SHILPA VIJAY

Postdoctoral Fellow ◇ Center for Turbulence Research ◇ Stanford University
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EDUCATION

University of Southern California, Los Angeles CA, USA
Ph.D. Mechanical Engineering — Dec 2023
M.S. Mechanical Engineering — May 2018

Ph.D. Dissertation Title: Flow and Thermal Transport at Porous Interfaces
Ph.D. Defense Committee: Prof. Mitul Luhar*, Prof. Satwinder Sadhal, Prof. Felipe De Barros

College of Engineering Pune, Maharashtra, India
B.Tech. Civil Engineering — May 2016

PROFESSIONAL EXPERIENCE

Postdoctoral Fellow — **Apr 2024 - Present**
Center for Turbulence Research (CTR), Stanford University, Stanford, CA
Faculty Sponsor: Prof. Beverley J. McKeon

- Leading experimental campaign for passive scalar transport over rough surfaces, developing advanced measurement techniques to elucidate turbulence–heat transfer coupling in complex boundary layers.
- Initiated and co-led a collaborative project with Dr. Sangjoon Lee to optimize porous media structures for flow and thermal control using Design-by-Morphing methodologies.
- Contributed to the preparation of the PSAAP IV proposal in predictive science and exascale computing, including presenting experimental approaches and validation strategies to U.S. Department of Energy program managers during the site review process.

Research Assistant — **Aug 2016 - Dec 2023**
Department of Aerospace and Mechanical Engineering, University of Southern California, Los Angeles, CA
Advisor: Prof. Mitul Luhar

- Ph.D. thesis focused on leveraging turbulence at the interface of engineered porous surfaces for passive flow control, with applications to thermal transport and drag reduction.
- Expertise in optical diagnostics, high-speed imaging, Particle Image Velocimetry, pressure sensing, flow sensing, thermal characterization, and 3D printing
- Conceptualized, designed, and fabricated an in-house experimental setup to quantify heat transfer and fluid flow in a partially porous channel.
- Utilized Particle Image Velocimetry (PIV) at the porous interface to quantify turbulent flow structures to demonstrate the effects of permeability over passive flow control

Undergraduate Research Intern — **Aug 2015 - May 2016**
College of Engineering Pune and R & D E, Defense Research and Development Organization, Pune, India
Advisors: Dr. B.M. Dawari and Dr. C. Ramadas

- Leveraged advanced Finite Element Analysis techniques using ANSYS Mechanical to optimize thickness tapering in composite materials.

Visiting Research Scholar — **June 2015 - Aug 2015**
University of Southern California, Los Angeles, CA
Advisor: Dr. Mitul Luhar

- Demonstrated expertise in experimental characterization by conducting hydraulic permeability analysis on custom-designed heterogenous 3D printed porous materials.

Member, Student Satellite Team **May 2013 - May 2016**
College of Engineering Pune and Indian Space Research Organization (ISRO)

- Designed and developed components for SWAYAM, a student-designed pico-satellite, successfully launched by ISRO in 2016.
- Contributed to the Attitude Control System by optimizing magnetorquer rods using ANSYS Maxwell.
- Presented the Critical Design Review (CDR) at the ISRO Satellite Center (ISAC), Bengaluru in 2015 as part of a joint effort, evaluating SWAYAM's flight readiness.
- Part of a nationally recognized team that was later felicitated by the Prime Minister of India.

FELLOWSHIPS

CTR Postdoctoral Fellowship **Apr 2024**
Stanford University, Stanford, CA

- Awarded to pursue independent postdoctoral research at the Center for Turbulence Research (CTR).

Viterbi Graduate Fellowship **Aug 2016**
University Of Southern California, Los Angeles, CA

- A 4-yr fellowship awarded to a few promising incoming PhD students by the USC Graduate School

S.N. Bose Scholarship **May 2015**
Indo-US Science and Technology Forum, New Delhi, India

- Awarded to top 55 students in India to pursue summer research at a US university *(Acceptance rate $< 5\%$)*

AWARDS AND HONORS

Finalist, USC Viterbi's 2^{nd} Annual 3MT Competition Watch video here **Nov 2023**
University Of Southern California, Los Angeles, CA

- Selected as a finalist across all engineering schools for the Three Minute Thesis (3MT®), a competition challenging PhD students to present their research and its significance in just three minutes using accessible, non-technical language.

