

James Scott Malloy

CONTACT INFORMATION

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RESEARCH INTERESTS

- Biomedical: Image-based modeling for biofluids and biomechanics; Pediatric cardiovascular device design; Hemodynamics and vascular transport processes; Procedure planning for correction of pediatric cardiovascular diseases; Stroke prediction in settings of vascular disease
- Computational: Computational fluid dynamics and transport processes; Fluid-particle and Fluid-structure interaction; Medical image segmentation; Finite-element analysis

EDUCATION

University of Colorado - Boulder, CO

Ph.D., Mechanical Engineering, May 2029

- Advisor: Dr. Debanjan Mukherjee

Purdue University - West Lafayette, IN

M.S., Biomedical Engineering, May 2024

- Thesis: *Predictive Modeling of Mechanical Platelet Activation in Fibromuscular Dysplasia*
- Advisor: Dr. Vitaliy Rayz

B.S. with Distinction, Biomedical Engineering, December 2022

B.S., Applied Statistics, December 2022

AWARDS & HONORS

1. *Singh Graduate Fellowship, University of Colorado - Boulder, August 2024*
2. *Dean's Future Leaders Fellowship, University of Colorado - Boulder, August 2024*
3. *Dean's Fellowship for Excellence, University of Colorado - Boulder, August 2024*
4. *Estus H. and Vashti L. Magoon Award for Excellence in Teaching, Purdue University College of Engineering, May 2024*
5. *Outstanding Undergraduate Teaching Assistant Student Choice Award, Purdue University Weldon School of Biomedical Engineering, May 2022*

JOURNAL ARTICLES

1. Ward, M.P., **Malloy, J.S.**, Kannmacher, C., and Steinhubl, S. (2023). Educating the healthcare workforce of the future: lessons learned from the development and implementation of a 'Wearables in Healthcare' course. *npj Digit. Med.* 6, 214.

ARTICLES IN PREPARATION

1. **Malloy, J.S.**, Kondratiuk, K., Cameron, S., and Rayz, V. Mechanical Platelet Activation in Variable Presentations of Fibromuscular Dysplasia.
2. Guntupalli, S.*, **Malloy, J.S.***, Kondratiuk, K., et. al. Computational and Experimental Modeling of Biomechanical Platelet Activation in the Carotid Artery.
3. Urban, J., **Malloy, J.S.**, Fitzgerald, P., et. al. Design, characterization, and in silico evaluation of metallic microstructured fasteners for mechanical adhesion to soft tissues.
(* indicates that authors contributed equally)

ABSTRACTS &
PRESENTATIONS

1. **Malloy, J.S.**, McGinty, I., Armstrong, A., Breuer, and C., Williams, C. Design and Development of a Balloon Expandable Fetal Heart Valve Stent. *Single Ventricle Investigator Meeting, Denver, Colorado*, October 2024
2. **Malloy, J.S.**, Guntupalli, S., Cameron, S., and Rayz, V. Computational Modeling of Carotid Artery Stenosis and Fibromuscular Dysplasia for Prediction of Biomechanical Platelet Activation. *Summer Biomechanics, Bioengineering, and Biotransport Conference, Lake Geneva, Wisconsin*, June 2024.
3. **Malloy, J.S.**, Guntupalli, S., Cameron, S., and Rayz, V. Modeling of Ex-Vivo Flow Cone System to Study Platelet Activation. *76th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Washington D.C.*, November 2023.

