

SERGIO E. GARCÍA-VERGARA

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RESEARCH INTERESTS

Autonomous robotic systems, systems and controls, healthcare robotics, assistive technology, human-robot interaction, computer vision, and machine learning.

EDUCATION

Georgia Institute of Technology	Atlanta, GA
<i>Ph.D. in Electrical and Computer Engineering</i>	May 2017
Dissertation: <i>Coupling of an Objective and Quantifiable Methodology for Assessing Upper-body Movements with VR Gaming Platforms</i>	
Georgia Institute of Technology	Atlanta, GA
<i>MS in Electrical and Computer Engineering</i>	May 2014
Minor: <i>Computer Science</i>	
University of Puerto Rico at Mayagüez	Mayagüez, PR
<i>BS in Electrical Engineering</i>	June 2011

SKILLS

Programming Languages	Python, C, C++, C#, Java
Engineering Software	ROS 1 & ROS 2, Matlab, Visual Studio, Simulink, Eclipse
Operating Systems	Linux, Windows
Tools	Docker, L ^A T _E X, Emacs, Git, Cygwin. CMake, Bash
Robotic Platforms	MEAU RV-8CRL, UR3e/5e, UFactory xarm6, DARwin-OP, AmigoBot, Pioneer 3-AT, BlueEagle, DJI S1000
Languages	Fully proficient in English and Spanish. (Basic knowledge in German).

WORK EXPERIENCE

CTO & Co-founder	October 2020 - present
<i>RIF Robotics Atlanta, GA</i>	
<ul style="list-style-type: none"> • Developing a platform that uses robotics, computer vision, and artificial intelligence to autonomously inspect surgical instruments and assemble surgical trays in hospitals' sterile processing departments. • Responsibilities include algorithm development, software development, proposal creation, fundraising, customer interfacing, and project management. 	
Robotics Consultant	July 2023 - present
<i>WDDLY Associates Corp. Atlanta, GA</i>	
<ul style="list-style-type: none"> • Providing expert guidance in path planning and software development for the startup's UR3e robotic manipulator, aimed to automating the cutting of chickens. • Successfully integrated the MoveIt motion planning framework for ROS 2 into the startup's autonomy architecture to generate robust and dynamic trajectories for their robotic manipulator. 	

- Successfully led the migration of WDDLY's autonomy architecture from ROS 1 to ROS 2, enhancing system reliability, scalability, and compatibility with modern robotic frameworks.

Robotics Consultant

February 2021 - October 2022

Greenzie Inc. | Atlanta, GA

- Provided expert guidance on advancing the startup's industrial autonomous lawnmower.
- Developed new algorithms and methodologies to enhance the lawnmower's obstacle avoidance capabilities, including the implementation of ray-tracing integrated with existing grid map usage, resulting in improved efficacy and efficiency in obstacle detection and clearance.
- Spearheaded the technical proposal for migrating Greenzie's autonomy architecture from ROS 1 to ROS 2, ensuring compatibility and leveraging the latest advancements in robotic frameworks.

Research Engineer II

January 2017 - October 2020

Georgia Tech Research Institute | Atlanta, GA

Supervisor: Dr. Charles Pippin

- Developed algorithms for collaborative autonomous systems including, but not limited to, task allocation, path planning, and computer vision.
- Helped develop the lab's autonomy architecture software and build system.
- Responsibilities included algorithm development, software development, proposal creation, technical reporting, customer interfacing, and project management.

Graduate Research Assistant

May 2012 - December 2016

Georgia Tech HumAnS Lab | Atlanta, GA

Supervisor: Dr. Ayanna M. Howard

- Developed an interactive virtual reality gaming system for rehabilitation in the home environment.
- Developed an objective and quantifiable methodology for evaluating the kinematic performance of individuals who have some form of motor skills disorder.
- Developed a pattern recognition algorithm to determine the level of the user's kinematic performance such that the virtual reality platform can autonomously adapt to the user's needs.

Graduate Research Assistant

August 2011 - May 2012

Georgia Tech MRL Lab | Atlanta, GA

Supervisor: Dr. Ronald C. Arkin

- Implemented the architecture and support for knowledge sharing across heterogeneous robotic agents as part of the MAST (Micro Autonomous Systems Technology) project.
- Designed the conceptual spaces for the different robotic platforms based on their respective sensors as a base for the communication and interpretation of the acquired data (i.e. vision, laser range finder, thermal, etc).

