Cesar A. Contreras

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BIO

Cesar A. Contreras is a PhD candidate at the University of Birmingham in the field of variable autonomy control for mobile manipulation, particularly with applications to nuclear decommissioning and AI. He holds a master's degree in computational Neuroscience and Cognitive Robotics with a Distinction, and his research has focused on VR, robotics, deep learning, variable autonomy, and cognitive sciences. Contreras has made contributions in lithium-ion battery recycling research and VR applications developed at the Extreme Robotics Laboratory, with his strong background in software engineering and usage of innovative technologies. His skill set includes programming, software development, and huge interest in robotics, AI, and adaptive technologies, showing his commitment to technological development and improvement in societal quality.

EDUCATION

University of Birmingham Birmingham, UK

PhD in Robotics **Sept 2023 - Sept 2027**

Dissertation Subject: Variable autonomy control paradigm applied to mobile manipulation.

Field: Robotics | Nuclear Decommissioning | Cognitive Sciences | Artificial Intelligence | XR

University of Birmingham Birmingham, UK

M.Sc. Computational Neuroscience and Cognitive Robotics with Distinction **Sept 2022 - Sept 2023**

Dissertation Subject: Falling Ball - Gravity perception and eye tracking during object interception in VR.

Field: Robotics | Neurosciences | Software Engineering | XR

Relevant Courses: Probabilistic Robotics, Mind Brains and Models, Brain Imaging, Electrophysiological Approaches in Cognitive Neuroscience.

Anahuac University North Campus Huixquilucan, MX

BSc in Mechatronics Engineering **Aug 2016 - Dec 2020**

Dissertation Subject: Robot Operating System for Industry 4.0

Field: Robotics | Software Engineering | Mechatronics | Automation.

- Industrial Automation Minor.
- Automotive Mechanics Design Minor.
- Entrepreneurial Studies Minor.

Relevant Courses: Robotics, Industrial Networks, Inmotics and Domotics, Industrial Vision Systems (Computer Vision), Computer Design, Informatics: AR and VR, Digital Circuits, Introduction to Bioengineering, Microelectromechanical Systems (MEMS), Embedded Systems.

EXPERIENCE

Extreme Robotics Laboratory Birmingham, UK

Robotics Research Engineer **Feb 2023 – Present**

- PhD Studentship funded by Nuclear Decommissioning Authority. Part of "Research and Development of a Highly Automated and Safe Streamlined Process for Increase Lithium-ion Battery Repurposing and Recycling" (REBELION)
- VR and Mixed Reality Technologies Research.
- Cognitive Robotics Research.

Sensorimotor Computation Lab (Yeo Lab) Birmingham, UK

MSc Student Researcher **Oct 2022 – Sept 2023**

- Created and conducted experiments related to eye tracking and eye movement using simulation, analyzing human biomechanics and movement predictions.
- Processed and cleaned data to generate a wide range of graphs and statistical models for in-depth analysis of experimental data, resulting in detailed insights into human behavior and physiology.
- Calibrated sensors and implemented device bridges to facilitate XR simulation and experimentation.

Grupo Importadores Eagle Pass, USA - Piedras Negras, MX

Software Engineer **Mar 2021 - Feb 2023**

- Demonstrated strong problem-solving skills and a passion for developing software solutions that catered to users' needs.
- Collaborated with a team to launch a new website, which led to a remarkable 50% increase in customer engagement and a surge of new clients.
- Ensured optimal performance and reliability of computer systems and servers by performing regular updates, diagnostics, and maintenance, resulting in a 95% uptime.

Dreamlands' Guild Eagle Pass, USA
Software Engineer **Mar 2021 - Sept 2022**

- Developed mobile applications using Flutter, delivering fast and responsive user experiences across multiple platforms.
- Designed and built games using Unity and programmed with C# and machine learning algorithms to strengthen user engagement and interactivity.
- Leveraged Python scripts to interface with software and hardware systems, enabling seamless communication and data exchange.

Laboratory of Automation and Manufacturing Anahuac University Huixquilucan, MX
Junior Robotics Engineer **Jun 2020 - Dec 2020**

- Collaborated as a member of a 4-person team to design and implement a methodology for integrating the Robot Operating System with existing lab equipment, paving the way for the development of future projects using this powerful framework.
- Conducted more than 50 simulations of robots using CIROS Studio, Gazebo, CoppeliaSim, MoveIt, and MATLAB, and ensured seamless integration with the ROS framework, rigorously testing and validating the functionality.

CADIT - Centro de Alta Dirección en Ingeniería y Tecnologías Huixquilucan, MX
Technology and Innovation Engineer **Aug 2019 - Dec 2020**

- Customized and automated 3D printing hardware to operate with in-house materials, reducing equipment costs by more than 30% and streamlining the prototyping process.
- Prototyped and tested body equipment to improve and adapt the functionality of existing Human-Machine Interface technology, facilitating user interaction.
- Led a small team of 3 people in finding potential applications for newly acquired equipment and components using rapid prototyping techniques, including commercially available hardware and in-house technology.

Laboratory of Automation and Manufacturing Anahuac University Huixquilucan, MX
Mechatronics Student Club Captain **Jan 2019 - Dec 2020**

- Led a team of 6 in completing time-based projects, achieving up to 15% reduction in project completion time and reducing final product costs by 5 to 10%.
- Identified and evaluated solutions to engineering problems and determined the most efficient and effective solutions to ensure successful project completion.
- Redesigned CAD files for simple robotic models and created electronic schematics for simulations. Programmed embedded systems and prototyped projects to verify the feasibility and increase the club's capabilities.

