Leonardo Tchen Hao Hang Wei, Ph.D.

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RESEARCH INTEREST

Experimental and computational biomechanics methods with a focus on musculoskeletal health, injury prevention, and human performance in occupational and clinical populations, with applications to ergonomics, human factors, and rehabilitation engineering.

EDUCATION

Texas Tech University 2021 – 2025
Ph.D. in Industrial Engineering (GPA: 3.97)
- *Dissertation:* Biomechanical Feasibility of Passive Shoulder Exoskeleton in Construction Work
- *Concentration:* Biomechanics
- *Advisor:* Suman Kanti Chowdhury

Pontifical Catholic University of Rio de Janeiro 2015 - 2020
B.S. in Mechanical Engineering
- *Dissertation*: Numerical Study of Flashback in Laminar Flows in Circular Tubes
- *Concentration*: Fluid Mechanics

Associate Degree in Mechanical Engineering 2011 – 2013
Department of Mechanical Engineering, Federal Technology Center Celso Suckow da Fonseca (CEFET-RJ), RJ, Brazil

PUBLICATIONS

Journals

1. **Wei, L.**, Paulon, G., Sarker, P., Chowdhury, S. (2025). Sustained-Till-Exhaustion Effects of Firefighter Helmets on Neck Muscle Fatigue Mechanism. *Ergonomics*. Available at https://doi.org/10.1080/00140139.2025.2548004
2. **Wei, L.**, & Chowdhury, S. (2025). An electromyography-based multi-muscle fatigue model to investigate operational task performance. *Computer Methods in Biomechanics and Biomedical Engineering*, 1–17. Available at https://doi.org/10.1080/10255842.2025.2510369
3. **Wei, L. H.**, Sudeesh, S., Chakroborty, S., & Chowdhury, S. K. (2025). A comprehensive methodological framework for 3D head anthropometric shape modeling of a small dataset. *Ergonomics*, 1-16. Available at https://doi.org/10.1080/00140139.2025.2518306
4. Zheng, L., Pan, C., **Wei, L**., Bahreinizad, H., Chowdhury, S., Ning, X., & Santos, F. (2024). Shoulder-assist exoskeleton effects on balance and muscle activity during a block-laying task on a simulated mast climber. International journal of industrial ergonomics, 104, 103652. https://doi.org/10.1016/j.ergon.2024.103652

5. Paulon, G., M., Sudeesh, S., **Wei, L**., & Chowdhury, S. K. (2024). Firefighter helmets and cervical intervertebral Kinematics: An OpenSim-Based biomechanical study. Journal of Biomechanics, 112364. https://doi.org/10.1016/j.jbiomech.2024.112364
6. Bahreinizad, H., Chowdhury, S. K., Paulon, G., **Wei, L**. (2023). Development and Validation of an MRI-Derived Head-Neck Finite Element Model. Biomechanics and Modeling in Mechanobiology (Accepted)

Conference

1. Wei, L. H., Paulon, G. M., & Chowdhury, S. K. (2025). Firefighter Helmets and Neck Muscle Fatigue. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (p. 10711813251371651). Sage CA: Los Angeles, CA: SAGE Publications.

Working papers

1. Wei, L., Chowdhury, S.K. Postural and Kinetic Responses to Exoskeleton Assistance in Construction Tasks. (Preparation for submission to applied ergonomics, 2026)
2. Wei, L., Chowdhury, S.K. The Influence of Exoskeleton Use on Motor Module Organization in Construction Tasks. (Preparation for submission to applied ergonomics, 2026)

TEACHING EXPERIENCE

Teaching Assistant, Texas Tech University, TX, USA — Jan 2025 – May 2025
Class: IE 5320/4320 – Systems Theory (class size: 70 students)

Teaching Assistant, Texas Tech University, TX, USA — Jan 2025 – May 2025
Class: IE 5325/4325 – Productivity and Performance Improvement in Organizations: Lean Methods (class size: 60 students)
- Assisted students in understanding many concepts, including theory of constraints, six sigma, and organizational structure.

