Kimberly Liu

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Education

Stanford University, Stanford, CA 2019-2024
Ph.D. Mechanical Engineering

Stanford University, Stanford, CA 2017-2019
M.S. Mechanical Engineering

California Institute of Technology, Pasadena, CA 2013-2017
B.S. Mechanical Engineering

Research Experience

Stanford University, Stanford, CA Dec 2017-Present
Graduate Research Assistant

- Advisor: Professor Ali Mani
- Direct numerical simulations of particle-laden and multiphase turbulent flow
- Implementation and validation of multiphase modelling of superhydrophobic surfaces and dynamic air-water interfaces
- Evaluated pressure-driven wall-normal jets for drag reduction in channel flow and boundary layer flow
- Developed macroscopic forcing method for superhydrophobic surfaces and studied nonlocality in slip length operator
- Closely collaborated with Morteza Gharib's group from Caltech to replicate their experimental findings

California Insititute of Technology, Pasadena, CA Jun 2016-Aug 2016
Undergraduate Research Fellow

- Worked with Professor Tim Colonius on simulating laminar fluid flows over rotating disks, with a focus on the effects of tip speed ratio and angle of attack on aerodynamic forces

Publications

Liu K, Mani A. "Direct measurement of eddy viscosity and slip length operator for turbulent channel flow over superhydrophobic surfaces." *Accepted for publication in 35th Symposium on Naval Hydrodynamics (2024).*

Zahtila T, Chan L, Ooi A, **Liu K**, Benjamin M, Iaccarino G. "Influence of Miura-origami shapes on drag in turbulent flows." *Proceedings of the Summer Program 2022.*

Liu K, Mani A. "On the nonlocality of the slip length operator for scalar and momentum transport on patterned superhydrophobic surfaces in turbulent flow." *Manuscript in preparation.*

Liu K, Mani A. "A modified Clauser chart method for determination of drag on superhydrophobic surfaces." *Manuscript in preparation.*

Presentations

Liu K, Mani A. Direct measurement of eddy viscosity and slip length operator for turbulent channel flow over superhydrophobic surfaces. 35th Symposium on Naval Hydrodynamics. July 2024.

Liu K, Mani A. Direct measurement of slip length operator and eddy viscosity fields for turbulent flows over superhydrophobic surfaces. 76th Annual Meeting of the APS Division of Fluid Dynamics. November 2023.

Liu K, Mani A. Assessment of Clauser chart method for determination of drag on superhydrophobic surfaces. 75th Annual Meeting of the APS Division of Fluid Dynamics. November 2022.

Liu K, Mani A. Drag reduction effects of dynamic superhydrophobic surface in turbulent channel. 74th Annual Meeting of the APS Division of Fluid Dynamics. November 2021.

Liu K, Mani A. Analysis of wall-normal jets induced by bubble oscillations on superhydrophobic surfaces. 73rd Annual Meeting of the APS Division of Fluid Dynamics. November 2020.

Liu K, Mani A. Investigation of turbulent flows over superhydrophobic surfaces with oscillatory slip length. 72nd Annual Meeting of the APS Division of Fluid Dynamics. November 2019.

Liu K, Esmaily M, Mani A. A novel approach for separation of inertial particles. 71st Meeting of the APS Division of Fluid Dynamics. November 2018.

Teaching Experience

Teaching Assistant, Introduction to Numerical Methods for Engineering (ME300C/CME206), Stanford University (Spring 2020, Spring 2021, Spring 2022)

Created and graded problem sets, held weekly office hours. This Master's level class emphasizes analysis of numerical methods for accuracy, stability, and convergence. It covers Lagrange interpolation, splines, numerical integration, and numerical solutions of ordinary differential equations, systems of differential equations, and partial differential equations. Student evaluations available.

Other Experience

- Peer Reviewer, Physical Review Fluids (2021-Present)
- Programming skills: Python, C++, Fortran, MATLAB, MPI, CUDA
- Selected coursework: Advanced Topics in Turbulence, Flow Instability, Parallel Computing, High Performance Computing, Asymptotic Methods in Computational Engineering, Deep Learning

Service

SeeME, Director of Teacher Training 2019-2024

SeeME is the official Stanford Mechanical Engineering outreach club. Created and taught workshops for Stanford graduate students on how to plan interesting and accessible classes for middle- and high-school students in the surrounding community using evidence-based and inclusive learning and teaching practices.

Stanford Mechanical Engineering PhD Mentorship Program 2020-2022

Mentored two Mechanical Engineering PhD students for two years.

Graduate Society of Women Engineers, Outreach Board 2017-2019

Organized for members to hold lab tours and informal coffee chats with members of Stanford's undergraduate chapter of SWE.