MAZIAR RAISSI

Assistant Professor of Applied Mathematics, University of Colorado Boulder

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https://github.com/maziarraissi/ **https://www.linkedin.com/in/mraissi/**
https://twitter.com/MaziarRaissi **https://www.youtube.com/channel/UCxEiGqJ2e-Mg9oQMjVv6poQ**
https://scholar.google.com/citations?user=dCdmUaYAAAAJ&hl=en

EXPERIENCE

Tenure Track Assistant Professor

University of Colorado Boulder
Department of Applied Mathematics

January 2020 – Ongoing — Boulder, CO

- Doing research (40%), teaching (40%) and providing services (20%) to the department.
- Doing research at the intersection of Probabilistic Machine Learning, Deep Learning, and Data-driven Scientific Computing. My research is funded by NSF, NVIDIA, Lambda Labs, and Australian Research Council.
- Teaching Introduction to Data Science and Machine Learning using GitHub, R, and Python.
- Teaching Applied Deep Learning (Parts I & II) using GitHub, PyTorch, and TensorFlow. This is a two-semester-long course that I designed at CU Boulder.
- Serving on the Undergraduate Committee and the Statistics & Data Science Committee.
- Served as the Colloquium Chair during the Spring 2021 semester, inviting prominent scientists in Artificial Intelligence (AI) from across the globe.
- The Applied Mathematics program at the University of Colorado Boulder is ranked 14 among the best graduate schools in the US.

Senior Software Engineer

NVIDIA Corporation

December 2018 – January 2020 — Santa Clara, CA

- Initiated a data-efficient deep learning product demoed by Jensen Huang (NVIDIA's Founder and CEO) at SC19, the International Conference for High Performance Computing, Networking, Storage, and Analysis.
- Learned about Ray Tracing, DLSS: Deep Learning Super Sampling, Digital Humans, Omniverse, 5G, Massive MIMO, mmWaves, Cloud Computing, Kubernetes, Helm, CI/CD, Jenkins, VLSI, Volta, Turing, DGX, EGX: Platform for Edge Computing, NGC: Platform for Cloud Computing, GFN: GeForce NOW, PhysX, Clara SDK, Genomics, IoT: Internet of Things, Digital Twins, IVA: Intelligent Video Analytics, Autonomous Vehicles, Xavier, Pegasus, Orin, Drive AV, Drive IX, Drive OS, Drive Sim, Constellation, Jarvis: Multimodal AI SDK, NeMo: Neural Modules, Robotics, Isaac SDK, etc.

Research Assistant Professor

Brown University
Division of Applied Mathematics

August 2017 – December 2018 — Providence, RI

- Led two grants (DARPA and AFOSR) on machine learning, deep learning, and data-driven scientific computing.
- Released more that 15 open-source C++, Cuda, Python and Matlab projects on GitHub.

Postdoctoral Research Associate

Brown University
Division of Applied Mathematics

January 2016 – August 2017 — Providence, RI

- Conceived the original ideas of physics-informed machine learning and deep learning. On March 30, 2021 I was issued patent number 10,963,540 by the United States Patent and Trademark Office for the innovative ideas of "Physics Informed Learning Machine".
- The Applied Mathematics program at Brown University is ranked 4 among the best graduate schools in the US.

Quantitative Research Associate

World Bank Group
International Finance Corporation (IFC)
Treasury Quantitative Analysis

February 2015 – August 2015 | Washington, DC

- Developed C++ codes to merge Summit, a multi-currency professional investment accounting system, and an in-house derivative pricing toolbox.
- Worked with Bloomberg Terminal, Numerix, and Summit on a daily basis.

EDUCATION

Ph.D. in Applied Mathematics & Statistics, and Scientific Computation
M.A. in Economics

University of Maryland College Park

2013 – 2016 | College Park, MD

- Dissertation Topic: Conic Economics
- Advisor: Dilip Madan
- The Applied Mathematics program at the University of Maryland College Park is ranked 13 among the best graduate schools in the US.
- The Economics program at University of Maryland College Park is ranked 21 among the best graduate schools in the US.
- Grade Point Average: 3.46 out of 4
- Courses: Advanced Macroeconomics I, Computational Methods in Macroeconomics, Econometrics I & II & III, Macroeconomic Analysis I & II, Microeconomic Analysis I & II, Numerical Methods in Partial Differential Equations, Seminar in Financial Theory, Advanced Numerical Analysis

