Samir Donmazov

Curriculum Vitae

Research Interests

Applied Mathematics and Mathematical Physics

Analysis and Partial Differential Equations

Inverse Scattering Transform and Asymptotic Analysis

Numerical Methods, Optimization and Machine Learning

Mathematical Modeling in Engineering

Education

2019 - Present **Ph.D. in Mathematics**, *University of Kentucky*, Lexington, KY, USA
Anticipated completion: Summer 2025
Dissertation Title: Long-Time Asymptotics for the Kadomtsev-Petviashvili I Equation with Small Initial Data
Advisor: Prof. Peter A. Perry

2021 **M.Sc. in Mathematics**, *University of Kentucky*, Lexington, KY, USA

2019 **M.Sc. in Physics**, *University of Kentucky*, Lexington, KY, USA

2016 **M.Sc. in Mechanical Engineering**, *Koc University*, Istanbul, Turkey

2013 **B.S. in Astronautical Engineering Engineering**, *Istanbul Technical University*, Istanbul, Turkey

Research Experience

Fall 2019 - Present **Department of Mathematics, University of Kentucky**, *Lexington, KY*

- **Dissertation:** Based on collaborative work with Prof. Peter Perry and Prof. Jiaqi Liu from the Chinese Academy of Sciences.
  - Constructed a weighted L^2 space for initial data ensuring global well-posedness and large-time asymptotics of solutions to the Kadomtsev-Petviashvili I (KP I) equation.
  - Derived leading asymptotic with $\mathcal{O}(t^{-1})$ decay for an oscillatory integral in the region with non-degenerate stationary phase points, using Airy function asymptotics, stationary phase methods, and specific decay and regularity properties of the scattering data.
  - Extracted $t^{-1/2}$ decay from the L^2 norm of the solution to the nonlocal Riemann-Hilbert problem, which is also an oscillatory integral, for non-degenerate stationary phase points and $t^{-1/3}$ decay for the degenerate stationary phase point.

- - Showed $o(t^{-1})$ decay using integration by parts in the region without stationary phase points.
  - - Obtained $\mathcal{O}(t^{-2/3})$ decay in the region with the degenerate stationary phase point.
  - ○ **Qualifying Exam:** Established a one-to-one correspondence between the direct scattering map for the KP I equation and the kernel of the Space-Time scattering operator, supervised by Prof. Peter Perry.
  - ○ **Master's Presentation:** Studied the inverse scattering transform for the KP I equation, under the supervision of Prof. Peter Perry.

Fall 2016 - **Department of Physics & Astronomy, University of Kentucky**, *Lexington,*
2019 *KY*

- ○ **Master's Presentation:** Studied the inverse scattering transform for the KdV equation, under the supervision of Prof. Peter Perry.
- ○ **Summer Research (2017):** Studied the Riemann hypothesis and its connection to quantum mechanics, particularly the Hilbert-Pólya conjecture. Investigated the correspondence between the distribution of the imaginary parts of nontrivial zeroes of the Riemann zeta function and the eigenvalues of a non-Hermitian Hamiltonian $\hat{H}$ such that $i\hat{H}$ has maximally broken $\mathcal{PT}$ symmetry (all eigenvalues of $\hat{H}$ are real), under the supervision of Prof. Anatoly Dymarsky and Dr. Paul de Lange.
  - - Subjects learned: Properties of the Riemann zeta function, distribution of prime numbers, random matrix theory, Gaussian Unitary Ensemble, Montgomery pair correlation conjecture.

Fall 2013 - **Department of Mechanical Engineering, Koc University**, *Istanbul, Turkey*
2016

- ○ Master's Thesis: Analyzed the mechanical properties of blood vessels and surgical conduits using nonlinear optimization techniques under the supervision of Prof. Kerem Pekkan.
  - - Developed a robust constrained nonlinear optimization algorithm for ill-conditioned systems, identifying material parameters of arteries.