Teaching Assistant, Texas Tech University, TX, USA — Aug 2024 – Dec 2024
Class: IE 5342 – Design of Experiment (class size: 20 students)
- Assisted students to code in R to perform statistical analysis. Graded projects, homeworks, quizzes, and exams.

Teaching Assistant, Texas Tech University, TX, USA — Aug 2024 – Dec 2024
Class: IE 5301 / IE 4301 – Engineering Design for People/ Advanced Industrial Ergonomics (class size: 75 students)
- Created class projects and assignments, graded projects, quizzes, homework, and exams.

Teaching Assistant, Texas Tech University, TX, USA — Jan 2023 – Jun 2023
Class: IE 5304 –Biomechanics and Workphysiology (class size: 20 students)
- Created projects, graded assignments, quizzes, and exams.

Teaching Assistant, Texas Tech University, TX, USA — Aug 2022 – Dec 2023
Class: IE 5301/ IE4301 – Ergonomics and Engineering Design (class size: 70 students)
- Prepared and lectured a few classes and graded assignments, quizzes, and exams.

Teaching Assistant, Pontifical Catholic University of Rio de Janeiro, RJ, Brazil — Feb 2021 – July 2021
Class: MEC 2335– Computational Fluid Dynamics (class size: 10 students)

- Assisted students in understanding key concepts of fluid dynamics and applied coding skills to bridge the gap between theory and practical applications.

PROPOSAL WRITING EXPERIENCE

1. National Science Foundation: "Unifying Neuroscience and Biomechanics Paradigms for Modeling Brain and Muscle Responses to Mechanical Impacts," P.I.: Dr. Suman Chowdhury. The project was successfully funded.

   My Role: Conceptualization, figure generation, and writing.

2. Defense Advanced Research Projects Agency: "BrainCrossNet: A Multiscale, Multiphysics Modeling Framework to Decode Cellular Interaction in Traumatic Brain Injury", P.I.: Dr. Suman Chowdhury.

   My Role: Conceptualization, writing, and figure generation.

CONFERENCE PRESENTATIONS

1. **Wei, L.**, Paulon, G., Sarker, P., Chowdhury, S. (2025). Influence of Firefighter Helmet Inertial Properties on Neck Muscle Fatigue. Submitted to *ASPIRE Human Factors and Ergonomics Society 2025 Annual Meeting. Lecture.*
2. **Wei, L.**, & Chowdhury, S. (2024). A comprehensive methodological framework for Anthropometric Head Shape Modeling Using Small Dataset. Submitted to *ASPIRE Human Factors and Ergonomics Society 2024 Annual Meeting*.
3. **Wei, L.**, & Chowdhury, S. (2021). An electromyography based multi-muscle fatigue index formulation and validation. Submitted to *North American Congress on Biomechanics 2021 Annual Meeting*

CURRENT AND RECENT RESEARCH PROJECTS

Project Title: *Effects of Passive Exoskeleton Applied in Masonry Tasks on a Mast Climbing Work Platform (NIOSH)* — Feb 2022 – Aug 2025

Institutions: Texas Tech University and National Institute for Occupational Safety

Role: PhD. research assistant with Dr. Suman Chowdhury and Dr. Christopher Pan

Brief Description: Investigated the efficacy of using passive shoulder exoskeletons in reducing musculoskeletal disorders for tasks performed on elevated platforms while lifting heavy cinder blocks. Motion capture, muscle activity, and ground reaction forces were collected to assess the biomechanical feasibility of exoskeleton assistance in such scenarios.

Project Title: *Next Generation Firefighter Helmet (DHS)* — Aug 2021 – Dec 2023

Institutions: Texas Tech University and Department of Homeland Security

Role: PhD. research assistant with Dr. Suman Chowdhury and Dr. Gregory McKenna

Brief Description: Studied the effects of prolonged use of existing firefighter helmets on neck and shoulder muscles by integrating in vivo biomechanical measurements (motion capture and electromyography) and 3D modeling (3D scanning) of the helmet-head-neck system. Additionally, subjective perspectives were gathered from firefighters through a questionnaire designed to assess key aspects of helmet performance and the level of protection these helmets provide in field conditions.

