Nadejda V. Drenska
Curriculum Vitae

Department of Mathematics, Louisiana State University
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Research Interests

Broad: data science, nonlinear analysis, PDEs, repeated two-person games, graph theory, applications in computer science, financial mathematics, biomedical applications
Specific: semi-supervised learning, online machine learning problems from prediction with expert advice, viscosity solutions of PDEs, optimal control theory, body composition analysis, investment algorithms

Positions Held

Assistant Professor at the Department of Mathematics, Louisiana State University 2023-present
Rufus Isaacs Postdoctoral Fellow at Applied Mathematics and Statistics Department, Johns Hopkins University 2021-2023
MCFAM Postdoctoral Associate at the School of Mathematics, University of Minnesota, Twin Cities 2018-2021

Education

New York University – Courant Institute of Mathematical Sciences 2017
Ph.D. in Mathematics
Thesis advisor Professor Robert V. Kohn,
Thesis topic: A PDE Approach to a Prediction Problem Involving Randomized Strategies
Brown University 2012
B. Sc. in Mathematics with Honors and B. Sc. in Applied Mathematics with Honors, *magna cum laude*
Applied mathematics thesis advisor Bjorn Sandstede,
Thesis topic: Numerical Approximation of Spectra for Localized Oscillatory Structures
Mathematics thesis advisor Jill Pipher,
Thesis topic: Representation of Periodic Data with Fourier Methods and Wavelets

Grant History

National Science Foundation: Machine Learning, Nonlinear PDEs, and Biomedical Applications 2024

Publications and Manuscripts

N. Drenska **Games on deBruijn Graphs and Cycle Means** *(submitted)*
D. Mosaphir, J. Calder, and N. Drenska. **Numerical Solution of a PDE Arising from Prediction with Expert Advice.** *(To appear in The European Journal of Applied Mathematics)*

J. Calder and N. Drenska. **Consistency of Semi-Supervised Learning, Stochastic Tug-of-War Games, and the *p*-Laplacian.** *Active Particles, Volume 4. Modeling and Simulation in Science, Engineering and Technology.* 2024. *https://doi.org/10.1007/978-3-031-73423-6_1*

N. Drenska and J. Calder. **Online Prediction with History-Dependent Experts: The General Case.** *Communications on Pure and Applied Mathematics (CPAM),* 2022, https://doi.org/10.1002/cpa.22049

N. Drenska and R. V. Kohn. **A PDE Approach to the Prediction of a Binary Sequence with Advice from Two History-Dependent Experts.** *Communications on Pure and Applied Mathematics (CPAM),* 2022 https://doi.org/10.1002/cpa.22071

J. Calder and N. Drenska. **Asymptotically Optimal Strategies for Online Prediction with History-Dependent Experts.** *Journal of Fourier Analysis and Applications, **27, article 20**,* 2020, https://doi.org/10.1007/s00041-021-09815-4

N. Drenska and R.V. Kohn. **Prediction with Expert Advice: a PDE Perspective.** *Journal of Nonlinear Science, 30(1): 137-173***,** 2020, https://doi.org/10.1007/s00332-019-09570-3

N. Drenska. **A PDE Approach to a Prediction Problem Involving Randomized Strategies.** PhD thesis**,** New York University*,* 2017

Select Talks

Body Composition: Insights Through Regression and Machine Learning
Math Club, LSU 2024
SIAM Annual Meeting 2024

Nadia Drenska's Machine Learning Journey
The Johns Hopkins University 2024
Louisiana State University 2023

Semi-Supervised Learning with the *p*-Laplacian in Geometric Methods in Machine Learning and Data Analysis
Numerical PDEs: Analysis, Algorithms, and Data Challenges, ICERM, March 2024 2024
International Congress on Industrial and Applied Mathematics 2023

Optimal Investment: Robo-Advising Under Small Changes of Risk Aversion
Joint Mathematics Meetings

