Jonathan Colen

Curriculum Vitae

Contact

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Experience

Research Assistant Professor Old Dominion University 2023-Present
Joint Institute on Advanced Computing for Environmental Studies
Hampton Roads Biomedical Research Consortium

Graduate Research Assistant University of Chicago 2018-2023
Department of Physics
James Franck Institute
Center for Living Systems
Kadanoff Center for Theoretical Physics

Undergraduate Research Assistant University of Virginia 2016-2018
Department of Physics
Department of Radiation Oncology

Intern

US Naval Research Laboratory	Astrophysics and Applications	2018
NASA Langley Research Center	Hypersonic Airbreathing Propulsion	2017
The MITRE Corporation	Center for Advanced Aviation Systems Development	2013-2015

Ranger Philmont Scout Ranch 2015-2016

Education

Ph.D. in Physics 2018-2023
University of Chicago
Thesis advisor: Vincenzo Vitelli
Thesis title: Learning physical models of biological materials

S.M. in Physics 2018-2019
University of Chicago

B.S. in Computer Science 2014-2018
University of Virginia, With Highest Distinction

Publications

[14] C. Huchthausen, M. Shi, G. Andrade de Sousa, **J. Colen**, E. Shelley, J. Larner, and K. Wijesooriya. Evaluation of radiomic feature harmonization techniques for benign and malignant pulmonary nodules. *ArXiv*:2412.16758, 2024. In Revision.

[13] K. Rajput, M. Schram, A. Edelen, **J. Colen**, A. Kasparian, R. Roussel, A. Carpenter, H. Zhang, and J. Benesch. Harnessing the power of gradient-based simulations for multi-objective optimization in particle accelerators. *ArXiv*:2411.04817, 2024. In Review.

[12] **J. Colen***, A. Poncet*, D. Bartolo, and V. Vitelli. Interpreting Neural Operators: How Nonlinear Waves Propagate in Nonreciprocal Solids. *Physical Review Letters*, 133(10):107301, 2024.

[11] **J. Colen***, C. Nguyen*, S. W. Liyanage, E. Aliotta, J. Chen, C. Alonso, K. Romano, S. Peach, T. Showalter, P. Read, J. Larner, and K. Wijesooriya. Predicting radiation-induced immune suppression in lung cancer patients treated with stereotactic body radiation therapy. *Medical Physics*, 51(9):6485–6500, 2024.

[10] S. A. Redford, **J. Colen**, J. L. Shivers, S. Zemsky, M. Molaei, C. Floyd, P. V. Ruijgrok, V. Vitelli, Z. Bryant, A. R. Dinner, and M. L. Gardel. Motor crosslinking augments elasticity in active nematics. *Soft Matter*, 20(11):2480–2490, 2024.

[9] M. S. Schmitt*, **J. Colen***, S. Sala, J. Devany, S. Seetharaman, A. Caillier, M. L. Gardel, P. W. Oakes, and V. Vitelli. Machine learning interpretable models of cell mechanics from protein images. *Cell*, 187(2):481–494.e24, 2024.

[8] M. Lefebvre*, **J. Colen***, N. Claussen*, F. Brauns, M. Raich, N. Mitchell, M. Fruchart, V. Vitelli, and S. J. Streichan. Learning a conserved mechanism for early neuroectoderm morphogenesis. *BioRxiv*:2023.12.22.573058, 2023. In Revision.

[7] D. S. Seara, **J. Colen**, M. Fruchart, Y. Avni, D. Martin, and V. Vitelli. Sociohydrodynamics: data-driven modelling of social behavior. *ArXiv*:2312.17627, 2023. In Revision.

[6] E. B. Kolomeisky, **J. Colen**, and J. P. Straley. Negative group velocity and Kelvin-like wake pattern. *Physical Review B*, 105(5):054509, 2022.

[5] J. Luo, S. Ransom, P. Demorest, P. S. Ray, A. Archibald, M. Kerr, R. J. Jennings, M. Bachetti, R. v. Haasteren, C. A. Champagne, **J. Colen**, C. Phillips, J. Zimmerman, K. Stovall, M. T. Lam, and F. A. Jenet. PINT: A Modern Software Package for Pulsar Timing. *The Astrophysical Journal*, 911(1):45, 2021.

[4] **J. Colen***, M. Han*, R. Zhang, S. A. Redford, L. M. Lemma, L. Morgan, P. V. Ruijgrok, R. Adkins, Z. Bryant, Z. Dogic, M. L. Gardel, J. J. de Pablo, and V. Vitelli. Machine learning active-nematic hydrodynamics. *Proceedings of the National Academy of Sciences*, 118(10):e2016708118, 2021.

