

Cong Wang

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EDUCATION

California Institute of Technology (Caltech) Ph.D. in Aeronautics, • Advisor: Morteza (Mory) Gharib • Thesis: On the Manipulation of A Turbulent Boundary Layer by Unsteady Boundary Conditions	Pasadena, CA 2014 – 2019
California Institute of Technology (Caltech) M.S. in Aeronautics,	Pasadena, CA 2013 – 2014
The National University of Singapore (NUS) B.Eng. (<i>first class honor</i>) in Engineering Science, minor in mathematics,	Singapore 2009 – 2013

POSITIONS AND EMPLOYMENT

The University of Iowa, Mechanical Engineering Assistant Professor,	Iowa city, IA Aug. 2023–Present
Caltech, Aerospace Engineering Research Scientist,	Pasadena, CA 2020 – 2023
Caltech, Aerospace Engineering Postdoc Associate	Pasadena, CA 2019 – 2020

RESEARCH INTERESTS

My research interests lie in the general area of flow physics, flow control, and advanced flow diagnosis techniques. I leverage on the fundamental understanding of flow phenomena to develop novel flow control systems to address the challenges in the broad area of energy, sustainability, and bio-medical devices. My current research focus is on turbulent flow, interfacial flow, and bio-inspired propulsion.

GRANTS

1. Co-PI, “Measurement of Eddy Diffusivity Operator in Subsurface and Near-surface Turbulent Wakes Using Three-dimensional Particle Image Velocimetry”, U.S. Office of Naval Research (ONR), \$680,000, 03/31/2022 - 04/01/2026 (PI: Morteza Gharib)

CONSULTING SERVICE

Sienza Energy	2016 – 2021
• A startup company focuses on developing high-energy-density and fast-charging lithium battery for electric vehicle and consumer electronics.	

PUBLICATIONS AND PATENTS

Corresponding author*

1. **Cong Wang***, Paloma, G. Garcia, Morteza Gharib, “Characters and physics of a novel synthetic jet actuator based on free-surface waves”, *In preparation*
2. **Cong Wang***, Morteza Gharib, “Physical mechanism of the drag reduction effect using dynamic free-slip surface”, *In preparation*

3. **Cong Wang***, Morteza Gharib, "On the Turbulent Drag Reduction Effect of the Dynamic Free-Slip Surface Method". *Journal of Marine Science and Engineering*, **10**(7), 879 (2022).
4. **Cong Wang***, Morteza Gharib, "Physics of a strongly oscillating axisymmetric air-water interface with a fixed boundary condition". *Physical Review Fluids*, **7**(4), 044003 (2022).
5. **Cong Wang***, Morteza Gharib, "Turbulent drag reduction using a dynamic free-slip surface", The 34th Symposium on Naval Hydrodynamics (2022).
6. **Cong Wang***, Morteza Gharib, "Re-laminarization mechanism generated by a dynamic free-slip boundary" *Physical Review of Fluids* **6** 084604 (2021)
7. Isabelle M. Darolles, Azin Fahimi, **Cong Wang**, Adrianus I. Aria, Luciana Cendon, Morteza Gharib "Vertical carbon nanotube and lithium ion battery chemistries, articles, architectures and manufacture", *US Patent 11,056,712*, (2021)
8. **Cong Wang**, Morteza Gharib*, "Effect of the dynamic slip boundary condition on the near-wall turbulent boundary layer." *Journal of Fluid Mechanics* **901** (2020). **Featured on the front cover of Journal of Fluid mechanics.**
9. **Cong Wang**, David Jeon, Morgane Grivel, and Francisco Pereira, Morteza Gharib, "Systems, methods and apparatuses for reducing hydrodynamic frictional drag", *US Patent 10,787,231*, (2020).
10. Morteza Gharib, Julia Cosse, Stephanie Rider, **Cong Wang**, "Micro-needle Drug Delivery System", *US Patent App. 14/947,767*, (2016).

AWARDS

1. **The Donald Coles Prize in Aeronautics**, Caltech 2019, awarded to a graduate student whose thesis displays the best design of an experiment or the best design for a piece of experimental equipment.
2. **The Ernest E. Sechler Memorial Award in Aeronautics**, Caltech, 2018: awarded to the graduate student who has made the most significant contribution to the GALCIT teaching and research effort.
3. **Dow Sustainability Innovation Student Challenge (Dow SISCA)** second place, Caltech, 2016: recognizing the research work that promotes sustainable solutions for environmental challenges.
4. **Stanback fellowship**, Caltech, 2014-2016: awarded to a graduate student who is devoted to the outreach education for underrepresented community college students.
5. **GALCIT fellowship**, Caltech, 2013-2014: providing full financial support for the pursuit of a Master degree in Aeronautics.
6. **Engineering Colors Award**, National University of Singapore, 2011: in recognition of the outstanding achievements in co-curriculum activities.
7. **J.N. Reddy Book Prize**, National University of Singapore, 2010: awarded to the top Engineering Science major student in terms of academic performance.
8. **Dean's List**, National University of Singapore, 2009/2010/2011/2012: awarded to the top 5% students in terms of academic performance.
9. **Ministry of Education Scholarship**, Singapore, 2009-2013: providing full financial support for the undergraduate study in Singapore.

RESEARCH EXPERIENCE

Research Scientist

California Institute of Technology

2020 – Present

Pasadena, CA

Project: **Measurement of Eddy Diffusivity Operator in Subsurface and Near-surface Turbulent Wakes Using Three-dimensional Particle Image Velocimetry**

- Conduct high-fidelity measurements using defocusing particle image velocimetry (DDPIV) on the bluff body turbulent wake
- A collaboration with the numerical simulation group led by Prof. Ali Mani from Stanford University

Project: **Physics and development of a novel synthetic jet actuator based on free-surface wave**

- We discovered that the free surface waves in certain regime can be focused into a strong streaming jet. We employ this physical phenomena to create an effective and efficient flow control actuator for .