A PDE Interpretation of Prediction with Expert Advice
University of Vermont 2023
University of North Carolina, Charlotte 2023
Louisiana State University 2023
University of Maryland, Baltimore County 2023
North Carolina State University 2023
University of Rhode Island 2023
NJIT 2022
Johns Hopkins Applied Mathematics and Statistics Colloquium 2021
JMU Artificial Intelligence and Machine Learning Seminar Series 2021
WPI Colloquium 2021
Joint Mathematics Meetings 2021
OneWorld Machine Learning 2020
LMS-Bath Symposium 2020

Two PDE Approaches to A Problem from Prediction with Expert Advice
IPAM, UCLA 2020
Analysis and Applied Mathematics Seminar, UIC 2020

PDE Approaches to Two Problems from Prediction with Expert Advice

Applied Interdisciplinary Mathematics Seminar, UMichigan 2019
A PDE Approach to Some Randomised-Strategy Two-Player Games
IMA Data Science Seminar, UMN 2018
Materials Working Groups, NYU 2016
A PDE Approach to Prediction with Expert Advice
WPI STEM Faculty Launch, WPI 2016
RPI Applied Math Days, RPI 2016
SIAM Conference on Analysis of PDEs, Scottsdale AZ (awarded SIAM Student Travel Award) 2015
Materials Working Group, NYU 2015

Teaching Experience

Department of Mathematics, Louisiana State University
Instructor for 4997 (Machine Learning) 2025
Instructor for 4020 (Machine Learning Capstone) 2024
Instructor for 4997 (Machine Learning) 2024
Instructor for 2057 (Multidimensional Calculus) 2024
Instructor for 4020 (Machine Learning Capstone) 2023
Applied Mathematics and Statistics Department, Johns Hopkins University
Instructor for Probability and Statistics for the Life Sciences 2021-2023
Instructor for and developer of Freshman Experience Course 'Mathematics in Baseball' 2021
University of Minnesota 2018-2021
Instructor for Multivariable Calculus, PDEs I and II
Instructor and course supervisor for 13 Multivariable Calculus sections 2018
Courant Institute of Mathematical Sciences, NYU 2014, 2015
Teaching Assistant for Calculus I, PDEs, and ODEs
Mathematics Department, Brown University 2009, 2010, 2012
Teaching Assistant and/or grader for Analysis, ODEs, PDEs, Multivariable Calculus
Division of Applied Mathematics, Brown University 2011
Teaching Assistant for Methods of Applied Mathematics I, Methods of Applied Mathematics II
Math Resource Center, Brown University 2009
Tutor for calculus, linear algebra, and methods of applied mathematics (differential equations)

Teaching High School Students

Guest lecturer for the LSU Math Circle 2024
Instructor and co-organizer for Machine Learning Virtual Summer Camp for high school students 2020

Awards and Recognition

Moses A. Greenfield Research Award for Outstanding Interdisciplinary studies, The Courant Institute, NYU 2016
Rohn Truell Prize to an outstanding undergraduate student in the Division of Applied Mathematics, Brown University 2012
Sarah Dyer Barnes Scholarship – Brown University 2011-2012
Henry Parker Manning Prize Examination – 1st prize 2011
Graduated (high school) with Recognition for Outstanding Achievements in the Areas of Mathematics and Physics 2007

National Diploma for Outstanding Achievements from the Minister of Education of Bulgaria 2007
Member of the **Bulgarian Extended National Team** for the International Mathematics Olympiad 2007
Member of the **Bulgarian Extended National Team** for the Balkan Mathematics Olympiad 2005
1st and 2nd prizes at National Physics Competitions in Bulgaria 2005-2006

Service

Guest Editor of Philosophical Transactions of the Royal Society A: 'PDEs in Data Science' 2024-on
Elected Postdoc Representative, Applied Mathematics and Statistics, Johns Hopkins University 2021-present
Co-organized an IMA workshop 'Optimal Control, Optimal Transport, and Data Science' 2020 with Jeff Calder, Dejan Slepcev, and Chai Wu
Co-organized a minisymposium 'Partial Differential Equations in Machine Learning and Data Science' with Jeff Calder at the SIAM Conference on Analysis of PDEs 2017
President of The Courant Student Organization 2014-2015
President of The Department Undergraduate Group of Applied Mathematics 2011-2012