

Daniel E. Martinez



LinkedIn

EDUCATION

Georgia Institute of Technology, Ph.D. Robotics

Expected June 2024

George W. Woodruff School of Mechanical Engineering – Robotics – Prof. Jun Ueda

GPA: 3.32/4.0

- Thesis: Image Guided High Precision Robotic Positioning in MRI for Medical Applications
- NSF Graduate Research Fellowship Program (GRFP) Fellow

Georgia Institute of Technology, M.S. Mechanical Engineering

George W. Woodruff School of Mechanical Engineering

GPA: 3.32/4.0

- NSF Accessibility, Rehabilitation, and Movement Science (ARMS) Traineeship Program (NRT)

Florida International University, B.S. Mechanical Engineering

FIU Department of Mechanical and Materials Engineering

GPA: 3.63/4.0

- Ronald E. McNair Scholar

SKILLS

- **Programming:** MATLAB, Python, C++, ROS
- **Process Optimization:** Six Sigma Certified
- **Languages:** English & Spanish (native), Japanese (advanced)
- **CAD:** SolidWorks, AutoCAD, Fusion 360

PROFESSIONAL EXPERIENCE

Robotic Safety Assessment of Medical Implants in MRI

Atlanta, GA

Georgia Institute of Technology BRHML Lab

Oct 2022 – Present

- Established novel method for measuring radiofrequency induced heating of medical implants in Magnetic Resonance Imaging (MRI) environment by navigating an acousto-optic sensor through ASTM standard gel phantom simulating thermoelectric properties of human tissue to comply with FDA, and ISO Standards
- Mechanically characterizing ASTM standard gel phantom for open-loop resistance compensation

MRI Guided Medical Injection Robot

Atlanta, GA

Georgia Institute of Technology BRHML Lab

Aug 2019 – Present

- Designed piezoelectrically actuated 4 Degree of Freedom (DOF) needle guidance robot with sub-millimeter positioning accuracy for stem cell injection into the ventral horn of the spinal cord
- Developed novel method of improving MRI resolution by combining multiple images with sub-pixel shifts induced by the MRI compatible surgical robot through super resolution algorithms
- Experimentally demonstrated 33% improvement in accuracy through the use of Position Sensitive Devices

Robotic Pipe Crawler for Power Plant Inspection

Miami, FL

Florida International University Applied Research Center

Sep 2018 – Aug 2019

- Designed peristaltic robotic pipe crawler to inspect 2 inch diameter pipes in coal power plants
- 3D printed components and integrated sensors, microcontrollers, and motors to control functional prototype
- Optimized pulling force to overcome the friction on the tether cable across several 180 degree bends

Physiological State Estimation for Social Robot Interaction

Wako, Japan

Honda Research Institute Japan

Oct 2022 – Jul 2023

- Integrated a non-invasive wrist sensor and classification model into a table-top social robot's functionality for live streaming and estimation of the user's physiological state as feedback for robot interactions
- Collaborated with researchers internationally to propose design changes to address mechanical issues

Path Planning and Trajectory Optimization of FANUC Robots

Detroit, MI

Fiat Chrysler Automobiles

May 2017 – Aug 2017

- Analyzed cycle time data of crankshaft line over several months to identify bottleneck operation
- Redesigned robot automation movement pattern to reduce cycle time and increase crankshaft production
- Benchmarked neighboring plant automation efficiency to assess transferable improvements
- Assisted contractors Komatsu NTC and PARI to install PLC and ladder logic for six axis FANUC robots

Development of Multi-Agent Swarm Robotics Platform

East Lansing, MI

Michigan State University

May 2018 – July 2018

- Designed and built a Wi-Fi enabled differential drive swarm robot test-bed to study swarm algorithms
- Interfaced ESP8266 Wi-Fi module with Arduino to demonstrate coverage control algorithm by processing data from VICON overhead camera system in MATLAB and wirelessly transmitting path-finding commands

