Youngjoon Suh

Mechanical and Aerospace Engineering
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Dr. Suh's research focuses on the fundamental investigation of nanoscale transport physics through data-driven deep learning techniques to address thermal challenges in modern electronics and energy applications.

I. Educational Background

University of California, Irvine **Irvine, CA**

2022 PhD in Mechanical & Aerospace Engineering
Thesis: Bridging the Gap: Vision-Inspired Two-Phase Heat Transfer Analysis
Advisor: Prof. Yoonjin Won

2019 MS in Mechanical & Aerospace Engineering
Thesis: Characterization of Microscopic Thermofluidic Transport for Development of Porous Media Used in Phase-Change Device
Advisor: Prof. Yoonjin Won

Chung-Ang University **Seoul, South Korea**

2016 BS in Mechanical Engineering

II. Professional Positions

University of California, Irvine **Irvine, CA**

2023-Current Postdoctoral Scholar
Occupation: Won Lab
Advisor: Prof. Yoonjin Won

2017-2022 Research Associate
Occupation: Won Lab
Advisor: Prof. Yoonjin Won

Chung-Ang University **Seoul, South Korea**

2016-2017 Research Associate
Occupation: Applied Fluid Mechanics Lab (AFML)
Advisor: Prof. Joong Yull Park

III. Awards and Honors

- **Keynote Presentation Award** at μFIP, June 2022
- **Keynote Presentation Award** at μFIP, June 2021
- **Best Poster Award** at NSF-JST Workshop, April 2021

- **Best Poster Award** at ASME ICNMM, June 2019.
- **Small Grant Award** UC Mexus, based on the research proposal entitled “Hybrid Materials (MOFs@membrane) for Water Harvesting in Arid Environments”, 2018-2019.
- **Cum Laude Graduation**, Chung-Ang University, 2016.
- **Presidential Undergraduate Scholarships** (2011, 2014, & 2015), National Agricultural Cooperative Federation Scholarship, 2014.
- **Silver Medallion for Merit**, Republic of Korea National Red Cross, 2015

IV. Research

A. Journal Publications

10. Lee, J.*, **Suh, Y.** *, Kuciej, M., Barako, M, T., Won, Y. (2022). Computer Vision-Assisted Investigation of Boiling Heat Transfer on Segmented Nanowires with Vertical Wettability. **Nanoscale**, *Contributed Equally. Selected for Cover Art.

9. Khodakarmi, S., Rabbi, K. F., **Suh, Y.**, Won, W., Miljkovic, N. (2022). Machine Learning Enabled Dropwise Condensation Heat Transfer Measurement. ***International Journal of Heat and Mass Transfer***, 194, 123016.

8. **Suh, Y.**, Lee, J., Simadiris, P., Yan, X., Sett, S., Li, L., Rabbi, F, L., Miljkovic, N., Won, Y. (2021). A Deep Learning Perspective on Dropwise Condensation. ***Advanced Science***, 22(8), 2101794. Selected for Cover Art.
    - Highlighted in Advanced Theory and Simulations as Hot Topic: Artificial Intelligence and Machine Learning.
    - Appeared in Korean Economic Newspaper, UCI news, and UIUC news.

7. **Suh, Y.**, Bostanabad, R., & Won, Y. (2021). Deep Learning Predicts Boiling Heat Transfer. ***Scientific Reports***, 11(1), 1-10.

6. **Suh, Y.**, Gowda, H., & Won, Y. (2020). In situ investigation of particle clustering dynamics in colloidal assemblies using fluorescence microscopy. ***Journal of Colloid and Interface Science***, *576*, 195-202. Selected for Cover Art.
    - Appeared in UCI news.

5. **Suh, Y.**, Lin, C. H., Gowda, H., & Won, Y. (2020). Multiscale Evaporation Rate Measurement Using Microlaser-Induced Fluorescence. ***Journal of Electronic Packaging***, *142*(3).

4. **Suh, Y.**, Pham, Q., Shao, B., & Won, Y. (2019). The Control of Colloidal Grain Boundaries through Evaporative Vertical Self-Assembly. ***Small***, *15*(12), 1804523. Selected for Cover Art.
    - Appeared in UCI news.

3. Lee, J., **Suh, Y.**, Dubey, P. P., Barako, M. T., & Won, Y. (2018). Capillary wicking in hierarchically textured copper nanowire arrays. ***ACS applied materials & interfaces***, *11*(1), 1546-1554.

