

Carlos Gutiérrez Álvarez

AI ENGINEER AND RESEARCHER IN REINFORCEMENT LEARNING & ROBOTICS

Alcalá de Henares, Madrid, Spain

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Education

University of Alcalá

Alcalá de Henares, Spain

PHD IN REINFORCEMENT LEARNING & ROBOTICS

2021 - 2026

- Advisor: Dr. Roberto J. López Sastre

Complutense University of Madrid

Madrid, Spain

MSC IN MATHEMATICAL ENGINEERING

2018 - 2019

- Thesis: "BERT for Question Answering"

Complutense University of Madrid

Madrid, Spain

BSC IN PHYSICS

2014 - 2018

- Honors thesis

Research Experience

University of Alcalá - Dept of Telecommunications and Signal Theory

Alcalá de Henares, Spain

ADVISOR: DR. ROBERTO JAVIER LÓPEZ SASTRE

Sep. 2021 - Present

- Development of reinforcement learning agents for visual semantic navigation in indoor environments using PyTorch.
- Implementation of artificial intelligence solutions over robotic platforms using ROS.
- Use of Gymnasium (former OpenAI Gym), Habitat, AI2-THOR, Isaac Lab and VizDoom simulators for training reinforcement learning agents.
- Exploration of several reinforcement learning algorithms: policy gradient methods (PPO, DD-PPO, TRPO), Q-learning methods (DQN, DDPG) and actor-critic methods (A2C, A3C) to resolve the usecase of visual semantic navigation.
- Exploration of meta reinforcement learning and meta imitation learning solutions for the sim-to-real gap in real robots.
- Integration of robotic platforms to help children with functional diversity.
- Use of Embodied AI techniques to improve the interaction between robots and its environment.
- Tuning of hyperparameters via Wandb Sweeps and exploration of the exploration-exploitation trade-off in reinforcement learning.
- Participation in two Knowledge Generation Projects funded by the Spanish Ministry of Science and Innovation.

Tokyo Institute of Technology - Dept of Computer Science

Tokyo, Japan

ADVISOR: DR. ASAKO KANEZAKI

March 2024 - Sep. 2024

- Offline reinforcement learning for robotic navigation tasks.
- Development of offline reinforcement learning algorithms (IQL, CQL, OffNav) to improve the learning process from pre-recorded datasets.
- Use of TSUBAME 4.0 supercomputer for distributed and multi-GPU training of deep reinforcement learning models.
- Training of visual reinforcement learning agents in Vizdoom environment for fast adaptation using SparsE-FeAture-based Regularization for Fine-tuning (SEFAR).

Complutense University of Madrid - Dept of Nanomaterials

Madrid, Spain

ADVISOR: DR. RAFAEL PEREZ

Dec. 2017 - June 2018

- Collaboration with the Nanomagnetism and Magnetization Processes Group at the Institute of Materials Science of Madrid (ICMM).
- Development of $Fe_{90}Si_5B_5$ alloys using voltaic arc melter.
- Production of microwires by the Taylor-Ulitovsky technique.
- Characterization of its magnetic properties by Vibrant Sample Magnetometer (VSM) and Kerr Magnetometry techniques.
- Characterization of its structural properties by X-Ray Diffraction (XRD).

Professional Experience

Indra

Madrid, Spain

SENIOR REINFORCEMENT LEARNING SPECIALIST

May 2025 - Present

- Responsible for the development of reinforcement learning solutions for all critical systems within Indra.
- Implementation of RL libraries (stable-baselines, rllib, agileRL, etc.) for the integration of reinforcement learning algorithms in Indra's several systems.
- Development of advanced communication protocols between C++ Windows envs and python algorithms on Linux servers using gRPC protocol.
- Implementation of multi-agent and hierarchical reinforcement learning solutions for complex environments.
- Use of cloud computing (AWS) for the training of reinforcement learning agents and custom deployment of MLOps and experiment tracking infrastructure.

University of Alcalá

Alcalá de Henares, Spain

SPANISH SCIENCE MINISTRY PRE-DOCTORAL SCHOLARSHIP

Sep. 2021 - May 2025

- Doctoral Thesis: "Reinforcement Learning for Visual Semantic Navigation"
- Working with a FPI scholarship by Spanish Science Ministry.