PROJECT EXPERIENCE

Senior Capstone Project: Low Cost Modular Hand Prosthesis

Florida International University

Miami, FL
Aug 2018 – May 2019

- Led team of 4 engineers to design, manufacture, and patent prosthetic fingers for hand amputees
- Improved accessibility to affordable prosthesis for both insured and uninsured veterans
- Modelled prosthesis for compatibility with different amputations and hand sizes

Pneumatic muscle system

Florida International University, MAIDROC Lab

Miami, FL
Sep 2017 – May 2019

- Prototyped pressurized contracting actuators to simulate human bicep and triceps movement
- Controlled an arrangement of solenoid valves with transistors to regulate air flow in pneumatic muscle

Virtual Reality Haptic Weight Sensing

Tohoku University

Sendai, Japan
Jul 2019 – Aug 2019

- Designed vibrational haptic feedback device to improve VR (Virtual Reality) training by enabling user to distinguish between weight of objects held in a VR environment
- Scripted C# physics for user to manipulate models with hand gestures read by Leap Motion sensor

IEEE SoutheastCon Robot

Florida International University

Miami, FL
Jan 2017 – Dec 2017

- Developed a six probe arm to decipher a password encoded as five different electronic components
- Nested Arduino probes in spring loaded retracting mechanisms to adjust for possible navigation errors

“RealWorks” Augmented Reality Furniture Visualizer

Florida International University

Miami, FL
Feb 2017 – Feb 2017

- Designed 3D SolidWorks models and exported them to Unity game engine for augmented reality
- Scripted C# physics for user to manipulate models with hand gestures read by Leap Motion sensor

LECTURES / SEMINARS

Kobe University, Robotics in Medicine Lecture Series

Mar 2021

- “AutoSPINE: High-Precision MRI-guided Direct Cell Injection Robot”

Hiroshima University, Invited Technical Seminar

Oct 2020

- “High-Precision MRI-guided Direct Cell Injection Robot”

LEADERSHIP

JSA (Japan Student Association)

Atlanta, GA

Events Coordinator

Sep 2021 – May 2022

- Plans and executes cultural and social events to educate on Japanese culture and foster community

RoboGrads (Robotics Graduate Student Organization)

Atlanta, GA

Social Vice President

May 2021 – May 2022

- Hosts social events to strengthen the community of graduate students studying robotics

LOGRAS (Latino Graduate Student Organization)

Atlanta, GA

Social and Cultural Chair

Jan 2021 – May 2022

- Plans events to strengthen the community of Latin American graduate students and to promote and educate members about different Latin American cultures
- Mentors new graduate students in their transition to graduate school and a different culture

Theta Tau Professional Engineering Fraternity

Miami, FL

Chapter President

Dec 2017 – May 2018

- Hosted a regional conference for over 100 members from all across Florida
- Led the 5 other executive board positions in handling all the operations of the chapter

Professional Development Chair

Dec 2016 – Dec 2018

- Collaborated with FIU Career Services to host workshops about professional development
- Managed a committee of 4 members to critique 100 resumes and cover letters

STEM Outreach Chair

May 2016 – Dec 2016

- Regularly visited elementary and middle schools to teach students about engineering
- Introduced students to the many fields in engineering, describing their career opportunities