2. **Suh, Y.**, & Park, J. Y. (2018). Effect of off-plane bifurcation angles of primary bronchi on expiratory flows in the human trachea. ***Computers in biology and medicine***, *95*, 63-74.

1. Lee, G. H., **Suh, Y.**, & Park, J. Y. (2018). A Paired Bead and Magnet Array for Molding Microwells with Variable Concave Geometries. ***JoVE (Journal of Visualized Experiments)***, (131), e55548.

B. Preprints

6. **Suh, Y.**, Won, Y., Chandramowlishwaran, A. (2023) Review: Artificial Intelligence for Liquid-Vapor Phase-Change Heat Transfer. *arXiv preprint*, arXiv:2309.01025

5. **Suh, Y.**, Chang, S. H., Simadiris, P., Inouyet, T., Hoque, M. J., Khodakarami, S., Kharangate, C., Miljkovic, N., Won, Y. (2023) VISION-iT: Deep Nuclei Tracking Framework for Digitalizing Bubbles and Droplets. *SSRN*, 4491956
   - Listed on SSRN's Top Ten download list for: Information Theory & Research eJournal and Web Technology eJournal.

4. Lu, D., **Suh, Y.**, Won, Y. (2023) Rapid Identification of Boiling Crisis with Event-based Visual Streaming Analysis. *SSRN*, 4463289

3. Chang, S. H., **Suh, Y.**, Kharangate, C., Won, Y. (2023) Application of Machine Learning-Based Autonomous Vision for Investigating Microgravity Flow Boiling in a Rectangular Channel. *SSRN*, 4458770

2. Hassan, S., Feeney, A., Dhruv, A., Kim, J., **Suh, Y.**, Ryu, J., Won, Y., Chandramowlishwaran, A. (2023) BubbleML: A Multi-Physics Dataset and Benchmarks for Machine Learning. *arXiv preprint*, arXiv:2307.14623.

1. Lee, J.*, **Suh, Y.***, Kuciej, M., Barako, M, T., Won, Y. (2022). Deep Vision-Inspired Bubble Dynamics on Hybrid Nanowires with Dual Wettability. *arXiv preprint*, arXiv:2202.09417. ***Contributed Equally** (*Accepted for Journal Publication*)

C. Papers in Preparation

15. Lu, D., **Suh, Y.**, Won, Y. (2022) Neuromorphic Deep Learning Framework for Real-Time Critical Heat Flux Prediction. (*Submitted*)

14. **Suh, Y.**, Chandramowlishwaran, A., Won, Y. (2022) Artificial Intelligence for Liquid-Vapor Phase-Change Heat Transfer. (*Submitted*)

13. Zhao, C., **Suh, Y.**, Won, Y. (2022) Computer Vision: Droplet Impact on Nanoscale Surfaces. (*In Preparation*)

12. **Suh, Y.**, Won, Y. (2022). Data-driven Bubble Dynamics in Pool Boiling. (*In Preparation*)

11. **Suh, Y.**, P, Simadiris., Chang, S. H., Won, Y. (2022) Deep Nuclei Tracking Framework for Phase-Change Heat and Mass Transfer. (*Submitted*)

D. Conference Publications

3. Quach, V. N., Pham, N. Q., Han, J-H., **Suh, Y.**, Park, J-S., Won, Y. (2020, October) Surface Engineering Through Atomic Layer Deposition on Three-Dimensionally Structured Materials. *In ASME 2020 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems.* American Society of Mechanical Engineers Digital Collection.

2. **Suh, Y.**, Lin, C. H., Gowda, H., & Won, Y. (2019, October). Evaporation Rate Measurement at Multiple Scales Using Temperature-Sensitive Fluorescence Dyes. In *ASME 2019 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems*. American Society of Mechanical Engineers Digital Collection.

1. Pham, Q. N., **Suh, Y.**, Shao, B., & Won, Y. (2019, October). Boiling Heat Transfer Using Spatially-Variant and Uniform Microporous Coatings. In *ASME 2019 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems*. American Society of Mechanical Engineers Digital Collection.

E. Book Chapters & Magazine Articles

1. Khodakarami, S., **Suh, Y.**, Won, Y., Miljkovic, N. (2023) An Intelligent Strategy for Phase Change Heat and Mass Transfer: Application of Machine Learning. ***Advanced heat transfer***.