TourQuiz

Alcalá de Henares, Spain

CO-FOUNDER

Dic. 2021 - Mar. 2022

- Development of TourQuiz App: A mobile app for gamified turistic tours.
- The app uses flutter and firebase technologies to bring a new experience to turistic tours.
- It proposes a 360 solution for gamified tourism, involving users, public administration and local businesses.
- Demo presented at Laboratorio de Patrimonio Cultural at Las Cinco Villas (Zaragoza).

Accenture Technology

Madrid, Spain

SENIOR AI ENGINEER

Feb. 2019 - Sep. 2021

- Development of cognitive systems: Virtual assistants, NLP and Image Recognition.
- Development of a mobile virtual assistant for one of the biggest Spanish electrical companies including:
 - Design of custom NLP neural architectures in Tensorflow.
 - CI/CD using Jira's suite and agile methodologies in AWS.
 - Design of workflows and reporting using Kibana and ElasticSearch.
 - Design of conversational flows using RASA.
 - Deployment of the whole system in AWS via Kubernetes.
- Implementation of Salesforce Einstein solutions for CRMs.
- Leadership of the spanish technical team in the development of a global AI solution for a big Italian energy company.

Banco Santander

Las Rozas, Spain

PLANNIFICATION ASSISTANT

June 2018 - Feb 2019

- Part of the Planning, Productivity and Quality department at Banco Santander, where we mainly make predictions for the working curves for different front and back office services.
- Development and improvement of company's reports and digital tools in cooperation with IT department.
- Collaboration with business, front and back office areas in designing pilot processes for efficiency improvements.
- Improvement of data acquisition and analysis in collaboration with IT department.
- Collaboration with business areas in the development of SLAs and KPIs related to the planning, adhesion, and efficiency of the services.
- Design and acquisition of quality reports using QlikView.

Publications

PUBLISHED

Blanco-Fernández E., **Gutiérrez-Alvarez C.**, Nasri N., Maldonado-Bascón S., López-Sastre R.J., *Live Video Captioning*, in Multimedia Tools and Applications, 2025.

Gutiérrez-Alvarez C., Ríos-Navarro P., Flor-Rodríguez-Rabadán R., Acevedo-Rodríguez F.J., López-Sastre R.J., *Visual Semantic Navigation with Real Robots*, in Applied Intelligence, 2024.

Gutiérrez-Alvarez C., Acevedo-Rodríguez F.J., López-Sastre R.J., Kanezaki A., *OffNav: Offline Reinforcement Learning for Visual Semantic Navigation*, in ICRA Human-aligned Reinforcement Learning for Autonomous Agents and Robots Workshop, 2024.

Lafuente-Arroyo S., Maldonado-Bascón S., Delgado-Mena D., **Gutiérrez-Alvarez C.**, Acevedo-Rodríguez F.J., *Multisensory Integration for Topological Indoor Localization of Mobile Robots in Complex Symmetrical Environments*, in Expert Systems with Applications, 2023.

Gutiérrez-Alvarez C., Ríos-Navarro P., Flor-Rodríguez-Rabadán R., Acevedo-Rodríguez F.J., López-Sastre R.J., *Evaluation of Visual Semantic Navigation Models in Real Robots*, in IROS Late Breaking Results, 2023.

Gutiérrez-Alvarez C., Hernández García S, Nasri N, Cuesta-Infante Alfredo, López-Sastre RJ, *Towards Clear Evaluation of Robotic Visual Semantic Navigation*, in ICARA, 2023.

Nasri N, López-Sastre RJ, Pacheco-da-Costa S, Fernández-Munilla I, **Gutiérrez-Álvarez C.**, Pousada-García T, Acevedo-Rodríguez FJ, Maldonado-Bascón S. *Assistive Robot with an AI-Based Application for the Reinforcement of Activities of Daily Living: Technical Validation with Users Affected by Neurodevelopmental Disorders*, in Applied Sciences, 2022.

PREPRINTS

Flor-Rodríguez-Rabadán R., **Gutiérrez-Álvarez C.**, Acevedo-Rodríguez F.J., Lafuente-Arroyo S., López-Sastre R.J. *SEMNAV: A Semantic Segmentation-Driven Approach to Visual Semantic Navigation*, in ArXiv 2025, abs/2506.01418 .