Papers in Preparation

- P. P. Chandran, J. A. Varsha, K. Sowmya, S. Methirumangalath, **S. Donmazov**, S. Piskin. Segmentation and 3D reconstruction of the left atrial wall.
- P. Pranith, S. Sriram, K. Sowmya, V. Yeshwanth, **S. Donmazov**, S. Piskin. Segmentation and 3D reconstruction of arteries.
- J. S. Femilda Josephin, T. T. Mirnalinee, J. Bhuvana, G. L. Gayathri, A. R. Fathima Naushin, G. Sowmya, **S. Donmazov**, S. Piskin. Segmentation and 3D reconstruction of the brain's grey matter, white matter and cerebrospinal fluid regions using DL techniques.

Papers Submitted/Under Review

- **S. Donmazov**, J. Liu, P. Perry. Large-time asymptotics for the Kadomtsev-Petviashvili I equation, arXiv:2409.14480 [math.AP], 2024.
- Yildirim, C., Ural, B., Odemis, E., **Donmazov, S.**, Pekkan, K. Computer-generated clinical decision-making in the treatment of pulmonary atresia with intact ventricular septum. *Cardivascular Engineering and Technology.* Submitted on May 5, 2024. Manuscript submission number: CVET-D-24-00083.

Peer-Reviewed Publications

1. **Donmazov, S.**, Piskin, S., Pekkan, K. Review of machine learning techniques in soft tissue biomechanics and biomaterials. *Cardivascular Engineering and Technology* (2024). https://doi.org/10.1007/s13239-024-00737-y
2. **Donmazov, S.**, Piskin, S., Gölcez, T., Kul, D., Arnaz, A., Pekkan, K. Mechanical characterization and torsional buckling of pediatric cardiovascular materials. *Biomechanics and Modeling in Mechanobiology* 23, 845–860 (2024). https://doi.org/10.1007/s10237-023-01809-z
3. Oguz, G. N., Piskin, S., Ermek, E., **Donmazov, S.**, Altekin, N., Arnaz, A., Pekkan, K. (May 3, 2017). Increased energy loss due to twist and offset buckling of the total cavopulmonary connection. ASME. *Journal of Medical Devices.* June 2017; 11(2): 021012. https://doi.org/10.1115/1.4035981
4. **Donmazov, S.**, Piskin, S., Pekkan, K. (June 1, 2015). Noninvasive in vivo determination of residual strains and stresses. ASME. *Journal of Biomechanical Engineering.* June 2015; 137(6): 061011. https://doi.org/10.1115/1.4030071

Conference Publications

1. Piskin, S., Elvan, O., Esen, K., Uzmansel, D., **Donmazov, S.** (November 6, 2023). 3D reconstruction of kidneys in cadever fetus. Acta Medica. November 2023; 54 (Suppl. 2). ISSN: 2147-9488. 23rd National Anatomy Congress, Hacettepe University, Ankara, Turkey, October 11 – 15, 2023.
2. Lashkarinia, S., **Donmazov, S.**, Bozkaya, T. A., Piskin, S., Pekkan, K. Sensitivity of pulmonary outflow patch reconstruction with respect to the native and artificial tissue properties. The 14th International Symposium Computer Methods in Biomechanics and Biomedical Engineering, Tel Aviv, Israel, September 20 – 22, 2016.

Oral Presentations

March 16 – 17 2024 | **Long-time asymptotics for the Kadomtsev-Petviashvili I (KP I) equation**, *Ohio River Analysis Meeting (ORAM 13)*, University of Kentucky, Lexington, KY, USA.

June 15 – 20 2014 | **Theoretical determination of residual strains**, *17th U.S. National Congress on Theoretical and Applied Mechanics*, Michigan State University, East Lansing, MI, USA.

Journal Referee Activities

2023 – 2024 | **Computers in Biology and Medicine**, *Elsevier*

Patents

Pub. Date: 04/21/2016 | **Non invasive determination of soft tissue residual stresses**, *Publication Number: WO 2016/060628*, Application Number: PCT/TR2014/000400.

