Juan M. Gandarias, Ph.D.

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Curriculum vitae last updated: August 23, 2023

EDUCATION

Ph.D. in Mechatronics at University of Málaga, Spain 2017-2020
Intelligent Haptic Perception for Physical Robot Interaction (10/10 - Cum Laude)

M.S. in Mechatronics at University of Málaga, Spain 2015-2017
Tactile perception applied to rescue robotics. M.S. Thesis: 10/10

B.S. in Industrial Engineering at University of Málaga, Spain 2010-2015
Specialization in Robotics, Automation and Control. B.S. Thesis: 9.3/10

POSITIONS HELD

Assistant Professor 2023
Systems Engineering and Automation Department, University of Málaga

Postdoctoral Researcher 2020 - 2023
HRI^2 *Lab, at Istituto Italiano di Tecnologia (IIT), Italy*

Postdoctoral Researcher 2020
Systems Engineering and Automation Department, University of Málaga

Researcher - PhD Student 2017 - 2020
Systems Engineering and Automation Department, University of Málaga

Visiting Ph.D. Student at University College London (UCL), UK 2019
Soft Haptics and Robotics Lab, Mechanical Engineering Department

Teaching Assistant 2018 - 2020
Systems Engineering and Automation Department, University of Málaga

R&D Engineering and Teaching Robotics 2016 - 2017
Stemxion, Spain. Courses development and teaching robotics in intermediate school.

SHORT BIOGRAPHY AND RESEARCH INTERESTS

Juan M. Gandarias is an Assistant Professor at the Systems Engineering and Automation Department at the University of Malaga, Spain, where he conducts his research in the Robotics and Mechatronics lab and in the Institute of Mechatronics and Cyber-physical Systems (IMECH.UMA). Previously, he was a postdoctoral researcher at the Human-Robot Interfaces and Interaction group at Istituto Italiano di Tecnologia (IIT). He received his PhD degree in Mechatronics Engineering from the University of Malaga, Spain in 2020. He was involved in the Horizon-2020 project SOPHIA and ERC project Ergo-Lean. He has also contributed to several Spanish, Italian and European research projects related to search-and-rescue, physical robotic assistance, and Human-Robot Collaboration in Industrial environments. He is the author of several publications in journals and international conferences and is the inventor of one international patent. He has contributed as editor of special issues in scientific journals and international workshops in flagship conferences in robotics and automation. He has served as a reviewer for high-relevance journals and conferences such as IEEE RAM, RA-L, ICRA, IROS, ToH, etc. His main research interests include physical Human-Robot Interaction, human modeling, and haptics.

AWARDS AND HONORS

2022 IROS 2022 Best Paper Award Finalist on Mobile Manipulation sponsored by OMRON Sinic X Corp.

2020 Best PhD in Mechatronics Engineering Award from the University of Málaga.

2020 Ph.D. Thesis with honors (Cum Laude). *Intelligent Haptic Perception for Physical Robot Interaction*

2019 Travel award IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

2017 Grant from the European Commission for the completion of the Ph.D. Thesis. *BES-2016-078237*

2017 M.S. Thesis with honors. *Applications of tactile perception to rescue robotics*

2015 B.S. Thesis with honors. *Enhanced control of an admittance-type haptic device for education*

PUBLICATIONS

Journal articles

[J1] L. Fortini, M. Leonori, J.M. Gandarias, E. de Momi, A. Ajoudani, "Markerless 3D human pose tracking through multiple cameras and AI: Enabling high accuracy, robustness, and real-time performance", Nature Machine Intelligence, 2023, (Q1, T1), (Submitted.). [Preprint]

[J2] Robin Arbaud, Maedeh Najafi, Juan M. Gandarias, Marta Lorenzini, Uttam C. Paul, Arkadiusz Zych, Athanassia Athanassiou, Pietro Cataldi, and Arash Ajoudani, "Towards Sustainable Haptics: A Solar-Powered Vibrotactile Wearable System with Biodegradable Components", Advanced Functional Materials, 2023, (Q2, T1), (Under Review).

