Hansol Lee

Email: numbers2x@kaist.ac.kr | **Website:** hansollee.netlify.app | **Linkdein:** linkedin.com/in/hansollee-research

RESEARCH INTERESTS

Electro-thermal co-design and co-optimization of 2.5D/3D heterogeneous integration / Thermal management of advanced electronics using embedded cooling / Integration of advanced functional materials with electronics

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) Mar. 2022 – Feb. 2024
M.S. Mechanical Engineering | ***GPA**: 4.26/4.3* *Advisor: Prof. Sung Jin Kim*

Korea Advanced Institute of Science and Technology (KAIST) Mar. 2015 – Feb. 2022
B.S. Mechanical Engineering | ***GPA**: 3.81/4.3* *Advisor: Prof. Wang-Yuhl Oh*

AWARDS & HONORS

Outstanding Master's Research Award (Top 3 Graduates) Nov. 2024
Department of Mechanical Engineering at KAIST

Outstanding Achievement Award (Top 10 Undergraduates) Mar. 2021
Department of Mechanical Engineering at KAIST

Scientific Writing Competition - *Encouragement Award* Mar. 2021
KAIST

National Science & Technology Scholarship Mar. 2015 – Aug. 2021
Korea Student Aid Foundation (KOSAF)

RESEARCH EXPERIENCE

Applied Heat Transfer Lab | KAIST Jan. 2021 – Present
Research Intern & Graduate Research Assistant (Advisor: Prof. Sung Jin Kim)

- **Thermal-hydraulic modeling of manifold microchannel (MMC) heat sinks**: Developed an analytical thermal-hydraulic model of MMC heat sinks for embedded cooling in ultra-high heat flux($>1kW/cm^2$) electronics. [Publication and presentations based on this work: (J1), (C1)-(C2)]
- **Multi-objective performance optimization of MMCs**: Performed multi-objective optimization of MMCs, achieving record-high thermal performance with uniform flow distribution through multi-fidelity surrogate modeling. [Publication based on this work: (J2)]
- **Thermal reliability verification of 2.5D/3D Processing-In-Memory (PIM) heterogeneous packages**: Developed a compact thermal model for 2.5D/3D PIM heterogeneous packages, reducing the computational cost by 98%. Invented TSV embedded manifold microchannels. [Patent based on this work: (P1)]
- **Hands-on experience in IR thermometry and pool boiling heat transfer analysis**: Led a project on the analysis of phase change heat transfer during pool boiling using IR thermometry and numerical analysis techniques.

Thermal Radiation Laboratory | KAIST Dec. 2017 – Feb. 2018
Undergraduate Research Assistant (Advisor: Prof. Bong Jae Lee)

- Explored and applied machine learning techniques to efficiently solve complex inverse heat conduction problems.

JOURNAL PUBLICATIONS

(J1) **H. Lee***, Y. J. Lee*, S. J. Kim, One-dimensional model of manifold microchannel heat sinks: Prediction of thermal performance and flow non-uniformity, *International Communications in Heat and Mass Transfer.* (2022 JCR: 4.7%, IF: 7.0) [Link]

(J2) Y. J. Lee*, **H. Lee***, C. Hwang*, I. Lee, S. J. Kim, Multi-objective thermal-hydraulic performance optimization of manifold microchannels for embedded cooling based on multi-fidelity surrogate modeling. *(In preparation)*

*First co-author

PATENTS

(P1) Embedded manifold microchannel heat sink utilizing through silicon via (TSV) for electrical communication as a heat dissipation structure in a 2.5D/3D packages, Y. J. Lee, **H. Lee**, S. J. Kim (South Korea, Application No.P2024-0824-KR01)

CONFERENCES

(C1) One-dimensional modeling of embedded manifold microchannels with plate fins for prediction of thermal performance and flow non-uniformity, ***Korean Society Mechanical Engineering Thermal Engineering Division* (2024 KSME-TED)**, Apr. 2024, Jeju, Republic of Korea

(C2) Thermal performance prediction of liquid-cooled manifold microchannel (MMC) heat sinks with plate fins, ***Korean Society Mechanical Engineering Thermal Engineering Division* (2023 KSME-TED)**, Apr. 2023, Gyeongju, Republic of Korea

(C3) One-dimensional model of Z-type manifold microchannels and experimental validation, ***24th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm2025).*** *(Abstract submitted)*

PROJECTS

3D Multiporous Cooling System for Ultra-high Heat Flux Applications Mar. 2022 – Feb. 2024

National Research Foundation of Korea (NRF) *PI: Prof. Sung Jin Kim*

- Conducted an analytical thermal-hydraulic modeling of 3D structured monoporous coolers with various types of manifold. Optimized its performance and contributed to the development of cooling solutions for ultra-high heat flux electronics.

Thermal Reliability Verification of 2.5D/3D PIM Heterogeneous Package Mar 2023 – Feb. 2024

Electronics and Telecommunications Research Institute (ETRI) *PI: Prof. Sung Jin Kim*

- Developed a compact thermal model of a PIM heterogeneous package to verify thermal reliability. Invented the embedded manifold microchannels utilizing through-silicon vias (TSV) for both electrical communication and heat dissipation. (see patent above)

PROFESSIONAL EXPERIENCE

Thermal/Research Engineer July. 2024 – Dec. 2024

Koolmicro Inc. *Hwaseong, Republic of Korea*

- Optimized the thermal performance of a liquid cooling module for large-die-size ($>$ 2cm $\times$ 2cm) chiplets, specifically for data centers and high performance computing (HPC) systems. Designed a thermal test section for evaluating the thermal performance of the liquid cooling module.

Research Intern Jun. 2018 – Feb. 2019

Beflex Inc. *Daejeon, Republic of Korea*

- Developed algorithms in biomechanical running trackers for measuring ground impact and GPS paths of runners. Conducted a user experience study for earphone-type running trackers.

EXTRACURRICULAR ACTIVITIES

Student Press - Editor in ME Newsletter Apr. 2022 – May. 2023

Department of Mechanical Engineering in KAIST

- Drafted, edited, and published articles introducing monthly research highlights in the ME department. Interviewed professors and researchers in the ME department.

Vice President of KAIST Entrepreneurs Mar. 2018. – Feb. 2019

KAIST K-School

- Developed a student-oriented social network connecting student startup teams via KE party. Interviewed and published articles introducing alumni entrepreneurs.

TEACHING

Physics tutoring for Gifted Education Sep. 2021 – Feb. 2022

KAIST Center for Gifted Education

- Taught physics to gifted middle school students and conducted regular mentoring sessions.

International Freshman Tutoring - General Physics I Mar. 2021 – Jun. 2021

KAIST

- Tutored international freshmen in general physics in English.

SKILLS

Programming languages: MATLAB, Python, C
Commercial software: ANSYS Fluent, Icepack, SpaceClaim, Inventor, AutoCAD, Illustrator
English proficiency: TOEFL 108 (R/L/S/W - 30/26/24/28)

MILITARY SERVICE

Capital Artillery Brigade March. 2019 – Oct. 2020
Army Sergeant, Honorable Discharge, Administration Specialist *Gimpo, Republic of Korea*