PUBLICATIONS

1. **D.E. Martinez**, H.A. Nieves-Vazquez, Y.S. Yaras, A. Khotimsky, B. Skowronski, L. Bradley, J. Oshinski, F.L. Degertekin & J. Ueda. "MRI Compatible Robotic Dosimeter System for Safety Assessment of Medical Implants", in *2024 IEEE/SICE International Symposium on System Integration (SII)* (pp. 25-29). IEEE. January 2024
2. W. Meinhold, H.A. Nieves-Vazquez, **D.E. Martinez**, J. Lee, S. Li, J. Ueda, and A.-P. Hu. "A Virtual Reality Guidance System for a Precise MRI Injection Robot." In *2023 IEEE/SICE International Symposium on System Integration (SII)*, pp. 1-6. IEEE, 2023.
3. C. Lara, J. Villamil, A. Abrahao, A. Aravelli, G. Daldegan, S. Sarker, **D. Martinez**, D. McDaniel, "Development of an Innovative Inspection Tool for Superheater Tubes in Fossil Fuel Power Plants", *Materials Evaluation*, vol. 79, no. 7 July 2021
4. **D. E. Martinez**, W. Meinhold, J. Oshinski, A.-P. Hu, and J. Ueda, "Super Resolution for Improved Positioning of an MRI-Guided Spinal Cellular Injection Robot", *Journal of Medical Robotics Research*, May 2021
5. W. Meinhold, **D. E. Martinez**, J. Oshinski, A. -P. Hu and J. Ueda, "A Direct Drive Parallel Plane Piezoelectric Needle Positioning Robot for MRI Guided Intraspinal Injection," in *IEEE Transactions on Biomedical Engineering*, vol. 68, no. 3, pp. 807-814, March 2021
6. **D. E. Martinez**, W. Meinhold, J. Oshinski, A. -P. Hu and J. Ueda, "Resolution-Enhanced MRI-Guided Navigation of Spinal Cellular Injection Robot," *2020 International Symposium on Medical Robotics (ISMR)*, 2020, pp. 83-88

PATENTS

1. W. Meinhold, A.-P Hu, J. Oshinski, J. Ueda, and **D.E. Martinez**. "Systems and methods for magnetic resonance imaging guided robotics." U.S. Patent Application 17/404,619 filed February 17, 2022.

AWARDS / SCHOLARSHIPS

- NSF Graduate Research Fellowship Program (GRFP)
- Outstanding Senior Design Proposal
- Fiat Chrysler Automotive Design Challenge 1st place
- NASCAR Ten80 National Aerodynamics 2nd place
- VEX Robotics Florida Build Award and Design Award
- Florida-Georgia Louis Stokes Alliance for Minority Participation (FGLSAMP) Scholarship
- Gold and Blue Achievement Award
- Florida Medallion Scholarship

TEACHING EXPERIENCE

Instructor

Georgia Institute of Technology

- ME 3801: Machine Design

Atlanta, GA
May 2024 – Jul 2024

Teaching Assistant

Georgia Institute of Technology

- ME 6407: Robotics

Atlanta, GA
Jan 2022 – May 2022

Teaching Assistant

Miami PREP Summer STEM Program

- Robotics Course

Miami, FL
Jun 2016 – Jul 2016

CONFERENCES / PRESENTATIONS

2024 IEEE/SICE International Symposium on System Integration (SII)

Jan 2024

- "MRI Compatible Robotic Dosimeter System for Safety Assessment of Medical Implants" *Oral Presentation*

Institute for Robotics and Intelligent Machines (IRIM) Fall Research Symposium

Nov 2023

- "High Precision Robotic Positioning Device for use in MRI for Medical Applications" *Poster Presentation*

2020 International Symposium on Medical Robotics (ISMR)	Nov 2020
– “Resolution-Enhanced MRI-Guided Navigation of Spinal Cellular Injection Robot” <i>Oral Presentation</i>	
FIU Senior Design Project Showcase	Apr 2019
– “Low Cost Modular Hand Prosthesis” <i>Poster Presentation</i>	
DOE NETL 2019 Annual Project Review Meeting	Apr 2019
– “Development of a Pipe Crawler Inspection Tool for Fossil Energy Power Plants” <i>Poster Presentation</i>	
FIU Senior Design Project Showcase	Nov 2018
– “Low Cost Modular Hand Prosthesis” <i>Poster Presentation</i>	
FIU McNair Scholars Research Conference	Oct 2018
– “Development of in vivo Programmable Robotic Swarms” <i>Oral and Poster Presentation</i>	
FIU McNair Scientific Research Symposium	Sep 2018
– “Development of in vivo Programmable Robotic Swarms” <i>Poster Presentation</i>	
Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE)	July 2018
– “Development of in vivo Programmable Robotic Swarms” <i>Oral and Poster Presentation</i>	