SKILLS AND INTERESTS

Programming Languages: Python, C#, MATLAB, C, C++, Flutter, Assembly, PLC (LD, FBD, ST, IL)
Software: CIROS Studio, Factory I/O, FluidSIM, Proteus, PTC Creo Parametric, SolidWorks, Simulink, Mastercam, Microsoft Office Suite, Multisim, Polyscope for UR, LOGO! by Siemens. Unity, Ubuntu, Linux.
Tools: PyCharm, Spyder, MATLAB, VS Code
Frameworks: OpenCV, UltraLeap SDK, FOVE SDK, OpenXR, OPENGL, Vuforia, POLHEMUS Fastrak
Languages: English, Spanish, French (Basic)

Interests: Robotics, assistive AI for human activities and videogames, adaptive VR/AR experiences, simulated environments, self-driving vehicles, computer vision, farming, dreams, and smart cities and homes.

OTHER EXPERIENCES

INGENIA (Co-Founder) Anahuac University Huixquilucan, MX
ASUA Anahuac University Huixquilucan, MX
INTERACT Club Treasurer for Rotary District 4110 Piedras Negras, MX

ADDITIONAL INFORMATION

Other Technical Skills:

- Proficient in operating robot arms from leading manufacturers such as UR, KUKA, and Mitsubishi, and in designing and operating advanced manufacturing cells to ensure maximum productivity.
- Skilled in prototyping with a range of microcontrollers, FPGA boards, and microprocessors.

PUBLICATIONS

- **Teleoperation in Extended Reality for Electric Vehicle Battery Disassembly Using Gaussian Mixture Regression.** Journal of Field Robotics. (2025).
- **An Exploratory Study on Crack Detection in Concrete through Human-Robot Collaboration**. preprint arXiv:2508.11404. (2025).
- **Utilizing Vision-Language Models as Action Models for Intent Recognition and Assistance**. preprint arXiv:2508.11093 (2025).
- **Probabilistic human intent prediction for mobile manipulation: An evaluation with human-inspired constraints**. preprint arXiv:2507.10131 (2025).
- **A mini-review on mobile manipulators with Variable Autonomy**. Frontiers in Robotics and AI 12 (2025): 1540476.
- **Advanced robotics for automated EV battery testing using electrochemical impedance spectroscopy**. Frontiers in Robotics and AI 11 (2025): 1493869.
- **Technoeconomic Assessment of Electric Vehicle Battery Disassembly–Challenges and Opportunities from a Robotics Perspective.** IEEE Access (2024).
- **Semi-Autonomous Robotic Disassembly Enhanced by Mixed Reality.** Proceedings of the 2024 4th international conference on robotics and control engineering. (2024).
- **Multi-robot task planning for efficient battery disassembly in electric vehicles.** Robotics 13.5 (2024)
- **Electric Vehicle Battery Disassembly using Interfacing Toolbox for Robotic Arms**. Batteries 10.5 (2024).
- **Hyperparameter-optimized CNN and CNN-LSTM for Predicting the Remaining Useful Life of Lithium-ion Batteries**. 2023 Eleventh International Conference on Intelligent Computing and Information Systems (ICICIS). IEEE, (2023).
- **Harnessing CNN-DNC and CNN-LSTM-DNC Architectures for Enhanced Lithium-Ion Remaining Useful Life Prediction.** 2023 Eleventh International Conference on Intelligent Computing and Information Systems (ICICIS). IEEE, (2023).

PEER REVIEWS

- Reviewed 37 manuscripts for *IEEE Access* (ISSN 2169-3536) during 2024–2025.
- Reviewed 2 Manuscripts for IEEE International Conference on Robotics and Automation (ICRA) in 2025.
- Reviewed 2 manuscripts for *Computers & Electrical Engineering* (ISSN 0045-7906) in 2024.

RESEARCH FUNDING

- **NDA studentship —** Funded by the UK Nuclear Decommissioning Authority (NDA) and supported by the UK National Nuclear Laboratory (UKNNL). This studentship supports the PhD research on variable autonomy for mobile manipulation 2023-2027.
- **REBELION project —** *Research and Development of a Highly Automated and Safe Streamlined Process for Increased Lithium-ion Battery Repurposing and Recycling*.
- Additional RTX computers funded by GalacNo Ltd.

OTHER PROJECTS AND PERSONAL WORK

- **Robocart – self-navigating shopping cart:** Developed a mobile shopping assistant that used an A* path-planning algorithm, Kalman filtering and multiple range sensors to autonomously navigate to predicted shopper positions.
- **Particle filter–based localization:** Implemented Monte Carlo localization using odometry and range data to sample posterior poses and improve pose estimation for indoor service robots.
- **Flexible robotics workcell:** Programmed a manual workcell using the to coordinate multiple industrial robots with state-dependent outputs and safe emergency stop behavior.
- **Mandible 3D scan and print:** Processed medical tomography data to generate a segmented mandible model, optimized the design and produced a 3D-printed replica for surgical planning.

GIVEN TALKS AND PRESENTATIONS.

- Master class on the Role of LLMs for the entertainment and business industry. (29 October – 2 November 2025, Bucharest Romania)
- KM Talks, United Kingdom National Nuclear Lab, Probabilistic Human Intent Recognition for Mobile Manipulators. (25 September 2025, United Kingdom)
- Workshop on the Role of Innovation in the Nuclear Back-End. Panel on Harnessing Robotics and Advanced Technologies for Safer More Efficient Activities. (31 March – 4 April 2025, Cumbria, United Kingdom)