

# SANGJOON (JOON) LEE

Ph.D. Candidate at University of California, Berkeley

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## RESEARCH INTERESTS

### Fluid Mechanics, 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 applicable to energy (e.g., wind turbine) and pollution (e.g., wildfire & micro-particle dissemination) issues

## EDUCATION

**University of California, Berkeley** – Berkeley, California, USA Aug. 2019 - Now

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

B.Sc., Mechanical & Aerospace Engineering

\* 2-year leave of absence for military service

B.B.A., Business Administration

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

## PUBLICATIONS

1. LEE, S., SHEIKH, H. M., LIM, D. D., & 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. (2022). **Linear Stability Analysis of Wake Vortices by a Spectral Method using Mapped Legendre Functions** [Preprint]. *arXiv e-prints.* [doi:10.48550/arXiv.2209.00295](https://doi.org/10.48550/arXiv.2209.00295)
3. SHEIKH, H. M., LEE, S., WANG, J. & MARCUS, P. S. (2022). **Airfoil Optimization using Design-by-Morphing** [Preprint]. *arXiv e-prints.* [doi:10.48550/arXiv.2207.11448](https://doi.org/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](https://doi.org/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](https://doi.org/10.1115/1.4041868).

## TALKS & 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)*, Indianapolis, IN, USA. American Physical Society.

2. 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)*, Pheonix, AZ, USA. American Physical Society.
3. 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 *KARI Computational Fluid Dynamics Seminar*, Daejeon, South Korea. Korea Aerospace Research Institute.
4. 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.
5. 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*

#### FELLOWSHIPS & SCHOLARSHIPS

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

- Departmental grants offering tuition and fee waivers

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

- Merit-based financial aids of \$120,000 for promising Ph.D. students studying out of Korea, selected as one of six 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

#### RESEARCH EXPERIENCE

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

- Numerical examination of linear instabilities of aircraft wake vortices using a global eigenvalue and eigenmode analysis in association with a spectral collocation method.

**Researcher** (*Director: Dr. Wontae Hwang*) Jul. 2017 - Aug. 2018  
Energy & Environmental Flow Lab, Seoul National University

- 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 cross-validation of large eddy simulation

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

- Large eddy simulation of flow around a rotating small vertical axis wind turbine based on an immersed boundary method

**TEACHING  
EXPERIENCE**

**Course Designer**, University of California, Berkeley  
Introduction to Aerospace Engineering Design (AERO ENG 10)

Aug. 2022 - Now

- Composed teaching outlines and instruction materials, especially for an airfoil design lab module

**Graduate Student Instructor**, University of California, Berkeley  
Experimentation and Measurements (MEC ENG 103)

Aug. 2019 - May 2022

- 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

**COURSEWORK**

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

Advanced Fluid Mechanics, Applications of Parallel Computers, Engineering Aerodynamics, Experimental Methods in Single-and Multiphase Flows, Graduate Ocean Engineering Seminar, Hydrodynamic Stability and Instability, Numerical Solution of Differential Equations, Oceanic and Atmospheric Waves, Optimization Models in Engineering, Spectral Methods for Fluid Dynamics, Teaching of Mechanical Engineering at the University Level, Theoretical Statistics, Topics in Fluid Mechanics - Vortex Dynamics

**Undergraduate Engineering Coursework**, Seoul National University

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