Sangjoon "Joon" Lee, Ph.D.

Postdoctoral Scholar at Stanford University

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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*

Seoul Science High School – Seoul, South Korea 2009/03 - 2012/02

WORK EXPERIENCE

Stanford University 2024/10 - Present
Postdoctoral Scholar, Aerospace Design Lab
(Faculty Sponsor: Dr. J. J. Alonso) [2026/01 - Present]
Postdoctoral Fellow, Center for Turbulence Research (CTR)
(Faculty Sponsor: Dr. B. J. McKeon) [2024/10 - 2025/12]

University of California, Berkeley 2020/01 - 2024/08
Graduate Student Researcher, Computational Fluid Dynamics (CFD) Lab
(Advisor: Dr. P. S. Marcus) [2020/01 - 2024/08]

Seoul National University 2016/09 - 2018/12
Researcher, Energy & Environmental Flow Lab (EEFL)
(Director: Dr. W. Hwang) [2017/09 - 2018/12]
Research Intern, Turbulence, Flow Control & CFD Lab
(Director: Dr. H. Choi) [2016/09 - 2017/12]

RESEARCH INTERESTS

Aerodynamics – *High-Fidelity CFD with AI/ML for Cost-Efficient, Physics-Based Optimization*
- Pioneering new engineering designs in turbulent thermo-fluid systems through high performance computing and physically grounded data-driven techniques
- Advancing the understanding of flow physics across multiple scales, from heat exchanger condensation and HVAC systems to aircraft, turbines and atmospheric flows

GRANTS

Precourt Institute for Energy Seed Grant 2026/02 - 2027/01
Stanford Precourt Institute for Energy
Co-PI · $100,000
- Highly efficient thermal management in hydrogen-powered aviation

GRANTS (Cont'd)

NSF ACCESS Allocation: PHY250071 — 2025/03 - 2027/02
ACCESS by the U.S. National Science Foundation (NSF)
PI · 1,500,000 HPC core-hours
- Surface topology optimization for thermally-efficient dropwise condensation

FELLOWSHIPS

CTR Postdoctoral Fellowship ($100,000) — 2024/10 - 2025/12
Center for Turbulence Research (CTR) at Stanford University

Departmental Graduate Fellowship ($23,825) — 2023/08 - 2023/12
College of Engineering at the University of California, Berkeley

Ilju Overseas Ph.D. Scholarship ($120,000), Study Abroad Doctoral Program — 2019/08 - 2023/07
Ilju Academy & Culture Foundation
- Merit-based; selected as one of six recipients in 2019

National Scholarship for Science and Engineering (Full-tuition) — 2012/03 - 2017/12
Korea Student Aid Foundation (KOSAF)

HONORS & AWARDS

Outstanding Graduate Student Instructor (OGSI) Award — 2021
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 & TUTORING

Teaching Assistant, University of California, Berkeley — 2024 Sp
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 SERVICE

Peer Reviewer
- *Journal of Computational Physics* (Elsevier) — 2026 -
- *Journal of Fluid Mechanics* (Cambridge University Press) — 2025 -
- *Physics of Fluids* (AIP Publishing) — 2024 -

COMMUNITY OUTREACH

Stanford seeME & CTR^2, Stanford University — 2025
Volunteer (Teaching, Photographing & On-day Assistance)
- On-campus hands-on classes for young students to learn various aspects of engineering

SNU Tomorrow's Engineers Membership, Seoul National University — 2016 - 2018
Member & Head Manager
- Annual *Vision Mentoring* events for high school students interested in engineering and science

