Rodrigo Chacón Quesada

Profile

Electrical engineer and educator with a unique blend of academic rigour and industrial pragmatism. With a PhD in Augmented Reality (AR) User Interfaces and Human-Centred Robotics (HCR) and a proven track record of designing and implementing innovative solutions that integrate technical expertise on AR Interfaces, HCR and Machine Learning. Proficient in a wide range of technical tools and robot platforms, including multiple programming languages, scientific software, versioning, and typographical tools.

Education

2018–2022 **Ph.D. in Human-Centred Robotics and Augmented Reality User Interfaces - Thesis title: Affordance Inference and Visualisation for Assistive Robotics**, *Personal Robotics Laboratory, Imperial College London*, London, United Kingdom.
Faculty of Engineering, Department of Electrical and Electronic Engineering.

Research Achievements

- Developed algorithms for assistive robots to infer affordances and determine feasible actions or sequences of actions. This by exploring state-of-the-art methods in object recognition, task planning, motion planning, colocalisation, and natural language processing.
- Explored the use of AR HMDs to display inferred affordances, aiming to replace traditional interaction methods like joysticks or keyboards with more natural and intuitive options. These include head-gaze, eye-gaze, voice commands, and hand gestures, offering users a more intuitive interface for controlling assistive robots.
- Identified UI features most effective in conveying inferred affordances across diverse cultural backgrounds to inform the design of signifiers, i.e., virtual elements communicating these affordances to the user.
- Assessed the impact of the proposed design paradigm on factors critical for successful human-robot interactions, such as cognitive workload, technology acceptance, fluency, system usability, and immersion, utilising multiple assistive robots across diverse experimental settings.

2010–2017 **M.Sc. Degree in Electrical Engineering (part time)**, *Universidad de Costa Rica*, San José, Costa Rica.
Faculty of Engineering, School of Electrical Engineering. Emphasis in Digital Systems. Graduated with Honours.

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2008–2009 **Postgraduate Degree (Licenciatura) in Electrical Engineering**, *Universidad de Costa Rica*, San José, Costa Rica.
Faculty of Engineering, School of Electrical Engineering. Emphasis in Communication Systems. Graduated with Honours.

2004–2008 **Bachelor's Degree in Electrical Engineering**, *Universidad de Costa Rica*, San José, Costa Rica.
Faculty of Engineering, School of Electrical Engineering.Emphasis in Electronics and Telecommunications.

Employment

2022-present **Research Associate in Trustworthy Human-Robot Interaction, UKRI Trustworthy Autonomous Systems Programme, Node on Trust**, *Personal Robotics Laboratory, Imperial College London*, London, United Kingdom.
Faculty of Engineering, Department of Electrical and Electronic Engineering.

2012–2017 **HFC Networks Maintenance Manager**, *CABLETICA*, San José, Costa Rica.
Primary responsible for the Hybrid Fiber Coaxial (HFC) network maintenance and operation. In charge of an operation with an average of 125 people with administrative (Dispatch Supervisors and Dispatchers) and technical profiles (Engineers and Technicians). Responsible for the design and implementation of CABLETICA's work force management software platform.

2008–2012 **HFC Network Design Engineer**, *CABLETICA*, San José, Costa Rica.
Hybrid Fiber Coaxial (HFC) network design, troubleshooting and installation inspection. Digital TV network design, maintenance and operation, responsible for the technician training program.

Teaching Experience

Course Instructor

2009–2012, 2016 **Sessional Lecturer of IE-0413: Electronics II**, *School of Electrical Engineering, Universidad de Costa Rica*, San José, Costa Rica.
This is a course on analogue electronics based on the study, analysis and design of circuits with operational amplifiers.

2008 **Sessional Lecturer of IE-0308: Electrical Laboratory I**, *School of Electrical Engineering, Universidad de Costa Rica*, San José, Costa Rica.
This is a course for implementing and verifying electronic circuits, following the knowledge acquired in the courses IE-0209: Linear Circuits I, IE-0309: Linear Circuits II and IE-0313: Electronics I.

Teaching Assistant

2018-2024 **Human-Centred Robotics**, *Imperial College London*, London, UK.
Guided students on their human-robot interaction projects and graded coursework. Prepared and presented tutorial lectures on the ROS middleware, Unity and Docker to undergraduate and graduate robotics students.

2018 **Second Year Electronics Laboratory**, *Imperial College London*, London, UK.
Guided students on on the construction and evaluation of a broadband, high-gain amplifier, using operational amplifiers.

Supervision and Mentorship

Master's Students.

2023 **Victor Starzec**, *Multi-modal Data Capture in a Smart Room*, Imperial College London, London, UK.

2023 **Anqi Qiu**, *Affordance-based AR control of robots*, Imperial College London, London, UK.

2022 **Sebastian Aegidius**, *ASFM: Augmented Social Force Model for Legged Robot Social Navigation*, Imperial College London, London, UK.

2022 **Arman Fidanoglu**, *Continuous Motion Planning for a Quadruped Mobile Manipulator*, Imperial College London, London, UK.

Publications

Journals

2024 **Chacon, R.**, Estévez, F. and Demiris, Y, An Integrated 3D Eye-Gaze Tracking Framework for Assessing Trust in Human-Robot Interaction. ACM Transactions on Human-Robot Interaction. Under review.

2024 **Chacon, Rodrigo** and Demiris, Yiannis, Multi-Dimensional Evaluation of an Augmented Reality Head-Mounted Display User Interface for Controlling Legged Manipulators. ACM Transactions on Human-Robot Interaction. April 2024. `https://doi.org/10.1145/3660649`. Supplementary video **available here**.

