

Jonathan Oliveira Luiz

RESEARCH ASSISTANT AND PH.D. CANDIDATE IN MECHANICAL ENGINEERING

Worcester, MA

☎ 857 334 2665 | ✉ joluiz@wpi.edu | 🌐 jonathanluiz

Education

WPI (Worcester Polytechnic Institute)

Worcester, Massachusetts

PH.D. IN MECHANICAL ENGINEERING

2023 - Present

Area of concentration: Optics and Acoustics. Advisor: Prof. Cosme Furlong. GPA: 4.00.

UFSC (Federal University of Santa Catarina)

Santa Catarina, Brazil

M.SC. IN MECHANICAL ENGINEERING

2019 - 2021

Area of concentration: Optical Metrology. Advisor: Prof. Armando Albertazzi. GPA: 3.69.

UniBremen (University of Bremen)

Bremen, Germany

STUDY ABROAD - SPRING SEMESTER

2018

Area of concentration: Laser processing.

UFSC (Federal University of Santa Catarina)

Florianópolis, Brazil

B.S. IN MECHANICAL ENGINEERING

2013 - 2019

Research Experience

CHSLT (Center for Holographic Studies and Laser micro-mechaTronics)

Massachusetts, United States

GRADUATE RESEARCH ASSISTANT IN OPTICAL METROLOGY AND BIOMECHANICS

2023 - Present

- Conducting collaborative research with Massachusetts Eye and Ear and Harvard Medical School on human middle- and inner-ear mechanics.
- Adapted a commercial spectral-domain Optical Coherence Tomography (OCT) system for phase-sensitive vibrometry and Optical Coherence Elastography (OCE), enabling synchronized, depth-resolved measurements of nanometer-scale responses.
- Developed custom software for external triggering, acquisition control, phase-resolved displacement reconstruction, full-field mapping, and automated time- and frequency-domain analyses.
- Investigating cochlear micromechanics and localized mechanical properties using acoustic and pulsed-laser excitation, traveling-wave analysis, phantoms, and cadaveric temporal-bone samples.
- Developing pulsed-laser excitation methods, including localized thermoelastic stimulation and laser-induced air sparks for non-contact dynamic testing.
- Characterizing nonlinear middle-ear transfer functions and impulse responses across sound pressure levels using high-speed 3D Digital Image Correlation (3D-DIC) and Laser Doppler Vibrometry (LDV).
- Integrating high-speed optical systems, pressure sensors, acoustic sources, pulsed lasers, and an instrumented shock tube to investigate tympanic-membrane dynamics, fracture, and fluid-structure interactions under blast exposure.
- Designing artificial phantoms and 3D-printed membranes for experimental validation and biomimetic studies.

ISI (SENAI Innovation Institute for Manufacturing Systems and Laser Processing)

Santa Catarina, Brazil

RESEARCHER AT ANNELIDA, A PROJECT FOCUSED ON DESIGNING A ROBOT TO UNCLOG PIPELINES IN THE OIL

2021 - 2022

INDUSTRY, IMPROVING OFFSHORE OIL PRODUCTION EFFICIENCY. MAIN ACTIVITIES INCLUDED:

- Designing, detailing, and overseeing the fabrication of mechanical components.
- Supporting the development of the robot's launching system through modeling, simulation, and prototype evaluation, in accordance with relevant engineering standards.
- Performing structural/mechanical analyses using numerical methods, including optimization and validation of critical components.

BIAS (Bremer Institut für angewandte Strahltechnik)

Bremen, Germany

UNDERGRADUATE RESEARCH ASSISTANT WORKING ON OIL/WATER SEPARATION USING PICOSECOND LASER

2018

ABLATION. MAJOR RESPONSIBILITIES WERE:

- Operating a picosecond laser system to fabricate microstructured filters for efficient oil/water separation.
- Characterizing laser-processed surfaces using microscopy and optical tools to assess wettability.
- Supporting multidisciplinary development involving mechanical components, sensors, and basic circuitry.

LABMETRO (Metrology and Measurement Automation Laboratory)

Santa Catarina, Brazil

UNDERGRADUATE RESEARCH ASSISTANT ON A PROJECT APPLYING SHEAROGRAPHY FOR NON-DESTRUCTIVE

2015 - 2017

INSPECTION OF COMPOSITE MATERIALS. MAIN ACTIVITIES WERE:

- Designing and assembling optomechanical systems for shearography-based inspection.
- Testing interferometers, light sources, and system performance under vibrations.
- Developing software for control, visualization, and optical data analysis.

Teaching Experience

Stress Analysis (Undergraduate Level)

INSTRUCTOR

Worcester Polytechnic Institute

A-Term 2026

- Delivered the first five lectures and guided students through foundational stress-analysis concepts and engineering problem solving.

Laser Metrology and Nondestructive Testing (Graduate Level)

GUEST LECTURER AND LABORATORY INSTRUCTION SUPPORT

Worcester Polytechnic Institute

Spring 2026

- Delivered selected lectures and supported hands-on experimental classes in laser metrology and nondestructive testing.

Integrated Thermomechanical Design and Analysis (Undergraduate Level)

GUEST LECTURER

Worcester Polytechnic Institute

Spring 2023

- Delivered selected lectures on integrated thermomechanical design and analysis.

