Jimmy Hyun Jin Kim

biophysics.princeton.edu/people/jimmy-kim

Education

2015–present **Northwestern University**, Evanston, IL.
Ph.D. Candidate, Physics
CGPA: 3.928

2011–2015 **University of Toronto**, Toronto, ON.
Honours B.Sc. with High Distinction, Mathematics and Physics Specialist
Philosophy Minor
CGPA: 3.97

2018–present Visiting Student, *Initiative for the Theoretical Sciences*, New York, NY.

2017–present Graduate Student Researcher, *Center for the Physics of Biological Function*, Princeton, NJ.

2017–2019 NSF Traineeship in Data-Driven Discovery (IDEAS), *Northwestern University*, Evanston, IL.

2017 Research Communication Training Program, *Northwestern University*, Evanston, IL.

2017 Cargèse Summer School on Theoretical Biophysics, *Institut d'Études Scientifiques*, Corsica, France.

2015 Ontario Summer School on High Performance Computing, *University of Toronto*, Toronto, ON.

Work Experience

Fall 2019 **Data Science Intern**, *Uber Technologies*, San Francisco, CA.

- Developed a document content extraction pipeline for the Customer Obsession team. This involved implementing and evaluating various tools and techniques for computer vision tasks such as image registration, text detection, optical character recognition, and barcode decoding.

Summer 2019 **Software Engineer Intern**, *Facebook*, New York, NY.

- Developed a cluster analysis pipeline for the Marketing Intelligence team.
- Created tools for generating natural language descriptions of clusters and for understanding and interpreting supervised model predictions.

Research Experience

2015–present **Graduate Research Assistant**, *Northwestern University*, Evanston, IL.

- Developed an algorithm based on variational lower bounds of mutual information for the efficient implementation of the maximally informative dimensions method of analyzing neural response. Currently investigating potential applications towards understanding deep neural networks. Supervised by Dr. David Schwab.
- Developed a platform for multi-agent reinforcement learning in game theory setting and characterized the dynamical landscape in terms of the exploration-exploitation tradeoff parameter. Supervised by Dr. David Schwab.
- Implemented a reinforcement learning inspired framework for active learning in language modelling. Supervised by Dr. Douglas Downey.
- Analytically derived optimal scaling relations of sensory and memory networks and developed simulations to numerically confirm the theoretical results. Publication in preparation. Supervised by Dr. David Schwab.

Summer 2014 **NSERC Undergraduate Research Assistant**, *University of Toronto*, Toronto, ON.

- Synthesized iridium-based single crystals and characterized them magnetically (using SQUID) as well as structurally (using 4-circle diffraction and the LAUE method). Participated in KFe_2As_2 high pressure X-ray diffraction experiment at the Argonne National Laboratory. Supervised by Dr. Young-June Kim.

Summer 2013 **NSERC Undergraduate Research Assistant**, *University of Toronto*, Toronto, ON.

- Developed an image processing platform in MATLAB for tracking and quantifying fluorescence intensity (proxy for activity) from multiple neurons in *C. elegans*. The platform has been used to discover a previously unknown neural circuitry (published in eLife). Supervised by Dr. William Ryu.

Summer 2012 **Summer Undergraduate Research Fellow**, *University of Toronto*, Toronto, ON.

- Calibrated and tested optical tweezers apparatus used for advanced physics laboratory course. Supervised by Dr. David Bailey.

Publications

2016 I. Kotera, N.A. Tran, D. Fu, **J.H.J. Kim**, J.B. Rodgers, W.S. Ryu. *Pan-neuronal screening in Caenorhabditis elegans reveals assymetric dynamics of AWC neurons is critical for thermal avoidance behavior*, eLife **5**, e19021 (2016)

Posters

2019 **J. Kim**, C. van der Poel, D. Schwab. *Control theory for multi-agent battle arena*. 120th Topical Symposium of the APS New York State Section: Physics of Artificial Intelligence, New York, NY.

2019 **J. Kim**, D. Shams, D. Schwab. *Dynamics of Multi-Agent Reinforcement Learning*. Dynamics Days 2019: International Conference on Nonlinear Dynamics, Evanston, IL.

Presentations

2020 **J. Kim**, D. Schwab. *Scalable maximally informative dimensions analysis of deep neural networks*. APS March Meeting, Denver, CO.

2019 **H.J. Kim**, D. Shams, D. Schwab. *Dynamics of Reinforcement Learning in Game Theory*. APS March Meeting, Boston, MA.

