Curriculum Vitae As of June 5, 2025

### Sangjoon "Joon" Lee, Ph.D.

CTR Postdoctoral Fellow at Stanford University

488 Escondido Mall, Bldg 500 Rm 500T, Stanford, CA 94305, United States

#### **EDUCATION**

#### University of California, Berkeley – Berkeley, CA, United States

2019/08 - 2024/08

Ph.D. / M.S. in *Mechanical Engineering* 

• Designated emphasis: Computational and Data Science and Engineering

#### **Seoul National University** – Seoul, South Korea

2012/03 - 2018/08

(involving 21-month military leave)

B.S. in Mechanical and Aerospace Engineering & B.B.A. (Bachelor of *Business Administration*)

• Honors: Summa Cum Laude

#### **RESEARCH EXPERIENCE**

#### Postdoctoral Fellow, Stanford University

2024/10 -

Center for Turbulence Research (CTR) (Faculty Sponsor: Dr. B. J. McKeon)

· Advanced analysis for physical insights into turbulence and related phenomena

#### **Graduate Student Researcher**, University of California, Berkeley

2020/01 - 2024/08

Computational Fluid Dynamics (CFD) Lab (Advisor: Dr. P. S. Marcus)

- · Numerical examination of destabilizing aircraft wake vortices using both linear and non-linear analyses in association with spectral collocation methods
- Data-driven topology optimization of hydro-/aerodynamic designs based on the Design-by-Morphing (DbM) technique

#### Researcher, Seoul National University

2017/07 - 2018/08

Energy & Environmental Flow Lab (Director: Dr. W. Hwang)

- Development of conjugate heat transfer codes analyzing heat convection and conduction simultaneously with an efficient interpolation scheme for thermal properties
- Turbulent channel flow visualization via magnetic resonance velocimetry supplemented with large eddy simulations

#### Research Intern, Seoul National University

2016/09 - 2017/12

Turbulence, Flow Control & CFD Lab (Director: Dr. H. Choi)

• Large eddy simulations of flow around a small rotating vertical axis wind turbine

#### RESEARCH **INTERESTS**

#### Fluid Mechanics (Emphasis in CFD), Computational Science & Flows in Human Environment

- Modeling and analyzing fundamental motions and instabilities in fluid mechanics
- Simulating and optimizing geometrically complex or dynamically turbulent flow motions in association with high-performance computing and reliable data-driven techniques
- Investigating flow problems with respect to sustainable energy (e.g., gas/wind turbines) and clean environment on various scales (from indoor air conditioning to condensation trails)

GRANTS	NSF ACCESS Allocation: PHY250071 ACCESS by the U.S. National Science Foundation (NSF) PI · 1,500,000 HPC core-hours • Surface topology optimization for thermally-efficient dropwise condens	2025/03 - 2026/02 ation
FELLOWSHIPS	CTR Postdoctoral Fellowship Center for Turbulence Research (CTR) at Stanford University • Funding granted by the Office of Naval Research (ONR)	2024 -
	Departmental Graduate Fellowship College of Engineering at the University of California, Berkeley • Selective departmental recognition offering stipends with tuition and fe	2023 e waivers
	<ul> <li>Ilju Overseas Ph.D. Scholarship, Study Abroad Doctoral Program</li> <li>Ilju Academy &amp; Culture Foundation</li> <li>Merit-based financial aids, selected as one of 6 recipients in 2019</li> </ul>	2019 - 2023
	National Scholarship for Science and Engineering Korea Student Aid Foundation (KOSAF)  • Full-tuition scholarship for undergraduates with strong academic perfor	2012 - 2017 mance
HONORS & AWARDS	Outstanding Graduate Student Instructor (OGSI) Award GSI Teaching & Resource Center at the University of California, Berkeley	2021
	Representative of the Engineering Class of 2018, 72nd Summer Commencem Seoul National University	ent 2018
	Student Paper Award: Bronze, 9th National Fluid Engineering Contest for Undergraduates Fluid Engineering Division of the Korean Society of Mechanical Engineers  2017	
TEACHING & TUTORING	<b>Teaching Assistant</b> , University of California, Berkeley Introduction to Computer Programming for Scientists and Engineers (ENGIN 7)	2024 Sp
	Course Designer / Graduate Student Instructor, University of California, Berkeley Introduction to Aerospace Engineering Design (AERO ENG 10)	2022 Fa - 2023 Sp
	<b>Graduate Student Instructor</b> , University of California, Berkeley Experimentation and Measurements (MEC ENG 103)	2019 Fa - 2022 Sp
PROFESSIONAL SERVICE	Peer Reviewer  • Physics of Fluids (AIP Publishing)  • Journal of Fluid Mechanics (Cambridge University Press)	2024 - 2025 -
COMMUNITY OUTREACH	Stanford seeME, Stanford University Volunteer (Photographing & On-day Assistance)  • On-campus hands-on classes for young students to learn various aspects	2025 s of engineering
	SNU Tomorrow's Engineers Membership, Seoul National University Member & Head Manager  • Annual Vision Mentoring events for high school students interested in eng	2016 - 2018

