HAOTIAN JIA

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- Ph.D. candidate in Mechanical Engineering, specializing in Heat Transfer, Fluid Mechanics, and Mass Transfer, with strong analytical problem-solving skills and deep knowledge of fundamental physics.
- 5+ years of research experience in Mechanical Design, Prototyping, Testing, Data Processing & Visualization,proficient in English and Mandarin.

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.S. Mechanical Design, Manufacturing, and Automation *Sep 2014 – Jun 2018*

Experience

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

Department of Mathematics, Imperial College London London, UK
Visiting Research Assistant, Global Research Assistant Program (GRAP) *Jun 2022 – Aug 2022*

Project

Ehanced Lubrication in Superhydrophobic Microchannels *NSF award 2140033*

- Designed and fabricated a transverse grooved superhydrophobic microchannel using SU-8 Soft-lithography with PDMS in a class 1000 cleanroom (Tufts Microfab) and examined the flow-field using the micro-PIV technique.
- Improved the model of photo-surfactants seeded flow within microchannel by taking into account surface tension and verifying the photochemical behaviors of photo-surfactants under transitions between UV and Blue light.

Permeability measurement of aerogel *NSF award 153060*

- Improved the existing direct permeability measurement technique for aerogel. Utilized Duhamel's theorem, and developed a non-destructive inverse approach to measure aerogel permeability.
- Developed an experimental apparatus for precise aerogel permeability measurement under supercritical CO_2 flows, and several custom LabVIEW and MATLAB programs for data collection and post-processing.

Jet-impingement enhanced freeze drying of aerogel *NSF STTR Phase I award 2014881*

- Designed, constructed, and utilized a first-of-its-kind drying system demo using jet-impingement to optimize Aerogel Technologies, LLC.'s patented freeze-drying process, resulting in a 75% reduction in production time.
- Developed a dehumidification process for compressed air to supply ultra-dry air to the jet stream. Achieved a dew point as low as -40°C while maintaining a high mass flow rate of up to 12.7 SCFM.

Inertial Effects on the Flow Resistance of Axial Groove Heat Pipes

- Modeled 2-phase flow inside heat pipe to capture the capillary limit of the heat pipe; Simplified and solved the governing PDEs employing asymptotic expansion techniques and utilizing MATLAB finite element method solvers.

2 Degree-of-Freedom Planar Robot Arm Design & Control

- Customized a National Instruments myRIO using the LabVIEW FPGA Module to design and compare multiple control methods for a 2 degree-of-freedom rhombus shape planar robot arm.

Solution for Cerebral Palsy Patient to Eat Independently

- Collaborated with patients and caregivers, design and fabricate a rotary food supply mechanism using LEGO and an Arduino-controlled stepper motor, while collaborating with teammates to deliver a preliminary solution.

Graduate Level Courses

Analytic Transport Phenomena | Applied Mathematics for Engineers | Assistive Design | Digital Control of Dynamic Systems | Fluid Mechanics | Heat Transfer | High Reynolds Number Flow | Inventive Design | Microfluidics | Numerical Analysis | Optics and Wave Motion | Simulation for Mechanical Engineer | Thermal Management of Electronics

Skills

Numerical Simulation & Analysis: Ansys Fluent | COMSOL | MATLAB PDE Toolbox | HPC environment

Mechanical Design & Manufacturing: SolidWorks | Solid Edge | AutoCAD | G-code | MasterCAM

Data Acquisition: LabVIEW (NI-DAQ) | Arduino | micro-PIV

Data Analysis & visualization: Excel | Inkscape | Adobe Illustrator | PowerPoint | WordPress | Word | LaTeX

Awards

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

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

Leadership

PR Department, Association Federation of Beijing Forestry University Beijing, China
Vice Minister *Jul 2015 – Sep 2016*

- Represented the university and its students in a diverse range of events organized by other universities in the Beijing area, fostering collaboration and networking opportunities.

LvFangCheng Electroacoustic Club, Art Troupe of Beijing Forestry University Beijing, China
President *Nov 2016 – Nov 2017*

- Oversaw the management of the club, including recruitment, and rehearsals. Coordinated with performance venues, and scheduled and organized several music events/ performances to provide opportunities for student performers.

Publications

- Jia, H., Hodes, M., and Kirk, T., "Inertial Effects on the Adiabatic-Section Flow Resistance of Axial Groove Heat Pipes." **In progress for submission** to the *Journal of Fluid Mechanics*.
- Mayer, M., Jia, H., Adler, J., Hu, X., and Hodes, M., "Enhanced Lubrication and Pumping of Flow in Superhydrophobic Microchannels via Chromocapillarity." **In progress for submission** to the *Journal of Fluid Mechanics*.
- Jia, H., Dinh, H., Hodes, M., Griffin, J., Mayer, M., Diorio, M., and Karamanis, G., "An Apparatus to Measure Permeability of Aerogels by Redundant Methods." **In progress for submission**.
- Jia, H., Karamanis, G., Abolorunke, F., Dinh, H., Griffin, J., and Hodes, M., "Jet-Impingement-Enhanced Ambient-Pressure Freeze Drying Of Aerogels." **In progress for submission**.

Conference Talks & Presentations

- **10th International Congress on Industrial and Applied Mathematics (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"*