Postdoctoral Research Associate

California Institute of Technology

2019 – 2020

Pasadena, CA

Project: **Physical mechanism of drag reduction using the dynamic free-slip surface method**

- Investigated the flow physics in turbulent shear flow manipulation using the dynamic free-slip surface method.

Graduate research assistant

California Institute of Technology

2014 – 2019

Pasadena, CA

Project: **Turbulent drag reduction using an array of dynamic free-slip surfaces**

- Invented a novel control technique for wall-bounded turbulent flow based on an array of oscillating free-slip surface. The achievable drag reduction effect is more than 40%.

Project: **Developing a pain-free micro-needle drug delivery system**

- Invented an auxiliary impulse injector to facilitate the drug delivery using pain-free micro-needle system.

Project: **Developing a fast recharging, high energy-density lithium-ion battery**

- Developed a novel electrode based on three-dimensional Carbon forreast structures.

TEACHING AND MENTORING EXPERIENCE

California Institute of Technology

Co-lecturer

Winter 2022

- Course: Experimental methods
 - Topics covered: Wind tunnel measurement, Oil-film interferometry

Lecturer

Winter/Spring 2021

- Course: Technical Fluid Mechanics
 - Topics covered: boundary layer, shear flow, jet, wake, wind tunnel design

Lecturer

2014 - 2020

- Course: Caltech/Base11 Aerospace Mentorship Program

- An outreach education program to provide research and education opportunities for the *under-served community college students*.

- Topics covered: Introductory level engineering mathematics, fluid mechanics, and solid mechanics

Mentor for summer research

2015 - 2022

- Paloma Garcia (2022), exchange graduate student from Technical University of Munich (TUM)
- Jerry Fu (2022), high school student (Poly-technical School, California)
- Kelvin Martinez (2020), Santa Monica College, transferred to Cal Poly, Long Beach
- Yukun Sun (2018), UC Irvine, now a graduate student at Cornell University
- Alejandro Stefan (2017), Santa Monica College, transferred to UC Berkeley, now a graduate student at Caltech
- Daniel Powers (2016), Skyline College, transferred to UC Santa Barbara
- Salwan Alhani (2015), West LA College, transferred to UCLA, now a MD/PhD student at William Beaumont School of Medicine, Oakland University.

Teaching Assistant

2017 - 2018

- Hydrodynamic Instability, (Winter 2017), Lecturer: Paul Dimotakis
- Aerospace Engineering Seminar, (2017-2018), Lecturer: Dan Meiron

INVITED TALKS

1. Boundary layer manipulation and drag reduction by a dynamic free-slip surface, Department of Mechanical Engineering, University of Illinois at Urbana-Champaign, 2022
2. Boundary layer manipulation and drag reduction by a dynamic free-slip surface, Department of Biological and Environmental Engineering, Cornell University, 2022
3. Turbulent drag reduction by a dynamic free-slip surface, Department of Mechanical Engineering, University of Houston, 2021
4. Turbulent boundary layer drag reduction by active free surface, Institute of High-Performance Computing, Agency for Science, Technology and Research (A*star), Singapore, 2018
5. A carbon-nanotube based micro-needle drug delivery system, Department of Aerospace Engineering, Tsinghua University, China, 2016
6. Porous Media Flow and A Passive Valve Design, Department of Engineering Science, National University of Singapore, 2015

CONFERENCE PRESENTATIONS

1. Turbulent drag reduction using a dynamic free-slip surface, 34th Symposium of Naval Hydrodynamics, Washington DC, 2022
2. Boundary layer control using a dynamic free-slip surface, 74th Annual Meeting of the APS Division of Fluid Dynamics, 2021
3. Physics of a dynamic free-slip surface in boundary layers, Office of Naval Research 331 Hydrodynamics Program Review, 2021
4. Physics of a dynamic free-slip surface, 73th Annual Meeting of the APS Division of Fluid Dynamics, 2020
5. Streaming motions created by a dynamic free-slip surface, Gallery of Fluid Motion, 73th Annual Meeting of the APS Division of Fluid Dynamics, 2020

6. A dynamic free-slip boundary for turbulence control, Office of Naval Research 331 Hydrodynamics Program Review, 2020
7. Manipulating near-wall turbulent boundary layer by unsteady air-films, 72th Annual Meeting of the APS Division of Fluid Dynamics, 2019
8. Reducing turbulent hydrodynamic frictional drag by modulating sustainable air films, Office of Naval Research 331 Hydrodynamics Program Review, 2019
9. A re-laminarization mechanism by sustainable thin air-films for turbulent drag reduction, 71th Annual Meeting of the APS Division of Fluid Dynamics, 2018
10. Reducing turbulent boundary layer drag by sustainable thin-air films, 70th Annual Meeting of the APS Division of Fluid Dynamics, 2017
11. A Passive Drag Reduction Surface Design, 69th Annual Meeting of the APS Division of Fluid Dynamics, 2016
12. Characterization of an Impinging Jet into Porous Media, 68th Annual Meeting of the APS Division of Fluid Dynamics, 2015
13. Unsteady Jet in Designing Innovative Drug Delivery System, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014

COLLABORATORS

Prof. Ali Mani (Stanford University)

Prof. Chris Roh (Cornell University)

Prof. Mingming Wu (Cornell University)

Prof. Leonardo Chamorro (University of Illinois at Urbana Champaign)