

Yuchen Hou

✉ yuh113@ucsd.edu ☎ 858-340-3803 📧 Yuchen Hou

EDUCATION

University of California, San Diego

Ph.D. student, Mechanical Engineering

Co-advisors: Abhishek Saha and Antonio Sanchez

Jul 2026 - Present

San Diego, CA

University of California, Irvine

Doctoral studies, Mechanical Engineering | GPA: 3.90/4.00

Sep 2025 - Jun 2026

Irvine, CA

University of California, San Diego

M.S., Mechanical Engineering | GPA: 3.855/4.00

Sep 2023 - Jun 2025

San Diego, CA

Advisor: David Saintillan. **Thesis:** Reinforcement Learning-Based Control of Topological Defects in 2D Active Nematics.

Southern University of Science and Technology

B.Eng., Aerospace Engineering | GPA: 3.63/4.00

Aug 2019 - Jun 2023

Shenzhen, China

Advisor: Bo Zhou. **Thesis:** Schlieren Imaging Velocimetry Based on Wavelet Optical Flow Method.

RESEARCH EXPERIENCE

UC San Diego | Dust Devil Boundary-Layer Modeling

Doctoral Research

Co-advisors: Abhishek Saha and Antonio Sanchez

Jul 2026 - Present

- Developing models of boundary-layer flows associated with dust devils.

UC San Diego | Saintillan Research Group

Master's Student Researcher | Advisor: David Saintillan

Feb 2024 - Jun 2025

Reinforcement learning control of active nematics

Jun 2024 - Jun 2025

- Developed a GPU-accelerated pseudospectral solver in PyTorch for two-dimensional active nematic flows and topological defect dynamics.
- Built a closed-loop reinforcement learning framework using Proximal Policy Optimization (PPO) to control active stress fields; implemented a CNN encoder for nematic tensor-field observations.
- Evaluated localized control strategies for suppressing defect formation and reducing defect lifetime, and tested policy performance across different system parameters.

SUSTech

Undergraduate Student Researcher | Advisor: Bo Zhou

Advanced Imaging for Propulsion & Power Generation

Sep 2021 - Jun 2023

Wavelet optical flow for schlieren velocimetry

Jul 2022 - Jun 2023

- Formulated schlieren motion estimation as a physics-constrained inverse problem and used L-BFGS to optimize the reconstruction objective.
- Implemented multilevel wavelet transforms to resolve density-gradient features and evaluated reconstruction accuracy on synthetic images generated from CFD fields.
- Benchmarked velocity-field reconstructions against Horn-Schunck and Lucas-Kanade optical flow methods; contributed to a coauthored Physics of Fluids article.

NH₃/H₂ premixed flame diagnostics

Dec 2022 - Mar 2023

- Calibrated and synchronized NH₃/NH/OH PLIF and Rayleigh scattering diagnostics for NH₃/H₂-air premixed flames, including background correction.
- Processed diagnostic fields to characterize flame-front topology, curvature, and local consumption rates; investigated the influence of low Lewis numbers on flame wrinkling.

RESEARCH EXPERIENCE (CONTINUED)

SUSTech

Sep 2021 - Jun 2023

Undergraduate Student Researcher / Advisor: Bo Zhou
Advanced Imaging for Propulsion & Power Generation

Synthetic focusing-schlieren imaging

Apr - Sep 2022

- o Built a modular ray-tracing code to generate synthetic schlieren and focusing-schlieren images from CFD density fields.
- o Studied knife-edge position, grid density, and lens configuration to assess imaging sensitivity and resolution and guide experimental setup.

JOURNAL ARTICLES

Mingjia Chen, Zhixin Zhao, **Yuchen Hou**, Jiajian Zhu, Mingbo Sun, and Bo Zhou. "Evaluation of seedless wavelet-based optical flow velocimetry for schlieren images." *Physics of Fluids* (2024). doi:10.1063/5.0208692.

CONFERENCE CONTRIBUTIONS

Yuchen Hou and David Saintillan. "Reinforcement Learning-Based Control of Topological Defects in 2D Active Nematics." *SoCal Fluids XVIII*, 2025.

Ze Wang, Xun Li, **Yuchen Hou**, Xiaohua Gan, and Bo Zhou. "Study on the structural characteristics of ammonia-hydrogen-Air turbulent premixed flames." *The China National Symposium on Combustion*, 2023.

Mingjia Chen, **Yuchen Hou**, Bing Liu, Fei Qin, and Bo Zhou. "Simulation study on schlieren focusing patterns based on real physical processes." *The China National Symposium on Combustion*, 2022.

INDUSTRY EXPERIENCE

AECC Hunan Aviation Powerplant Research Institute

Jun - Aug 2022

Simulation Engineer Intern

Zhuzhou, China

- o Generated meshes for combustor chambers and nozzle sections, simulated steady combustion, and supported transient combustion simulations.
- o Performed mesh-independence and turbulence-chemistry model sensitivity studies to assess the influence of numerical and modeling choices.

ADDITIONAL EXPERIENCE

Fluid Mechanics Experimental Education Center

Oct 2021 - Feb 2022

Student Assistant

Shenzhen, China

- o Maintained fluid mechanics laboratory equipment and supported wind-tunnel and water-tunnel maintenance and test-system setup.

HONORS AND AWARDS

Powell Fellowship | UC San Diego, Jacobs School of Engineering

Sep 2026

MAE Department Fellowship | UC Irvine

Sep 2025

Merit Student Scholarship, Third Class | SUSTech

Oct 2022

Scholarship of Progress | SUSTech

Oct 2021

Outstanding Student Reporter | SUSTech

Sep 2021

Scholarship for Outstanding Freshmen, Second Class | SUSTech

Sep 2019

TECHNICAL SKILLS

Programming: Python, MATLAB, Fortran, Shell, Java; LaTeX

Scientific computing and ML: PyTorch, TensorFlow, NumPy, scikit-learn, OpenCV, Gym; pseudospectral methods, optical flow, reinforcement learning

Simulation: Ansys, COMSOL, Abaqus, OpenVSP; direct simulation Monte Carlo (DSMC)

Design and fabrication: SolidWorks, CAD, 3D printing, laser cutting, machining