2021 • Typeset in  $X_{\overline{1}}I_{\overline{1}}X$  http://rjbaraldi.github.io/cv