[J3] A. Giammarino, J.M. Gandarias, P. Balatti, M. Lorenzini, M. Leonori, A. Ajoudani, "SUPER-MAN: SUPERnumerary Robotic Bodies for Physical Assistance in HuMAN-Robot Conjoined Actions", Mechatronics, 2023, (Q2, T1), *Under review.* [Preprint]

[J4] J.M. Gandarias*, M. Leonori*, A. Ajoudani, "MOCA-S: A Sensitive Mobile Collaborative Robotic Assistant exploiting Low-Cost Capacitive Tactile Cover and Whole-Body Control", IEEE Robotics and Automation Letters, 2022, (Q2, T1). **Equal contribution.*[Preprint]

[J5] Y. Kato, P. Balatti, J.M. Gandarias, M. Leonori, T. Tsuji, A. Ajoudani, "A Self-Tuning Impedance-based Interaction Planner for Robotic Haptic Exploration", IEEE Robotics and Automation Letters, 2022, (Q2, T1). [Preprint]

[J6] J. Zhao, A. Giammarino, E. Lamon, J.M. Gandarias, E. De Momi, A. Ajoudani, "A Hybrid Learning and Optimization Framework to Achieve Physically Interactive Tasks with Mobile Manipulators", IEEE Robotics and Automation Letters, 2022, (Q2, T1). [Preprint]

[J7] W. Kim, V. Ruiz-Garate, J.M. Gandarias, M. Lorenzini, A. Ajoudani, "A Directional Vibrotactile Feedback Interface for Ergonomic Postural Adjustment", IEEE Transactions on Haptics, 2021, (Q2, T1). [Preprint]

[J8] F. Ruiz-Ruiz, J.M. Gandarias, F. Pastor, J.M. Gómez-de-Gabriel, "Upper-Limb Kinematic Parameter Estimation and Localization Using a Compliant Robotic Manipulator", IEEE Access, vol. 9, pp.48313 – 48324, 2021, (Q1, T1). [Open Access]

[J9] F. Pastor, J. García-González, J.M. Gandarias, D. Medina, P. Closas A.J. García-Cerezo, J.M. Gómez-de-Gabriel, "Bayesian Inference on LSTM-based Object Recognition from Tactile and Kinesthetic Information", IEEE Robotics and Automation Letters, vol. 6(1), pp.231 – 238, 2020, (Q2, T1).

[J10] J. Ballesteros, F. Pastor, J.M. Gómez-de-Gabriel, J.M. Gandarias, A.J. García-Cerezo, C. Urdiales, "Proprioceptive Estimation of Forces Using Underactuated Fingers for Robot-Initiated pHRI", Sensors, vol. 20, 2863, 2020, (Q1, T1). [Open Access]

[J11] J.M. Gandarias, Y. Wang, A. Stilli, A.J. García-Cerezo, J.M. Gómez-de-Gabriel, H.A. Wurdemann "Open-loop position control in collaborative, modular Variable-Stiffness-Link (VSL) robots", *IEEE Robotics and Automation Letters (Accepted for presentation at ICRA 2020)*, vol. 5(2), pp.1772 – 1779, 2020, (Q2, T1). [Preprint]

[J12] F. Pastor, J.M. Gandarias, A.J. García-Cerezo, J.M. Gómez-de-Gabriel, "Using 3D convolutional neural networks for tactile object recognition with robotic palpation", Sensors, vol. 19(24), 5356, 2019, (Q1, T1). [Open Access]

[J13] J.M. Gandarias, A.J. García-Cerezo and J.M. Gómez-de-Gabriel, "CNN-based methods for object recognition with high-resolution tactile sensors", *IEEE Sensors Journal*, vol. 19(16), pp. 6872 - 6882, 2019, (Q2,T1). [Preprint]

[J14] J.M. Gandarias, J.M. Gómez-de-Gabriel and A.J. García Cerezo, "Enhancing perception with tactile object recognition in adaptive grippers for human-robot interaction", *Sensors*, vol. 18(3), 692, 2018, (Q1, T1). [Open Access]

Refereed Conference Articles

[C1] A. Giammarino, J.M. Gandarias, A. Ajoudani, "An Open Tele-Impedance Framework to Generate Large Datasets for Contact-Rich Tasks in Robotic Manipulation", IEEE International Conference on Adcanced Robotics and its Social Impact (ARSO), 2023.

