

# ETHAN YOUNGIN SHIN

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## RESEARCH INTERESTS

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Atmospheric Boundary Layer, Turbulence, Uncertainty Quantification, Bayesian Inference, Environment-Energy System Interactions, Engineering for Global Development

## EDUCATION

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### Massachusetts Institute of Technology, Cambridge, MA, United States

Sep. 2022 – Present

Ph.D. Candidate in Civil and Environmental Engineering  
Thesis Advisor: Michael F. Howland

### Yonsei University, Seoul, Republic of Korea

Mar. 2016 - Aug. 2022

B.S. in Mechanical Engineering  
Honors: *magna cum laude*

## RESEARCH EXPERIENCE

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### Howland Lab (Prof. Michael Howland), Massachusetts Institute of Technology

Graduate Research Assistant

Sep. 2022 - Present

- Coupling multifidelity simulations of atmospheric boundary layer flows with forward and inverse uncertainty quantification methods, to improve parameterizations of atmospheric turbulence
- Leveraging analytical models and data-driven techniques to improve parameterizations of urban roughness in simulations of atmospheric boundary layer flows

### Innovative Design and Integrated Manufacturing Lab (Prof. Sung-Hoon Ahn), Seoul National University

Undergraduate Research Intern

Dec. 2020 - Feb. 2022

- Conducted field demonstration of a polling-based energy management system with an off-grid solar power plant in Tanzania
- Investigated feasibility of a smart electric mobility operating system for integration with off-grid solar power plants in Tanzania

### Multiphysics Energy System Laboratory (Prof. Jongsup Hong), Yonsei University

Undergraduate Research Intern

Jul. 2020 - Aug. 2020

- Conducted a thermofluidic analysis of a solid oxide fuel cell (SOFC) cooling system using ANSYS Fluent
- Designed and tested the effects of rib turbulators on SOFC interconnect fuel channels

## PUBLICATIONS

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### Journal Publications

3. **Shin, E. Y.** and Howland, M. F. Accelerated Bayesian calibration and uncertainty quantification of RANS turbulence model parameters for stratified atmospheric boundary layer flows. *Boundary-Layer Meteorology*, 192(3).
2. **Shin, E. Y.**, Yang, X. I. A., and Howland, M. F. Addressing grid convergence and log-layer mismatch in wall modeled large eddy simulations of geophysical flows over rough surfaces and canopies. *Boundary-Layer Meteorology*, 191(42).
1. Rhee, H., Im, H., Manongi, F., **Shin, E. Y.**, Song, H., Jung, W., Ahn, S. (2021). Smart Electric Mobility Operating System Integrated with Off-Grid Solar Power Plants in Tanzania: Vision and Trial Run. *Journal of Appropriate Technology*, 7(2), 127-135.

### Conference Proceedings

1. **Shin, E. Y.**, Chan, M., Wang, J., Zahtila, T., Gorle, C., Iaccarino, G., and Howland M. F. (2024). Multifidelity modeling and uncertainty quantification of heterogeneous roughness. *Proceedings of the Summer Program, Center for Turbulence Research, Stanford University*.

## CONFERENCE PRESENTATIONS AND POSTERS

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5. **Shin, E. Y.** Yang, X. I. A., and Howland, M. F. Addressing grid convergence and log-layer mismatch in wall modeled large eddy simulations over rough surfaces and canopies. *77th Annual Meeting of the APS Division of Fluid Dynamics, Nov. 23-25, 2025, Houston, TX, USA.*
4. **Shin, E. Y.** and Howland, M. F. Bayesian inversion to quantify parameter uncertainty in RANS turbulence models for stratified atmospheric boundary layer flows. *AMS 25th Symposium on Boundary Layers and Turbulence, Jun. 17-20, 2025, Turin, IT.*
3. **Shin, E. Y.** and Howland, M. F. Accelerated uncertainty quantification of RANS turbulence models for stratified atmospheric boundary layer flow. *AGU24 Annual Meeting, Dec. 9-13, 2024, Washington, DC, USA.*
2. **Shin, E. Y.**, Chan, M., Wang, J., Zahtila, T., Gorle, C., Iaccarino, G., and Howland M. F. Multi-fidelity modeling and uncertainty quantification of heterogeneous roughness. *77th Annual Meeting of the APS Division of Fluid Dynamics, Nov. 24-26, 2024, Salt Lake City, UT, USA. (Invited)*
1. **Shin, E. Y.** and Howland, M. F. Uncertainty quantification of RANS turbulence model parameters with ensemble Kalman methods and machine learning. *76th Annual Meeting of the APS Division of Fluid Dynamics, Nov. 19-21, 2023, Washington, DC, USA.*