Ph.D. in Applied Mathematics

George Mason University

2011 – 2013 | Fairfax, VA

- Dissertation Topic: Multi-fidelity Stochastic Collocation Methods
- Advisor: Padmanabhan Seshaiyer
- Grade Point Average: 3.97 out of 4
- Courses: Advanced Methods in Applied Mathematics, Banach Spaces of Analytic Functions, Complex Functions, Computational Analysis of Social Complexities - Agent-based Computing in Social Sciences, Fourier Analysis, Mathematical (Financial) Derivatives, Mathematics of Finite Element Method, Numerical Linear Algebra, Stochastic Finite Elements, Stochastic Processes

M.S. in Applied Mathematics

Isfahan University of Technology

2008 – 2011 | Isfahan, Iran

- Dissertation Topic: Numerical Continuation of Connecting Orbits of Maps in Matlab
- Advisors: Reza Mokhtari and Reza Khoshsiar Ghaziani
- Grade Point Average: 17.53 out of 20
- Courses: Dynamical Systems I & II, Nonlinear Functional Analysis, Nonlinear PDEs, Numerical Analysis I & II, Numerical Solutions to Ordinary Differential Equations, Numerical Solutions to Partial Differential Equations, Real Analysis

B.S. in Applied Mathematics

University of Isfahan

2004 – 2008 | Isfahan, Iran

- Grade Point Average: 17.30 out of 20
- Courses: Algebra I & II, Calculus I & II, Data Structures and Algorithms, Database Design, Discrete Mathematics, Fundamentals of Economics, Fundamentals of Mathematics, Linear Algebra I & II, Math Softwares, Mathematical Analysis I & II, Operations Research, Optimization, Partial Differential Equations, Probability and Statistics I & II, Advanced Programming, Differential Equations

PUBLICATIONS

Dissertations

[1] Maziar Raissi. "Conic Economics". PhD thesis. University of Maryland, College Park, 2016. URL: http://bit.ly/2hkIHZ1.

[2] Maziar Raissi. "Multi-fidelity Stochastic Collocation". PhD thesis. George Mason University, 2013. URL: http://bit.ly/2xggpcn.

Journal Articles

[3] Ehsan Haghighat, Maziar Raissi, Adrian Moure, Hector Gomez, and Ruben Juanes. "A physics-informed deep learning framework for inversion and surrogate modeling in solid mechanics". In: *Computer Methods in Applied Mechanics and Engineering* 379 (2021), p. 113741. URL: https://bit.ly/3nInVEP.

[4] Maziar Raissi, Alireza Yazdani, and George Em Karniadakis. "Hidden Fluid Mechanics: Learning Velocity and Pressure Fields from Flow Visualizations". In: *Science* (2020). URL: https://bit.ly/2SyVVpa.

[5] Alireza Yazdani, Lu Lu, Maziar Raissi, and George Em Karniadakis. "Systems biology informed deep learning for inferring parameters and hidden dynamics". In: *PLoS computational biology* 16.11 (2020), e1007575. URL: https://bit.ly/2Rk33aC.

[6] Mamikon Gulian, Maziar Raissi, Paris Perdikaris, and George Karniadakis. "Machine Learning of Space-fractional Differential Equations". In: *SIAM Journal on Scientific Computing* 41.4 (2019), A2485–A2509. URL: https://bit.ly/396B3LX.

[7] Maziar Raissi, Hessam Babaee, and Peyman Givi. "Deep Learning of Turbulent Scalar Mixing". In: *Phys. Rev. Fluids* 4 (12 Dec. 2019), p. 124501. URL: https://bit.ly/35RYDu3.

[8] Maziar Raissi, Hessam Babaee, and George Em Karniadakis. "Parametric Gaussian Process Regression for Big Data". In: *Computational Mechanics* 64.2 (2019), pp. 409–416. URL: https://bit.ly/34UsvVg.

[9] Maziar Raissi, Paris Perdikaris, and George E Karniadakis. "Physics-Informed Neural Networks: A Deep Learning Framework for Solving Forward and Inverse Problems Involving Nonlinear Partial Differential Equations". In: *Journal of Computational Physics* 378 (2019), pp. 686–707. URL: https://bit.ly/2SmVsqq.

[10] Maziar Raissi, Niloofar Ramezani, and Padmanabhan Seshaiyer. "On Parameter Estimation Approaches for Predicting Disease Transmission through Optimization, Deep Learning and Statistical Inference Methods". In: *Letters in Biomathematics* (2019), pp. 1–26. URL: https://bit.ly/2Ss3sXf.

[11] Maziar Raissi. "Deep Hidden Physics Models: Deep Learning of Nonlinear Partial Differential Equations". In: *Journal of Machine Learning Research* 19.25 (2018), pp. 1–24. URL: http://jmlr.org/papers/v19/18-046.html.