2022 **Chacon, Rodrigo** and Demiris, Yiannis, "Proactive Robot Assistance: Affordance-Aware Augmented Reality User Interfaces", in IEEE Robotics & Automation Magazine, vol. 29, no. 1, pp. 22-34, March 2022, `doi: 10.1109/MRA.2021.3136789`. Supplementary video **available here**.

Conferences

2024 **Chacon, R.**, Estévez, F. and Demiris, Y, On the Effect of Augmented-Reality Multi-User Interfaces and Shared Mental Models on Human-Robot Trust. In 2024 IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), August 2024. In press.

2023 **Chacon, Rodrigo** and Demiris, Yiannis, "Design and Evaluation of an Augmented Reality Head-Mounted Display User Interface for Controlling Legged Manipulators," In 2023 IEEE International Conference on Robotics and Automation (ICRA), London, United Kingdom, 2023, pp. 11950-11956, `doi:10.1109/ICRA48891.2023.10161278`. Supplementary video **available here**.

2022 **Chacon, Rodrigo** and Demiris, Yiannis, "Holo-SpoK: Affordance-Aware Augmented Reality Control of Legged Manipulators," In 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan, 2022, pp. 856-862, doi:10.1109/IROS47612.2022.9981989. Supplementary video **available here**.

2020 **Chacon, Rodrigo** and Demiris, Yiannis, "Augmented Reality User Interfaces for Heterogeneous Multirobot Control", In 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2020).doi:10.1109/IROS45743.2020.9341422. Supplementary video **available here**.

2019 **Chacon, Rodrigo** and Demiris, Yiannis, "Augmented Reality Controlled Smart Wheelchair Using Dynamic Signifiers for Affordance Representation", In 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2019). doi:10.1109/IROS40897.2019.8968290. Supplementary video **available here**.

2017 **Chacon, Rodrigo**, and Siles, Francisco, "Evaluation of Different Histogram Distances for Temporal Segmentation in Digital Videos of Football Matches from TV Broadcast," 2017 International Conference and Workshop on Bioinspired Intelligence (IWOBI), Funchal, Portugal, 2017, pp. 1-7. doi:10.1109/IWOBI.2017.7985543

2016 **Chacon, Rodrigo**, Calderon, Saul and Siles, Francisco, "Improving the temporal segmentation in digital videos using the Deceived Bilateral Filter," 2016 IEEE 36th Central American and Panama Convention (CONCAPAN XXXVI), San Jose, Costa Rica, 2016, pp. 1-6. doi:10.1109/CONCAPAN.2016.7942343

Workshops

2018 **Chacon, Rodrigo** and Demiris, Yiannis, "Augmented Reality Control of Smart Wheelchair Using Eye-Gaze–Enabled Selection of Affordances", In IROS 2018 Workshop on Robots for Assisted Living. https://spiral.imperial.ac.uk:8443/handle/10044/1/71986

Invited Talks and Demonstrations

2024 AR for Human-Centred Robotics. Centre for Robotics Research, Department of Engineering, King's College London.

2024 AR for Human-Centred Robotics. Intelligent Systems and Networks Group, Department of Electrical and Electronic Engineering, Imperial College London.

2023 Assistive Robotics and Trust in Autonomous Systems. Workshop Series on Applied Artificial Intelligence. ExO Latam. Talk recording.

2023 Assistive Robotics and Trust in Autonomous Systems. International Seminar on Biomedical Science and Technologies. National Institute of Astrophysics, Optics and Electronics (INAOE), Mexico. Talk recording.

2023 Boston Dynamics - Personal Robotics Laboratory Demo on AR Control of Legged Manipulators. International Conference on Robotics and Automation (ICRA).

2021 Affordance Inference and Visualization for Assistive Robotics. ICRA 2021 Workshop on Semantic Representations for Robotics through Continuous Interaction and Incremental Learning. Talk recording.

Awards

2024 Imperial College London, Department of Electrical and Electronic Engineering, Department Award for Citizenship and Community.

Research Funding

2018-2022 Awarded Costa Rican Ministry of Science, Innovation, Technology and Telecommunications Studentship for PhD.

2018-2022 Awarded University of Costa Rica Studentship for PhD.

Technical Skills and Languages

Industry and Academia: Human-Machine Interfaces, Control Theory, Qualitative Research, Research Methods, Bayesian Inference, Quality Assurance, Sensor Fusion, Natural Language Processing, Hardware Design, Empirical Research, Artificial Intelligence, Statistical Computing, Data Collection, Technology Management, Technical Leadership, Human-Computer Interaction, Pattern Recognition, Lecturing, Intelligent Systems, Statistics, Programming, Employee Training, Presentations, User Interface Design, Telecommunications, University Teaching, Communications, Academic Writing.

Tools and Technologies: Linux, Windows, macOS, Python, C Sharp, LaTeX, ROS, Unity3D, R, Docker, Git, Boston Dynamics Spot, Kinova Gen3, ABB Yumi, Clearpath Ridgeback, Microsoft HoloLens 1, Microsoft Hololens 2, Apple Vision Pro, Azure Spatial Anchors, ROS Sharp, Unity Robotics Hub, PyTorch, Cameras, Object Detection, Robot Programming, Augmented Reality.

Languages: Spanish (native), English (fluent).

References

Professor Yiannis Demiris, FIET, FBCS. Director, Personal Robotics Laboratory. Head, Intelligent Systems and Networks Group. Department of Electrical and Electronic Engineering. Imperial College London. Email: y.demiris@imperial.ac.uk. Tel: +44-(0)2075946300.