

# Takumi Matsuzawa

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## EDUCATION

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<b>The University of Chicago</b> (Chicago, IL)	2016 - Expected 2022
<i>Ph.D. candidate</i> , Physics, Advisor: Dr. William T.M. Irvine, GPA: 3.81/4.0	
<b>The University of Chicago</b> (Chicago, IL)	2016-17
<i>Master of Science</i> , Physics, Advisor: Dr. Sidney R. Nagel	
<b>Kalamazoo College</b> (Kalamazoo, MI)	2013-16
<i>Bachelor of Arts</i> , Physics with honors and Chemistry, <i>summa cum laude</i> , GPA: 4.0/4.0	

## RESEARCH EXPERIENCE

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<b>The University of Chicago</b> (Chicago, IL) <i>Research Assistant</i>	2016-Present
<ul style="list-style-type: none"><li>■ Lead a project to generate controlled turbulence which involves cutting-edge 3D flow measurement techniques (Funded by Army Research Office over \$500k)</li><li>■ Collaborate with a CS research group to develop novel velocimetry techniques using machine learning</li><li>■ Developed and managed codes for statistical analyses, flow simulations, and data visualization</li><li>■ Created a data pipeline to efficiently extract and analyze a velocity field from 100GB image data, which successfully reduced the total processing time from several days to a few hours</li><li>■ Supervised two undergraduates about machine-learning vortex dynamics and 4D data visualization</li></ul>	
<b>Fermi National Accelerator Laboratory</b> (Batavia, IL) <i>Lee Teng Fellow</i>	2015
<ul style="list-style-type: none"><li>■ Assessed the merits of the proposed proton beamline upgrade for the Mu2e experiment using an particle physics simulator called G4beamline</li><li>■ Proposed necessary experimental configurations to maximize the probability to detect the target phenomenon at the general progress meeting</li></ul>	
<b>Kalamazoo College</b> (Kalamazoo MI) <i>Research Assistant</i>	2014-16
<ul style="list-style-type: none"><li>■ Discovered that 3D melting of the Yukawa system can be described by a percolation theory through the molecular dynamics simulation (LAMMPS), and Monte Carlo simulation with Java</li><li>■ Constructed a mathematical framework of the synaptic plasticity altered by Alzheimer's disease, resulting in two publications and a presentation at Society for Neuroscience</li><li>■ Quantified the effectiveness of vaccines through a mathematical model as a part of an interdisciplinary study on effectiveness of vaccines to bridge citizens and public health offices</li></ul>	
<b>KEK- High Energy Accelerator Research Organization</b> (Japan) <i>Visiting researcher</i>	2014
<ul style="list-style-type: none"><li>■ Conducted the laser break-down spectroscopy to evaluate composition of alloys</li></ul>	

## SKILLS

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<b>Programming</b>	C, C++, C#, Java, Python, SQL, HTML, CSS, Matlab, NumPy, SciPy, Pandas, Matplotlib, Seaborn, Tensorflow, PyTorch
<b>Software &amp; Tools</b>	Mathematica, Root, LabView, LAMMPS, Blender, Houdini, L <sup>A</sup> T <sub>E</sub> X, Git, AP
<b>Languages</b>	English (proficient), Japanese (native) and German (conversational)
<b>Others</b>	Flow measurement, laser tomography, CAD, 3D printing, machining

## PUBLICATIONS

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**T. Matsuzawa** and W.T.M. Irvine. Realization of Confined Turbulence Through Vortex Ring Collision (In preparation)

**T. Matsuzawa**, L. Zalányi, T. Kiss and P. Érdi, Multi-scale modeling of altered synaptic plasticity related to Amyloid  $\beta$  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  $\beta$  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 AWARDS AND SCHOLARSHIPS

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Sidney Nagel Prize for Creativity in Research	2020
- Awarded for scholastic excellence in experimental physics	
John Wesley Hornbeck Prize for Excellence in Physics	2016
Senior Leadership Recognition Award for Excellence in Teaching Physics	2016
The 39th Lower Michigan Mathematics Competition, 2nd Place	2015
Lee Teng Undergraduate Fellowship in Accelerator Science and Engineering	2015
A. W. S. Scholarship for the Sciences	2014-16
J. Ward and Mary Greiner Grant	2014
The ACSJL Interdisciplinary Research Grant	2014
The 36th Professor Harry Messel International Science School	2011
- One of the eight winners of the Prime Minister scholarship from the Japanese government	

## SELECTED PRESENTATIONS

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American Physical Society March Meeting, <i>Virtual Talk</i>	Mar. 2021
"Creation of an isolated turbulent blob sustained by vortex ring injection"	
Simons Foundation, Turbulence Across Vast Scales, <i>Poster</i>	Dec. 2019
"Turbulence through Vortex Ring Collisions"	
American Physical Society Division of Fluid Dynamics, <i>Talk</i>	Sep. 2019
"Realization of Confined Turbulence Through Multiple Vortex Ring Collision"	
The University of Chicago, Soft Matter Bag Lunch, <i>Talk</i>	Sep. 2019
"How does nature cook and eat up a turbulent puff?"	
American Physical Society March Meeting, <i>Talk</i>	Mar. 2019
"Realization of Confined Turbulence Through Multiple Vortex Ring Collision"	
Japanese Researchers Crossing in Chicago, Consulate of Japan, <i>Talk</i>	Oct. 2018
"Topology in Fluids"	
Kalamazoo College, Conference for Complex Systems, <i>Invited Talk</i>	May 2017
"Multi-Scale Modeling of Altered Synaptic Plasticity Related to Amyloid-Beta Effects"	
TEDx at Kalamazoo College, <i>Selected speaker</i>	Apr. 2016
"Mathematical thinking in life"	
Fermi National Accelerator Laboratory, <i>Talk and Poster</i>	Aug. 2015
"Targeting Studies of the Second-Generation Mu2e Experiment"	
Annual Meeting of Society for Neuroscience, Chicago <i>Poster</i>	Oct. 2015
"Modeling Altered Synaptic Plasticity due to Amyloid-Beta"	
KEK, Summer School, <i>Talk and Poster</i>	Aug. 2014
"Laser Break-Down Spectroscopy on Alloys"	