[12] Maziar Raissi and George Em Karniadakis. "Hidden Physics Models: Machine Learning of Nonlinear Partial Differential Equations". In: *Journal of Computational Physics* 357 (2018), pp. 125–141. URL: https://bit.ly/2D7oi4p.

[13] Maziar Raissi, Paris Perdikaris, and George Em Karniadakis. "Numerical Gaussian Processes for Time-Dependent and Nonlinear Partial Differential Equations". In: *SIAM Journal on Scientific Computing* 40.1 (2018), A172–A198. URL: https://bit.ly/2K5rIXL.

[14] Maziar Raissi and Padmanabhan Seshaiyer. "Application of Local Improvements to Reduced-order Models to Sampling Methods for Nonlinear PDEs with Noise". In: *International Journal of Computer Mathematics* 95.5 (2018), pp. 870–880. URL: http://bit.ly/2jLMsLR.

[15] Paris Perdikaris, Maziar Raissi, Andreas Damianou, Neil D. Lawrence, and George Em Karniadakis. "Nonlinear Information Fusion Algorithms for Data-efficient Multi-fidelity Modelling". In: *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 473.2198 (2017). URL: http://bit.ly/2w7HJWx.

[16] Maziar Raissi, Paris Perdikaris, and George Em Karniadakis. "Inferring Solutions of Differential Equations using Noisy Multi-fidelity Data". In: *Journal of Computational Physics* 335 (2017), pp. 736–746. URL: http://bit.ly/2jMANfP.

[17] Maziar Raissi, Paris Perdikaris, and George Em Karniadakis. "Machine Learning of Linear Differential Equations using Gaussian Processes". In: *Journal of Computational Physics* 348 (2017), pp. 683–693. URL: http://bit.ly/2fC9ccs.

[18] Paul Cashin, Kamiar Mohaddes, Maziar Raissi, and Mehdi Raissi. "The Differential Effects of Oil Demand and Supply Shocks on the Global Economy". In: *Energy Economics* 44 (2014), pp. 113–134. URL: http://bit.ly/2yrqv88.

[19] Maziar Raissi and Padmanabhan Seshaiyer. "A Multi-fidelity Stochastic Collocation Method for Parabolic Partial Differential Equations with Random Input Data". In: *International Journal for Uncertainty Quantification* 4.3 (2014). URL: http://bit.ly/2yryAJR.

Preprints

[20] Maziar Raissi. "Forward-Backward Stochastic Neural Networks: Deep Learning of High-dimensional Partial Differential Equations". In: *arXiv preprint arXiv:1804.07010* (2018). URL: https://arxiv.org/abs/1804.07010.

[21] Maziar Raissi, Paris Perdikaris, and George Em Karniadakis. "Multistep Neural Networks for Data-driven Discovery of Nonlinear Dynamical Systems". In: *arXiv preprint arXiv:1801.01236* (2018). URL: https://arxiv.org/abs/1801.01236.

[22] Maziar Raissi and George Karniadakis. "Deep Multi-fidelity Gaussian Processes". In: *arXiv preprint arXiv:1604.07484* (2016). URL: https://arxiv.org/abs/1604.07484.

RESEARCH INTERESTS

Within the field of applied mathematics, my research interests span the areas of probabilistic machine learning, deep learning, data-driven scientific computing, multi-fidelity modeling, uncertainty quantification, big data analysis, economics, and finance.

Watch my talk: https://bit.ly/2MkU2J2

PATENTS & AWARDS

Physics Informed Learning Machine
U.S. Patent Number 10,963,540, March 30, 2021.

Office of Provost Fellowship
George Mason University

Ranked first
National university entrance exam for PhD degree in Applied Mathematics in 2011 among thousands of participants.

