Takumi Matsuzawa

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EDUCATION

The University of Chicago (Chicago, IL) 2016 - Jan 2023(expected)
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

The University of Chicago (Chicago, IL) *Graduate Researcher* Sep 2016-Present

- Engineered an innovative data acquisition system involving multiple high-speed cameras and a laser for volumetric analyses of complex fluid phenomena (Funded by Army Research Office over $500k)
- Created a data pipeline to process TB of raw image data into a few GB for statistical analyses, which reduced the processing time from several days to a few hours
- Built and maintained a Python library (>20k lines) to analyze 3D/4D flow single-handedly
- Developed a deep learning model to predict the underlying flows from an image time series
- Mentored several graduate and undergraduate students for experimental and computational projects including machine-learning vortex dynamics and 4D data visualization

Kalamazoo College (Kalamazoo, MI) *Research Assistant* Sep 2013 - Sep 16

- Constructed a mathematical model about synaptic plasticity of Alzheimer's patients using MATLAB, which resulted in academic paper and a book chapter
- Implemented Monte Carlo and molecular dynamics simulations in Java to study how a crystal melts

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 Department of Energy

KEK- High Energy Accelerator Research Organization (Japan) *Visiting Researcher* Jul 2014

- Conducted the laser break-down spectroscopy to evaluate composition of alloys

SKILLS

Programming	Python (including NumPy,SciPy, Pandas, OpenCV, PyTorch, and Scikit-learn), Java, C, MATLAB, shell scripting, HTML, CSS
Software & Tools	Mathematica, Root, LabView, LAMMPS, Blender, Houdini, LaTeX, Git
Data analysis	Image processing, computer vision, machine learning; principal component analysis, Monte Carlo methods, parallel and distributed computing
Operating Systems	Linux, Mac, Windows
Techniques	Prototyping, 3D printing, machining, CAD, 2D & 3D velocimetry
Languages	English (proficient), Japanese (native) and German (conversational)

SELECTED AWARDS

Grainger Foundation Fellowship for Outstanding Research in Experimental Physics 2022
- Awarded for demonstrating excellent research ability in experimental physics

Sidney Nagel Prize for Creativity in Research 2020
- Awarded for conducting original research that includes beguiling imagery

John Wesley Hornbeck Prize for Excellence in Physics 2016
- Awarded for the most promising graduating senior with a physics degree

Senior Leadership Recognition Award for Excellence in Teaching 2016
- Awarded for leading a peer-led teaching guild for undergraduates in STEM

PUBLICATIONS

T. Matsuzawa and W.T.M. Irvine. Creation of an isolated turbulent blob fed by vortex rings (In review)
T. Matsuzawa and W.T.M. Irvine. Free decay of confined turbulence (In preparation)
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 (5 OUT OF 17)

American Physical Society March Meeting, *Virtual Talk* Mar 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"
The University of Chicago, Soft Matter Bag Lunch, *Talk* Sep 2019
"How does nature cook and eat up a turbulent puff?"
Japanese Researchers Crossing in Chicago, Consulate of Japan, *Talk* Oct 2018
"Topology in Fluids"
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
- Managed the performance of 3 undergraduate students over research projects (two from The University of Chicago and one from Florida International University)
- Trained three junior graduate students for experimental apparatuses at The University of Chicago
- Led Society of Physics Students, Kalamazoo College Chapter as a chair
- Co-founded a support group for underrepresented students in sciences at Kalamazoo College

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

- Provide an educational aid every week for a 9 year-old child with autistic spectral disorder
- Conducted scientific demonstrations for over 10 outreach programs for a general public
- Contributed articles and edited manuscripts for Kagakusha Network, a non-profit organization supporting international careers for scientists
- Presented a one-hour talk on "mathematical wonders in life" at TEDxKalamazooCollege