Women in Science and Engineering (WiSE) Travel Grant **Nov 2019**
University Of Southern California, Los Angeles, CA

INSPIRE Scholarship for Higher Education (SHE) – Offered, Declined **June 2012**
Department of Science and Technology, Government of India

- Awarded to the top 1% of high school graduates in India to pursue education in basic sciences. *(Declined to pursue an engineering degree).*

PEER REVIEWED PUBLICATIONS

Vijay, S., Luhar, M. Pressure drop measurements over anisotropic porous substrates in channel flow. Exp Fluids 65, 135 (2024). https://doi.org/10.1007/s00348-024-03873-2

Chavarin, A., Efstathiou, C., **Vijay, S.** and Luhar, M., 2020. Resolvent-based design and experimental testing of porous materials for passive turbulence control. International Journal of Heat and Fluid Flow, 86, p.108722. https://doi.org/10.1016/j.ijheatfluidflow.2020.108722

TECHNICAL REPORTS

Vijay, S., McKeon, B. J. Thermal footprint of boundary layer with a step change in roughness (2025) Center for Turbulence Research, Annual Research Briefs [*in press*]

Lee, S. **Vijay, S.**, Topology-aware permeability modeling in structured porous media for passive flow control (2025) Center for Turbulence Research, Annual Research Briefs [*in press*]

Vijay, S., McKeon, B. J. Experimental investigation of heat transfer over roughness elements: design and preliminary results. (2024) Center for Turbulence Research, Annual Research Briefs

Preskett, T. Jaiswal, P. Ganapathisubramani, B. Jaroslawski, T. Gomez, S. R. **Vijay, S.**, and McKeon, B. J. Resolvent analysis of high Reynolds number turbulent boundary layers subjected to pressure gradient histories. (2024) Center for Turbulence Research, Proceedings of the Summer Program

MANUSCRIPTS UNDER PREPARATION

Vijay, S., Luhar, M. Convective heat transfer in partially porous channel flow (*in prep*)

CONFERENCE PROCEEDINGS

Vijay, S., McKeon, B.J., "Thermal Boundary Layer Development over a Step Change in Surface Roughness," 14th International Symposium on Turbulent and Shear Flow Phenomena (TSFP-14), Heidelberg, Germany, July 28–31, 2026. (*Accepted for oral presentation; full paper in preparation*)

Shilpa Vijay, and Beverley McKeon (2025). Experimental investigation of turbulent heat transfer over roughness elements. The 11th International Symposium on Turbulence, Heat and Mass Transfer (THMT'25), Tokyo, Japan, July 21–25, 2025.

Sasindu N. Pinto, Yang Zhang, Louis N. Cattafesta, Rajat Mittal, Charles Meneveau, Mitul Luhar, Mostafa Aghaeijouybari, Jung-Hee Seo, **Shilpa Vijay** and Idan Eizenberg. "Characterization of Periodic Lattice Anisotropic Porous Materials for Passive Flow Control," AIAA 2023-3448. AIAA AVIATION 2023 Forum. June 2023.

Madeleine E. Yee, Andrew Chavarin, **Shilpa Vijay** and Mitul Luhar. "Simulations of Respiratory Droplet Spray," AIAA 2022-3323. AIAA AVIATION 2022 Forum. June 2022.

