

Jeromi G. López - Santiago

CONTACT INFORMATION

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SUMMARY

Mechanical Engineer with expertise in additive manufacturing, microfluidic systems, and computational analysis. Proficient in materials characterization, microfabrication, cellular mechanotransduction, and multi-physics simulations. Experienced in finite element analysis, experimental design, and data acquisition. Proven ability to translate research into practical engineering solutions through rigorous methodologies and cross-functional collaboration

PROFESSIONAL INTERESTS

Additive Manufacturing, Biomechanics, Composite Materials, Finite Element Analysis, Mechanobiology, Mechanotransduction, Microfabrication, Microfluidics

EDUCATION

University of Puerto Rico, Mayagüez, Puerto Rico
Department of Mechanical Engineering

Ph.D., Mechanical Engineering (Bio and Microscale Engineering), Expected: July 2025

Dissertation: Design and Characterization of a Rapidly Prototyped Pneumatic Microfluidic Device for the Study of Vinculin Expression at Focal Adhesions in Response to Continuous Mechanical Stimulation

Advisor: Dr. Paul A. Sundaram

M.Eng., Mechanical Engineering (Bio and Microscale Engineering), Completed: December 2024

B.Sc., Mechanical Engineering, Graduated: December 2015

RELEVANT COURSEWORK

Biomaterials, Biostatistical Analysis, Design of Microfluidic Systems, Finite Element Analysis, Fundamentals of Micro and Nanofabrication, Mathematical Methods for Chemical Engineers, Mechanical Fundamentals of Electronic Packaging, Mechanics of Composite Materials, Mechanobiology and Cell Mechanics, Molecular and Cellular Biology for Engineers, Numerical Optimization, Scientific Communication

CERTIFICATIONS

Google Project Management [Certificate of Completion](#).

WORK EXPERIENCE

U.S. Army Engineer Research and Development Center *Vicksburg, Mississippi, USA*
Information Technology Laboratory, Computational Science and Engineering Division,
Computational Analysis Branch

Mechanical Engineer (Student Trainee)

June 2023 - June 2024

- Led a thermomechanical FEA study using Abaqus to predict shrinkage stresses caused by thermal gradients to improve printing parameters and minimizing warping in real-world parts.
- Critically reviewed literature on thermomechanical modeling of additive manufactured (AM) parts, enhancing understanding of complex thermal-mechanical interactions during the 3D printing process to improve build quality.
- Inspecting and repairing an aged sector gear at Cheatham Lock and Dam, identifying wear patterns and potential failure points, and documenting the repair process using a carbon fiber-reinforced polymer in a detailed technical report.

U.S. Army Engineer Research and Development Center *Vicksburg, Mississippi, USA*
Information Technology Laboratory, Computational Science and Engineering Division

Education and Research Internship Program (ERIP)

Summer 2022

Supervisor: Guillermo A. Riveros, Ph.D.

- Designed and conducted a preliminary thermomechanical analysis of an idealized 3D-printed filament using Abaqus to simulate the effects of shrinkage associated to thermal gradients.
- Streamlined part creation and model creation processes using Python scripting to enhance efficiency and automation in finite element analysis.
- Reviewed literature on thermomechanical modeling of additive manufactured parts, focusing on the latest advancements in predicting residual stresses, distortions, and microstructural evolution during the printing process.
- Applied technical expertise, engineering analysis, and programming skills for data analysis.

Smart Surface Designs, LLC

Manhattan, New York City, NY, USA

Research and Development Engineer

Summer 2012

- Reviewed and analyzed amputee-socket designs to enhance functionality and comfort, ensuring better fit and reduced discomfort for amputees. item Developed protocols to quantify, reduce, and optimize the time spent creating 3D models from Computerized Tomography (CT) scans for finite element analysis, resulting in a 25% efficiency improvement.
- Validated and optimized 3D meshes from transtibial amputees to fit custom variable volume sockets generated in Siemens NX using PTC Geomagics, ensuring precise and comfortable prosthetic solutions.

RESEARCH
EXPERIENCE

University of Puerto Rico - Mayagüez Campus

Mayagüez, Puerto Rico

Graduate Research Assistant

January 2016 - Present

Advisor: Paul A. Sundaram, Ph.D.

