ALEXEY MIROSHNIKOV

CURRICULUM VITAE

University of Massachusetts Amherst
Department of Biostatistics and Epidemiology
Amherst, Massachusetts 01003, USA

alexeym@umass.edu
https://www.people.umass.edu/~alexeym
phone: (413) 461-5009

Education

- **UNIVERSITY OF MARYLAND – COLLEGE PARK**
  Ph.D. Mathematics, 2012
  Advisor: Athanasios Tzavaras, Konstantina Trivisa.

- **VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY**
  M.Sc. Mathematics, 2004

- **MOSCOW STATE TECHNOLOGICAL UNIVERSITY STANKIN**
  M.Sc. Computer Science, Honors, 2002
  B.Sc. Mechanical Engineering, Honors, 2000

Appointments

Academic Appointments

- **UNIVERSITY OF MASSACHUSETTS AMHERST**, Amherst, Massachusetts
  Postdoctoral Research Associate. Department of Biostatistics and Epidemiology, 2015 – Present

- **UNIVERSITY OF MASSACHUSETTS AMHERST**, Amherst, Massachusetts
  Visiting Assistant Professor. Department of Mathematics and Statistics, 2012 – 2015

Visiting Appointments

- **INSTITUTE OF APPLIED & COMPUTATIONAL MATHEMATICS – FORTH**, Crete, Greece
  Marie Curie Early Stage Researcher. 2008 and 2009 – 2010

- **ARGONNE NATIONAL LABORATORY,** Chicago, Illinois
  Visiting Position. Mathematics and Computer Science Division. summer 2004

Research Interests

- Analysis of Partial Differential Equations
- Hyperbolic Conservation Laws
- Applications to Materials Science and Nonlinear Solid Mechanics
- Cavitation and Fracture in Hyperelastic Solids
- Mathematical Biology, Structured Population Dynamics
- Statistics and Bioinformatics

Publications

Accepted and Published Papers

1. A. Miroshnikov, Z. Wei, E. Conlon, Parallel Markov Chain Monte Carlo for Non-Gaussian Posterior Distributions, **Stat.** (2015), DOI:10.1002/sta4.97.

2. A. Miroshnikov, K. Trivisa, Stability and Convergence of Relaxation Schemes to Hyperbolic Balance Laws via a Wave Operator, **Journal of Hyperbolic Differential Equations** (2015), Vol. 12, No. 1, 189-219.

3. A. Miroshnikov, A. Tzavaras, On the Construction and Properties of Weak Solutions Describing Dynamic Cavitation, **Journal of Elasticity** (2015), 118-2, 141-185

4. J. Philips, A. Miroshnikov, P.-J. Haest, D. Springael, and E. Smolders, Motile Geobacter Dechlorinators Migrate into a Model Source Zone of Trichloroethene Dense Non-aqueous Phase Liquid: Experimental Evaluation and Modeling, **Journal of Contaminant Hydrology** (2014), 170, 28-38.

5. A. Miroshnikov, E. Conlon, ParallelMCMCcombine: An R Package for Bayesian Methods for Big Data and Analytics, **PLoS ONE** (2014), 9(9):e108425. DOI:10.1371/journal.pone.0108425.

6. A. Miroshnikov, K. Trivisa, Relative Entropy in Hyperbolic Relaxation for Balance Laws, **Communications in Mathematical Sciences** (2014), 12-6, 1017-1043.

7. A. Miroshnikov, A. Tzavaras, Convergence of Variational Approximation Schemes for Elastodynamics with Polyconvex Energy, **Journal of Analysis and its Applications (ZAA)** (2014), 33-1, 43-64.

8. J. Giesselmann , A. Miroshnikov, A. Tzavaras, The problem of Dynamic Cavitation in Nonlinear Elasticity, **Séminaire Laurent Schwartz - EDP et applications (2012-2013)**, Exp. 14, 1- 17.

9. A. Miroshnikov, A. Tzavaras, A Variational Approximation Scheme for Radial Polyconvex Elasticity That Preserves the Positivity of Jacobians, **Communications in Mathematical Sciences** (2012), 10-1, 87-115.

Submitted Papers and Preprints

10. A. Miroshnikov, R. Young, Weak* Solutions I: A New Perspective on Solutions to Systems of Conservation Laws. **Methods and Application of Analysis**, Submitted (2016), `arXiv:1511.02579`.

11. P.-E. Jabin, A. Miroshnikov, R. Young, Cellulose Biodegradation Models; an Example of Cooperative Interactions in Structured Populations, **Journal of Mathematical Biology**. Submitted (2015), `arXiv:1411.7476`.