F. Patents

2. Chandramowlishwaran, A., Won, Y., **Suh, Y.**, Barschkis, S. Digital twin for two-phase pool boiling dynamics, UC Case No. 2023-752, *Submitted*. Patent Pending.

1. Won, Y., **Suh, Y.**, Bostanabad, R. Machine-learning assisted smart flow boiling, UC Case No. 2021-708, *Submitted*. Patent Pending.

G. Presentations

10. Need for Speed: Digitalizing Boiling Dynamics using Deep Learning-Assisted Optical Flow, International Conference on micro Flow and Interfacial Phenomena (μFIP), Evanston, IL, USA, 2023.

9. "VISIONiT: A Vision-based Framework for Nucleation Phase Change Science," International Conference on micro Flow and Interfacial Phenomena (μFIP), Irvine, CA, USA, 2022. **Keynote Presentation Award**

8. "Learning Droplets, Bubbles, and their Dynamics," International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS), Palm Springs, CA, USA, 2021.

7. "Intelligent Vision Enables Data-driven Analysis for Pool Boiling," International Conference on micro Flow and Interfacial Phenomena (μFIP), Virtual Conference, Online, 2021. **Keynote Presentation Award**

6. "AI enables new phase change studies," NSF-JST Workshop, Virtual Conference, 2021. **Best Poster Award**

5. "A deep learning framework for predicting boiling heat transfer," International Conference on Nanochannels, Microchannels, and Minichannels (ICNMM), Virtual Conference, Online, 2020.

4. "Evaporation Rate Measurement at Multiple Scales Using Temperature Sensitive Fluorescence Dyes," ASME International Technical Conference and Exhibition of Packaging and Integration of Electronic and Photonic Microsystems (InterPACK), Anaheim, CA, USA, 2019.

3. "Microstructural Patterning of Self-Assembled Colloidal Particles," 17th International Conference on Nanochannels, Microchannels, and Minichannels (ICNMM), St. John's, Newfoundland, Canada, 2019

2. "Evaporation Rate Measurement at the Submicron Level using Temperature-Sensitive Fluorescence Thermometry," 17th International Conference on Nanochannels, Microchannels, and Minichannels (ICNMM), St. John's, Newfoundland, Canada, 2019. **Best Poster Award**

1. **"**Effect of Airway Geometry on Expiratory Flow**,"** The Korean Society of Medical & Biological Engineering Conference, Korea University, Seoul, South Korea, 2016.

H. Selected Media Coverage

7. Top Downloads For: Information Theory & Research eJournal, Appeared in: https://papers.ssrn.com/sol3/topten/topTenResults.cfm?groupingId=3507073&netorjrnl=jrnl (Aug 2023)
6. AI '물방울 분석' 기술, 미세먼지 해결 나선다, Korean Economic Newspaper, Appeared in : https://www.hankyung.com/it/article/2021120345101 (Dec 2021)
5. Big Data from Little Droplets: Unlocking Condensation Insights with AI and Machine Learning, UCI Samueli School of Engineering News, Appeared in : https://engineering.uci.edu/news/2021/10/big-data-little-droplets-unlocking-condensation-insights-ai-and-machine-learning (Oct 2021)
4. Hot Topic: Artificial Intelligence and Machine Learning, Advanced Theory and Simulations, Wiley, Appeared in: https://onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)2513-0390.hottopic-artificialintelligence (Sep 2021)
3. Fluorescence Microscopy Provides Key to Grain Boundary Understanding, UCI Samueli School of Engineering News, Appeared in: https://engineering.uci.edu/news/2020/9/fluorescence-microscopy-provides-key-grain-boundary-understanding (Sep 2020)
2. Two Win Best Poster Awards, UCI Samueli School of Engineering News, Appeared in: https://engineering.uci.edu/news/2019/12/two-win-best-poster-awards (Dec 2019)
1. Researchers Control Defects in Nanomaterial, UCI Samueli School of Engineering News, Appeared in: https://engineering.uci.edu/news/2019/5/researchers-control-defects-nanomaterials (May 2019)

V. Education

A. Student Mentoring – Deep Learning Subgroup

Eventually joined the lab as Graduate Student Researcher† or Engineering Specialist§

