

Mohammad Mirzadeh, Ph.D.

CONTACT INFORMATION	Department of Chemical Engineering, Building 66, Room 465, Massachusetts Institute of Technology, 77 Massachusetts Ave., Cambridge, MA 02139.	(805) 705 – 1819 linkedin.com/in/mmirzadeh mirzadeh@mit.edu mirzadeh.github.io
STATUS	Permanent Resident. Green Card holder legally authorized to work permanently in the US.	
INTERESTS	Data Science, Machine Learning, Spatial Data Structures, Parallel Computing, HPC.	
COMPUTER SKILLS	Programming Languages <i>proficient in {C, C++, Python, MATLAB}, Julia.</i> Machine Learning Frameworks TensorFlow, PyTorch, Scikit-Learn. Parallel Programming <i>proficient in {MPI, OpenMP}, CUDA.</i> Data Visualization <i>proficient in {matplotlib, ParaView}, vtk.</i> Software Development <i>proficient in {git, CMake}, Docker.</i>	
EXPERIENCE	RESEARCH: <ul style="list-style-type: none">• Simulation of Fluid Mixing in Random Media <i>MIT, 2020</i> Developed a Python fluid simulation code to study mixing in random media. Created a simulation pipeline to generate random geometry, run simulation code, and collect data. Performed statistical analysis of simulation data to predict mixing efficiency as a function of random geometry. Wrote a research article and submitted to <i>Physical Review Fluids</i> journal for publication.• Statistical Analysis of High-Speed Video Footage <i>MIT, 2019</i> Collaborated with experimentalists at MIT and Saint Gobain Inc. to analyze high-speed video footage of electrostatic particle projection. Created data analysis pipeline in MATLAB to clean, process, and visualize raw data files of more than 85 individual experiments. Performed statistical analysis of more than 1500 particles to measure the impact of experimental conditions on projection efficiency. Published results in <i>Physical Review Applied</i> journal.• Parallel Simulation of Pattern Formation in Fluids <i>MIT, 2017</i> Developed a parallel C++ code using MPI to simulate fluid flow and interfacial dynamics in Hele-Shaw cells. Tested and improved parallel efficiency of the code on the Stampede2 supercomputer at Texas Advanced Computing Center, achieving more than 85% parallel efficiency on 256 CPU cores. Created visualization pipeline in ParaView to handle large (>100 GB) simulation data. Published results in the <i>Physical Review Letters</i> journal.• Massively Parallel Level-Set Simulation Library <i>UC Santa Barbara, 2014</i> Developed a distributed parallel level-set library using MPI. Designed and implemented numerical algorithms based on Octree and Quadtree data structures in more than 65K lines of C++ code. Debugged and fine-tuned the performance on 4,096 CPU cores of the Stampede supercomputer at Texas Advanced Computing Center. Achieved more than 65% parallel efficiency on 4,096 CPU cores for problems with more than one billion unknowns. Created a distributed 3D visualization pipeline based on VTK format and ParaView, allowing for visualization of very large simulation data (> 2 TB). Published research paper in the <i>Journal of Computational Physics</i>.• High-fidelity Simulator for Electrochemical Systems <i>UC Santa Barbara, 2012</i> Developed numerical algorithms for simulation of electrochemical systems for engineering and biological applications. Implemented high-fidelity algorithms for accurate reconstruction of complex 3D protein surfaces from point clouds in C++. Improved scalability to large proteins using OpenMP (10,000 atoms) and MPI (500,000 atoms). Published results in three individual research articles in the <i>Journal of Computational Physics</i>.	

INDUSTRY:

- **GenapSys Inc.**, *Redwood City, CA, 2014 - 2015*
Worked as a scientific consultant for modeling next-generation DNA sequencing sensors. Developed mathematical models to predict the electrochemical response of sensors during nucleotide binding events. Implemented models using Finite Element Method in C++ and COMSOL Multiphysics. Performed Monte Carlo simulations and statistical analysis to find optimal sensor geometry and chemical composition to boost signal-to-noise ratio. Presented results in meetings and collaborated with experimentalists and sensor designers to implement optimal conditions.

MANAGEMENT:

- **Co-organizer of 13th ELKIN Conference** *Cambridge, MA, June 12-14, 2019*
Served as co-organizer and the Head of Local Organizing Committee for the 13th International Symposium on Electrokinetics (ELKIN) at MIT. Managed individual task forces for handling the web portal, finances, and program execution. Successfully received more than 350 submissions from more than 25 countries and increased the organization balance sheet from \$3,000 to \$20,000.

FUNDED PROPOSALS:

- **MIT Energy Initiative - \$150,000 awarded** *MIT, 2017*
Proposed and defined the scopes of an experimental research study in collaboration with the main PI in my research group. This study was based on my earlier theoretical research. Wrote and submitted a proposal to MIT's Energy Initiative which was successfully funded for \$150,000. The money was used to hire a new postdoctoral researcher to collaborate with on the experiments. This work resulted in new discovery and publication in the *Nature Communications* journal.
- **XSEDE Program - \$130,000 (equivalent) awarded** *UC Santa Barbara, 2014*
Co-authored a research proposal to gain access to national supercomputers. Developed, debugged and tuned the parallel scalability of self-written massively parallel C++ code. Improved parallel efficiency to more than 65% across 4,096 CPU cores on the Stampede supercomputer at Texas Advanced Computing Center. Submitted proposal to the National Science Foundation and received funding for 2 million core-hours computation time through the XSEDE program.

EDUCATION

Massachusetts Institute of Technology, *Cambridge, MA, 2015-present*
Postdoctoral research in Chemical Engineering

University of California Santa Barbara, *Santa Barbara, CA, 2008-2014*
Ph.D. in Mechanical Engineering

University of Tehran, *Tehran, Iran, 2003-2008*
B.S. in Mechanical Engineering

AWARDS

Best Ph.D. Dissertation Award (2014)
Received from Department of Mechanical Engineering, UC Santa Barbara.

Excellence Fellowship (2012)
Received from the Department of Mechanical Engineering, UC Santa Barbara.

PUBLICATIONS &
PRESENTATIONS

Journal Publications *(visit scholar.google.com for more information)*
Authored and co-authored more than 15 research articles in top scientific journals, including *Nature Communications*, *Physical Review Letters*, *Journal of Computational Physics*, *Journal of Computational Neuroscience*, and *Physical Review Applied*.

Conference Presentations
Gave research and invited talks at more than 13 scientific conferences including *Society for Industrial and Applied Mathematics*, *American Physical Society*, and *American Institute of Chemical Engineers*.