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 -
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 coupled with AI/ML for Cost-Efficient, Physics-Based Optimization*

- Pioneering new engineering designs in turbulent fluid and thermal systems through high performance computing and physically grounded data-driven techniques
- Advancing the understanding of flow physics for sustainability 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**. *Journal of Fluid Mechanics*, Under Review.
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.** (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.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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*.