RECENT IN-PERSON TALKS

- Department of Mechanical Engineering, Rice University, February 19, 2020, Houston, TX, USA.
- Institute for Pure & Applied Mathematics, UCLA, October 29, 2019, Los Angeles, CA, USA. Video:
- The Monterey Data Conference, August 8, 2019, Monterey, CA, USA.
- Computational Science Research Center, June 1–10, 2019, Beijing, China.
- Jack Baskin School of Engineering, University of California Santa Cruz, April 22, 2019, Santa Cruz, CA, USA.
- Center of Mathematical Sciences and Applications, Harvard University, April 17, 2019, Cambridge, MA, USA.
- School of Earth, Energy & Environmental Sciences, Stanford University, April 1, 2019, Stanford, CA, USA.
- Swanson School of Engineering, University of Pittsburgh, February 21, 2019, Pittsburgh, PA, USA.
- Department of Mathematics, University of South Carolina, January 24, 2019, Columbia, SC, Canada.
- ICERM Workshop on Scientific Machine Learning, January 28–30, 2019, Providence, RI, USA. Video:
- School of Mathematical and Statistical Sciences, Arizona State University, January 17, 2019, Tempe AZ, USA.
- Department of Applied Mathematics, University of Waterloo, January 7, 2019, Waterloo, ON, Canada.
- Department of Mechanical Engineering, Massachusetts Institute of Technology, November 30, 2018, Cambridge, MA, USA.
- Department of Mathematics and Statistics, University of Maryland, October 5, 2018, Baltimore County, MD, USA.
- NVIDIA, September 27, 2018, Santa Clara, CA, USA.
- Schlumberger-Doll Research Center, September 6, 2018, Cambridge, MA USA.
- The 13th World Congress in Computational Mechanics, July 22–27, 2018, New York City, NY, USA.
- SIAM Annual Meeting, July 9–13, 2018, Portland, OR, USA.
- School of Computational Science and Engineering, Georgia Tech, February 8, 2018, Atlanta, GA, USA.
- DARPA EQUiPS PI Review Meeting, February 12–13, 2018, Arlington, VA, USA.
- School of Natural Sciences, University of California, January 26, 2018, Merced, CA, USA.
- Michigan Institute for Computational Discovery and Engineering, University of Michigan, December 4, 2017, Ann Arbor, MI, USA.
- Schlumberger-Doll Research Center, October 5, 2017, Cambridge, MA USA.
- Department of Mechanical Engineering, Massachusetts Institute of Technology, September 14, 2017, Cambridge, MA, USA.
- DARPA EQUiPS PI Review Meeting, August 16–18, 2017, Arlington, VA, USA.
- SIAM Annual Meeting, July 10–14, 2017, Pittsburgh, PA.
- ICERM Workshop on Probabilistic Scientific Computing, June 5–9, 2017, Providence, RI, USA. Video:
- DARPA EQUiPS PI Review Meeting, March 28–30, 2017, Austin, TX, USA.
- DARPA EQUiPS PI Review Meeting, September 21–23, 2016, Arlington, VA, USA.
- DARPA EQUiPS PI Review Meeting, March 22–24, 2016, Stanford University, CA, USA.

TEACHING

- Applied Deep Learning (Part II) using GitHub, PyTorch, and TensorFlow, University of Colorado Boulder, Spring 2021.
- Applied Deep Learning (Part I) using GitHub, PyTorch, and TensorFlow), University of Colorado Boulder, Fall 2020.
- Introduction to Data Science and Machine Learning using GitHub, R, and Python, University of Colorado Boulder, Fall 2020.
- Introduction to Data Science and Machine Learning using GitHub, R, and Python, University of Colorado Boulder, Spring 2019.
- Gaussian Processes and Deep Learning, Tutorial, Brown University, Spring 2017.
- Introduction to Linear Algebra, Teaching Assistant, University of Maryland – College Park, Fall 2015.
- Calculus 3, Teaching Assistant, University of Maryland – College Park, Fall 2014.
- Research Experience for Undergraduate Students, Graduate Mentor, University of Maryland – College Park, Summer 2014.
- Linear Algebra for Scientists and Engineers, Teaching Assistant, University of Maryland – College Park, Spring 2014.
- Differential Equations, Teaching Assistant, University of Maryland – College Park, Fall 2013.
- Research Experience for Undergraduate Students, Graduate Mentor, George Mason University, Summer 2012 & 2013.

SKILLS

Python (NumPy/SciPy)
Scikit-learn & StatsModels
R
Matlab

Object Oriented Programming
C & C++ & Cuda
Parallel Computing (MPI)

Deep Learning
Tensorflow & Keras
PyTorch & Autograd
MXNet, Chainer, JAX, ONNX, Hugging Face Transformers, OpenAI Gym, etc.

Big Data
Apache Spark (Scala)

Mathematica
Fortran
Maple

SQL
Pandas
Stata & EViews
VBA
SAS & SPSS

Flask
Heroku
NLTK & spaCy

Bloomberg
Numerix
Summit

LANGUAGES

Farsi (Persian)
English
French
German

REFERENCES

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Division of Applied Mathematics, Brown University

Michael Triantafyllou
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Dilip Madan
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Department of Finance, University of Maryland College Park

Padmanabhan Seshaiyer
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Department of Mathematical Sciences, George Mason University

Peyman Givi
@ peg10@pitt.edu
Department of Mechanical Engineering, University of Pittsburgh

Mark Girolami
@ mag92@cam.ac.uk
Department of Engineering, University of Cambridge