Summer Undergraduate Researcher

Summer 2010

University of California | Berkeley, CA

Supervisor: Dr. Seth Sanders

- Used COMSOL Multiphysics to design a 3-phase 6-pole permanent magnet alternator to be coupled with a Stirling engine system.

Summer Undergraduate Researcher

Summer 2009

Purdue University | West Lafayette, IN

Supervisor: Dr. Eric Stach

- Used LabVIEW to write the needed drivers to couple mass flow controllers with the Birck Nanotechnology Center's transmission electron microscope.

Undergraduate Research Assistant
University of Puerto Rico | Mayagüez, PR

August 2009 - January 2011
Supervisor: Dr. Eduardo Ortiz

- Designed the control system to control the speed of a DC motor powered by a fuel cell.
- Designed, built, and programmed a nonholonomic small robot car to find the center of an arbitrary 16x16 square maze.

Undergraduate Research Assistant
University of Puerto Rico | Humacao, PR

Summer 2008
Supervisor: Dr. Rolando Oyola

- Interfaced a fast spectroscopy device with an oscilloscope using LabVIEW to automate a nanosecond-laser flash photolysis system.

PUBLICATIONS AND PRESENTATIONS

Journal Publications and Book Chapters

1. Y.P. Chen, **S. García-Vergara**, and A.M. Howard, "Effect of feedback from a socially interactive humanoid robot on reaching kinematics in children with and without cerebral palsy: a pilot study," *Developmental Neurorehabilitation*, Vol. 21, No. 8, pp. 490-496, 2018.
2. Y.P. Chen, **S. García-Vergara**, and A.M. Howard, "Effect of a Home-Based Virtual Reality Intervention for Children with Cerebral Palsy using Super Pop VRTM Evaluation Metrics: A Feasibility Study," *Rehabilitation Research and Practice*, 2015.
3. **S. García-Vergara**, L. Brown, H.W. Park, and A.M. Howard, "Engaging children in play therapy: The coupling of virtual reality games with social robotics," *Technologies of Inclusive Well-Being*, Springer Berlin Heidelberg, pp. 139-163, 2014.

Refereed Conference Publications

1. D. Bryant, J. Boyd, J. Harris, M. Smith, **S. García-Vergara**, Y.P. Chen, and A.M. Howard, "An Infant Smart-Mobile System to Encourage Kicking Movements in Infants At-Risk of Cerebral Palsy," *IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO)*, pp. 1-5, 2017.
2. **S. García-Vergara**, P. Robinette, Y.P. Chen, and A.M. Howard, "Validation of a Physical Rehabilitation Game using Markerless versus Marker-based Motion Capture Systems," *IEEE EMBS Conference*, 2016.
3. **S. García-Vergara**, L. Brown, Y.P. Chen, and A.M. Howard, "Increasing the Efficacy of Rehabilitation Protocols for Children via a Robotic Playmate Providing Real-time Corrective Feedback," *IEEE Conference on Robot and Human Interactive Communication (Ro-Man)*, pp. 700-705, 2016.
4. L. Brown, **S. García-Vergara**, and A.M. Howard, "Evaluating the Effect of Robot Feedback on Motor Skill Performance in Therapy Games," *IEEE Conference on Systems, Man, and Cybernetics (SMC)*, pp. 1060-1065, 2015.
5. **S. García-Vergara**, H. Li, and A.M. Howard, "Increasing Super Pop VRTM Users' Intrinsic Motivation by Improving the Game's Aesthetics," *International Conference on Universal Access in Human-Computer Interaction*, pp. 432-441, 2015.
6. **S. García-Vergara**, M.M. Serrano, Y.P. Chen, and A.M. Howard, "Developing a Baseline for Upper-body Motor Skill Assessment Using a Robotic Kinematic Model," *IEEE Conference on Robot and Human Interactive Communication (Ro-Man)*, pp. 911-916, 2014.

