

Exponent®
Engineering & Scientific Consulting

Zach Davis, Ph.D.

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Professional Profile

Dr. Davis is a biomechanics consultant with a vast biomedical engineering background and a focus on tissue-level mechanics and medical imaging. Dr. Davis applies a multidisciplinary methodology to assess kinematics and injury mechanics in a wide range of environments that includes motor vehicles, workplace incidents, and recreational activities. His work directly applies to quantifying tissue content and mechanical properties using multiple imaging techniques as well as directly measuring tissue mechanics.

Prior to joining Exponent, Dr. Davis completed his Ph.D. in biomedical engineering at Purdue University. His research focused on using MRI outputs to predict scaffold content and collagen microarchitecture. He also compared mechanical outputs in genetic knockout mice to control counterparts, accounting for weight and sex-based differences. His work includes using semi-automated segmentations in various tissue types from medical imaging platforms, evaluating both clinical and pre-clinical MRI outputs, and mechanically testing multiple tissues sourced from multiple different animal models.

Additional works of interest include: designing a pneumatic MRI compatible loading device for soft tissues; culturing cartilage tissue and tissue-engineered hydrogels for mechanical loading; creating software to generate pixel-wise quantitative-MRI outputs; using dimensional-reduction techniques to evaluate high-dimensional datasets from mouse models

Academic Credentials & Professional Honors

Ph.D., Biomedical Engineering, Purdue University, 2025

B.S., Biomedical Engineering, University of Rochester, 2020

Purdue Summer Research Grant, 2024

Dean’s Scholarship, University of Rochester, 2016-2020

Prior Experience

Graduate Research Assistant and Teaching Assistant, Purdue University, 2020-2025

Undergraduate Research Assistant, University of Rochester, 2020

Undergraduate Research Assistant, University of Pennsylvania, 2019

Research and Development Assistant, Essential Medical, 2018

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Professional Affiliations

Purdue Biomedical Engineering Graduate Student Association, Vice President, 2022-2023

Publications

Chatterjee A, Davis ZR, Lescun T, et al. Multiscale correlations between joint and tissue-specific biomechanics and anatomy in postmortem ovine stifles. Sci Rep 2025; 15:4630.

Presentations

Chatterjee A, Davis ZR, Lescun T. Multiscale correlations between joint and tissue biomechanics and morphology in ovine stifles. Poster Presentation, SB3C, Lake Geneva, WI, 2024.

Project Experience

Scanned multiple different tissue types using MRI and computed tomography. Made custom software to segment and analyze tissue geometries and quantity MRI outputs.

Developed software to correlate quantitative MRI outputs to mechanical properties in cadaveric intervertebral discs. Modeled the disc mechanics using inverse modeling approach.

Formulated hydrogel recipes using collagen and hyaluronic acid. Constructed the gels using these formulas for further analysis with varying concentration, collagen microarchitecture, and hyaluronic acid molecular weight.

Designed a pneumatic MRI-compatible mechanical loading device. Developed the NIDAQ software to synchronize loading to MRI acquisition.