[3] **J. Colen** and E. B. Kolomeisky. Kelvin–Froude wake patterns of a traveling pressure disturbance. *European Journal of Mechanics - B/Fluids*, 85:400–412, 2021.

[2] J. Luo, S. Ransom, P. Demorest, R. van Haasteren, P. Ray, K. Stovall, M. Bachetti, A. Archibald, M. Kerr, **J. Colen**, and F. Jenet. PINT: High-precision pulsar timing analysis package. *Astrophysics Source Code Library*, ascl:1902.007, 2019.

[1] J. Yang, **J. Colen**, J. Liu, M. C. Nguyen, G.-w. Chern, and D. Louca. Elastic and electronic tuning of magnetoresistance in MoTe2. *Science Advances*, 3(12):eaao4949, 2017.

Invited talks and guest lectures

Biomedical Research & Innovation Center Seminar. Oct 21, 2024. Jefferson Lab, Newport News, VA.

School of Data Science Colloquium. May 13, 2024. Old Dominion University, Norfolk, VA.

HRBRC Spring Seminar Series. May 9, 2024. Portsmouth, VA.

JFI Emerging Frontiers Seminar. November 15, 2021. University of Chicago, Chicago, IL.

Conference submissions and presentations

Explainable physics-based constraints on reinforcement learning for accelerator controls. 5th ICFA Beam Dynamics Mini-Workshop on Machine Learning for Particle Accelerators. April 8-11, 2025. Geneva, Switzerland.

Learning how genetic patterns and protein dynamics govern morphogenesis. APS March Meeting. March 20-22, 2023. Las Vegas, NV.

Machine learning approaches to biomechanics. APS March Meeting. March 14-18, 2022. Chicago, IL.

Machine learning active-nematic hydrodynamics. APS March Meeting. March 15-19, 2021. Virtual.

Photon vs proton therapy comparison of clinically significant dosimetric parameters that lead to radiation induced toxicity in Lung SBRT. Joint AAPM COMP Meeting. July 12-16, 2020. Virtual

Modeling lymphocyte loss following radiation therapy treatments: A machine learning approach. International Conference on the Use of Computers in Radiation Therapy. June 17-21, 2019. Montreal, Canada.

Clinical significance of treatment related lymphopenia in lung SBRT and a method to ameliorate them. ESTRO 38. April 26-30, 2019. Milan, Italy.

Simulating lymphotoxicity in lung SBRT: treatment planning considerations. MAC-AAPM Fall Annual Meeting. October 5-6, 2018. Richmond, VA.

Teaching

University of Chicago Teaching Assistant

Environmental Data Science Bootcamp	Fall 2020, 2021
Soft Matter Physics	Spring 2021
Modern Physics	Fall 2019
Introduction to Mathematical Methods of Physics	Spring 2019
Honors Mechanics	Fall 2018

University of Virginia Teaching Assistant

Introduction to Condensed Matter Physics	Fall 2017
General Physics I: Mechanics	Spring 2017
Widely Applied Physics	Fall 2016

Modern Physics Fall 2016

Patents

System, Method and Computer Readable Medium to Estimate the Post-Treatment Blood Cell Sub Type Count in Patients Treated via Radiation Therapy. US 2021/0335496 A1. Patent pending

Service

Faculty Search Committee ODU AI-Infused Systems for Health and Medicine, 2024-2025

Seminar Committee, Hampton Roads Biomedical Research Consortium 2023-Present

Journal Referee, Science Advances, Biophysical Journal, PRX Life

Conference Reviewer, Design Automation Conference, 2025

Grant Reviewer, Climate Change AI Innovation Grants program, 2024

Professional activities

ICFA Beam Dynamics Mini-Workshop on Machine Learning for Particle Accelerators, CERN, April 8-11, 2025.

Machine Learning and the Physical Sciences, NeurIPS 2023, December 15, 2023.

AI+Science Summer School, University of Chicago Data Science Institute, August 8-12, 2022.

Learning Dynamical Models from Biophysical Data, Aspen Center for Physics, June 19-26, 2022.

Princeton Deep Learning Theory Summer School, July 27-August 4 2021.

Honors

Bascom S. Deaver Scholarship UVA Department of Physics 2017

L. Frazier Fall Scholarship UVA School of Engineering and Applied Sciences 2017

Outstanding Undergraduate Research Award University of Virginia 2017

Intermediate Honors University of Virginia 2016

Demonstrated Innovation Award The MITRE Corporation 2013