12. E. Conlon, A. Miroshnikov, E. Savel'ev, BayesSummaryStatLM: An R package for Bayesian Linear Models in Data Science and Big Data, Preprint (2015), `arXiv:1503.00635`.

13. A. Miroshnikov, E. Savel'ev, Asymptotic properties of parallel kernel density estimators. Preprint (2016).

14. A. Miroshnikov, Stability and Convergence of Fully Discrete Variational Schemes for Elastodynamics with a Polyconvex Stored Energy. Preprint (2015).

15. A. Miroshnikov, R. Young, Weak* Solutions II: The Vacuum in Lagrangian Gas Dynamics. Preprint (2015).

Papers in Preparation

16. A. Miroshnikov, M. Steinrücken, Accurate and efficient inference of population size history from genomic sequence data of multiple individuals.

17. A. Miroshnikov, M. Steinrücken, The marginal and joint distributions of the total tree length at loosely linked loci in populations with variable size.

18. A. Miroshnikov, R. Young, Weak* Solutions III: A General Unified Approach for Balance Laws.

19. P.E. Jabin, A. Miroshnikov, R. Young, Stochastic Models in Cellulose Biodegradation; Cooperative Interactions in Structured Populations.

20. I. Kyza, A. Miroshnikov, K. Trivisa, Finite Element Relaxation Schemes to Hyperbolic Balance Laws via a Wave Operator.

Software Publications

21. A. Miroshnikov, E. Conlon, R-package parallelMCMCcombine: Methods for combining subset Markov chain Monte Carlo posterior samples to estimate a posterior density given the full data set (2015), `https://CRAN.R-project.org/web/packages/parallelMCMCcombine/`.

22. E. Savel'ev, A. Miroshnikov, E. Conlon, R-package BayesSummaryStatLM: methods for generating Markov Chain Monte Carlo posterior samples of Bayesian linear regression model parameters that require only summary statistics of data as input (2015), software available from `https://CRAN.R-project.org/web/packages/BayesSummaryStatLM.`

Grants and Awards

- Research Fellow offer by Shanghai Jiao Tong University, Shanghai, China, 2015. Declined.

- Graduate Summer Fellowship, University of Maryland – College Park, 2011, 2012.

- EU EST-project DEASE: MEST-CT-2005-021122. Research Support Funding awarded by Marie Curie Initial Training Network. IACM – FORTH, Crete, Greece, 2008. Re-awarded 2009 – 2010.

- Michael Brin Fellowship, University of Maryland – College Park, 2006 – 2010.

- Kaplan Travel Grant, University of Maryland – College Park, 2011 – 2012.

- AMS Grad Student Travel Grant awarded by AMS, 2011.

- Fellowship of the President of Russian Federation, MSTU Stankin, 2000 and 1998.

- Fellowship of the Government of Russian Federation, MSTU Stankin, 1999.

- Fellowship of the President of Russian Federation, MSTU Stankin, 1998.

Research Experience

- **UNIVERSITY OF MASSACHUSETTS AMHERST**, Massachusetts, Amherst

Postdoctoral Research Associate. Department of Biostatistics & Epidemiology, 2015 – Present.

- Development and implementation of methods for statistical inference of demographic histories from next generation sequencing data.

- **UNIVERSITY OF MASSACHUSETTS AMHERST**, Massachusetts, Amherst
Visiting Assistant Professor. Department of Mathematics, 2012 – 2015.
  - Conducted research in the area relevant to analysis of partial differential equations with the focus on hyperbolic conservation laws and nonlinear solid mechanics. Postdoctoral mentor: Robin Young.

- **THE INSTITUTE FOR COMPUTATIONAL AND EXPERIMENTAL RESEARCH IN MATHEMATICS (ICERM)**, Brown University, Providence, Rhode Island
IdeaLab 2014 participant. Program for Early Career Researchers, August 2014
  - Program: Toward a more realistic model of ciliated and flagellated organisms.

- **INSTITUTE OF APPLIED AND COMPUTATIONAL MATHEMATICS – FORTH**, Greece, Crete
Marie Curie Early Stage Researcher, Spring 2008 – 2010
  - Managed research project, analysis of cavitation phenomena in elastic materials.

- **ARGONNE NATIONAL LABORATORY**, Chicago, Illinois,
Visiting Position, Mathematics and Computer Science Division, Summer 2004
  - Developed parallel computer codes for sensitivity analysis of Large Eddy Simulation models (http://www.icam.vt.edu/ViTLES/gallery/sens_verify.html).

