

Haobo Zhao

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EDUCATION

Johns Hopkins University, Baltimore, MD

Sep. 2023 - Present

Master in Mechanical Engineering

GPA: 3.86/4

Advisor: Dr. Rajat Mittal and Dr. Jung-Hee Seo

Southern Illinois University, Carbondale, IL, U.S.

2022-2023

Aviation Technologies (Dual Degree Program with SAU)

GPA: 4.0/4.0

Dean's list: Spring 2022, Fall 2022

Magna cum Laude

Shenyang Aerospace University, Shenyang, Liaoning, China

2019-2023

Aircraft Propulsion Engineering

GPA: 3.8/4.0

National Scholarship (2021, top 1% in Department)

SAU First Class Scholarship (Fall 2020, Fall 2021, Spring 2022)

MAJOR HONORS AND AWARDS

- **National Scholarship (2021)**: Top 1% in Department (Academic Performance). China top scholarship among college students
- **First Prize of National Mathematics Competition (China, 2020)**: Top 8% for non-Mathematical majored college students.
- **Third Prize of Mechanics Competition of Zhou Peiyuan(China, 2021)**: Mechanics competition
- **Top 5 in China of iCAN Innovation Contest (2021)**: 5/3000 in China, AI video surveillance clarity process

RESEARCH INTERESTS

Fluid dynamics, applied mechanics, computational fluid dynamics, multiphase flows, biological flows, immersed boundary methods, multi-physics modeling

RESEARCH EXPERIENCE

Johns Hopkins University, Baltimore, MD

Sep. 2023 - Present

Master Thesis (Advisor: Dr. Rajat Mittal, Dr. Jung-Hee Seo) – Department of Mechanical Engineering

- Developed an imaging data-based computational model of pancreatic duct (PD) using CFD solver, predict pressure drop and compared with clinical data.
- Built a pipeline for patient-specific pancreatic duct models using cine-MRI data.
- Developed theoretical pancreatic duct flow model to predict pressure drop along PD.
- Simulated the mechanism of pancreatic duct flow, measured pressure drop, correspond to pre-post ERCP pain score.

Shenyang Aerospace University, Shenyang, China

Sep. 2021 - Dec. 2021

Mathematical Modeling–Oil Tank Movement Simulation (Advisor: Dr. Wei Sha) – Department of Mechanical Engineering

- Simulated oil movement in oil tank under different flight conditions

Southern Illinois University, Carbondale, IL

Sep. 2022 - Spr. 2023

Urban UAS System (Advisor: Dr. Wei Sha) – Department of Mechanical Engineering

- Simulated oil movement in oil tank under different flight conditions

Johns Hopkins University, Baltimore, MD

Sep. 2023 - Present

Master Thesis (Advisor: Dr. Rajat Mittal, Dr. Jung-Hee Seo) – Department of Mechanical Engineering

- Developed an imaging data-based computational model of the stomach using an immersed boundary solver.
- Incorporated chemical reactions of food hydrolysis into the model to run chemo-fluid dynamic simulations.
- Employed particle resolved simulations with 6-degrees-of-freedom to model tablets and large food particles.
- Implemented Lagrangian Point Particle Model (LPPM) to simulate small-sized food particles.
- Built a pipeline for patient-specific stomach models using cine-MRI data.
- Used Volume of Fluids (VOF) approach to account for different density fluids.
- Incorporated the stomach muscles via Fluid-Structure-Electrophysiological-Interaction (FSEI) model.
- Studied the effect of posture and motility disorders on the dissolution of an oral tablet.
- Quantified the effects of motility disorders on the mixing and hydrolysis function of the stomach.
- Modeled the consequences of pyloric surgery in different emptying rate disorder patients.
- Simulated the mechanism of gastritis due to bile reflux in patients.