PRESENTATIONS

Invited Presentations

Shilpa Vijay "Towards designer porous surfaces for multi-functional passive flow control" *Applied Mathematics Seminar, Department of Mathematics, UC Berkeley / Lawrence Berkeley Laboratory, March 2025* [Talk]

Shilpa Vijay, "Yes-And: Improv-ing in Research – Lessons in Adaptability and Creativity," *Mechanical Engineering Women and Gender Minorities Group (MEGM) Annual Seminar Series, ENGR311A, Stanford University, January 23, 2025* . [Talk]

Shilpa Vijay, "Flow and Thermal Transport at Porous Interfaces." *CTR Tea Seminar, Center for Turbulence Research, Stanford University, April 2024* [Talk]

Shilpa Vijay, "Experimental Characterization of Permeability in 3-D Printed Porous Cylinders." *Annual Student Symposium for S.N. Bose, Khorana, and Viterbi India Scholars, Indo-US Science and Technology Forum, New Delhi, India, August 2015* [Poster]

Contributed Presentations

Shilpa Vijay and Beverley McKeon, "Thermal footprint of boundary layer under step change in surface roughness" *76th Annual Meeting of APS Division of Fluid Dynamics, November 2024* [Talk]

Shilpa Vijay, "Experimental investigation of heat transfer over roughness elements" *Stanford Thermal & Fluid Sciences Affiliates Annual Conference (TFSA), Stanford University, February 2024* [Poster]

Shilpa Vijay and Mitul Luhar, "Pressure Drop Measurements over Anisotropic Porous Substrates in Channel Flow." *76th Annual Meeting of APS Division of Fluid Dynamics, November 2023* [Talk]

Shilpa Vijay, Bowei Wu, Upasana Godumarri, and Mitul Luhar, "Tunable Porous Media for Multifunctional Passive Flow Control." *XVI Southern California Flow Physics Symposium, SDSU, April 2023* [Talk]

Shilpa Vijay and Mitul Luhar, "Thermal Transport in Partially Porous Channel Flow." *ASME Summer Heat Transfer Conference, 2022* [Talk]

Shilpa Vijay, Taylor McLaughlin, Bryce Heitner, Stara Shinsato, and Mitul Luhar, "Tunable Hydraulic and Thermal Properties via 3-D Printing." *ASME Summer Heat Transfer Conference, 2022* [Talk]

Shilpa Vijay and Mitul Luhar, "Convective Heat Transfer in Partially Porous Channel Flow." *72nd Annual Meeting of APS Division of Fluid Dynamics, November 2019* [Talk]

Shilpa Vijay and Mitul Luhar, "Convective Heat Transfer in Partially Porous Channel Flow." *71st Annual Meeting of APS Division of Fluid Dynamics, November 2018* [Talk]

PROFESSIONAL DEVELOPMENT ACTIVITIES

NASA Thermal and Fluids Analysis Workshop (TFAWS) **August 2025**
NASA Ames and San Jose State University, San Jose CA

- Engaged with advances in thermal modeling and flow physics, identifying key intersections with my research on turbulent heat transfer and adaptive surfaces.

First National Security and Naval Power Bootcamp **June 2024**
Consortium on Naval Enterprise Pathways, George Washington University, Washington D.C.

- A week-long, residential course designed for participants to explore policy, security, and technical issues at the intersection of national security and naval power.

TEACHING

Guest Lecturer
Stanford University, Stanford, CA

- ME 351A Fluid Mechanics Nov 2024
- ME 354 Experimental Methods in Fluid Mechanics May 2024

Teaching Assistant
University of Southern California, Los Angeles, CA

- AME 309 Dynamics of Fluids (Spring 2020, Spring 2022, Spring 2023, Fall 2023)
- AME 331 Heat Transfer (Spring 2022)
- AME 105 Introduction to Aerospace Engineering (Fall 2021)
- AME 310 Thermodynamics (Fall 2019)

MENTORING

M.S. Students

Adrian Loekman	Stanford University	2024–2025
Bowei Wu, Upasana Goddumari, Taylor McLaughlin, Yixuan Song	USC	2017–2023

Undergraduate Students

Dayna Jackson	Stanford University	2024
Gerald Flores, Bryce Heitner, Stara Shinsato, Michelle Karpishin, Julia Wang	USC	2019–2023

High School Students

Arjun Sathish	Stanford University	2024
Sonal Sukhatme, Asa Garner, Madeleine Yee, Noah Shen, Jacklyn Oldoerp, Sarah Fry, Brody Bishop	USC	2018–2023

OUTREACH

Session Facilitator, CTR^2 Summer Program **July 2025**

- Leading an interactive workshop using a vortex cannon to introduce undergraduate and community college students from underserved communities to turbulence and fundamental fluid mechanics concepts.