Biomechanics and Biomaterials Laboratory

- Designed and fabricated a custom resin mold using 3D printing technology to cast PDMS microfluidic devices for live-cell imaging via pneumatic actuation.
- Utilized multiphysics software to comprehensively characterize, test, and simulate device performance, optimizing functionality for live-cell experiments.
- Conducted complex cell-stretching experiments, demonstrating expertise in microfluidic device application and cell biology.
- Mentored and supervised undergraduate students, fostering their research skills and contributing to their development.
- Collaborated on interdisciplinary projects, fostering research and development within the university.
- Employed Python for data analysis and statistical analysis.

University of Virginia Health System

Charlottesville, Virginia, USA

Visiting Scholar

February 2018 - December 2018

Supervisor: Thomas Barker, Ph.D.

Matrix Biology and Engineering Laboratory

- Investigated the effects of mechanical stress on vinculin in NIH/3T3 fibroblasts using a custom cell-stretching device for live-cell imaging.
- Designed and prototyped 3D molds to create custom substrates for commercial substrate stretching platforms, enhancing experimental capabilities.
- Upgraded and maintained cell-stretching equipment, ensuring optimal functionality and reliability, and reducing equipment downtime.
- Provided engineering and technical support, including troubleshooting experiments and maintaining cell-stretching platforms, advancing research capabilities.

MD Anderson Cancer Center

Houston, Texas, USA

Graduate Student

June 2016 - July 2016

Supervisor: Andrew Gladden, Ph.D.

Gladden Laboratory

- Investigated the localization of vinculin, a critical adhesion protein, in MFC10A cells subjected to continuous mechanical stimulation, contributing to comprehensive cellular research.
- Analyzed and characterized the impacts of cyclic strain on normal and cancerous cells, with a

focus on resultant changes in cellular phenotype.

- Developed skills in advanced microscopy techniques, genetic analysis, and molecular biology methodologies, supporting comprehensive cellular research.

Biomechanics and Biomaterials Laboratory
Undergraduate Research Assistant

Advisor: Paul A. Sundaram, Ph.D.

Mayagüez, Puerto Rico

January 2014 - December 2015

- Quantified the mechanical properties of partially mineralized collagen type I fascicles immersed in Simulated Body Fluid (SBF) under monotonic loading, contributing to significant research findings.
- Designed and conducted experiments to assess the mechanical behavior of collagen fascicles in simulated physiological conditions, enhancing understanding of biomaterial properties.
- Analyzed experimental data to derive meaningful insights into the mechanical properties and performance of collagen type I fascicles, publishing research outcomes in a peer-reviewed article.
- Presented findings at national and international conferences, contributing to the broader scientific community.

Orthopaedic Research Group
Undergraduate Research Assistant

Advisor: Christopher Papadopoulos, Ph.D.

Mayagüez, Puerto Rico

May 2011 - December 2013

- Developed a simplified femoral implant model using Siemens NX and NASTRAN to simulate the stress-shielding effect on the femur-implant interface under normal loading conditions.
- Led the design and simulation of the theoretical model for the femoral implant, ensuring accurate representation of biomechanical properties and validating the model using Finite Element Analysis (FEA).

Ubaldo M. Córdova - Figueroa Research Group
Undergraduate Research Assistant

Advisor: Ubaldo M. Córdova - Figueroa, Ph.D.

Mayagüez, Puerto Rico

February 2010 - May 2011

- Studied the diffusivity due to metabolic activity of non-motile bacteria under different substrate concentrations.
- Led the experimental design and task delegation among undergraduate researchers, ensuring efficient project management.
- Coordinated and supervised the research team to execute experiments and analyze data effectively, enhancing research productivity.

**TEACHING
EXPERIENCE**

Department of Mechanical Engineering
Graduate Teaching Assistant

Mayagüez, Puerto Rico

August 2020 - May 2023

- INME 4107 - Materials Science and Engineering Laboratory: Introduced students to fundamental MSE concepts, including statistical analysis and essential laboratory skills, providing a solid foundation for their engineering studies.
- INME 4235 - Mechatronics Laboratory: Taught students key Mechatronics principles and practical skills, equipping them with the theoretical and hands-on experience necessary for success in their studies.