2018 **J. Kim**, *Optimizing neural coding and short term memory*. ITS Informal Seminar, New York, NY.

2018 **H.J. Kim**, I. Fiete, D. Schwab. *Optimizing population coding with unimodal tuning curves and short-term memory in continuous attractor networks*. APS March Meeting, Los Angeles, CA.

2018 **J. Kim**. *Optimal neural coding and short term memory*. SIAM Bridging the Gap Seminar, Evanston, IL.

2017 **J. Kim**. *Too much precision can be bad*. Seven Minutes of Science Symposium, Evanston, IL.

Teaching Experience

2016–2018 **Graduate Teaching Assistant**, *Northwestern University*, Evanston, IL.

- Led discussion sessions consisting of 10-50 students, held office hours, and graded tests. Subjects included classical mechanics, electromagnetism, special relativity, and quantum mechanics.

Selected student evaluations
"By far the best TA I have ever had at Northwestern. Truly wants the students to succeed, is helpful and very knowledgable. Cannot speak more highly of Jimmy."
"Jimmy was very helpful to us in our discussion sections and helped us understand concepts"
"Jimmy was very nice and seemed like he wanted to help us do well in the class."
"Jimmy is da man - great sense of humor and a fair TA. He was awesome."

Volunteering & Outreach

2020–present **Homework Helper**, *Queens Public Library at Hunters Point*, Queens, NY.

- Helping children from preschool to elementary school age complete their homework assignments as well as facilitating various library activities centered around children. Currently on hold due to COVID-19 outbreak.

July 1, 2019 **Painter**, *Jackie Robinson Park*, New York, NY.

- Helped to beautify Jackie Robinson Park in Harlem by repainting benches and other structures.

May 30, 2018 **Judge, High School Project Showcase**, *Northwestern University*, Evanston, IL.

- Listened to groups of high school students presenting their research and evaluated their work. More importantly, engaged with the students, showed interest, and encouraged them in their pursuit of science.

2017–2018 **Mentor, Physics Mentorship Program**, *University of Toronto*, Toronto, ON.

- Mentored a third year undergraduate student in physics, holding regular remote meetings to discuss academic progress, research opportunities, and graduate schools.

June 7, 2014 **Demonstrator, 100 in 1 Day**, *University of Toronto*, Toronto, ON.

- Demonstrated the Monty Hall Problem to the general public as part of the exhibition organized by the Department of Mathematics. Also helped with logistical matters.

2012, 2014 **Demonstrator, Science Rendezvous**, *University of Toronto*, Toronto, ON.

- Demonstrated optical magic tricks to the general public as part of the exhibition organized by the Institute for Optical Sciences (May 12, 2012).
- Demonstrated the bead problem (also known as Nim) to the general public as part of the exhibition organized by the Department of Mathematics (May 10, 2014).
- Also helped with setting up various exhibits and other logistical matters on both occasions.

2009–2010 **Volunteer, Play It Forward Program**, *YMCA*, Mississauga, ON.
- Mentored school-age children and taught various activities ranging from soccer to hip-hop dancing.

Awards

2015 The Hymie and Roslyn Mida Student Award in Theoretical Physics
2015 Trinity College Provost's Scholar
2013, 2014 NSERC Undergraduate Student Research Award
2012–2014 Dean's List Scholar
2013 The Coxeter Scholarship in Mathematics
2013 The William Ramsay Scholarship in Physics
2013 The Harry Boxen Memorial Scholarship in Physics
2012, 2013 Chancellor's Scholarship
2012 Dr. John Knowles Colling Memorial Scholarship
2012 Summer Undergraduate Research Fellowship
2011 University of Toronto Scholar
2011 The Wasteneys Admission Scholarship

Certificates

2019 Quantitative Analyst with R *DataCamp*
2019 Databases and SQL for Data Science *Coursera*
2017 Neural Networks for Machine Learning *Coursera*
2017 Computational Neuroscience *Coursera*
2017 Integrated Data Science *Northwestern University*
2016 An Introduction to Evidence-Based Undergraduate STEM Teaching *CIRTL*
2016 Machine Learning *Coursera*
2015 High Performance Computing *SciNet*
2015 Scientific Computing *SciNet*

Languages

fluent English, Korean, Python, MATLAB, Mathematica
familiar R, SQL, HTML, CSS, JavaScript, C++, Visual Basic