RESEARCH
EXPERIENCE

- **Image-Based Modeling of Platelet Activation in Fibromuscular Dysplasia**
Purdue University, Advised by: Dr. Vitaliy Rayz
 - Generated hemodynamic models of complex flow devices and arteries in ANSYS to characterize stress on platelets.
 - Developed python code to track particles through flow systems to record mechanical fluid stress history, incorporating models of shear induced platelet activation to predict clot formation.
 - Evaluated Lagrangian and Eulerian metrics of platelet activation, stress, and exposure time to characterize variability in disease presentation.
- **Design of Endoscopic Intervention for Pulmonary Hypertension in Newborns**
Purdue University, Senior Design, Advised by: Dr. Sherry Harbin
 - Designed a minimally invasive proof of concept device to reduce pulmonary pressure in newborns with ventricular septal defects.
 - Simulated implanted device in COMSOL to extract pressure and shear data to inform design.
 - Created a flow loop using peristaltic pumps and pressure sensors to test pressure drop across device.
 - Awarded the “Design Iteration Award” indicative of an extensive and iterative prototyping process.
- **Other experiences**
 - Robotic assisted printing and functionalization of biosensors detecting neurotransmitters with Dr. Hyowon Lee at Purdue University’s Laboratory of Implantable Microsystems Research
 - Protein purification protocol optimization for elastin-like polypeptides with Dr. David Thompson Group at Purdue University
 - Immunological testing of mice vaccinated with purified plant-virus vaccines against malaria under Dr. Sheetij Dutta at Walter Reed Army Institute of Research.

INDUSTRY
EXPERIENCE

- **Bioengineering Intern, Draper Laboratories**
Cambridge, MA, May 2022 - August 2024
 - Led development of bio-resorbable, balloon-expandable stent, as a scaffold for heart valve implantation *in utero* by managing budget, team meetings, design, and testing.
 - Prototyped initial designs using 2D laser cutting out of stainless steel to understand compressibility.
 - Evaluated stent performance and design using Finite Element Analysis in ANSYS Mechanical.
 - Developed shear testing system to characterize adhesion of variations of microneedle arrays to tissue.
 - Contributed to project proposals to funding organizations including ARPA-H and CDMRP.
- **Research and Development Engineering Intern, Boston Scientific**
Marlborough, MA, May 2021 - August 2021
 - Developed testing protocol on Instron to understand endoscopic needle tissue puncture behavior.
 - Managed electrical safety testing of devices to meet ISO standards.
 - Constructed ex-vivo models of endoscopic pathways to identify clinical navigational limitations.
- **Manufacturing Engineering Co-Op, Abbott Laboratories**
Sylmar, CA, July 2020 - December 2020
 - Initiated lean improvement activities, like equipment changes and fixture redesign, to reduce component rejects, improve ergonomics, and lower costs based on open feedback with operators.

- Tracked manufacturing factors and equipment in excel to organize qualifications and calibrations.
- **Process Development Engineering Co-Op, Boston Scientific**
Spencer, IN, January 2020 - May 2020
 - Evaluated effect of excess adhesive on leak testing data, implementing corrective actions against these defects.
 - Reduced takt time for adhesive stations, while maintaining joint durability by redesigning curing fixtures in Solidworks.

TEACHING &
ACADEMIC
EXPERIENCE

Graduate Teaching Assistant, Purdue University

1. *BME 390: Professional Development and Design, Spring 2024*, Advised by: Dr. Jonathan Cody
2. *BME 489: Senior Design Laboratory, Fall 2023*, Advised by: Dr. Steven Steinhubl
3. *BME 389: Junior Design Laboratory, Spring 2023*, Advised by: Dr. Tamara Kinzer-Ursem

Undergraduate Teaching Assistant, Purdue University

1. *BME 304: Transport Fundamentals (Biofluid Mechanics), Fall 2022*, Advised by: Dr. Vitaliy Rayz
2. *BME 256: Physiological Modeling in Human Health, Spring 2022*, Advised by: Dr. Charles Babbs

PROFESSIONAL
SERVICE

1. *Engineering Projects in Community Service, Purdue University*
Project Manager, Spring 2023, Fall 2023
Design Lead, Fall 2022

MENTORSHIP &
OUTREACH

1. *Biomedical Engineering Society Mentorship Program, Purdue University*
Peer Mentor, Fall 2022 - Spring 2024