UFSC (Federal University of Santa Catarina)

UNDERGRADUATE TEACHING ASSISTANT IN MATHEMATICS FOR ENGINEERING STUDENTS

Santa Catarina, Brazil

2014

Peer-Reviewed Journal Articles

Quantifying real-time dynamic responses and damage mechanics of human tympanic membranes exposed to blast waves

ASME JESMDT

J. OLIVEIRA LUIZ, A. ALIPANAHI, J. ROSOWSKI, C. FURLONG, J. CHENG

2024

High-speed 3D-Digital Image Correlation and Schlieren imaging integrated with shock tube loading for investigating dynamic response of human tympanic membrane exposed to blasts

ASME JESMDT

A. ALIPANAHI, J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG

2024

Residual stress characterization in cross-sections of small parts by combining the contour method and scanning white-light interferometry

Experimental Mechanics

J. OLIVEIRA LUIZ, M. R. VIOTTI AND A. ALBERTAZZI JR.

2022

Conference Proceedings and Presentations

Characterizing human middle ear dynamics by combined High-Speed 3D-DIC and Laser Doppler Vibrometry

Summer School of Vibrometry,
Northeastern University and Polytec

Selected Student Technical Presentation - J. OLIVEIRA LUIZ

2025

Full-field evaluation of middle ear nonlinearities across moderate and high-intensity sound levels by high-speed 3D-DIC and LDV

ARO MidWinter Meeting

Poster Presentation - J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG

2026

Phase-sensitive Optical Coherence Elastography for characterizing cochlear micromechanics with multiple excitation methods

ARO MidWinter Meeting

Poster Presentation - J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG

2026

High-Speed Optical Characterization of Middle- and Inner-Ear Mechanics Across Dynamic and Elastic Regimes

Worcester Polytechnic Institute

Graduate Research and Innovation Exchange - J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG

2026

Characterization of the human eardrum transfer functions under moderate and high-intensity sound levels by high-speed 3D-DIC

SEM Annual Conference

Conference Proceedings - J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG

2025

Development of mixed reality methods for immersive visualization of 3D dynamic optical testing measurements

SEM Annual Conference

Conference Proceedings - D. RUIZ-CADALSO, L. GENUA, J. OLIVEIRA LUIZ, C. FURLONG, L. MORADI, AND V.

VANTSEVICH

2025

Development of an instantaneous phase-shifting lensless digital holographic otoscope for quantitative imaging of the human eardrum in vivo

SEM Annual Conference

Conference Proceedings - D. RUIZ-CADALSO, J. OLIVEIRA LUIZ, J. CHENG, AND C. FURLONG

2025

Middle ear transfer functions: High-speed measurement and analysis at moderate to high-intensity sound levels	ARO MidWinter Meeting
Poster Presentation - J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG	2025
Study of human eardrums subjected to high acoustical levels by accurate parametric 3D-printed models	SEM Annual Conference
Conference Proceedings - J. OLIVEIRA LUIZ, A. ALIPANAHI, J. ROSOWSKI, C. FURLONG, J. CHENG	2024
Active anti-fogging by ultrasonic excitation to enhance visual acuity through transparent media	SEM Annual Conference
Conference Proceedings - D. RUIZ-CADALSO, A. SALERNI, H. ZHENG, J. OLIVEIRA LUIZ, C. FURLONG, AND D. ZIEGLER	2024
An integrated high-speed 3D-Digital Image Correlation and Schlieren imaging methodology for studying human eardrums exposed to shock waves	SEM Annual Conference
Conference Proceedings - A. ALIPANAHI, J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG	2024
Dynamics and fluid-solid interaction of human tympanic membranes exposed to blast	ARO MidWinter Meeting
Podium Presentation - J. OLIVEIRA LUIZ, A. ALIPANAHI, J. ROSOWSKI, C. FURLONG, J. CHENG	2024
An integrated high-speed 3D-Digital Image Correlation and Schlieren methodology for studying tympanic membrane exposed to blast	ARO MidWinter Meeting
Podium Presentation - A. ALIPANAHI, J. OLIVEIRA LUIZ, J. ROSOWSKI, C. FURLONG, J. CHENG	2024
High-speed Schlieren imaging of shock waves for the study of tympanic membrane's response	ASME IDETC/CIE
Conference Proceedings - J. OLIVEIRA LUIZ, A. ALIPANAHI, J. CHENG, J. ROSOWSKI, C. FURLONG	2023
Blast production by a shock tube for use in studies of exposure of the tympanic membrane to high-intensity sounds	SEM Annual Conference
Conference Proceedings - A. ALIPANAHI, J. OLIVEIRA LUIZ, J. CHENG, J. ROSOWSKI, C. FURLONG	2023
Development of a shock tube equipped with high-speed Schlieren imaging and Laser Doppler Vibrometry for studying tympanic membrane fractures	SEM Northeastern Symposium
Conference Presentation - J. OLIVEIRA LUIZ	2023

Honors & Awards

2025	G. L. Cloud Scholarship Award - 3rd place , SEM	Milwaukee, WI
2025	MidWinter Meeting Travel Award , ARO	Florida, USA
2017	Officer Travel Activity Grant , SPIE	California, USA
2018	Undergraduate Research Assistant Scholarship , BIAS	Bremen, Germany
2019	Fellowship for Master's Program in Mechanical Engineering , CNPq	Florianópolis, Brazil
2019	Fellowship for Master's Program in Mechanical Engineering , FEESC	Florianópolis, Brazil
2015	Undergraduate Research Assistant Scholarship , FEESC	Florianópolis, Brazil
2014	Teaching Assistant Scholarship , CAPES	Florianópolis, Brazil

Leadership & Outreach

SPIE UFSC Student Chapter	Santa Catarina, Brazil
CHAPTER PRESIDENT	2017
- Developed leadership, communication, and outreach skills. - Gained hands-on experience in optics through experiment design and participation in technical events. - Organized the workshop "Full-field Optical Metrology for micro and macro 3D engineering structures," led by Prof. Małgorzata Kujawińska.	
Einstein Floripa Preparatory Course	Santa Catarina, Brazil
VOLUNTEER MATH TEACHER	2020
Einstein Floripa is a free pre-college course for low-income students in Florianópolis, Brazil.	