**MENTORING
EXPERIENCE**

Biomechanics and Biomaterials Laboratory

Mayagüez, Puerto Rico

- Mentored multiple undergraduate students in the Biomechanics and Biomaterials Laboratory at the University of Puerto Rico - Mayagüez.
- Guided students through all stages of their research projects, from experimental design to data analysis and interpretation.
- Facilitated collaboration and hands-on experience within the laboratory, fostering a comprehen-

sive understanding of biomaterials research.

- Assisted students in the preparation of their reports, providing academic support and technical expertise.

***Reconfigurable and Multifunctional Soft Materials REU
Pre-faculty Mentor***

*Mayagüez, Puerto Rico
Summer 2015*

- Mentored an undergraduate student in the Research Experience for Undergraduates (REU) program focused on Reconfigurable and Multifunctional Soft Materials at the University of Puerto Rico - Mayagüez.
- Facilitated collaboration between the student and the Biomechanics and Biomaterials Laboratory, fostering interdisciplinary research.
- Guided the student in conducting research in biomaterials, providing technical expertise and academic support.

**VOLUNTEERING
EXPERIENCE**

***Comprehensive Cat Census and Management Plan for the Mayagüez Pueblo Area: A
Citizen Based Strategy for Humane Population Control
Project Leader***

August 2024 - Present

- Spearheaded a comprehensive cat census project in Mayagüez, managing a diverse team of experts and volunteers to assess and address the cat population's wellbeing and its impact on public health.
- Reviewed literature on large-scale data collection efforts to estimate cat population size, identifying areas of high cat density, and evaluating the effectiveness of population management strategies.
- Conducted preliminary field surveys to estimate free-roaming cat populations using line transect methods and initiated the development of an algorithm in R to predict population size based on counted cats, transect length, detection probability, and density.
- Proposed community-based strategies to educate the public about responsible cat ownership, humane population control, and zoonotic disease prevention.

SKILLS

- Languages: Fluent in both English and Spanish
- Programming Languages: Python, Julia, R, Arduino IDE
- Engineering: Additive Manufacturing, Data Analysis, Fiber Reinforced Composites, Finite Element Analysis, Mechanical Testing, Microfabrication, Microfluidics, Multiphysics Analysis, Project Management, Thermomechanical Analysis
- Design and Simulation Software: Abaqus, Ansys, AutoCAD and Fusion 360, COMSOL Multiphysics, Elmer FEM, FreeCAD, NX, SolidWorks
- Mathematics and Statistics Software: MATLAB, Minitab, Jamovi
- Image Analysis and Visualization Software: ImageJ, Paraview, SciDAVis
- Graphic Design Software: GIMP, Inkscape
- Laboratory Techniques: Cell Culture, Immunocytochemistry, Material Sample Preparation, Mechanical Testing, Microfabrication, Microscopy, Soft Lithography
- Applications: L^AT_EX

**PUBLISHED
PAPERS**

Herdocia - Llubes, C. S., Jana, Z., Guo, K., Blanco, A., Elías, A., **López - Santiago, J. G.**, and Chardón, A. (2025) *Fracture resistance of analog and computer-aided design/computer-aided manufacturing long-span fixed provisional restorations: An in-vitro experimental study*. Journal of Prosthodontics. [JOPR-24-571.R1](#). Accepted for Publication.

López - Santiago, J. G., Rodríguez Martínez, O. M., and Sundaram, P. A. (2024) *3D printed microfluidic and millifluidic devices for cell culture and mechanotransduction studies: a review*. Journal of Micromanufacturing. DOI: [10.1177/25165984241286651](#).

