Jiajian Luo

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EDUCATION

University of California, Irvine, CA, USA

- *Doctor of Philosophy in Mechanical Engineering* (GPA: 3.90/4.0) *Sep. 2021- Sep. 2025 (Expected)*
- *Master of Science in Mechanical Engineering* (GPA: 3.93/4.0) *Sep. 2019 - Jun. 2021*

Wuhan University, Hubei, China

- *Bachelor of Engineering in Power Engineering* (GPA: 3.21/4.0) *Sep. 2014 - Jun. 2018*

EXPERIENCE

Graduate Researcher *Sep. 2019 - PRESENT*

Department of Mechanical and Aerospace Engineering, UC Irvine (Advisor: Prof. Jaeho Lee)

✧ ***Development of Nanoscale Thermoelectric Coolers (TECs) for Transistors*** *Sep. 2021 - PRESENT*

- Collaborated with Texas Instruments Incorporated, delivered bi-weekly presentations and reports.
- Designed and simulated holey Si-based TEC to reduce 8°C under 400W/cm^2 hotspot in power transistors.
- Fabricated nanoscale TEC in cleanroom environment using lithography, etching, metallization, etc.
- Characterized experimental cooling performance using RTD measurement and IR thermography.

✧ ***Thermal Optimization of Intense Pulse Light (IPL) Soldering for Advanced Packaging*** *Feb. 2024 - PRESENT*

- Partnered with Samsung Electronics, conducted monthly presentations and in-person meetings.
- Performed high-fidelity FEA simulations with components including PCBs, solder balls, chips and MLCC.
- Reduced package temperature non-uniformity by 78.5%, enhancing product reliability.

✧ ***Machine Learning-Aided Dynamic Thermal Management of TECs*** *Dec. 2023 – June. 2024*

- Scripted and automated 100,000+ FEM simulations for convolutional neural network training.
- Built CNN model with 120,000,000 + parameters to predict temperature and power consumption with RMSE less than 0.40%.
- Provided optimal cooling control under dynamic workloads within 1.6s, reduced peak hotspot temperature by 50.6%.

Undergraduate Lab Assistant *May. 2016 - Jun. 2018*

School of Power & Mechanical Engineering, Wuhan University (Advisor: Prof. Xuejiao Hu)

✧ ***Theoretical analysis of Non-Fourier Heat Conduction Problem*** *Mar. 2018 - Sep. 2019*

- Conducted analytical analysis of ultra-fast heat transfer problem for laser heating applications.

✧ ***Thermal Conductivity Characterization*** *Sep. 2016 - Mar. 2018*

- Characterized thermal conductivity of porous materials using transient hot-wire method.
- Designed, built and tested laboratory apparatus for thermal reflectance spectroscopy.

SKILLS

- **Thermal Design & Optimization**
  5 years of thermal design and optimization experience in thermoelectric coolers, data center air-cooling systems, passive cooling components in electronic systems (TIM, IHS, heat sink, Solder joints, PCB, etc.).
- **Thermal Testing & Characterization**
  5 years of hands-on thermal experiment including steady-state method, IR thermography, RTD measurement, 3-omega method, transient hot-wire method, transient hot-plate method, and thermal reflectance spectroscopy.
- **Simulation**
  5 years of FEM modeling experience in COMSOL/ANSYS using thermal/ electrical/ mechanical/ CFD modules.
- **Data Analysis and Machine learning**
  Proficient in programming languages including MATLAB (8 years), C/C++ (8 years) and python (3 years). Proficient in using TensorFlow (2 years) for neural network architectures including NN, CNN and LSTM.
- **Cleanroom Fabrication**
  2 years of cleanroom experience including lithography (Karl Suss MA6), e-beam evaporation (CHA Solution Mark-40), LPCVD (ASM), RIE (Trion/STS Etcher), DRIE (PlasmaTherm DSE III FDRIE), wet silicon etching (HF/BOE), wafer cleaning (solvent/RCA/piranha), wafer dicing (ADT 7910 Dicing Saw), lift-off (Lift-off Resist, NMP/acetone), thermal oxidation, SEM (Hitachi S4700) and thin-film analysis (Filmetrics F40/ Dektak Profilometer).
- **Computer Aided Design**
  SolidWorks (5 years), Autodesk CAD (5 years), Cadence (2 year), L-edit(2 year).
- **Languages**
  English (fluent), Chinese (native), Cantonese (native).

CONFERENCE EXPERIENCE

- The 24th International Mechanical Engineering Congress & Exposition (IMECE 2024, Author & Presenter, Portland)
- The 24th ASMC Summer Heat Transfer Conference (SHTC 2024, Author & Presenter, Anaheim)
- The 39th Annual International Conference on Thermoelectrics (ICT 2023, Author & Presenter, Seattle)
- The 21st IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm 2022, Author, San Diego)

PUBLICATION

Luo, J. and Lee J. "Machine Learning-Assisted Thermoelectric Cooling for Multi-Hotspot Dynamic Thermal Management." *Journal of Applied Physics* (2024) https://doi.org/10.1063/5.0206287

Luo, J. et al. "Dynamic Thermal Management in SOI Transistors Using Holey Silicon-Based Thermoelectric Cooling." *IEEE Transaction on Electron Devices* (2024) https://doi.org/10.1109/TED.2024.3358788

Luo, J. et al. "Analysis of Non-Fourier Heat Conduction Problem with Suddenly Applied Surface Heat Flux." *Journal of Thermophysics and Heat Transfer* (2020) https://doi.org/10.2514/1.T5849

LEADERSHIP & SERVICE

Mentor of First-Gen Students at UCI Next Gen Pathway *Jul. 2023 – Jul.2024*

- Currently providing mentoring for 7 first-generation students at University of California, Irvine with resource guidance, academic support and daily convenience.