[C2] L. Fortini, M. Leonori, J.M. Gandarias, A. Ajoudani, "Open-VICO: An Open-Source Gazebo Toolkit for Vision-Based Skeleton Tracking in Human-Robot Collaboration", IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), 2022.

[C3] M. Lorenzini, S. Ciotti, J.M. Gandarias, S. Fani, M. Bianchi, A. Ajoudani, "Performance Analysis of Vibrotactile and Slide-and-Squeeze Haptic Feedback Devices for Whole-Body Postural Adjustment", IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), 2022.

[C4] M. Lorenzini, J.M. Gandarias, L. Fortini, W. Kim, A. Ajoudani, "ErgoTac-Belt: Anticipatory Vibrotactile Feedback to Lead Centre of Pressure during Walking", IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomecatronics (BioRob), 2022.

[C5] J.M. Gandarias*, P. Balatti*, E. Lamon, M. Lorenzini, A. Ajoudani, "Enhancing Flexibility and Adaptability in Conjoined Human-Robot Industrial Tasks with a Minimalist Physical Interface", IEEE International Conference on Robotics and Automation (ICRA), 2022. **Equal contribution.*

[C6] F.J. Ruiz-Ruiz, A. Giammarino, M. Lorenzini, J.M. Gandarias, J.M. Gómez-de-Gabriel, A. Ajoudani, "Improving Standing Balance Performance through the Assistance of a Mobile Collaborative Robot", IEEE International Conference on Robotics and Automation (ICRA), 2022.

[C7] J.M. Gandarias, F. Pastor, A.J. Muñoz-Ramírez, A.J. García-Cerezo, J.M. Gómez-de-Gabriel, "Underactuated Gripper with Forearm Roll Estimation for Human Limbs Manipulation in Rescue Robotics", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019.

[C8] F. Pastor, J.M. Gandarias, A.J. García-Cerezo, J.M. Gómez-de-Gabriel, "Grasping Angle Estimation of Human Forearm with Underactuated Grippers Using Proprioceptive Feedback", ROBOT 2019: Fourth Iberian Robotics Conference, Springer, 2019.

[C9] J.M. Gandarias, F. Pastor, A.J. García-Cerezo, J.M. Gómez-de-Gabriel, "Active Tactile Recognition of Deformable Objects with 3D Convolutional Neural Networks", IEEE World Haptics Conference (WHC), 2019.

[C10] T. Sánchez-Montoya, J.M. Gandarias, F. Pastor, A.J. Muñoz-Ramírez, A.J. García-Cerezo, J.M. Gómez-de-Gabriel, "Diseño de una pinza subactuada híbrida soft-rigid con sensores hápticos para interacción física robot-humano", XL Jornadas de Automática, 2019.

[C11] J.M. Gómez-de-Gabriel, J.M. Gandarias, F.J. Pérez-Maldonado, F.J. García-Núñez, E.J. Fernández-García, A.J. García-Cerezo, "Methods for Autonomous Wristband Placement with a Search-and-Rescue Aerial Manipulator", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2018.

[C12] A.J. Muñoz-Ramírez, J.M. Gómez-de-Gabriel, J.M. Gandarias, J. Cárdenas, J. Molina, A. Mandow, "Uso de Google Classroom como repositorio de robótica práctica: PieroAcademy" XXXIX Jornadas de Automática, 2018.

[C13] F.J. Ruíz-Ruíz, J.M. Gandarias, A.J. Muñoz-Ramírez, A.J. García-Cerezo, F. Pastor, J.M. Gómez-de-Gabriel, "Monitorización de víctimas con manipuladores aéreos en operaciones de búsqueda y rescate", XXXIX Jornadas de Automática, 2018.

