Curriculum Vitae As of February 27, 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 2025/03 - 2026/02 ACCESS by the U.S. National Science Foundation (NSF) PI · 1,500,000 HPC core-hours • Surface topology optimization for thermally-efficient dropwise condensation **FFILOWSHIPS** 2024 -CTR Postdoctoral Fellowship Center for Turbulence Research (CTR) at Stanford University • Funding granted by the Office of Naval Research (ONR) **Departmental Graduate Fellowship** 2023 College of Engineering at the University of California, Berkeley • Selective departmental recognition offering stipends with tuition and fee waivers 2019 - 2023 Ilju Overseas Ph.D. Scholarship, Study Abroad Doctoral Program Ilju Academy & Culture Foundation · Merit-based financial aids for promising Ph.D. students studying out of Korea • Selected as one of 6 recipients in 2019 2012 - 2017 **National Scholarship for Science and Engineering** Korea Student Aid Foundation (KOSAF) • Full-tuition scholarship for undergraduates with strong academic performance **HONORS & Outstanding Graduate Student Instructor (OGSI) Award** 2021 **AWARDS** GSI Teaching & Resource Center at the University of California, Berkeley Representative of the Engineering Class of 2018, 72nd Summer Commencement 2018 Seoul National University Student Paper Award: Bronze, 9th National Fluid Engineering Contest for Undergraduates 2017 Fluid Engineering Division of the Korean Society of Mechanical Engineers **TEACHING & Teaching Assistant**, University of California, Berkeley 2024 Sp TUTORING Introduction to Computer Programming for Scientists and Engineers (ENGIN 7) Course Designer / Graduate Student Instructor, University of California, Berkeley 2022 Fa - 2023 Sp Introduction to Aerospace Engineering Design (AERO ENG 10) Graduate Student Instructor, University of California, Berkeley 2019 Fa - 2022 Sp Experimentation and Measurements (MEC ENG 103) Undergraduate Tutor, Seoul National University 2013 Sp - 2013 Fa Basic Calculus 1, 2 & Basic Physics 1 (007.098A, 102 & 099A) **PROFESSIONAL Peer Reviewer SERVICE** • Physics of Fluids, AIP Publishing (invited since 2024) SNU Tomorrow's Engineers Membership, Seoul National University 2016 - 2018 **COMMUNITY** OUTREACH Member & Head Manager Annual Vision Mentoring events for high school students interested in engineering and science

JOURNAL PUBLICATIONS

- * Corresponding
- † Co-first
- 1. <u>Lee, S.</u> & Sheikh, H. M. (2025). **Reduced Design-Space Dimensionality of Design-by-Morphing for Airfoil Optimization**. In Preparation.
- 2. <u>Lee, S.</u>, Baek, S., Ryu, J., Song, M. & Hwang, W. (2025). **Impact of Additively Manufactured Surface Roughness on Flow within Ribbed Channels**. In Preparation.
- 3. Duarte, C., Raftery, P., <u>Lee, S.</u>, & Solmaz, A. S. (2025). **Effect of Elevated Air Movement on Radiant Cooling Systems**. In Preparation.
- 4. Lee, S., & Marcus, P. S. (2025). **Transient Growth of a Wake Vortex and its Initiation via Inertial Particles**. *Journal of Fluid Mechanics*, In Press. doi:10.48550/arXiv.2402.07469.
- 5. Wang, J., Lee, S., & Marcus, P. S. (2024). **Triadic Resonance in Columnar Vortices**. *arXiv Preprint*. doi:10.48550/arXiv.2402.05287.
- 6. Lee, S.*, 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.†, 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. Lee, S., & 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

- 1. 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.
- 2. 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.
- 3. <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.

- 5. 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.
- 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.
- 7. Marcus, P. S., Wang, J. & <u>Lee, S.</u> (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.
- 8. <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.
- 9. Wang, J., <u>Lee, S.</u>, & 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.
- 10. Lee, S., & 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.
- 11. 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.
- 12. 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*.
- 13. Baek, S., <u>Lee, S.</u> & 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. <u>Lee, S.</u> (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). https://github.com/ucbCFD/MLegS.