7. **S. García-Vergara**, and A.M. Howard, “Three-dimensional Fitts Law Model used to Predict Movement Time in Serious Games for Rehabilitation,” *International Conference on Virtual, Augmented and Mixed Reality*, pp. 287-297, 2014.
8. **S. García-Vergara**, Y.P. Chen, and A.M. Howard, “*Super Pop VRTM* : an Adaptable Virtual Reality Game for Upper-Body Rehabilitation,” *International Conference on Human-Computer Interaction*, pp. 40-49, 2013.
9. R.C. Arkin, **S. García-Vergara**, and S.G. Lee, “Architectural Design and Support for Knowledge Sharing Across Heterogeneous MAST systems,” *SPIE Conference*, pp. 84070C, 2012.
10. A.M. Howard, L. Roberts, **S. García-Vergara**, and R. Quarells, “Using Mixed Reality to Map Exercise Demonstrations to a Robot Exercise Coach,” *IEEE Mixed and Augmented Reality (ISMAR) Conference*, 2012.
11. P.J. González-Rivera, J. Santiago-González, **S. García-Vergara**, and E. Ortiz-Rivera, “Design of an Observer and Speed Controller for a DC Motor Fed by Fuel Cells and DC to DC Converters,” *IEEE Power and Energy Society General Meeting*, pp. 1-6, 2011.
12. **S. García-Vergara**, P. León, Y.J. Díaz-Mercado, and E. Ortiz-Rivera, “An Integrated Undergraduate Research Experience in Control, Power Electronics, and Design using a Micromouse,” *IEEE Frontiers in Education Conference*, pp. T3D-1, 2010.

Refereed Conference Presentations

1. L. Clackum, F. Fayyaz, T. Gordon, K. Lansing, Y.P. Chen, **S. García-Vergara**, A.M. Howard, B. Weissman, and J. Hallman-Cooper, “Effect of Functional Strength Training to Improve Arm Function in Children with Cerebral Palsy: A Case Study,” *Combined Sections Meeting, American Physical Therapy Association*, New Orleans, LA, February, 2018.
2. Y.P. Chen, **S. García-Vergara**, and A.M. Howard, “Evaluation of trials necessary to achieve performance stability in a reaching kinematics movement analysis game,” *Combined Sections Meeting, American Physical Therapy Association*, New Orleans, LA, February, 2018.
3. Y.P. Chen, **S. García-Vergara**, A.M. Howard, “Examining the Effect of Feedback from a Humanoid Robot on Reaching Kinematics in Children with Cerebral Palsy,” (Poster presented at) *NEXT Conference, American Physical Therapy Association*, Boston, MA, June, 2017.
4. L. Clackum, F. Fayyaz, T. Gordon, K. Lansing, Y.P. Chen, **S. García-Vergara**, and A.M. Howard, “Effect of Rhythmic Auditory Stimulation in Virtual Reality Games to Improve Arm Function in Children with Cerebral Palsy: A Case Study,” (Poster presented at) *NEXT Conference, American Physical Therapy Association*, Boston, MA, June, 2017.
5. C. Beegle, A. Rollins, J. Tyra, Y.P. Chen, **S. García-Vergara**, and A.M. Howard, “Test-retest Reliability and Minimal Detectable Change in the Super Pop VRTM Game in Children with and without Cerebral Palsy,” (Poster presented at) *Combined Sections Meeting, American Physical Therapy Association*, San Antonio, TX, February, 2017.
6. E. Danish, S. Epling, S. Smelser, Y. Zhang, Y.P. Chen, **S. García-Vergara**, A.M. Howard, B. Weissman, and J. Hallman-Cooper, “Virtual Reality Gaming System can be used in Home Based Treatment in Children with Cerebral Palsy: A Case Study,” (Poster presented at) *NEXT Conference, American Physical Therapy Association*, Nashville, TN, June, 2016.
7. E. Bermudez, M. Layman, E. Shepard, Y.P. Chen, **S. García-Vergara**, and A.M. Howard, “Test-Retest Reliability and Minimal Detectable Change in the Super Pop VRTM game in Healthy Children,” (Poster to be presented at) *Combined Sections Meeting, American Physical Therapy Association*, Anaheim, CA, February 2016.

8. Y.P. Chen, **S. García-Vergara**, and A.M. Howard, “Test-Retest Reliability and Minimal Detectable Change of Super Pop VR™ in Healthy Adults,” (Poster presented at) *Combined Sections Meeting, American Physical Therapy Association*, Indianapolis, IN, February, 2015.
9. B. Denmark, A. Harrod, B. Steele, T. Weekley, **S. García-Vergara**, A.M. Howard, and Y.P. Chen, “Effect of Virtual Reality Intervention on Upper-Extremity Function in a Child with Cerebral Palsy: A Case Study,” (Poster presented at) *Physical Therapy Association of Georgia*, Atlanta, GA, September, 2014.

