# SANGJOON (JOON) LEE

Ph.D. Candidate at University of California, Berkeley

6116 Etcheverry Hall, University of California, Berkeley, CA 94720, USA
✉ sangjoonlee@berkeley.edu   |   🌐 https://sangjoonlee.info/

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| **EDUCATION** | **University of California, Berkeley** – Berkeley, California, USA    Aug. 2019 - May 2024 (Exp.) |

*Ph.D. Candidate, Mechanical Engineering (Advisor: Dr. Philip S. Marcus)*

- Designated emphasis in *Computational and Data Science and Engineering*

**Seoul National University** – Seoul, South Korea    Mar. 2012 - Aug. 2018
*\* 2-year leave of absence for military service*

*B.Sc., Mechanical & Aerospace Engineering*
*B.B.A., Business Administration*

- Graduation representative of the Engineering Class of 2018 (*Summa cum laude*)

**RESEARCH INTERESTS**

**Fluid Mechanics (Emphasis in CFD), Computational Science & Environmental Flows**

- Modeling, computing and analyzing motions and instabilities of aerodynamic or hydrodynamic flows (e.g., aircraft wake vortices) with concurrent heat transfers

- Investigating environmental flow problems that are relevant to clean energy (e.g., wind turbine), pollution control (e.g., wildfire & micro-particle dissemination) and so forth.

**SKILLS**

**Parallel Programming & Numerical Analysis**

- Python, Fortran, C/C++, MATLAB, MPI, OpenMP, Bash, Git & CFD tools (OpenFOAM, Fluent)

**Interdisciplinary Research & Communication**

- Scientific writing, data visualization, academic presentation, problem solving & collaboration

**RECENT PUBLICATIONS**

1. Lee, S., Sheikh, H. M., Lim, D. D., Gu, G. X., & Marcus, P. S. (2023). **Bayesian-Optimal Design of Riblet Surfaces for Turbulent Drag Reduction via Design-by-Morphing with Large Eddy Simulation** [Manuscript in preparation].

2. Lee, S., & Marcus, P. S. (2023). **Linear Stability Analysis of Wake Vortices by a Spectral Method using Mapped Legendre Functions** [Preprint]. *arXiv e-prints.* doi:10.48550/arXiv.2209.00295

3. Sheikh, H. M., Lee, S., Wang, J. & Marcus, P. S. (2023). **Airfoil Optimization using Design-by-Morphing** [Preprint]. *arXiv e-prints.* doi:10.48550/arXiv.2207.11448

**FELLOWSHIPS**

**Departmental Block Grant Fellowship**    Aug. 2019 - Now
Department of Mechanical Engineering, University of California, Berkeley

- Departmental block grants offering tuition and fee waivers

**Overseas Ph.D. Scholarship**, Study Abroad Doctoral Program    Aug. 2019 - Jul. 2023
Ilju Academy & Culture Foundation

- Merit-based financial aids of $120,000 for promising Ph.D. students studying out of Korea
- Selected as one of 6 recipients in 2019

**National Scholarship for Science and Engineering**    Mar. 2012 - Dec. 2017
Korea Student Aid Foundation (KOSAF)

- Full-tuition scholarship for undergraduates with strong academic performance

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| RESEARCH EXPERIENCE | **Graduate Student Researcher**, University of California, Berkeley | Jan. 2020 - Now |

**RESEARCH EXPERIENCE**

**Graduate Student Researcher**, University of California, Berkeley     Jan. 2020 - Now
Computational Fluid Dynamics Lab *(Director: Dr. Philip S. Marcus)*

- Numerical examination of linear instabilities of aircraft wake vortices using a global eigenvalue and eigenmode analysis in association with a spectral collocation method
- Optimization of hydro-/aerodynamic designs with a Bayesian inference or a genetic algorithm using the Design-by-Morphing technique

**Researcher**, Seoul Natinonal University     Jul. 2017 - Aug. 2018
Energy & Environmental Flow Lab *(Director: Dr. Wontae 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 with large eddy simulation

**Research Intern**, Seoul National University     Sep. 2016 - Dec. 2017
Turbulence, Flow Control & CFD Lab *(Director: Dr. Haecheon Choi)*

- Large eddy simulation of flow around a rotating small vertical axis wind turbine

**TEACHING EXPERIENCE**

**Course Designer / Graduate Student Instructor**, University of California, Berkeley     Aug. 2022 - Now
Introduction to Aerospace Engineering Design (AERO ENG 10)

- Instructed a module for two-dimensional airfoil design and wind tunnel experimentation module

**Graduate Student Instructor**, University of California, Berkeley     Aug. 2019 - May 2022
Experimentation and Measurements (MEC ENG 103)

- Taught experimental techniques for mechanical engineering, run lab sessions, graded assignments and reports, had office hours and answered questions in person and online
- Received Outstanding Graduate Student Instructor (OGSI) Award in Apr. 2021

**Teaching Assistant**, Seoul National University     Mar. 2013 - Dec. 2013
Basic Calculus 1, 2 & Basic Physics 1 (007.098A, 102 & 099A)

- Tutored freshmen who have difficulty in studying university-level calculus and physics

**COURSEWORK**

**Graduate Coursework**, University of California, Berkeley

- Fluid Mechanics

  Advanced Fluid Mechanics, Engineering Aerodynamics,
  Experimental Methods in Single-and Multiphase Flows, Graduate Ocean Engineering Seminar,
  Hydrodynamic Stability and Instability, Oceanic and Atmospheric Waves,
  Teaching of Mechanical Engineering at the University Level, Topics in Fluid Mechanics - Vortex Dynamics
- Computational Science

