MAMIKON ARMEN GULIAN

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SUMMARY

I am a computational scientist with a background in mathematics, machine learning, and software engineering. I work in teams of scientists, engineers, and policy experts to make an impact in fields ranging from climate and groundwater hydrology to circuit design and national security. I seek to apply mathematical modeling and novel tools from statistics, artificial intelligence, and high-performance computing to solve challenging, multifaceted quantitative problems. My drive and diverse research experience enable me to contribute to fast-paced projects as a leader, analyst, and engineer.

EDUCATION

PhD (2019) and MS (2015) in Mathematics   Brown University, Providence, RI
B.S. (2013) in Mathematics   University of Maryland Baltimore County, Catonsville, MD

EXPERIENCE

Sandia National Laboratories   Livermore, CA
Research & Development, Quantitative Modeling & Software Engineering   September 2021 - Present

- Co-PI on a Sandia-funded project evaluating time series forecasting methods for polar vortex dynamics.
- Contributed to verification and validation of electromagnetic simulations used for the W80-4 system.
- Developed data-driven surrogate models for circuit and climate systems for design and attribution problems.
- Calibrated nonlocal and fractional-order coarse grained models for anomalous subsurface transport.
- Led proposals through all stages of development; served as reviewer for DOE ASCR and Sandia LDRD.

Sandia National Laboratories   Albuquerque, NM
John von Neumann Postdoctoral Fellow in Computational Science   June 2019 – September 2021

- Developed robust machine learning methods that augment limited training data with scientific knowledge.
- Led interns on foundational research projects on nonlocal and fractional-order vector calculus modeling.
- Completed 10 peer-reviewed articles while supported by a competitive and self-directed fellowship.

Brown University   Providence, RI
Deans' Faculty Fellow and Visiting Assistant Professor of Mathematics   January 2019 – June 2019

- Published research on Gaussian processes, anomalous diffusion, fractional calculus, and Monte Carlo methods.
- Developed and taught an advanced undergraduate one-semester course on Scientific Machine Learning.

SELECTED PUBLICATIONS

Co-authored 18 peer-reviewed articles; `h-index` $= 12$; `i10-index` $= 14$; over 950 citations on Google scholar.

- "Solving High-Dimensional Inverse Problems with Auxiliary Uncertainty via Operator Learning with Limited Data", w/ J. Hart, I. Manickam & L. Swiler, *Journal of Machine Learning for Modeling and Computing* (2023).
- "Gaussian Processes Constrained by Boundary Value Problems", w/ A. Frankel & L. Swiler, *Computer Methods in Applied Mechanics and Engineering* (2022).
- "Connections between nonlocal operators: from vector calculus identities to a fractional Helmholtz decomposition", w/ M. D'Elia, T. Mengesha & J. M. Scott, *Fractional Calculus and Applied Analysis*, (2022).
- "Partition of unity networks: deep hp-approximation", w/ K. Lee, N. Trask, R. Patel & E. Cyr, *AAAI-MLPS* (2021).

PROPOSALS FUNDED

- "Improved Subseasonal Forecasting of Extreme Polar Vortices using Machine Learning", SNL-LDRD (2023, \$82,000).
- John von Neumann Fellowship, "Data-Driven Discovery of Physical Laws: Fractional, Nonlocal, and Beyond" (2019).
- Brown University Deans' Faculty Fellowship (Fall 2018 – Spring 2019).
- Brown International Colloquia Grant (2014 & 2015, \$10,000).
- NSF Graduate Research Fellowship (2013).

SKILLS

- **Professional Development:** ESP700 "Introduction to Verification, Validation, and Uncertainty Quantification" at SNL; time series analysis and nonparametric statistics courses through Statistical Horizons.
- **Programming:** Python with numpy, pandas, scikit-learn, statsmodels, Tensorflow, PyTorch, Jax; MATLAB; R; C++ with MPI; Fortran; LaTeX; Bash scripting and general Linux system administration.
- **Software:** Sandia Analysis Workbench, Xyce, Slurm, Paraview, CUBIT, dfnWorks, ABINIT.
- **Communication:** Over 40 invited talks at scientific conferences and seminars; Brown University Research Matters! talk on Fractional Calculus & Hidden Physics (TED-style talk to general audience) with over 8.9K views.
- **Volunteer Work:** DOE Science Bowl; Lecturer for Business Mathematics at Rhode Island Correctional Facilities.