Takumi Matsuzawa, PhD

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EDUCATION

The University of Chicago (Chicago, IL)   2016 - Aug 2023
Doctor of Philosophy, Physics, Advisor: Dr. William T.M. Irvine
The University of Chicago (Chicago, IL)   2016-17
Master of Science, Physics, Advisor: Dr. Sidney R. Nagel
Kalamazoo College (Kalamazoo, MI)   2013-16
Bachelor of Arts, Physics with honors and Chemistry, *summa cum laude*

RESEARCH EXPERIENCE

Cornell University (Ithaca, NY) *Schmidt Science Postdoctoral Fellow*   Sep 2023 - Present
- Directing laboratory research investigating the thermodynamic effects of small molecules on biomolecular condensates

The University of Chicago (Chicago, IL) *Graduate Researcher*   Sep 2016 - Aug 2023
- Streamlined data analysis by developing a pipeline that condensed terabytes of image data into gigabytes, significantly cutting down processing time from days to hours
- Authored and maintained a Python library (over 25,000 lines) for scientific research, enabling advanced 3D/4D flow analysis from visualization to statistical evaluations.
- Developed a deep learning model for accurately predicting flow patterns from sequential image data
- Designed a cutting-edge data collection system using high-speed cameras and lasers for detailed fluid dynamics studies, securing over $250k in funding from the Army Research Office
- Communicated scientific ideas to a variety of audiences from experts to the general public, recognized by multiple awards from the American Physics Society and the University of Chicago
- Guided graduate and undergraduate students on various projects, including machine learning applications in vortex dynamics and advanced 4D data visualization techniques

Fermi National Accelerator Laboratory (Batavia, IL) *Lee Teng Fellow*   Jun - Oct 2015
- Performed particle physics simulations in C++ (Geant4) to assess the merits of the proposed proton beamline upgrade for the Mu2e experiment, one of the flagship projects by the Department of Energy

SKILLS

Programming	Python (including NumPy, SciPy, Pandas, OpenCV, PyTorch, and Scikit-learn), Java, C, MATLAB, SQL, shell scripting, CUDA, OpenGL
Software & Tools	Git, Mathematica, LAMMPS, Blender, Houdini, LaTeX
Data analysis	Machine learning, image processing, 2D/3D computer vision, object tracking, Monte Carlo methods, parallel and distributed computing
Operating Systems	Linux, Mac, Windows
Languages	English (fluent), Japanese (native) and German (conversational)

SELECTED AWARDS

Schmidt Science Fellowship   2024
- Awarded to outstanding early-career scientists who drive scientific innovation and interdisciplinary research, nominated by the university and selected through a highly competitive global search process
Grainger Foundation Fellowship for Outstanding Research in Experimental Physics   2022
- Awarded for demonstrating excellent research ability in experimental physics

- Awarded for conducting original research that includes [beguiling imagery](#)

PUBLICATIONS

T. Matsuzawa, M. Zhu, W.T.M. Irvine, and N. Goldenfeld. Decay and propagation of confined turbulence (In preparation)

T. Matsuzawa, N. P. Mitchell, S. Perrard, and W. T. M. Irvine, Turbulence through sustained vortex ring collisions, *Phys. Rev. Fluids* **8**, 110507 (2023)

T. Matsuzawa, N. P. Mitchell, S. Perrard, and W.T.M. Irvine, Creation of an isolated turbulent blob fed by vortex rings, *Nat. Phys.* **19**, 1193–1200 (2023)

Z. Zhao, **T. Matsuzawa**, W.T.M. Irvine, M. Maire, G. Kindlmann, Reevaluating Machine Learning Models with NERO: Non-Equivariance Revealed on Orbits. D. Archambault, R. Bujack, and T. Schreck, editors, *EuroVis 2023 - Full Papers*, The Eurographics Association, 2023.

T. Matsuzawa, L. Zalányi, T. Kiss and P. Érdi, Multi-scale modeling of altered synaptic plasticity related to Amyloid β effects, Neural Networks, 2017.

P. Érdi, **T. Matsuzawa**, T. John, T. Kiss and L. Zalányi: Connecting Epilepsy and Alzheimer's Disease: Modeling of Normal and Pathological Rhythmicity and Synaptic Plasticity Related to Amyloid β Effects. In: P. Érdi, B.S. Bhattacharya and A. Cochran (Eds.): Computational Neurology and Psychiatry (Springer Series in Bio-/Neuroinformatics) 1st ed. 2017 Edition, pp 93-119.

SELECTED PRESENTATIONS (4 OUT OF 21)

American Physical Society Division of Fluid Dynamics, *Talk*   Nov 2023
"Death and propagation of confined turbulence"
American Physical Society Division of Fluid Dynamics, *Talk*   Nov 2022
"Creation of an isolated turbulent blob sustained by vortex ring injection"
Simons Foundation, Turbulence Across Vast Scales, *Poster*   Dec 2019
"Turbulence through vortex ring collisions"
Fermi National Accelerator Laboratory, *Talk and Poster*   Aug 2015
"Targeting studies of the second-generation Mu2e experiment"

LEADERSHIP AND SCIENTIFIC ACTIVITIES

Management
- Organize a weekly meeting of the laboratory by scheduling presenters and providing feedback
- Spearheaded IT operations within the laboratory, including the maintenance of databases, implementation of security measures, and management of the lab's wiki, ensuring efficient data integrity
- Led scientific collaborations, leveraging interdisciplinary approaches to advance research initiatives.
- Trained and mentored eight students, enhancing their research skills and scientific inquiry at the University of Chicago and Cornell University.

Teaching
- Instructed 12 physics courses in total at the University of Chicago and Kalamazoo College by leading weekly discussion sections, supervising experiments, and grading assignments and exams

Outreach
- Dedicated weekly support to a child with autism spectrum disorder, providing educational assistance tailored to their learning needs
- Engaged the public in science through conducting physics demonstrations at over 10 outreach events, making science accessible and enjoyable