## AWARDS AND SCHOLARSHIPS

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**1st Place Best Student Oral Presentation, American Meteorological Society** (25th Symposium on Boundary Layers and Turbulence, Jun. 17-20, 2025)

**CEE Mathworks Fellowship, Massachusetts Institute of Technology** (Fall 2023, Spring 2024)

**Louis Berger Fellowship, Massachusetts Institute of Technology** (Spring 2023)

**Schoettler Fellowship, Massachusetts Institute of Technology** (Fall 2022)

**Highest Honors, Yonsei University** (Spring 2021)

**Honors, Yonsei University** (Fall 2016, Spring 2019, Spring 2020, Fall 2020)

**Merit-based Scholarship, Yonsei University** (2019, 2020, 2021, 2022)

**National Scholarship, Korea Student Aid Foundation** (2016, 2019, 2020)

**Lee Choong Kon Pay Forward Scholarship** (Spring 2019)

## TEACHING EXPERIENCE

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### Teaching Assistant

*1.61/1.061 Transport Processes in the Environment (Prof. Heidi Nepf)*

*Sep. 2025 - Present*

- Delivered two lectures, created a problem set, held two office hours per week, and designed a laboratory class on particle advection and diffusion.

### Guest Lecturer

*Leaders in Industry-University Cooperation 3.0*

*Jul. 2023 - Present*

- Delivered guest lectures on modeling wind in the atmospheric boundary layer to undergraduate students from Korean universities (Jeonbuk National University, Sookmyung Women's University)

### Participant

*MIT Teaching & Learning Lab*

*Feb. 2023 - Dec. 2023*

- Completed the four tracks of the Grad Teaching Development Tracks (equivalent to Kaufman Teaching Certificate Program), a set of workshops intended for early- and mid-program graduate students interested in improving their teaching skills

### Part-time Teacher

*ASAP Academy*

*Jul. 2019 - Aug. 2020*

- Taught high school math, physics, and English grammar to classes of up to 7 students

## VOLUNTEER EXPERIENCE

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### Volunteer

*Loaves and Fishes Meal Program*

*Dec. 2022 - Sep. 2024*

### Volunteer

*Yonsei Habitat for Humanity*

*Mar. 2020 - Jun. 2022*

### Student Volunteer

*Incheon Support Center for Foreign Workers*

*Mar. 2016 - Jun. 2016*

## LEADERSHIP EXPERIENCE

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### Student Member

*Committee on Boundary Layers and Turbulence, American Meteorological Society*

*Feb. 2025 - Present*

<b>Panel Director</b>	
<i>MIT Energy Conference</i>	<i>Oct. 2023 - Mar. 2024</i>
<b>President</b>	
<i>Charles River Running Crew, MIT KGSA</i>	<i>June. 2023 - June. 2024</i>
<b>15th Class President</b>	
<i>Yonsei Habitat for Humanity</i>	<i>Mar. 2020 - Jun. 2021</i>
<b>Student Ambassador</b>	
<i>Yonsei-Waseda Exchange Program</i>	<i>Jul. 2016, Feb. 2019</i>
<b>Police Bus Driver</b>	
<i>Auxiliary Police, Republic of Korea (Military Service)</i>	<i>Apr. 2017 - Dec. 2018</i>