[C14] J.M. Gandarias, J.M. Gómez-de-Gabriel, A.J. García-Cerezo, "Tactile Sensing and Machine Learning for Human and Object Recognition in Disaster Scenarios", ROBOT 2017: Third Iberian Robotics Conference, Springer, 2017.

[C15] J.M. Gandarias, J.M. Gómez-de-Gabriel, A.J. Garcia-Cerezo, "Human and object recognition with a high-resolution tactile sensor", IEEE Sensors, 2017.

[C16] J.M. Gandarias, J.M. Gómez-de-Gabriel, A.J. García-Cerezo, "Clasificación de información táctil para la detección de personas", XXXVIII Jornadas de Automática, 2017.

[C17] J.M. Gandarias, A.J. Muñoz-Ramírez, J.M. Gómez-de-Gabriel, "Uso del Haptic Paddle con aprendizaje basado en proyectos", XXXVIII Jornadas de Automática, 2017.

[C18] F. Pastor, J.M. Gandarias, J.M. Gómez-de-Gabriel, "Cinemática y prototipado de un manipulador paralelo con centro de rotación remoto para robótica quirúrgica", XXXVIII Jornadas de Automática, 2017.

[C19] J.M. Gandarias, S. Akbari-Kalhor, J.M. Gómez-de-Gabriel, "Diseno y uso de una paleta háptica para prácticas de teleoperación con simulink", XXXVII Jornadas de Automática, 2016.

Patents

[P1] J.M. Gómez-de-Gabriel, A.J. MuñozRamírez, J.M. Gandarias, F. Pastor, J. Ballesteros, A.J. García-Cerezo. "Device, System and Method for Controllable Fastening Using a Mechanical Arm," WO/2020/065117.

Invited/Non-refereed/Short Conference Articles and Abstracts

[I1] J.M. Gandarias, F. Pastor, A.J. Muñoz-Ramírez, J.M. Gómez-de-Gabriel, "Human-Arm Roll Estimation in Underactuated Grippers with Proprioceptive Feedback", Work-In-Progress at IEEE World Haptics Conference (WHC), 2019.

[I2] J.M. Gandarias, F. Pastor, A.J. Muñoz-Ramírez, A.J. García-Cerezo, J.M. Gómez-de-Gabriel. Transfer learning or design a custom CNN for tactile object recognition. *International Workshop on Robotac: New Progress in Tactile Perception and Learning in Robotics at IEEE/RSJ International Conference on Intelligent Robots and Systems, 2018*

PROJECTS

ERC - Ergo-Lean 2019-2024

Rethinking Human Ergonomics in Lean Manufacturing and Service Industry:
Towards Adaptive Robots with Anticipatory Behaviors
Amount: 1 488 750 EUR
Principal Investigator: Arash Ajoudani
Position: Researcher

SOPHIA 2019-2024

Socio-Physical Interaction Skills for Cooperative Human-Robot Systems in Agile Production
Amount: 6 548 620 EUR
Principal Investigator: Arash Ajoudani
Position: Researcher

RAFI (UMA-CEIATECH-23) 2020-2021

Intelligent Physical Care Robot
Amount: 31 306 EUR
Principal Investigator: Jesús Manuel Gómez de Gabriel
Position: Researcher

TRUST-ROB (RTI2018-093421-B-I00) 2019-2022

Towards Resilient UGV and UAV Manipulator Teams for Robotic Search and
Rescue Tasks
Amount: 291 610 EUR
Principal Investigator: Alfonso José García Cerezo and Anthony Mandow
Position: Researcher

FIRST-ROB (DPI2015-65186-R) 2015-2019

Multi-Robot System for Cooperation with First Response Human and Canine
Rescue Teams in Catastrophe Scenarios
Amount: 272 250 EUR
Principal Investigator: Alfonso José García Cerezo
Position: Researcher

