Myung Chul (Michael) Kim

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Summary

I am a third year PhD candidate in mechanical engineering at Stanford university. My research interest lies in development of theory and numerical algorithms to accelerate rare transition events between metastable states. Recently, I have been working on accelerated kinetic monte carlo simulation in discretized phase space, utilizing branching random walk and neural network biasing.

Education

Stanford University, PhD in Mechanical Engineering [3.94/4.0] Sept. 2023 – Present

- Research Advisor: Professor Wei Cai
- Research Area: Monte Carlo Methods, Molecular Dynamics, Statistical Mechanics, Polymer Modeling
- Relevant Coursework: Numerical Linear Algebra, Partial Differential Equations, Stochastic Differential Equations, Finite Element Analysis, High Performance Computing

KAIST, BS in Mechanical Engineering and Electrical Engineering [3.99/4.3] Mar. 2019 – Aug. 2023

Georgia Institute of Technology, Exchange Program in Mechanical Engineering Jan. 2022 – Dec. 2022

Research Experience

PhD Candidate, Stanford University – Stanford, CA Sept. 2023 – Present

- Development of theory and implementation of numerical methods for importance sampling algorithm to accelerate rare transition events via kinetic Monte Carlo simulation using neural network.
- Application of importance sampling guided kinetic Monte Carlo simulation to atomistic models (e.g., Lennard–Jones cluster) to bias rare transitions between local minima.
- Polymer network modeling using coarse-grained molecular dynamics (CGMD) simulation to study mechanical behaviors of polymers under various loading conditions.
- Utilizing machine learning interatomic potentials for large scale molecular dynamics; study of mechanical properties (e.g., ductility) of metallic nanowires.
- Development of analytical model for dislocation network link length evolution.

Research Assistant, Georgia Institute of Technology – Atlanta, GA Jan. 2022 – Dec. 2022

- Conceptualization, design, and fabrication of soft electronic stretchable pressure sensor for tactile sensing using curved and inter–digitated serpentine structure.
- Development of closed–loop controllable mask fit adjusting mechanism and fabrication of flexible gas sensors for automatic fit-adjustable smart filtering mask.
- Design of flexible PCBs and 3D-printed custom mechanical components for integration with soft electronic devices, optimizing for seamless assembly in wearable electronics applications.

Publications

Accelerating Monte Carlo Simulation of Rare Events by Importance Sampling using Neural Network In Preparation

Myung Chul Kim, Wei Cai

Smart Filtering Facepiece Respirator with Self-Adaptive Fit and Wireless Humidity Monitoring Mar. 2025

Kangkyu Kwon, Yoon Jae Lee, Yeongju Jung, Ira Soltis, Yewon Na, Lissette Romero, **Myung Chul Kim**, Nathan Rodeheaver, Hodam Kim, Chaewon Lee, Seung-Hwan Ko, Jinwoo Lee, Woon-Hong Yeo

10.1016/j.biomaterials.2024.122866

Stretchable Wearable Wireless Bioelectronics Using All Printed Pressure Sensors and Strain Gauges Oct. 2024

Nathan Zavanelli, Yoon Jae Lee, **Myung Chul Kim**, Allison Bateman, Matthew Guess, Hyeonseok Kim, Dinesh K. Patel, Woon-Hong Yeo

10.1002/admt.202400998

Advances in Electrochemical Sensors for Detecting Analytes in Biofluids Mar. 2023

Jimin Lee, **Myung Chul Kim**, Ira Soltis, Sung Hoon Lee, Woon-Hong Yeo

10.1002/adsr.202200088

Conferences

Includes upcoming events

APS Global Physics Summit 2026, American Physical Society - Denver, CO Mar. 2026

- Neural Network Driven Importance Sampling for Accelerated Kinetic Monte Carlo of Rare Events

DAMOP 2025, The 56th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics - Portland, OR June 2025

- Accelerating Monte Carlo Simulation of Rare Events by Importance Sampling using Neural Network

Gordon Research Conference, Multifunctional Materials and Structures - Ventura, CA Sept. 2022

- Stretchable Pressure Sensor using Inter-Digitated Serpentine Structure

Awards and Honors

James D. Plummer Graduate Fellowship, Stanford University Sept. 2023 – Aug. 2024

Young Engineers Honors Society, National Academy of Engineering of Korea Mar. 2020 – Aug. 2023

National Science & Technology Scholarship, Korea Ministry of Science and ICT Mar. 2019 – Aug. 2023

Global Leadership Award, KAIST Mar. 2023

Student Design Finalist, Biomedical Engineering Society and Medtronic Oct. 2022

Open Innovation Challenge Award, Korean Society of Mechanical Engineers Oct. 2022

President's Undergraduate Research Award, Georgia Institute of Technology Aug. 2022

Guwon Academic Excellence Scholarship, Guwon Scholarship Foundation Aug. 2020

KAIST Academic Excellence Scholarship, KAIST Aug. 2020

Service and Teaching Activities

Teaching Assistant, Stanford University

- ME 346A: Introduction to Statistical Mechanics (Winter 2025)

Summer Undergraduate Research Fellow Mentor, Stanford University

- Machine Learning Interatomic Potentials for Large Scale Molecular Dynamics (Summer 2025)

Undergraduates Mentored, Stanford University

- Saul Eduardo Perez Herrera (Summer 2025) → National Autonomous University of Mexico
- Eitan Cohen Arazi (Winter 2024) → University of Buenos Aires

Patents

A Method and Apparatus for Classifying Special Types of Cells through Hybrid Learning-Based Morphology and Mobility Characteristics Jan. 2025

Hyunjong Shin, Chanhong Min, Minwoo Kang, Hyuntae Jeong, Taeyoon Kwon, ***Myung Chul Kim***

KR Patent 10-2762542

Skills

Programming Languages: Python, C, MATLAB

Softwares / Technologies: LAMMPS, FEniCS, AutoCAD, Solidworks, Altium Designer, PSpice