

Sangjoon “Joon” Lee, Ph.D.

Ph.D. Graduate at University of California, Berkeley

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EDUCATION

University of California, Berkeley – Berkeley, CA, USA

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

B.S. in *Mechanical & Aerospace Engineering*

* 2-year leave of absence for military service

B.B.A. (*Business Administration*)

- Honors: *Summa Cum Laude*

RESEARCH EXPERIENCE

Graduate Student Researcher, University of California, Berkeley

2020/01 - 2024/08

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

- Numerical examination of destabilizing aircraft wake vortices using both linear and non-linear analyses in association with spectral collocation methods
- Machine Learning (ML)-based optimization of hydro-/aerodynamic designs using a Bayesian inference or a genetic algorithm in association with Design-by-Morphing (DbM)

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 INTEREST

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

- Modeling and analyzing fundamental solutions and instabilities in fluid mechanics
- Computing and optimizing geometrically complex or dynamically turbulent flow motions in association with machine learning 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)

1. Lee, S., Baek, S. & Hwang, W. (2024). **Impact of Additively Manufactured Surface Roughness on Flow Motion in Internal Cooling Passages without or with Ribs.** [In Preparation].
2. Duarte, C., Raftery, P., Lee, S., & Solmaz, A. S. (2024). **Effect of Elevated Air Movement on Radiant Cooling Systems.** [In Preparation].
3. Lee, S., & Marcus, P. S. (2024). **Transient Growth of a Wake Vortex and its Initiation via Inertial Particles.** *arXiv Preprint*. [arXiv:2402.07469](https://arxiv.org/abs/2402.07469) [Preprint].
4. Wang, J., Lee, S., & Marcus, P. S. (2024). **Triadic Resonance in Columnar Vortices.** *arXiv Preprint*. [arXiv:2402.05287](https://arxiv.org/abs/2402.05287) [Preprint].
5. 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](https://doi.org/10.1115/1.4064413).
6. 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](https://doi.org/10.1017/jfm.2023.455).
7. Sheikh, H. M., Lee, S. (co-first), 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](https://doi.org/10.1093/jcde/qwad059).
8. 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](https://doi.org/10.1016/j.ijheatmasstransfer.2019.01.019).
9. 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](https://doi.org/10.1115/1.4041868).

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.** In *Abstr. 77th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)*, Salt Lake City, UT, USA. American Physical Society.
2. Lee, S., & Marcus, P. S. (2024, Aug 25-30). **Particle-Initiated Transient Growth of a Wake Vortex in Consideration of Condensation Trails.** In *Ext. Abstr. 26th International Congress of Theoretical and Applied Mechanics (ICTAM)*, Daegu, South Korea (no. AO-FM16-0219). International Union of Theoretical and Applied Mechanics.
3. Lee, S., & Marcus, P. S. (2023, Nov 19-21). **Investigation of Triggering Vortex Instabilities with Inertial Particles.** In *Abstr. 76th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)*, Washington, DC, USA (no. ZC38.5). American Physical Society.
4. Wang, J., Lee, S., & Marcus, P. S. (2023, Nov 19-21). **Three-Wave Resonance in Neutrally Stable Wake Vortices.** In *Abstr. 76th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)*, Washington, DC, USA (no. ZC38.2). American Physical Society.