Project Title: *Mission-Adaptive, Modular Law Enforcement Helmet Design (DHS)* Oct 2022 – May 2024

Institutions: Texas Tech University and Department of Homeland Security

Role: PhD. research assistant with Dr. Suman Chowdhury

Brief Description: Developed a modular, mission-adaptive new generation helmet for law enforcement officers and first responders that could provide both concussive and ballistic protection while being lightweight, ergonomically adaptable, and comfortable when worn for long periods.

WORKING EXPERIENCE

Researcher – PUC Rio Combustion Lab, Rio de Janeiro, Brazil Mar 2020 – Dec 2020

- Conducted CFD simulations of pre-mixed natural gas mixtures in offshore flares to evaluate and mitigate flashback risks.
- Designed and manufactured airflow tubes to improve flow quality and optimize oxygen–fuel balance in combustion systems.

Project Engineer, DORIS Group, Rio de Janeiro, Brazil Jan 2019 – Dec 2020

- Assessed mechanical fatigue to predict failures, enhance safety, and extend platform lifespan by 3 years.
- Developed mechanical solutions that reduced platform maintenance time and improved operational efficiency by 30%
- Performed finite element simulations to identify critical oil platform components impacted by sea corrosion.

Engineering Intern, CarriLee, Rio de Janeiro, Brazil Jan 2016 – Jul 2016

- Led a team of 10 to diagnose and resolve air conditioning equipment failures in industrial buildings, optimizing efficiency and procedure effectiveness.
- Achieved a 22% reduction in energy costs by implementing advanced temperature monitoring systems.

Manufacturing Manager, Pontifical Catholic University Robotic Team Rio Botz, Rio de Janeiro, Brazil Oct 2016 – Dec 2018

- Led end-to-end manufacturing operations, including 3D-printed prototype design, production planning, supplier management, quality assurance, and maintenance optimization.
- Contributed to iterative design improvements by analyzing failures and implementing upgrades for subsequent builds.
- Tracked key performance indicators (KPIs) to support strategic decision-making in acquiring cutting-edge technologies to enhance robots' performance.
- Collaborated with cross-functional teams to integrate mechanical projects with electronics, control systems, and design.

PROFESSIONAL AFFILIATIONS

- Member of the Human Factors and Ergonomics Society 2021 – Present
- Member of the American Society of Biomechanics (ASB) 2022 – 2023

AWARDS

- Third place in presentation award for BioMed Journal Club (Texas Tech internal) 2023
- Gold medal in Robogames competition, San Francisco, California 2018
- 2017 Student Scholarship award from National Center for Science and Development (CNPQ – Brazil) 2017

SKILLS

Instrumentation	• Motion capture system (Motion Analysis), electromyography (Delsys), force platforms (Bertec and Kinvent), 3D scanner (Shinning 3D), Dynamometer (Biodex)
Modeling	• SolidWorks, Finite Element Analysis (ANSYS, ANSA), LS-Dyna, SolidWorks, Image Segmentation (Mimics), GEOMAGIC, 3-Matic, and AutoCAD, Rhino
Coding Languages	• MATLAB/Simulink, Python, Visual Basics, C++, R
Languages	• English (fluent), Portuguese (native)

SELECTED GRADUATE COURSES

Industrial, Manufacturing, & Systems

- Ergonomics and Design
- Biomechanics and Work physiology
- Biomedical Design and Manufacturing
- Systems Safety Engineering
- Design of Experiment
- Advanced Manufacturing Process
- Principles of Operations Research

Other departments

- Numerical Methods in Engineering
- Applied Statistics II
- Machine Learning
- Computational Fluid Dynamics
- Applied Linear Algebra
- Advanced Fluid Mechanics I