PATENTS

1. R.E. Torres-Muñiz, **S.E. García-Vergara**, B.A. Llorens-Bonilla, D. Sánchez-Cordero, and M. Lizama, “Switch-Actuated Joystick for Power Wheelchairs”, U.S. Patent 8 622 166 B1, January 7, 2014.

Developed a switch-actuated adapter for joystick controlled wheelchairs such that individuals with limited mobility can continue making use of their chairs and avoid spending money on new ones.

Provisional

1. C. Farill, K. DeMarco, and **S. García-Vergara**, “Robotic end effector with secondary gripper mechanism”, USPTO application number 63/592,191, October 22, 2023.

Developed a secondary gripper mechanism, to be attached to any off-the-shelf parallel jaw gripper, allowing for the grasping of scissor-like objects by the finger loops without hindering the pinching capability.

FELLOWSHIPS & AWARDS

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| 1. <i>Sam Chih Foundation Award</i> , Georgia Institute of Technology | 2016 |
| 2. <i>Alfred P. Sloan Foundation Fellowship</i> , Georgia Institute of Technology | 2013-2016 |
| 3. <i>Goizueta Fellowship</i> , Georgia Institute of Technology | 2012-2016 |
| 4. <i>NSF Graduate Research Fellowship</i> , Georgia Institute of Technology | 2012-2015 |
| 5. <i>Marion & Henry Bourne ECE Graduate Fellowship</i> , Georgia Institute of Technology | 2011 |
| 6. <i>Member of the Tau Beta Pi National Honor Society</i> , University of Puerto Rico at Mayagüez | 2010 |
| 7. <i>Puerto Rico - Louis Stokes Alliance for Minority Program (PRLSAMP) Scholarship</i> , University of Puerto Rico at Mayagüez | 2008 |
| 8. <i>Member of the Dean's List throughout undergraduate studies</i> , University of Puerto Rico at Mayagüez | 2006-2011 |

TEACHING & MENTORING EXPERIENCE

Teaching Certificate

Tech to Teaching

May 2015

Georgia Tech | Atlanta, GA

- Higher Education Pathway Intermediate Certificate

Summer Mentorship

Georgia Tech

Summer 2019

GTRI | Atlanta, GA

- Mentored a high school student interested in Robotics.
- Guided the student through ROS tutorials, and had him help me develop solutions for visual servoing an autonomous UAV.

Instructor on Record

August 2014 - December 2014

Course: Graduate Teaching Assistant Preparations

Georgia Tech | Atlanta, GA

- Prepared weekly lesson plans and gave in-class lectures.
- Graded homeworks and course materials.

Graduate Teaching Assistant

June 2013 - August 2013

Course: Linear Circuits

Georgia Tech | Atlanta, GA

- Answered students' questions in the classroom and via the student forums on the Coursera website.
- Prepared and explained practice problems to help students better understand the material.

SERVICE & VOLUNTEER WORK

Reviewer

1. IEEE International Symposium on Robot & Human Interactive Communication (RO-MAN)

Outreach

1. *Coach for the First Lego League Competition*, East Atlanta Kids Club 2017
2. *Brownwood Bike Rally Volunteer*, East Atlanta Kids Club 2017
3. *Summer Undergraduate Research in Engineering (SURE) Program, Graduate Student Mentor*, Georgia Institute of Technology 2016
4. *Middle School STEM Camps, Graduate Student Mentor*, Georgia Institute of Technology 2016
5. *National Robotics Week, Robotics and Intelligent Machines Center Open House*, Georgia Institute of Technology 2016
6. *GoSTEM Latino STEM Fair*, Georgia Institute of Technology 2015-2016
7. *FOCUS Program, New Students Visitation Weekend*, Georgia Institute of Technology 2013-2016
8. *ECE Recruiting Events, Lab Tours and Demos*, Georgia Institute of Technology 2013-2016
9. *Chestatee Academy Middle School Latino Students Visit, Graduate Student Panel*, Georgia Institute of Technology 2015
10. *GoSTEM Latino STEM Education Day*, Meadowcreek High School 2014-2015
11. *Science Fair Judge*, Lilburn Elementary School 2014
12. *Technology Student Association (TSA), High School TEAMS Competition*, Georgia Institute of Technology 2013-2014
13. *H.O.T. Days, Robot Programming Workshop*, Georgia Institute of Technology 2013-2014
14. *Campbell Middle School Minority Students Visit, Graduate Student Panel*, Georgia Institute of Technology 2013
15. *Southwest Miami High School Latino Students Visit, Graduate Student Panel*, Georgia Institute of Technology 2012