## JOURNAL PUBLICATIONS

correspondingco-first

- 1. <u>Lee, S.</u>\* & Sheikh, H. M. (2025). **Airfoil Optimization using Design-by-Morphing with Minimized Design-Space Dimensionality**. In Preparation.
- 2. Duarte Roa, C., Raftery, P., <u>Lee, S.</u>, & Solmaz, A. S. (2025). **Effect of Elevated Air Movement on Radiant Cooling Systems**. In Preparation.
- 3. <u>Lee, S.</u>, & Marcus, P. S. (2025). **Transient Growth of a Wake Vortex and its Initiation via Inertial Particles**. *Journal of Fluid Mechanics*, In Press.
- 4. Lee, S., Baek, S., Ryu, J., Song, M. & Hwang, W. (2025). Flow in Ribbed Cooling Channels with Additive Manufacturing-Induced Surface Roughness. *Physics of Fluids*, 37(6), 065118. doi:10.1063/5.0268180.
- 5. Wang, J., Lee, S., & Marcus, P. S. (2024). **Triadic Resonance in Columnar Vortices**. *arXiv Preprint*. doi:10.48550/arXiv.2402.05287.
- 6. <u>Lee, S.\*</u>, Sheikh, H. M., Lim, D. D., Gu, G. X., & Marcus, P. S. (2024). **Bayesian-Optimized Riblet Surface Design for Turbulent Drag Reduction via Design-by-Morphing with Large Eddy Simulation**. *Journal of Mechanical Design*, 146(8), 081701. doi:10.1115/1.4064413.
- 7. Lee, S., & Marcus, P. S. (2023). Linear Stability Analysis of Wake Vortices by a Spectral Method Using Mapped Legendre Functions. *Journal of Fluid Mechanics*, 967, A2. doi:10.1017/jfm.2023.455.
- 8. Sheikh, H. M., Lee, S.<sup>†</sup>, Wang, J. & Marcus, P. S. (2023). **Airfoil Optimization using Design-by-Morphing**. *Journal of Computational Design and Engineering*, 10 (4), 1443-1459. doi:10.1093/jcde/qwad059.
- 9. <u>Lee, S.</u>, & Hwang, W. (2019). **Development of an Efficient Immersed-Boundary Method with Subgrid-Scale Models for Conjugate Heat Transfer Analysis using Large Eddy Simulation**. *International Journal of Heat and Mass Transfer, 134*, 198-208. doi:10.1016/j.ijheatmasstransfer.2019.01.019.
- 10. Baek, S., Lee, S., Hwang, W., & Park, J. S. (2019). **Experimental and Numerical Investigation of the Flow in a Trailing Edge Ribbed Internal Cooling Passage**. *Journal of Turbomachinery*, 141 (1), 011012. doi:10.1115/1.4041868.

# CONFERENCE PAPERS & PRESENTATIONS

- Hong, J., Lee, S., Lee, D., Bae, J. & Hwang, W. (2025, Sep 15-19). Experimental and Numerical Investigation of 3D Flow Structures in a Turbulent Channel Flow with Riblets. 16th International Symposium on Experimental and Computational Aerothermodynamics of Internal Flows (ISAIF), Prague, Czech Republic. Institute of Thermomechanics, Czech Academy of Sciences.
- Lee, S., Wang, J. & Marcus, P. S. (2024, Nov 24-26). Modernized and Parallelized Mapped Legendre Spectral Method Code for Unbounded Vortical Flow Simulations. 77th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Salt Lake City, UT, United States (no. L16.7). American Physical Society.
- 3. Wang, J., Lee, S. & Marcus, P. S. (2024, Nov 24-26). Stability Analysis of the Q-Vortex: Critical Swirling Parameter Determination via Perturbation Theories and Resonant Triadic Perturbations in the Sub-Critical Region. 77th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Salt Lake City, UT, United States (no. J38.5). American Physical Society.