PIE17-118 2017-2019

Development of novel educational techniques for teaching robotics in
undergraduate and postgraduate courses
Amount: 3 000 EUR
Principal Investigator:Antonio Muñoz Ramírez
Position: Collaborator

TEACHING

University of Málaga, Spain 2020-2021
Laboratory Teaching Assistant

- Automatics and Control, *B.S. Industrial Technology Engineering*
- Railway Systems Control, *B.S. Electronics, Robotics and Mechatronics Engineering*

University of Málaga, Spain 2019-2020
Laboratory Teaching Assistant

· Automatics and Control, *B.S. Industrial Technology Engineering*
· Railway Systems Control, textitB.S. Electronics, Robotics and Mechatronics Engineering

University of Málaga, Spain 2018-2019
Laboratory Teaching Assistant

· Railway Systems Control, *B.S. Electronics, Robotics and Mechatronics Engineering*
· Robotic Systems, *B.S. Industrial Technology Engineering*

ADVISING

PhD Students
Supervision

· Francisco J. Ruiz-Ruiz, Safe Manipulation of Humans in Robot-driven Physical Human-Robot Interaction, co-supervised with Prof. Jesús M. Gómez-de-Gabriel, University of Málaga, 2019-2023

PhD Students
Research and Engineering Support

· Luca Fortini, A marker-less, multi camera system for 3D human skeleton tracking, Istituto Italiano di Tecnologia, 2021-2023
· Doganay Sirintuna, Human-robot collaborative transportation of objects with vibrotactile feedback, University of Málaga, Istituto Italiano di Tecnologia, 2023
· Idil Ozdamar, Pushing objects with a tactile sensor frame in a mobile manipulator, Istituto Italiano di Tecnologia, 2023
· Francisco Pastor, Learning-based multi-modal tactile perception in robotic grippers, University of Málaga, 2018-2020.

Research Fellows
Supervision

· Hamidreza Raei, An open framework for local and remote operation of robots using admittance control and visual-inertial odometry, Istituto Italiano di Tecnologia, 2023.
· Robin Arbaud, Sustainable vibrotactile haptic devices, Istituto Italiano di Tecnologia, 2022.
· Yasuhiro Kato, A self-tunning impedance-bace approach for autonomous physical interaction planning, Istituto Italiano di Tecnologia, 2021.
· Alberto Giammarino, Supernumerary Bodies for physical assistance in human-robot conjoined actions, Istituto Italiano di Tecnologia, 2021.

Master Students
Supervision

· Adrián Bañuls Arias, Dynamic modeling of an underactuated gripper for Physical Human-Robot Interaction, University of Málaga, 2020
· Daniel Capilla Tovar, Design and implementation of a Rolling-finger-based robotic gripper for physical Human-Robot Interaction, University of Málaga, 2020

Undergraduate Students

Supervision

- Pablo Aguilar Orellana, Low consumption system for remote monitoring of robotic walkers, University of Málaga, 2020
- Trinidad Sánchez Montoya, Design of an underactuated robotic hand with a flexible tactile sensor, University of Málaga, 2019
- Jose Antonio Figuerola Palacios, Sensorized human arm model for researching in physical Human-Robot Interaction, University of Málaga, 2019
- Miguel de Médicis Barrionuevo, Visual control of a parallel aerial manipulator, University of Málaga 2019.
- Francisco Jesús Ruiz Ruiz, Wearable sensorized wristband for victims monitoring, University of Málaga, 2018
- Maria Fernández Hijano, Pressure images data acquisition system for an array, resisitve-based tactile sensor, University of Málaga , 2018
- José Andrés Lorenzo Robles, Connected, portable force measurement device, University of Málaga, 2018

Visiting Students and Scholars

- Francisco J. Ruiz-Ruiz, Improving Standing Balance Performance through the Assistance of a Mobile Collaborative Robot, 3-months research stay at HRI^2, IIT, 2021.

