REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-25-07

Multi-joint Loading Distributions During Parachute Operations

PROJECT DESCRIPTION: The Advanced Research in Musculoskeletal Modeling for Operational Readiness (ARMMOR) group is dedicated to quantifying and mitigating musculoskeletal injury risks for warfighters through advanced biomechanical sensing and modeling capabilities. Computational modeling tools such as OpenSim, an open-source musculoskeletal modeling software, have permitted researchers to assess whole body, muscle, and joint-level mechanics to glean insights into injury risk mitigation strategies. Additionally, methods such as finite element modeling (FEM) has allowed researchers to explore tissue-load transfer within the spine for decades. Integrating FEM practices, largely driven by cadaveric studies, and OpenSim methodology, largely driven by experimental, human-based data, allows researchers to extract meaningful musculoskeletal properties from natural human movements; thus, paving the way to explore new data and findings.
For this project, we are interested in using outputs of musculoskeletal properties from FEM simulations of in-field data to examine the biofidelity of OpenSim models in capturing essential biomechanical features for injury risk mitigation and assessment. For instance, interns could participate in innovative research to develop methodology to strategically model joint loading pressure distributions and how these are influenced by different parachute jump techniques. The intern will also investigate potential relationships amongst multi-joint loading distributions across parachute jumps and how they may relate to lumbar spine loading patterns.
Qualified candidates will have some experience in computational modeling (e.g., Visual3D. OpenSim, etc.) and MATLAB/Python.
Highly qualified candidates will have some experience in LS-DYNA, Adams, and/or Abaqus.

LEARNING OBJECTIVES: 1) Integrate into a multidisciplinary team combining biomechanics, physiology, engineering, and data software skills. 2) Engage with projects related to interventions for the warfighter. 3) Gain hands-on experience with leveraging advanced computational methods to enhance lumbar spine injury risk assessment.

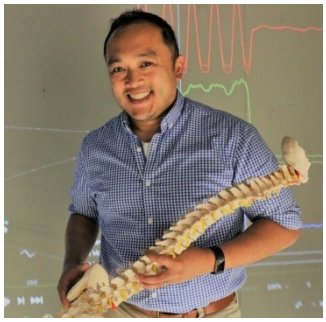
ACADEMIC LEVEL: Undergraduate; Masters; Doctoral

DISCIPLINE NEEDED:

- Engineering

RESEARCH LOCATION: Wright-Patterson Air Force Base, Dayton, Ohio

RESEARCH MENTOR: Peter P. Le, Ph.D.
Industrial and Systems Engineering, The Ohio State University, 2016



Dr. Peter Le is a Senior Research Biomedical Engineer at the Air Force Research Laboratory, 711th Human Performance Wing and serves as the Lead for the Aerospace Operations Chronic Health Risk Modeling Line of Effort. He earned his PhD in Industrial and Systems Engineering (Human Systems Integration) from The Ohio State University in 2016 with extensive training at the Spine Research Institute. His current research interests are in aircrew neck and back pain, musculoskeletal modeling, and wearable sensing to inform decision guidance tools for injury mitigation / human performance optimization.

The material was CLEARED on 04 Nov 2024; Case Number: AFRL-2024-6170.