  Applications of Parallel Computers, Numerical Solution of Differential Equations,
  Optimization Models in Engineering, Spectral Methods for Fluid Dynamics, Theoretical Statistics

**Undergraduate Coursework**, Seoul National University

- Engineering

  Applied Fluid Mechanics, Creative Engineering Design, Digital Computer Concept and Practice,
  Digital Fabrication and Manufacturing, Dynamics, Engineering Mathematics, Fluid Mechanics,
  Heat Transfer, Introduction to Electrical and Computer Engineering,
  Management in Mechanical Engineering, Manufacturing Processes, Mechanical Drawing,
  Mechanical Engineering Lab, Mechanical System Design Project, Mechanics and Design,
  Solid Mechanics, Thermodynamics, Writing in Science and Technology
- Business

  Capital Markets and Accounting, Corporate Strategy, Fundamentals of Economics,
  Human Resource Management, International Business Management,
  Management Information System, Management Science, Managerial Accounting,
  Marketing Management, Mathematics for Economics, Operations Management,
  Principles of Accounting, Principles of Management

PUBLICATIONS

1. LEE, S., SHEIKH, H. M., LIM, D. D., GU, G. X., & MARCUS, P. S. (2023). **Bayesian-Optimal Design of Riblet Surfaces for Turbulent Drag Reduction via Design-by-Morphing with Large Eddy Simulation** [Manuscript in preparation].

2. LEE, S., & MARCUS, P. S. (2023). **Linear Stability Analysis of Wake Vortices by a Spectral Method using Mapped Legendre Functions** [Preprint]. *arXiv e-prints*. doi:10.48550/arXiv.2209.00295

3. SHEIKH, H. M., LEE, S., WANG, J. & MARCUS, P. S. (2023). **Airfoil Optimization using Design-by-Morphing** [Preprint]. *arXiv e-prints*. doi:10.48550/arXiv.2207.11448

4. 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.

5. BAEK, S., LEE, S., HWANG, W., & PARK, J. S. (2018). **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.

PRESENTATIONS

1. LEE, S., & MARCUS, P. S. (Nov 21, 2022). **Viscous Perturbation to Inviscid Wake Vortices - Perturbation Theory in Vortex Stability.** In *the 75th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)* (No. Q11.7), Indianapolis, IN, USA. American Physical Society.

2. MARCUS, P. S., WANG, J. & LEE, S. (Nov 21, 2022). **A General Framework for Destabilizing Neutrally-Stable Flows Applied to Aircraft Wake Vortices.** In *the 75th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)* (No. L18.1), Indianapolis, IN, USA. American Physical Society.

3. LEE, S., & MARCUS, P. S. (Nov 21, 2021). **Linear Instability Analysis of Wake Vortices by a Spectral Method using Mapped Legendre Functions.** In *the 74th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)* (No. E24.1), Pheonix, AZ, USA. American Physical Society.

4. WANG, J., LEE, S., & MARCUS, P. S. (Nov 21, 2021). **Destabilizing Neutrally Stable Wake Vortices Using Degenerate Eigenmodes.** In *the 74th Annual Meeting of the APS Division of Fluid Dynamics (APS-DFD)* (No. E24.3), Pheonix, AZ, USA. American Physical Society.

5. BAEK, S., LEE, S., HWANG, W. & PARK, J. S. (Jun 12, 2018). **Experimental and Numerical Investigation of the Flow in a Trailing Edge Ribbed Internal Cooling Passage.** In *ASME 2018 Turbo Expo: Turbomachinery Technical Conference and Exposition* (No. GT2018-76741), Lillestrøm, Norway. American Society of Mechanical Engineers. *Journal-Quality Appraisal and Published to J. Turbomach.*

6. LEE, S., & HWANG, W. (Jul 6, 2018). **Validation of a Conjugate Heat Transfer Code with Subgrid-scale Models for Turbulent Flow.** In *Proc. KSFM 2018 Summer Conference* (pp. 197-198), Jeju, South Korea. Korean Society for Fluid Machinery.

7. LEE, S. (Nov 3, 2017). **2D Simulation of an Unsteady Flow around a Small Vertical Axis Wind Turbine Using an Immersed Boundary Method.** In *Proc. KSME 2017 Annual Conference* (pp. 741-745), Jeju, South Korea. Korean Society of Mechanical Engineers. *Student Paper Award: Bronze Prize.*

8. BAEK, S., LEE, S. & HWANG, W. (Nov 3, 2017). **Investigation of Fully Developed Turbulent Pipe Flow Using Magnetic Resonance Velocimetry (MRV) and Large Eddy Simulation (LES).** In *Proc. KSME 2017 Annual Conference* (pp. 581-583), Jeju, South Korea. Korean Society of Mechanical Engineers.

SEMINARS & TALKS

1. LEE, S. (Nov 16, 2022). **Modern Applications of Computational Fluid Dynamics (CFD).** In *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.

2. LEE, S. (Aug 8, 2018). **An Introduction to In-House LES - Applications to Turbine Internal Cooling and Recent Improvements for Conjugate Heat Transfer Analysis.** In *the KARI Computational Fluid Dynamics Seminar*, Daejeon, South Korea. Korea Aerospace Research Institute.