PEER-REVIEWED PUBLICATIONS

* corresponding
† co-first

1. Hong, J., **Lee, S.**†, Lee, D., Bae, J. & Hwang, W. (2026). **Experimental and Numerical Investigation of 3D Flow Structures in a Turbulent Channel Flow with Riblets**, In Preparation.
2. **Lee, S.**, Nasr, A., Yildizdağ, M. E. & Sheikh, H. M. (2026). **Topology Optimization of Dimpled Surfaces**, In Preparation.
3. Jung, J., **Lee, S.** & Gu, G. X. (2026). **Data-Driven Optimization of Novel Morphing Airfoil Designs for Enhanced Flutter Control**, In Preparation.
4. Wang, J., **Lee, S.**, & Marcus, P. S. (2026). **Perturbation Analysis of Triadic Resonance in Columnar Vortices**, In Preparation. https://arxiv.org/abs/2402.05287.
5. Duarte, C., Raftery, P., **Lee, S.**, & Solmaz, A. S. (2026). **Effect of Elevated Air Movement on Radiant Cooling Systems**. *Journal of Building Performance Simulation*, Under Review.
6. **Lee, S.** & Sheikh, H. M. (2026). **Airfoil Optimization using Design-by-Morphing with Minimized Design-Space Dimensionality**. *Journal of Computational Design and Engineering*, 13 (1), 108–124. https://doi.org/10.1093/jcde/qwaf124.
7. **Lee, S.**, Song, H., & Lele, S. K. (2025). **Global Stability Analysis for Multidimensional Flow using an Augmented State Vector Formulation**. In *Annual Research Briefs 2025* (pp. 313–323). Center for Turbulence Research, Stanford University. https://web.stanford.edu/group/ctr/ResBriefs/2025/28_Lee.
8. **Lee, S.**, Vijay, S. (2025). **Topology-Aware Permeability Modeling in Structured Porous Media for Passive Flow Control**. In *Annual Research Briefs 2025* (pp. 351–361). Center for Turbulence Research, Stanford University. https://web.stanford.edu/group/ctr/ResBriefs/2025/31_Lee.
9. **Lee, S.**, & Marcus, P. S. (2025). **Transient Growth of a Wake Vortex and its Initiation via Inertial Particles**. *Journal of Fluid Mechanics*, 1014, A16. https://doi.org/10.1017/jfm.2025.253.
10. **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. https://doi.org/10.1063/5.0268180.
11. **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. https://doi.org/10.1115/1.4064413.
12. **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. https://doi.org/10.1017/jfm.2023.455.
13. 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. https://doi.org/10.1093/jcde/qwad059.
14. **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. https://doi.org/10.1016/j.ijheatmasstransfer.2019.01.019.

15. 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. https://doi.org/10.1115/1.4041868.

CONFERENCE PAPERS & PRESENTATIONS

1. Park, J., **Lee, S.**, Li, J., Schiavon, S., Chen, K. W. & Izuhara, I. (2026, May 18–22). **A Simulation Study on Condensation Risk in Radiant Cooling Panels with Elevated Air Movement.** 12th International Conference on Indoor Air Quality, Ventilation & Energy Conservation in Buildings, Los Angeles, CA, United States. IAQVEC Association.
2. **Lee, S.** & Vijay, S. (2025, Nov 23–25). **Topological Design of Porous Structures for Flow Control: A Design-by-Morphing Approach**. 78th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Houston, TX, United States (no. J32.3). American Physical Society.
3. 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 (no. C7.1). Institute of Thermomechanics, Czech Academy of Sciences.
4. **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.
5. 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.
6. **Lee, S.**, & 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.
7. **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.
8. Wang, J., **Lee, S.**, & 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.
9. **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.
10. 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.

11. **Lee, S.**, & 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.

12. 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.

13. **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.

14. 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. https://doi.org/10.1115/GT2018-76741. *Journal-Quality Appraisal and Transferred to J. Turbomach.*

15. **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*.

16. 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. **Lee, S.** (2026, Feb 5). **Training-Free Design Generation through Morphing and Its Applications in Fluid Dynamics**. MAE 297 Seminar Series, Davis, CA, United States. Department of Mechanical and Aerospace Engineering, University of California, Davis.

2. **Lee, S.** (2025, Aug 19). **Topology Optimization of Complex Nonlinear Systems Using High-Performance Simulations and Data-Driven Approaches**. GTR Technical Research Society Seminar, Suwon, South Korea. Global Technology Research, Samsung Electronics.

3. **Lee, S.** (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.

4. **Lee, S.** (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.

5. **Lee, S.** (2023, Aug 8). **Design-by-Morphing (DbM): A Novel Design Methodology for Aerodynamic Optimization**. 2023 Hyundai Vision Conference, Seoul, South Korea. Hyundai Motor Company.

6. **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.

7. **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.**, Wang, J. (2025). **MLegS: Modernized and Parallelized Mapped Legendre Spectral Method Code** (v1.0.2). https://github.com/ucbCFD/MLegS.
2. **Lee, S.** (2025). **roughSurfaceGen: Artificial Rough Surface Generator that Fits Prescribed Surface Roughness Parameters** (v1.0.1). https://github.com/jun9303/roughSurfaceGen.

DISSERTATION

1. **Lee, S.** (2024). **Linear Stability of a Wake Vortex and its Transient Growth: Numerical Analysis in Light of Critical-Layer Eigenmodes and Spectra** (Publication No. 31483920) [PhD Dissertation, University of California, Berkeley]. *ProQuest Dissertations & Theses*.