INVITED TALKS

Active Supernumerary Bodies for Physical Robotic Assistance in Industrial Operations

- Workshop on Floating-base Robots in Manufacturing and Logistics Operations: Opportunities and Challenge, IEEE International Conference on Humanoid Robots, 2021, *(Video of the talk)*

EXHIBITIONS AND MEDIA

Interview for Class CNBC September, 2021

- Inside Leonardo Labs: Robotics applied to the industrial manufacturing sector. *(Video of the interview in italian)*

Interview for the blog and YouTube channel"Quantum Society June, 2020

- Quantum Society Podcast: Physical Human-Robot Interaction with Juan M. Gandarias (In Spanish). *(Quantum Society)*

First PhD Thesis Defended by Videoconference at the University of Málaga March, 2020

- Cum laude for the first doctoral thesis defended since the confinement in Málaga (In Spanish). *(La Opinion de Málaga)*
- First defense of a PhD thesis via online at the University of Málaga (In Spanish). *(UMA Press)*

Exhibition at European Robotics Forum March, 2020

- Search and rescue with robotic assistance. In collaboration with KUKA. *(KUKA Press)*

PROFESSIONAL SERVICES

International Program, Editorial, and Review Committees

- Associate Editor ICAR2023 - International Conference on Advanced Robotics. 2023.

- International Program Committee ROBOT2023 - Sixth Iberian Robotics Conference. 2023.
- Session Chair at the 19th IEEE International Conference on Advanced Robotics and Its Social Impacts (ARSO). Session: Socio-physical Interaction Skills for Cooperative Human-Robot Systems in Agile Production. 2023.
- Senior Reviewer at IEEE RAS Young Reviewers Program. 2023.
- Review Editor in Frontiers in Robotics and AI - Robot Design. 2022.
- Program Committee ROBOT2022 - Fifth Iberian Robotics Conference. 2022
- Guest Editor, MDPI Sensors Special Issue on Robotic Contact with the Human Body in Physical Human-Robot Interaction. 2021

Professional Memberships

- IEEE Institute for Electrical and Electronic Engineers, Robotics and Automation Society.
- CEA Comité Español de Automática (Spanish Automation Society).

Reviews

- More than 60 manuscripts reviewed.
- Journals: IEEE Robotics and Automation Magazine, IEEE Transactions on Mechatronics, Robotics and Computer-Integrated Manufacturing, Computers & Industrial Engineering, IEEE Transactions on Haptics, IEEE Robotics and Automation Letters, Information Fusion, Scientific Reports, Frontiers in Robotics and AI, IEEE Sensors Journal, Expert Systems, MDPI Robotics, MDPI Sensors.
- Conferences: IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE World Haptics Conference (WHC), IEEE International Conference on Advance Robotics (ICAR), IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), IEEE RAS/EMBS International Conference on Biomedical Robotics & Biomechatronics (BioRob), IEEE International Conference on Soft Robotics (RoboSoft), IEEE Intelligent Transportation Systems Society Conference (ITSC).

Organization of Workshops and Tutorials

- Workshop on Assistive Robotic Systems for Human Balancing and Walking: Emerging Trends and Perspectives, IEEE International Conference on Intelligent Robots and Systems (IROS), October 23-27, 2022. (Co-Organizer)
- Workshop on Floating-base Robots in Manufacturing and Logistics Operations: Opportunities and Challenge, IEEE International Conference on Humanoid Robots, July 19-21, 2021. (Co-Organizer)

Courses, Talks and Seminars

- Summer School on Cognitive Robotics (University of Southern California, US) 2019
- Online course (Udacity): Deep Learning Nanodegree Foundation (Udacity) 2018
- Workshop on Space Robotics (University of Málaga, Spain) 2018
- Course: The future of drones: Aerial Robotics (International University of Andalusia, Spain) 2017
- Seminar: Multi-robot reconnaissance of inaccessible areas and robotic multispectral scanning for medical applications (University of Málaga, Spain) 2017
- Seminar: Deep learning: theory, applications and tools (University of Málaga, Spain) 2017
- Seminar: Modeling of Mechatronic Systems (University of Málaga, Spain) 2017
- Online course: Introduction to Tensorflow and Artificial Intelligence (Coursera) 2017