Workshops and Conferences

June 24 – 27 2024	**SIAM Conference on Nonlinear Waves and Coherent Structures (NWCS24)**, Lord Baltimore Hotel, Baltimore, MD, USA.
July 25 – 29 2022	**2022 University of Minnesota Summer Workshop on Analysis of PDEs**, University of Minnesota, Twin Cities, MN, USA.
April 2 – 3 2022	**Ohio River Analysis Meeting (ORAM 11)**, University of Kentucky, Lexington, KY, USA.
August 16 – 20 2021	**International Workshop on Operator Theory and its Applications**, Lancaster University, virtual meeting.
May 21 – 24 2019	**Workshop on Nonlinear Dispersive Partial Differential Equations and Inverse Scattering**, Fields Insitute, University of Toronto, Toronto, ON, Canada.

Teaching Experience

Department of Mathematics, University of Kentucky, *Lexington, KY*, Instructor of Record

Spring 2024	Calculus IV - Ordinary Differential Equations
Spring 2023	Intro to Contemporary Mathematics
Summer 2021	Calculus II

Department of Mathematics, University of Kentucky, *Lexington, KY*, Recitation Leader

Fall 2023	Calculus II with Life Science Applications
Fall 2022	Calculus I with Life Science Applications
Summer 2022	Elementary Calculus
Spring 2022	Calculus II (MathExcel*)
Fall 2021	Calculus I (MathExcel*)
	*Students in MathExcel sections spend extra time each week in recitation, working on problems in small groups with assistance from the TA and two undergraduate assistants.
Spring 2021	Calculus II
Fall 2020	Calculus III
Summer 2020	Elementary Calculus
Spring 2020	Algebra and Trigonometry for Calculus
Fall 2019	Calculus I

Department of Physics & Astronomy, University of Kentucky, *Lexington, KY*

Spring 2019, Fall 2017 - Spring 2018	Laboratory Leader, General Physics II
Fall 2018, Fall 2016 - Spring 2017	Recitation Leader, General Physics I

Department of Mechanical Engineering, Koc University, *Istanbul, Turkey,* Recitation Leader

Spring 2015 - Spring 2016, Fall 2013	General Physics I
Fall 2014	Machine Design
Spring 2014	Thermodynamics

Awards and Funding

2024, 2023	**Summer Research Fellowship**, *University of Kentucky, Lexington, KY, USA*
2023	**Carl Lee Excellence in Teaching Award**, *University of Kentucky, Lexington, KY, USA*
2022	**Travel Funding by the Institute for Mathematics and Its Applications**, *University of Minnesota, Twin Cities, MN, USA*
2019	**Travel Funding by the Fields Institute for Research in Mathematical Sciences**, *University of Toronto, Toronto, Ontario, Canada*
2014 - 2016	**The Scientific and Technical Research Council of Turkey (TÜBİTAK) Graduate Scholarship**, *Istanbul, Turkey*
2013 - 2014	**Funded by the European Research Council (ERC) Starting Grant**, *Istanbul, Turkey*
2013 - 2015	**The Nippon Foundation Scholarship for Graduate Study**, *Istanbul, Turkey*
2007 - 2011	**The Nippon Foundation Scholarship for Undergraduate Study**, *Istanbul, Turkey*
2005 - 2010	**Turkey Premiership Foundation Scholarship for Undergraduate Study**, *Istanbul, Turkey.*
2005 - 2007	**Istanbul Metropolitan Municipality Foundation Scholarship for Undergraduate Study**, *Istanbul, Turkey*

Computer Skills

Programming

Advanced	MATLAB,
Intermediate	Python, Keras, TensorFlow
Basic	C++, Fortran

Software

Advanced	LaTeX, Wolfram Mathematica, Microsoft Office
Intermediate	ADINA, OpenFOAM, AutoCAD

Operating Systems

Advanced	Windows, Linux