- 4. <u>Lee, S.</u>, & Marcus, P. S. (2024, Aug 25-30). **Particle-Initiated Transient Growth of a Wake Vortex in Consideration of Condensation Trails**. 26th International Congress of Theoretical and Applied Mechanics (ICTAM), Daegu, South Korea (pp. 2009-2010). International Union of Theoretical and Applied Mechanics.
- Lee, S., & Marcus, P. S. (2023, Nov 19-21). Investigation of Triggering Vortex Instabilities with Inertial Particles. 76th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Washington, DC, United States (no. ZC38.5). American Physical Society.
- Wang, J., <u>Lee, S.</u>, & Marcus, P. S. (2023, Nov 19-21). Three-Wave Resonance in Neutrally Stable Wake Vortices. 76th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Washington, DC, United States (no. ZC38.2). American Physical Society.
- 7. Lee, S., & Marcus, P. S. (2022, Nov 20-22). Viscous Perturbation to Inviscid Wake Vortices Perturbation Theory in Vortex Stability. 75th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Indianapolis, IN, United States (no. Q11.7). American Physical Society.
- 8. Marcus, P. S., Wang, J. & Lee, S. (2022, Nov 20-22). A General Framework for Destabilizing Neutrally-Stable Flows Applied to Aircraft Wake Vortices. 75th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Indianapolis, IN, United States (no. L18.1). American Physical Society.
- 9. <u>Lee, S.</u>, & Marcus, P. S. (2021, Nov 21-23). **Linear Instability Analysis of Wake Vortices by a Spectral Method using Mapped Legendre Functions**. 74th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Pheonix, AZ, United States (no. E24.1). American Physical Society.
- 10. Wang, J., Lee, S., & Marcus, P. S. (2021, Nov 21-23). **Destabilizing Neutrally Stable Wake Vortices Using Degenerate Eigenmodes**. 74th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Pheonix, AZ, United States (no. E24.3). American Physical Society.
- 11. <u>Lee, S.</u>, & Hwang, W. (2018, Jul 4-6). **Validation of a Conjugate Heat Transfer Code with Subgrid-scale Models for Turbulent Flow**. KSFM 2018 Summer Conference, Jeju, South Korea (pp. 197-198). Korean Society for Fluid Machinery.
- 12. Baek, S., Lee, S., Hwang, W. & Park, J. S. (2018, Jun 11-15). Experimental and Numerical Investigation of the Flow in a Trailing Edge Ribbed Internal Cooling Passage. ASME 2018 Turbo Expo: Turbomachinery Technical Conference and Exposition, Lillestrøm, Norway (no. GT2018-76741). American Society of Mechanical Engineers. doi:10.1115/GT2018-76741. Journal-Quality Appraisal and Transferred to J. Turbomach.
- 13. Lee, S. (2017, Nov 1-3). **2D Simulation of an Unsteady Flow around a Small Vertical Axis** Wind Turbine Using an Immersed Boundary Method. KSME 2017 Annual Conference, Jeju, South Korea (pp. 741-745). Korean Society of Mechanical Engineers. *Student Paper Award: Bronze*.
- 14. Baek, S., Lee, S. & Hwang, W. (2017, Nov 1-3). Investigation of Fully Developed Turbulent Pipe Flow Using Magnetic Resonance Velocimetry (MRV) and Large Eddy Simulation (LES). KSME 2017 Annual Conference, Jeju, South Korea (pp. 581-583). Korean Society of Mechanical Engineers.

#### INVITED TALKS & SEMINARS

- 1. <u>Lee, S.</u> (2025, Jan 10). **Unmasking Hidden Physics and Bridging Data Sparsity: Two Paths to Tackling Fluid Problems**. CTR Tea Seminar, Stanford, CA, United States. Center for Turbulence Research, Stanford University.
- 2. <u>Lee, S.</u> (2024, Sep 10). **Physics-Based Computation in the Modern Era of Data-Driven Fluid Mechanics**. SNU Mechanical Engineering Seminar, Seoul, South Korea. Department of Mechanical Engineering, Seoul National University.
- 3. <u>Lee, S.</u> (2023, Aug 8). **Design-by-Morphing (DbM): A Novel Design Methodology for Aerodynamic Optimization**. 2023 Hyundai Vision Conference, Seoul, South Korea. Hyundai Motor Company.
- 4. Lee, S. (2022, Nov 16). Modern Applications of Computational Fluid Dynamics (CFD). 2022 Online Special Lecture Series: Research Reinforcement for Sustainable Buildings and Urban Systems in Future, Online. Department of Architectural and Urban Systems Engineering, Ewha Womans University.
- Lee, S. (2018, Aug 8). An Introduction to In-House LES Applications to Turbine Internal Cooling and Recent Improvements for Conjugate Heat Transfer Analysis. KARI Computational Fluid Dynamics Seminar, Daejeon, South Korea. Korea Aerospace Research Institute.

## SOFTWARE & CODES

- 1. Lee, S. (2025). roughSurfaceGen: Artificial Rough Surface Generator that Fits Prescribed Surface Roughness Parameters (v1.0.1). https://github.com/jun9303/roughSurfaceGen.
- 2. <u>Lee, S.</u>, Wang, J. (2024). **MLegS: Modernized and Parallelized Mapped Legendre Spectral Method Code** (v1.0.1). https://github.com/ucbCFD/MLegS. doi:10.5281/zenodo.14976470.