Speaker, Pint of Science USA – "The Secret Life of Turbulence" **May 2025**

- Selected to present at an international public science festival aimed at communicating research to non-specialist audiences through engaging, accessible talks in informal settings.

Invited Interview: Aerowomen X (formerly Twitter) Page **Feb 2024**

- Published by Aerowomen, a volunteer-run platform dedicated to raising the visibility of women in Aerodynamics and Fluid Dynamics through published Q&As. Link to the interview.

Contributing Author: Stories of Women in Fluids (SOWIF) **Jan 2024 - Present**

- Contributing to The Stories of Women in Fluids initiative by writing anthologies. This platform aims to inspire and empower women and girls in fluid dynamics careers through mentorship and motivational stories (*in press*).

Liaison: Women in Science and Engineering (WiSE) **Aug 2022 - May 2023**
University of Southern California, Los Angeles CA

- Facilitated seamless communication between the PhD community at the Aerospace and Mechanical Engineering Department and the WiSE PhD Advisory Board, connecting students with valuable resources.
- Collaborated with the WiSE PhD Advisory Board to plan impactful events, including the Alumni Fireside Chat in November 2022, and the Imposter Syndrome Seminar for March 2023.

Contributed talk: WiSE STEM Bytes Seminar **Sept 2022**
University of Southern California, Los Angeles CA

- The USC WiSE program hosts a series of seminars aimed at undergraduate students titled STEM Bytes. The goal of the series is to introduce undergraduate students to research opportunities in science and engineering at USC.

Top Writer 2018 **2017 - 2018**
Quora, Inc.

- Recognized for high-quality contributions and expertise in topics related to PhD life, graduate school admissions process, and life as an international student. Link to the profile.

Careers in STEM Summer workshop series **Jul 2018**
University of Southern California, Los Angeles, CA

- Participated in the workshop to promote the STEM fields to local middle and high school students.

STEM Spotlight on AME Open House **Oct 2017**
University of Southern California, Los Angeles, CA

- Organized an Open House to over 100 high-school students.
- Led a hands-on demonstration of 3-D printing technologies and their impact on aerospace engineering.

SERVICE

Member: Graduate Student and Postdoc Advisory Committee (SPACE) **Sept 2024**
Nominated by the Office of the Vice Provost for Graduate Education, Stanford University

Judge: 4th Stanford Mechanical Engineering Conference (MECON) **May 2024**
Department of Mechanical Engineering, Stanford University

Judge: Senior Design Project Annual Showcase **Dec 2021**
Department of Aerospace and Mechanical Engineering, Univeristy of Southern California

Peer Reviewer: Physical Review Fluids, Scientific Reports, Physics of Fluids **2024 - Present**

SKILLS

CAE Tools: ANSYS Fluent, ICEM CFD, Mechanical, Maxwell, SolidWorks, OnShape, OpenSCAD, AutoCAD, SpaceClaim

Programming and Machine Learning Frameworks: MATLAB, Mathematica, Python, PyTorch

Experimental Skills: Infrared Imaging, Data Acquisition Systems, Thermocouples, Pressure Sensors, Flow Sensors, High Speed Imaging, Particle Imaging Velocimetry (PIV), Image Analysis

OTHER LEADERSHIP AND COMMUNICATION

Co-Director, Vidushak Improv Comedy Group **Jan 2019 – May 2022**
University of Southern California, Los Angeles CA

- Steered a 15-member team of dedicated improv comedy enthusiasts at USC.
- Spearheaded weekly practice sessions, ensuring a well-maintained roster, effective fund management, and the conception and direction of an annual scripted performance. Link to the Youtube channel.