Sterlite Technologies, Dadra & Nagar Haveli, India

Jun. 2019 - Sep. 2020

Modeling and Simulations Division – Research & Development

- Developed theoretical and semi-empirical models to predict the onset of signal attenuation in fiber optic cable designs.
- Simulated structural deformation in finite-element software to analyze cable designs.
- Developed excel-based tools for predicting fiber-optic cable behaviors in extreme temperatures.
- Patented grooved cable designs with higher drag to enable air blowing cables to longer distances.
- Patented flexible ribbon design to enable more efficient packing of fibers inside the cable.

Indian Institute of Technology, Kanpur, UP, India

May 2018 - Jun. 2019

Masters Thesis (Advisor: Arun K. Saha) – Department of Mechanical Engineering

- Using a Marker-and-Cell (MAC) based solver, studied the flow past a square cylinder at different blockages.
- Developed a code to perform the linear stability analysis of the steady symmetric flow.
- Studied the effect of wall proximity on transition from steady to unsteady (Hopf bifurcation) and from symmetric to asymmetric flow (Pitchfork bifurcation).

McGill University, Quebec, Canada

May 2017 - Jul. 2017

MITACS Globalink Summer Internship – Department of Mining Engineering

Advisor: Agus P. Sasmito

- Studied the flow of mine backfill slurry (40-70% solid fraction) through the hydraulic network in mines.
- Modeled the slurry as a two-phase mixture, using Dense Discrete Phase Model (DDPM), and as a Bingham fluid to predict the pumping requirements through different approaches.
- Compared the simulations against different friction factor model predictions and against in-situ data.

Indian Institute of Technology, Kanpur, UP, India

May 2016 - Jul. 2016

Summer Undergraduate Research (Advisor: Arun K. Saha)

- Implemented the immersed boundary method in an existing finite difference flow solver.

JOURNAL PUBLICATIONS

- **S. Kuhar and R. Mittal**, “Computational Models of the Fluid Mechanics of the Stomach.” *Journal of the Indian Institute of Science*, (2024).

- **S. Kuhar, J. H. Seo, P. J. Pasricha, and R. Mittal**, “In silico modelling of the effect of pyloric intervention procedures on gastric flow and emptying in a stomach with gastroparesis”, *Journal of the Royal Society Interface*, 21(210), (2024).
- **S. Kuhar, J. H. Lee, J. H. Seo, P. J. Pasricha, and R. Mittal**, “Effect of stomach motility on food hydrolysis and gastric emptying: Insight from computational models”, *Physics of Fluids*, 34(11), 111909, (2022).
- **J. H. Lee, S. Kuhar, J. H. Seo, P. J. Pasricha, and R. Mittal**, “Computational modeling of drug dissolution in the human stomach: Effects of posture and gastroparesis on drug bioavailability”, *Physics of Fluids*, 34(8), 081904, (2022).
- **B. Bharathan, M. McGuinness, S. Kuhar, M. Kermani, F. P. Hassani, and A. P. Sasmito**, “Pressure loss and friction factor in non-Newtonian mine paste backfill: Modelling, loop test and mine field data.” *Powder Technology*, 344, 443–453, (2019).

VOLUNTEERING

Core Team Member

Mar. 2016 - Apr. 2017

Institute Counseling Service, IIT Kanpur

- Part of 10-member team responsible for campus-wide counseling service activities.
- Negotiated with banks to raise 150k INR in scholarships for needy students.
- Led a team of 137 student guides during 6-day long orientation program for freshers with a budget of 450k INR.
- Worked with professional counselors to aid in providing emotional, mental, and financial support to students.
- Hosted sessions aimed at providing academic or career help to students.

Assisting my PhD advisor with writing funding grants, submitting annual project reports, and peer-reviewing manuscripts in the field of modeling flow inside the stomach and the intestines.

MENTORING

- **Masters Research:** Weixuan Li, Johns Hopkins University *2023 - Present*
- **Undergraduate Research:** Aditi Gupta, Johns Hopkins University *May 2023 - Jul. 2023*

TEACHING EXPERIENCE

Teaching Assistant at Shenyang Aerospace University:

- Calculus I, Fall 2018
- Turbulent Flow, Spring 2019