- **VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY**, Blacksburg, Virginia
Research Assistant, Interdisciplinary Center for Applied Mathematics, Summer 2003, Spring 2005
  - Implemented parallel finite element codes for Large Eddy Simulation of Turbulent Flows (http://www.icam.vt.edu/ViTLES/index.html).

Teaching Experience

- **UNIVERSITY OF MASSACHUSETTS AMHERST**, Amherst, Massachusetts, 2012 – 2015
Instructor for:
  - Calculus I, II & III, Calculus I Honors
  - Advanced Calculus
  - ODEs for Scientists and Engineers

- **UNIVERSITY OF MARYLAND – COLLEGE PARK**, College Park, Maryland, 2006 – 2012
  - ODEs for Scientists and Engineers (instructor)
  - College Algebra, Elementary Calculus I & II (discussion leader)

- **VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY**, Blacksburg, Virginia, 2002 – 2006
  - Vector Geometry (discussion leader)
  - Tutoring Lab (post-class mentoring)

- **MOSCOW STATE TECHNOLOGICAL UNIVERSITY STANKIN**, Moscow, Russia, 2001 – 2002
  - Linear Algebra (discussion leader)

Mentoring

- Konstandinos Kotsiopoulos, Ph.D. student, UMass Amherst, 2015 – Present.
- Evgeny Savel'ev, lecturer, Virginia Tech, 2014 – Present.

Invited and Contributed Talks

- British Applied Mathematics Colloquium, University of Oxford, Oxford, UK, 2016.
- SIAM-SEAS Conference. University of Alabama Birmingham, Alabama. 2015.
- SAND Lab seminar, Massachusetts Institute of Technology, Cambridge, Massachusetts. 2014.
- AMS Spring Western Section Meeting, Albuquerque, University of New Mexico. 2014.
- SIAM Conference on Analysis of Partial Differential Equations, Orlando, Florida. 2013.
- PDE seminar, University of Connecticut, Connecticut, 2013.
- PDE seminar, Brown University, Providence, Rhode Island. 2013.
- SIAM Conference on Analysis of PDE, San Diego. Contributed talk. 2011.
- AMS Fall Western Section Meeting, University of Utah. 2011.
- The 3rd Annual Meeting of Marie Curie Initial Training Network DEASE, Institute of Applied and Computational Mathematics, FORTH, Crete, Greece. Contributed talk. 2009.
- PDE Seminar, Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 2008.
- Computational Aeroacoustics Seminar*,* Institute of Mathematical Modeling, Russian Academy of Science, Moscow, Russia. 2005.
- SIAM Conference on Computational Science & Engineering, Orlando, Florida. Contribute Talk. 2005.
- Mathematical Modeling Seminar, Institute of Mathematical Modeling, Russian Academy of Science, Moscow, Russia. 2002.
- The 2nd International Conference of the Young Scientists and Students: Actual Problems of Modern Science. Samara, Russia. Contributed talk. 2001.
- Annual Conference, Moscow State Technological University Stankin, Moscow, Russia. Contributed talk. 2000.

Additional Conferences and Workshops Attended

- Participant of IdeaLab 2014: Program for Early Career Researchers: Toward a more realistic model of ciliated and flagellated organisms, ICERM, Brown University, Providence, Rhode Island, 2014.
- Research Workshop: Hyperbolic Conservation Laws and Infinite-Dimensional Dynamical Systems. Department of Mathematics, University of Pittsburgh, Pittsburgh, Pennsylvania. 2012.

- IMA Workshop: Mathematics at the Interface of Partial Differential Equations, the Calculus of Variations, and Materials Science, IMA, University of Minnesota, 2014.

- SIAM Conference on Mathematical Aspects of Material Science, Philadelphia, Pennsylvania. 2013.

- Conference on Hyperbolic Conservation Laws and Continuum Mechanics in Honor of Constantine Dafermos' 70-th Birthday, Brown University, Providence, Rhode Island. 2011.

- Kinetic Description of Multiscale Phenomena: Modeling, Theory, and Computation. Annual Kinetic FRG meeting, University of Wisconsin-Madison, Madison, Wisconsin. 2011.

- Research Workshop: Hyperbolic Conservation Laws and Fluid Dynamics, University of Parma, Italy. 2010.

Affiliations

- American Mathematical Society (AMS)

- Society for Industrial and Applied Mathematics (SIAM)

Technical Proficiencies

- C, C++, R, MATLAB

- Message Passing Interface (MPI), Automatic Differentiation (ADIC)

- Portable Extensible Toolkit for Scientific Computation (PETSc)

Languages

- Russian (native), English (fluent), Greek (basic knowledge)