HAOTIAN JIA

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- Ph.D. candidate in Mechanical Engineering specializing in fluid mechanics & heat transfer, with extensive experience in design of experiments, testing & lab equipment, data acquisition, and precise thermal & fluid measurements.
- Expert in thermal-fluid systems (heat pipes, cold plates, microchannels, porous media, etc.) with strong applied math skills and a deep understanding of fundamental physics for reduced-order and numerical modeling using CFD and FEM solvers.
- Experienced in designing and building custom test platforms with integrated data acquisition for experimental validation, familiar with thermal technologies like heat pipes, cold plates, heat sinks, and conduction/convection applications.

Experience

Tufts University, Department of Mechanical Engineering — Medford, MA
Research Assistant — *Sep 2019 – Jun 2024*
Teaching Assistant — *Sep 2024 – Present*

Nokia Bell Labs, Optical Systems and Device Research Lab — Murray Hill, NJ
Data Center Thermal Management Research Co-op — *May 2024 – Aug 2024*

Imperial College London, Department of Mathematics — London, UK
Awarded Visiting Research Assistant — *Jun 2022 – Aug 2022*

Education

Tufts University — Medford, MA
Ph.D. Mechanical Engineering (GPA: 3.82/4.0) — *Sep 2020 – Present*
M.S. Mechanical Engineering — *Sep 2018 – Present*

Beijing Forestry University — Beijing, China
B.E. Mechanical Design, Manufacturing, and Automation — *Sep 2014 – Jun 2018*

Project

Data Center Thermal Management — *ARPA-E COOLERCHIPS*
- Conducted thermal characterization of two-phase cold plates, optimized procedures to enhance test efficiency by 25%.
- Contributed to developing a passive evaporative AI data center cooling solution at the server rack level for testing and demonstration, tailored for Multi-Chip Module CPUs/GPUs and the state-of-the-art Thermal Test Vehicle.

Internal Flow Modeling of Heat Pipe — *Part of Ph.D. Thesis*
- Analyzed two-phase flow in the adiabatic sections of axial-grooved heat pipes with varying liquid-vapor interface shapes, using reduced order modeling through asymptotic expansion and other advanced applied mathematics techniques.
- Developed a numerical solver built on MATLAB PDE Toolbox to compute the heat pipe's flow resistance and capillary limit.

Aerogel Permeability Measurement under Supercritical CO_2 Flows — *NSF award 1530603*
- Developed an experimental apparatus and wrote custom LabVIEW and MATLAB programs for data acquisition and analysis.
- Addressed the gap in measuring permeability under supercritical CO_2 flows by expanding the existing technique and inventing a non-destructive inverse approach, using Duhamel's theorem and other numerical and applied mathematics techniques.

Microchannel Flow Lubrication Enhancement — *NSF award 2140033*
- Investigated photoisomerization kinetics of a shape-changing photo-surfactant and its adsorption model on bulk and interfacial flows in superhydrophobic microchannels, to determine the optimal surface tension isotherm under varying light profiles.
- Fabricated proof-of-concept superhydrophobic microchannels in cleanroom and conducted flow-field analysis using micro-PIV.

Jet-impingement Enhanced Aerogel freeze drying — *NSF STTR PhaseI award 2014881*
- Collaborated with Aerogel Technologies, LLC. to design, build, and optimize a jet-impingement drying system with integrated data acquisition and control, improving the patented freeze-drying process and cutting production time by 75%.
- Developed a dehumidification process, supplying ultra-dry compressed air at -40°C dew point and 12.7 SCFM to jet stream.

Website Development for Research Group
- Designed and maintained Transport Phenomena Lab website on WordPress, see https://sites.tufts.edu/tplab for reference.

Skills

Programming language: MATLAB, LaTeX, Python, LabVIEW, Arduino, C, HTML, HPC environment

CFD/FEM Software: Ansys Fluent, Ansys Workbench, MATLAB PDE Toolbox,COMSOL, SolidWorks Simulation

CAD Software: SolidWorks, Inkscape, Adobe Illustrator, AutoCAD, MasterCAM, G-code

Graduate Level Courses

Fluid Mechanics & Heat Transfer: Thermal Fluid Transport I&II, High Reynolds Number Flow, Microfluidics, Thermal Management of Electronics, Analytic Transport Phenomena, Thermal Fluid Systems II (TA)

Math & Simulation: Numerical Analysis, Applied Mathematics for Engineers, Simulation for Mechanical Engineer

Design, Ctrl & Optics : Inventive Design, Assistive Design, Digital Control of Dynamic Systems, Optics & Wave Motion

Publications

- **Jia, H.**, Karamanis, G., Dinh, H., Diorio, M., Mayer, M., and Hodes, M., "Dual Apparatuses and Methods to Measure Permeability of Nanoporous Aerogels." **In progress for submission** to *Review of Scientific Instruments.*
- Apigo, D., Parbat, S., **Jia, H.**, Roy, R., Bongarala, M., Faisal, S., Qiu, H., Kabirzadeh, P., Miljkovic, N., and Salamon, T., "Thermofluidic design and characterization of microchannel evaporators in a two-phase low global warming potential refrigerant pump loop." **In progress for submission** to the *Applied Thermal Engineering.*
- Hodes, M., Daetz, A., **Jia, H.**, and Kirk, T., "Adiabatic-section flow resistance of axial-groove heat pipes for slowly-varying meniscus curvature." **In progress for submission** to the *Journal of Fluid Mechanics.*

Conference Talks & Presentations

- **10th International Congress on Industrial and Applied Mathematics (ICIAM 2023) |** Talk in Minisymposia titled *"Inertial Effects on the Adiabatic-Section Flow Resistance of Axial Groove Heat Pipes"*
- **The Red Lotus Project |** Presented a series of talks at video-conference events and mini-symposia to mathematicians at Imperial College London, promoting interdisciplinary collaboration in the field of surface engineering, with a focus on microfabrication and photochemistry applications.
- **Online Aerogel Seminar 2020 |** Presented talk titled *"Permeability of Aerogels under Supercritical CO_2 Conditions"*

Awards

Outstanding Innovation Award
Nokia Bell Labs, Global Student Program 2024 *Aug 2024*

Dean's Fellowship
Tufts University, School of Engineering *Jan 2024 - Jun 2024*

Global Research Assistant Program Award (GRAP)
Tufts University, Global Tufts *Jun 2022*