Nasri N., **Gutiérrez-Álvarez C.**, Lafuente-Arroyo S., Maldonado-Bascón S., López-Sastre R.J. *Realistic Continual Learning Approach using Pre-trained Models*, in ArXiv 2024, abs/2404.07729.

Presentations

CONTRIBUTED PRESENTATIONS

Gutiérrez-Álvarez, C., Flor-Rodríguez-Rabadán R., Acevedo-Rodríguez F.J., López-Sastre R.J., Kanezaki.A, *OffNav: Offline Reinforcement Learning for Visual Semantic Navigation*. Poster presentation at

Human-aligned Reinforcement Learning for Autonomous Agents and Robots Workshop, ICRA 2024, Yokohama, Japan.

Gutiérrez-Álvarez, C, Flor-Rodríguez-Rabadán R., Acevedo-Rodríguez F.J., López-Sastre R.J., Kanezaki.A, OffNav: Offline Reinforcement Learning for Visual Semantic Navigation. Late breaking results at ICRA 2024, Yokohama, Japan.

Gutiérrez-Álvarez, C, Ríos-Navarro P., Flor-Rodríguez-Rabadán R., Acevedo-Rodríguez F.J., López-Sastre R.J., Evaluation of Visual Semantic Navigation Models in Real Robots. Poster and oral presentation: IROS 2023, Detroit, Michigan.

Gutiérrez-Alvarez C, Hernández García S, Nasri N, Cuesta-Infante Alfredo, López-Sastre RJ, Towards Clear Evaluation of Robotic Visual Semantic Navigation, in ICARA 2023, Abu Dhabi, United Arab Emirates.

SEMINARS AND WORKSHOPS

Winter 2025. *Visual Semantic Navigation*. Doctorate School of Engineering: Smart systems for Ambient Assisted Living, University of Alcalá, Madrid, Spain.

Autumn 2024. *Real Navigation for Real Robots*. 5th EUGLOH Annual Student Research Conference, University of Alcalá, Madrid, Spain.

Autumn 2024. *El Futuro de la Robótica Móvil: Navegación Basada en Visión Semántica*. Mobile Week Alcalá de Henares, University of Alcalá, Madrid, Spain.

Summer 2024. *Reinforcement Learning para la robótica*. Workshop at Msc in Telecommunications Engineering, University of Alcalá, Madrid, Spain.

Summer 2023. *Basics of Robotic Navigation*. Seminar at Axpe Consulting, Madrid, Spain.

INVITED TALKS

Spring 2023. *Abro Micro: Inteligencia artificial e interpretación de conferencias*. Podcast. Madrid, Spain.

Teaching Experience

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| Fall 2024 | Computer Vision and Image Processing , Teaching Assistant at University of Alcalá, Madrid. |
| Fall 2023 | Circuits Theory , Teaching Assistant at University of Alcalá, Madrid. |
| 2021 | Coding for Applied AI , Private Tutor. |

Mentoring

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| 2023-2024 | Alejandro Martín Sánchez , BSc in Computer Science, University of Alcalá. Honors in final BSc project. |
| 2025-2025 | Rafael Flor Rodríguez Rabadán , MSc in Telecommunication Engineering, University of Alcalá. Honors in final MSc project. |

Awards, Fellowships, & Grants

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| 2021 | FPI Graduate Research Fellowship , Spanish Science Ministry | 109.070€ |
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Outreach & Professional Development ---

CERTIFICATIONS

- 2024 **Deep Reinforcement Learning Course**, Hugging Face.
- 2021 **Certified Machine Learning Specialty**, Amazon Web Services.
- 2020 **Certified Cloud Practitioner**, Amazon Web Services.
- 2020 **TensorFlow Developer Certification**, Coursera.
- 2019 **Deep Learning Specialization**, Coursera.

PEER REVIEW REVISOR

- 2024 **Expert Systems with Applications**, ESWA.
- 2023 **Computer Vision and Pattern Recognition**, CVPR.
- 2023 **International Conference on Learning Representations**, ICLR.