Graduate Students: Peter Simadiris†, Marissa N. Lee†, Sanghyeon Chang, Annie Dinh, Di Fan, Yiming Shen, Kourosh Sohrabi, Jaeyun Lee, Jooho Park

Undergraduate Students: Amy Hyunh, Kayla S. Pedro, Peter Simadiris†, Tiffany B. Inouye§, Marissa N†. Lee†, Jared Stoneking, Jason Anthony Miralles, Dale Lu, Ziyi Zhang, Sean Lee, Padma Iyengar, Sorah Chung, Jiyun Lee, Changhun Lee

High School Interns: Kayla Kim, Abigail Kim, Miriam Chen, Sean Mei, Ellen Jo, Charles Yang, Mirue Kang, Ashley Chan

B. Teaching Assistant

Fall, 2021 MAE 120: Heat and Mass Transfer

Half Time

- Led virtual and in-person discussion sessions.
- Held office hours.
- Prepared supplementary lectures.
- Helped create Midterm and Final problems.
- Helped prepare class materials.

Fall, 2020 MAE 120: Heat and Mass Transfer
Full Time
- Led virtual discussion sessions.
- Held office hours.
- Prepared supplementary lectures.
- Helped prepare online class materials.

Winter, 2020 MAE 152: Introduction to Computer-Aided Engineering
Full Time
- Led tutorial sessions.
- Graded homework and exams.

Fall, 2019 MAE 120: Heat and Mass Transfer
Full Time
- Led discussion lectures.
- Held office hours
- Occasionally covered lectures for instructor.
- Created homework problems.
- Helped create Midterm and Final problems.
- Graded homework and exams.

Spring, 2019 MAE 91: Introduction to Thermodynamics
Full Time
- Led discussion sessions.
- Held office hours.
- Assisted in-class activities.
- Graded homework and exams.

Fall, 2018 MAE 120: Heat and Mass Transfer
Full Time
- Led discussion lectures.
- Held office hours
- Created homework problems.
- Helped create Midterm and Final problems.
- Graded homework and exams.

C. Educational Activities

- Volunteer Teacher, The California State Summer School for Mathematics and Science (COSMOS), University of California, Irvine, CA, USA (Aug 2023)
  Prepared two 3-hr lectures and student activities for Cluster 8: Bioengineering and Characterizing Human Skin Organoids.
- Host, Summer Annotation Camp, University of California, Irvine, CA, USA (2022)
- Participant, Human vs Computers Virtual Background Design Contest, University of California, Irvine,

CA, USA (March 2022). **Selected as Semi-Finalist**

- Co-Host, Summer Annotation Camp, University of California, Irvine, CA, USA (2021)
- Participant, Michigan State University Virtual Science Art Exhibition, Michigan State University, East Lansing, MI, USA (September 2020)

  Artwork donated to be displayed in local libraries and schools to inspire the youth.
  https://www.msuscicomm.org/2020-sciart-exhibition/youngjoon-suh
- Research Presenter, Johns Hopkins Center for Talented Youth Family Academic Programs, University of California, Irvine, CA, USA (May 2019)

VI. Service

A. Organization of Technical Sessions, Workshops and Conferences

- Volunteer, AI for Thermal Energy Science Workshop, Irvine, CA, USA, 2023
- Volunteer, Scientists and Engineers Early Career Development (SEED) Workshop, Arlington, VA, USA, 2022
- Student Chair, International Conference on Micro Flow and Interfacial Phenomena (μTAS), Irvine, CA, USA, 2022

B. Reviewed Journal and Conference Publications

Reviewed for:

- Nanoscale and Microscale Thermophysical Engineering – (1)
- The Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm) – (1)
- International Conference on micro Flow and Interfacial Phenomena (μFIP) – (10)

C. Community Service

- Volunteer, The Frontiers Peace Camp, Suaii, East Timor, 2009 (1 month)
- Manager, The Frontiers Peace Camp, Becora, East Timor, 2010 (1 month)
- Volunteer, Chung-Ang University Rotary Club, Seoul, South Korea, 2010 – 2011
- Military Service, Capital Mechanized Infantry Division, Gapyeong, South Korea, 2011 – 2012
- Volunteer, Korea Disaster Relief Service, Seoul, South Korea, 2014
- Volunteer, Church Community Outreach Service, Ho Chi Minh City, Vietnam, 2014 (2 weeks)