5. Lee, S., & Marcus, P. S. (2022, Nov 20-22). **Viscous Perturbation to Inviscid Wake Vortices - Perturbation Theory in Vortex Stability.** In *Abstr. 75th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Indianapolis, IN, USA* (no. Q11.7). American Physical Society.
6. Marcus, P. S., Wang, J. & Lee, S. (2022, Nov 20-22). **A General Framework for Destabilizing Neutrally-Stable Flows Applied to Aircraft Wake Vortices.** In *Abstr. 75th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Indianapolis, IN, USA* (no. L18.1). American Physical Society.
7. Lee, S., & Marcus, P. S. (2021, Nov 21-23). **Linear Instability Analysis of Wake Vortices by a Spectral Method using Mapped Legendre Functions.** In *Abstr. 74th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Pheonix, AZ, USA* (no. E24.1). American Physical Society.
8. Wang, J., Lee, S., & Marcus, P. S. (2021, Nov 21-23). **Destabilizing Neutrally Stable Wake Vortices Using Degenerate Eigenmodes.** In *Abstr. 74th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD), Pheonix, AZ, USA* (no. E24.3). American Physical Society.
9. Lee, S., & Hwang, W. (2018, Jul 4-6). **Validation of a Conjugate Heat Transfer Code with Subgrid-scale Models for Turbulent Flow.** In *Proc. KSFM 2018 Summer Conference, Jeju, South Korea* (pp. 197-198). Korean Society for Fluid Machinery.
10. 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.** In *Proc. ASME 2018 Turbo Expo: Turbomachinery Technical Conference and Exposition, Lillestrøm, Norway* (no. GT2018-76741). American Society of Mechanical Engineers. [doi:10.1115/GT2018-76741](https://doi.org/10.1115/GT2018-76741). *Journal-Quality Appraisal and Transferred to J. Turbomach.*
11. Lee, S. (2017, Nov 1-3). **2D Simulation of an Unsteady Flow around a Small Vertical Axis Wind Turbine Using an Immersed Boundary Method.** In *Proc. KSME 2017 Annual Conference, Jeju, South Korea* (pp. 741-745). Korean Society of Mechanical Engineers. *Student Paper Award: Bronze.*
12. 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).** In *Proc. KSME 2017 Annual Conference, Jeju, South Korea* (pp. 581-583). Korean Society of Mechanical Engineers.

INVITED
TALK &
SEMINAR

1. Lee, S. (2023, Aug 8). **Design-by-Morphing (DbM): A Novel Design Methodology for Aerodynamic Optimization.** *2023 Hyundai Vision Conference, Seoul, South Korea.* Hyundai Motors.
2. 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.
3. 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.

TEACHING & TUTORING	Teaching Assistant , University of California, Berkeley Introduction to Computer Programming for Scientists and Engineers (ENGIN 7) • Essential programming strategies and numerical methods for scientific computing 2024 Sp
	Course Designer / Graduate Student Instructor , University of California, Berkeley Introduction to Aerospace Engineering Design (AERO ENG 10) • Computer-aided two-dimensional airfoil design practices with wind tunnel experiments 2022 Fa - 2023 Sp
	Graduate Student Instructor , University of California, Berkeley Experimentation and Measurements (MEC ENG 103) • Measurements and experimental techniques for mechanical engineers 2019 Fa - 2022 Sp
	Undergraduate Tutor , Seoul National University Basic Calculus 1, 2 & Basic Physics 1 (007.098A, 102 & 099A) • Review of basics of university-level calculus and physics 2013 Sp - 2013 Fa
GRANT & FELLOWSHIP	Departmental Graduate Fellowship College of Engineering at University of California, Berkeley • Selective departmental recognition offering stipends with tuition and fee waivers 2023
	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 2019 - 2023
	National Scholarship for Science and Engineering Korea Student Aid Foundation (KOSAF) • Full-tuition scholarship for undergraduates with strong academic performance 2012 - 2017
HONOR & AWARD	Outstanding Graduate Student Instructor (OGSI) Award GSI Teaching & Resource Center at University of California, Berkeley 2021
	Representative of the Engineering Class of 2018 , 72nd Summer Commencement Seoul National University 2018
	Student Paper Award: Bronze , 9th National Fluid Engineering Contest for Undergraduates Fluid Engineering Division of Korean Society of Mechanical Engineers 2017
PROFESSIONAL SERVICE	Peer Reviewer • <i>Physics of Fluids</i> , AIP Publishing (invited since 2024)
COMMUNITY OUTREACH	SNU Tomorrow's Engineers Membership , Seoul National University Member & Head Manager • Annual <i>Vision Mentoring</i> for high school students interested in engineering and science • Student-driven regular intercollegiate academic knowledge exchange sessions 2016 - 2018
LANGUAGE	English, Korean Native/Bilingual