	López - Santiago, J. G., and Sundaram, P. A. (2022). <i>Mechanical Properties of Mineralized Collagen Type I Rat-Tail Tendon Fascicles</i> . European Journal of Dental and Oral Health, 3(4), 7-11. DOI: 10.24018/ejdent.2022.3.4.160 .
PAPERS IN PREPARATION	López - Santiago, J. G., Ríos - López, W. N., Rodríguez - Martínez, O. M., and Sundaram, P. A. <i>Rapid prototyping of a microfluidic cell stretching platform for live-cell imaging from 3D-printed molds</i> . In preparation.
ORAL PRESENTATIONS	<p>J. López - Santiago and G. A. Riveros. Numerical Simulations of Thermal Stresses and Bond-Slippage in Parts Built via Fused Deposition (3D Printing). U.S. Army Engineer Research and Development Center Summer 2022 Final Briefings, Vicksburg, Mississippi, USA, August 2022.</p> <p>J. López - Santiago, A. Gladden, and P. Sundaram. Expression of Vinculin at Focal Adhesions in Response to Mechanical Stimulus of a Soft-Substrate. 2nd Transformational Initiative for Graduate Education and Research Symposium, Mayagüez, Puerto Rico, September 2017.</p> <p>López - Santiago, J., B. Calcagno, and P. Sundaram. Mechanical Characterization of Mineralized Collagen Type I Fascicles from Rat-tail Tendon. American Chemical Society 39th Senior Technical Meeting, Ponce, Puerto Rico, November 2015.</p>
POSTER PRESENTATIONS	<p>López - Santiago, A. Gladden, and P. Sundaram. Expression of Vinculin at Focal Adhesions in Response to Cyclical Loading of a Substrate in MCF10A Cells. 1st Transformational Initiative for Graduate Education and Research Symposium, Mayagüez, Puerto Rico, September 2016.</p> <p>López - Santiago, J., B. Calcagno, and P. Sundaram. Mechanical Behavior of Collagen Type I Fascicles Extracted from Rat-Tail Tendon Immersed in Simulated Body Fluid. World Congress on Regenerative Medicine, Leipzig, Germany, October 2015.</p> <p>Santana - Monterrey, C., J. López - Santiago and P. Sundaram. Mechanical Behavior of Rat-Tail Tendon Immersed in Simulated Body Fluid. Research Experience for Undergraduates in Reconfigurable and Multi-functional Soft Materials Poster Session, Mayagüez, Puerto Rico, July 2015.</p> <p>López - Santiago, J. and P. Sundaram. Mechanical Behavior of Collagen Type I Fascicles Extracted from Rat-Tail Tendon Immersed in Simulated Body Fluid. Sigma Xi Poster Day, Mayagüez, Puerto Rico, April 2015.</p> <p>López - Santiago, J. and P. Sundaram. Mechanical Behavior of Collagen Type I Fascicles Extracted from Rat-Tail Tendon Immersed in Simulated Body Fluid. Emory University Laney Graduate School STEM Research and Career Symposium, Atlanta, Georgia, USA, March 2015.</p> <p>López - Santiago, J. and P. Sundaram. Mechanical Behavior of Collagen Fascicles Immersed in Simulated Body Fluid. 8th NEA Science Day, Mayagüez, Puerto Rico, March 2015.</p> <p>López - Santiago, J. and P. Sundaram. Mechanical Behavior of Collagen Type I Fascicles Tested at Varying Strain Rates. Sigma Xi Poster Day, Mayagüez, Puerto Rico, April 2014.</p> <p>L. Medina, W. Rivera, M. Díaz, J. Soto, J. López, M. López, R. Cortés, L. Ríos-Hernández, and U. M. Córdova-Figueroa. Intracellular metabolism of substrates enhances single-cell diffusion in <i>Enterococcus faecalis</i> a non-motile bacterium. PRISM 2011, Interamerican University - Bayamón, Puerto Rico, March 2011.</p> <p>M. Díaz, J. Soto - Rodríguez, M. Hidalgo - Santiago, J. López - Santiago, L. Ríos - Hernández, and U. M. Córdova - Figueroa. Intracellular metabolism of substrates enhances single-cell diffusion</p>

in *Enterococcus faecalis* a non-motile bacterium. AIChE Annual Meeting, Salt Lake City, Utah, USA November 2010.

M. Hidalgo, **J. López**, J. Soto, M. Díaz, L. Ríos - Hernández, and U. M. Córdova - Figueroa. Intracellular metabolism enhances single-cell diffusion in *Enterococcus faecalis* a non-motile bacterium. PR - LSAMP 5th Transdisciplinary Research Conference, San Juan, Puerto Rico, May 2010.

HONORS AND AWARDS

- Alfred P. Sloan Foundation - UPRM Ph.D. Enrichment Program Fellowship, 2021
- Extramural Research Enhancement Award (EREA) Fellow, 2016
- Transformational Initiative for Graduate Education and Research (TIGER) Fellow, 2016
- NIH RISE-2-BEST Fellow, 2014
- Puerto Rico Louis Stokes Alliance for Minority Participation Fellow, 2011

ACADEMIC SERVICE

Reviewer for Journal of Micromanufacturing (*Sage Journals*)