

Exponent®
Engineering & Scientific Consulting

Josh Drost, Ph.D.

Senior Associate | User Sciences
Farmington Hills
+1-248-324-9108 | jdrost@exponent.com

Professional Profile

Dr. Drost's areas of expertise include biomechanics specifically with respect to the upper extremity, imaging analysis, fracture mechanics, kinematics and kinetics of human motion, and simulation of tissue mechanics and blood flow. His research and testing experience are centered around developing unique testing protocols utilizing a variety of laboratory and clinical tools to calculate biomechanical metrics.

Dr. Drost's research prior to starting at Exponent focused on identifying clinically measurable parameters that could be used for early diagnosis of conditions related to aging. While studying as a Graduate Research Assistant in the Biomechanics Design and Research Lab at Michigan State University, Dr. Drost assessed quantifiable changes in finger function due to osteoarthritis and evaluated how hand and finger function could be improved by different surgical interventions. Additionally, while researching as a Post-Doctoral Fellowship in the Bone and Joint Center at Henry Ford Hospital in Detroit, Michigan, he assessed the biomechanical loading in vertebrae at risk for osteoporotic fractures using advanced techniques for assessing medical imaging (e.g. using digital volume correlation on digital tomosynthesis images). Dr. Drost has experience collecting and analyzing kinematic and kinetic data collected from high-speed motion capture systems (Qualysis) and load cells (AMTI) using advanced computational methods (Matlab, R, Python, ImageJ).

Since joining Exponent, Dr. Drost has utilized his experience and expertise to develop unique protocols for the testing and evaluation of biomechanical outcomes in a broad range of environments and use cases. These efforts continue to target various immersed and real-world environments, consumer products and technologies, medical devices, AI and ML algorithm characterization and benchmarking. Dr. Drost has additional expertise in designing and implementing large scale user studies to support these above capabilities, drawing on substantial knowledge of state of the art technologies and equipment and supporting data processing and analysis tools.

Academic Credentials & Professional Honors

Ph.D., Engineering Mechanics, Michigan State University, 2019

B.S., Material Science, Michigan State University, 2014

Prior Experience

Postdoctoral Fellow Henry Ford Hospital, 2019-2022

Graduate Researcher Michigan State University, 2014-2019

Undergraduate Researcher Michigan State University, 2010-2014

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Publications

Yener N. Yeni, Daniel Oravec, Joshua Drost, Roger Zauel, and Michael Flynn. "Stiffness and Strain Properties Derived From Digital Tomosynthesis-based Digital Volume Correlation Predict Vertebral Strength Independently From Bone Mineral Density." Journal of Biomechanical Engineering (2022): 1 -37.

Joshua P Drost; James Clarkson; Tamara Reid Bush. “Functional Testing Using a Force Motion Capture Device for Hand Surgery Outcome Assessment: A Proof of Concept.” Plastic and reconstructive surgery. 149 (2022).

Yener N Yeni; Daniel Oravec; Joshua Drost; et al. “Bone health assessment via digital wrist tomosynthesis in the mammography setting.” Bone. 144 (2021).

Daniel Oravec; Joshua Drost; et al. “Assessment of Intravertebral Mechanical Strains and Cancellous Bone Texture Under Load Using a Clinically Available Digital Tomosynthesis Modality.” Journal of Biomechanical Engineering. 143 (2021).

Joshua P Drost, Mark D. Shafer, Tamara Reid Bush. “Comfortable Leg Splay of Mid-Sized Males in Automotive Seats.” Applied Ergonomics. 85 (2020): 103062.

Joshua P Drost, Hyokyoung G. Hong, Tamara Reid Bush. “Mapping together kinetic and kinematic abilities of the hand.” Journal of Biomechanical Engineering. 142 (2)

Zachary Sadler, Justin Scott, Joshua Drost, Sheng Chen, Sara Roccabianca, Tamara Reid Bush. “Initial estimation of the in vivo material properties of the seated human buttocks and thighs.” International Journal of Non-Linear Mechanics. 107 (2018): 77-85.

Wu Pan, Joshua P. Drost, Sara Roccabianca, Seungik Baek, and Tamara Reid Bush. "A Potential Tool for the Study of Venous Ulcers: Blood Flow Responses to Load." Journal of Biomechanical Engineering 140.3 (2018): 031009.

Wu Pan, Joshua Drost, Mark Basson, Tamara Reid Bush. "Skin perfusion responses under normal and combined loadings: Comparisons between legs with venous stasis ulcers and healthy legs." Clinical Biomechanics 30.10 (2015): 1218-1224.

Presentations

J. Drost, D. Oravec, P. Soni, R. Zauel, M. Flynn, Y. Yeni. “Tomosynthesis-Based Digital Volume Correlation Properties Predict Vertebral Strength Independently from Bone Mineral Density.” Orthopedics Research Society. Pheonix, Arizona. February 8-12, 2020.

J. Drost, T. Reid Bush. "This Hand is My Hand, This Hand is Your Hand." Summer Biomechanics, Bioengineering and Biotransport Conference Poster. Tuscon, AZ. 2017.

J. Drost, H. Hong, T. Reid. Bush. “Quantifying Changes in Hand Function: A Model for Use in Rehabilitation.” American Society of Biomechanics National Conference, Raleigh, NC, USA, August 2-5 2016.

J. Drost, S. Lietkam, T. Reid Bush. “Modeling Finger Forces over Range of Motion in Healthy and Reduced Hand Functionality Subjects” American Society of Biomechanics National Conference, Columbus, OH, August 5-7 2015.

J. Drost, A. Manorama, T. Reid. Bush “Blood Flow Characterization During Normal and Shear Loading.” American Society of Biomechanics National Conference, Omaha, Nebraska, September 4-7 2013.

Peer Reviews

Journal of Biomechanics

ASME Journal of Medical Devices

Applied Ergonomics