

Carlos Gutiérrez Álvarez

AI ENGINEER AND RESEARCHER IN REINFORCEMENT LEARNING & ROBOTICS

Alcalá de Henares, Madrid, Spain

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Education

University of Alcalá

PHD IN REINFORCEMENT LEARNING & ROBOTICS

- Advisor: Dr. Roberto J. López Sastre

Alcalá de Henares, Spain

2021 - 2026

Complutense University of Madrid

MSC IN MATHEMATICAL ENGINEERING

- Thesis: "BERT for Question Answering"

Madrid, Spain

2018 - 2019

Complutense University of Madrid

BSC IN PHYSICS

- Honors thesis

Madrid, Spain

2014 - 2018

Research Experience

University of Alcalá - Dept of Telecommunications and Signal Theory

ADVISOR: DR. ROBERTO JAVIER LÓPEZ SASTRE

Alcalá de Henares, Spain

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

Sep. 2021 - May 2025

SPANISH SCIENCE MINISTRY PRE-DOCTORAL SCHOLARSHIP

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

TourQuiz

Alcalá de Henares, Spain

Dic. 2021 - Mar. 2022

Co-FOUNDER

- 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

Feb. 2019 - Sep. 2021

SENIOR AI ENGINEER

- 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

- 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.

June 2018 - Feb 2019

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-Álvarez 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

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

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

2021 **FPI Graduate Research Fellowship**, Spanish Science Ministry

109.070€

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.