Tomàs Ortega

Curriculum Vitae

✉ *tomaso@uci.edu*
tomasortega.net
LinkedIn profile

PhD candidate at UC Irvine studying distributed optimization with communication compression, focusing on Privacy-Preserving Machine Learning. This includes algorithms for Federated Learning and Decentralized Control for wireless communication scenarios.
More broadly, I am interested in optimization, information theory, and AI. I also organized a group for people in the greater LA area to learn how to write mathematical proofs in the Lean formal verification language.

Education

2021 – now **PhD in Electrical Engineering and Computer Science**, *UC Irvine*, Irvine.
Graduating Spring 2026 (expected)

2020 – 2021 **M.S. in Mathematics**, *UPC*, Barcelona.

2015 – 2020 **B.S. in Mathematics**, *CFIS, UPC*, Barcelona.

2015 – 2020 **B.Eng. in Telecommunications Engineering**, *CFIS, UPC*, Barcelona.

Professional and Research Experience

Summer 2025 **Research Intern at Nokia Bell Labs**, *Designing trustless decentralized data storage and management systems*, Murray Hill.

Summer 2024 **Research Intern at the Vector Institute**, *Investigating and improving the optimization of Large Language Models in Federated Learning scenarios*, Toronto.

Summer 2022 **Graduate Fellow at NASA Jet Propulsion Laboratory**, *Designing and supervising the experimental tests for the channel sounding of Lunar South Pole communications. Developing novel algorithms for cooperative and compressed localization*, Pasadena.

Fall 2020 **Research Assistant at UPC (Signal Theory and Communications Department)**, *Design and optimization of 5G coverage estimators in urban scenarios, along with implementation and testing of the proposed solutions*, Barcelona.

February – July 2020 **JVSRP Internship at NASA Jet Propulsion Laboratory**, *Development and implementation of an adaptive-sweep algorithm for carrier acquisition and tracking in spacecraft radios*, Pasadena.

Winter 2019 **Research Project Collaborator at HP**, *Design of an ultrasound positioning system for mobile printers with a network of sensors, specializing in the position calculation and communications software*, Barcelona.

Summer 2018 **Summer Internship at BaseTIS**, *Enhancing task automation and parallelization for data analysis and reporting for Gas Natural Informatica*, Barcelona.

Skills

- **Distributed Systems & Software Engineering:** Decentralized optimization, consensus protocols, trustless/decentralized data-ledgers, cryptographic primitives
- **AI/ML Systems:** Federated learning (quantized, asynchronous, personalized), privacy-preserving aggregation, model-parallel training pipelines, performance benchmarking
- **Programming & Prototyping:** Python (TensorFlow, PyTorch), C++, Java, Git, Docker, CI/CD pipelines
- **Research and R&D Deliverables:** Publication pipeline (IEEE/ICML conferences & journals), patent drafting, experimental design, open-source library contributions
- **Tools & Platforms:** Linux, Kubernetes, AWS/GCP, LaTeX, Lean theorem prover, Jupyter, GitHub Actions
- **Communication & Collaboration:** Technical leadership, conference presentations, peer review (IEEE T-COM, DCC, IEEE SPS), cross-disciplinary collaboration
- **Languages:** Catalan (native), Spanish (native), English (proficient – Cambridge Proficiency certificate), French (conversational – DELF certificate)

Publications

[1] **T. Ortega** and H. Jafarkhani. "Decentralized Parameter-Free Online Learning". In: *arXiv preprint arXiv:2510.15644* (2025).

[2] **T. Ortega** et al. *Communication Compression for Distributed Learning with Aggregate and Server-Guided Feedback*. 2025. arXiv: 2512.22623 [cs.LG].

[3] S. Ball and **T. Ortega**. *Practical implementation of geometric quasi-cyclic LDPC codes*. 2024. arXiv: 2405.20524 [cs.IT].

[4] **T. Ortega** and H. Jafarkhani. "Decentralized Optimization in Networks with Arbitrary Delays". In: *ICC 2024 - IEEE International Conference on Communications*. 2024, pp. 794–799. DOI: 10.1109/ICC51166.2024.10622164.

[5] **T. Ortega** and H. Jafarkhani. *Decentralized Optimization in Time-Varying Networks with Arbitrary Delays*. 2024. arXiv: 2405.19513 [cs.LG].

[6] **T. Ortega** and H. Jafarkhani. "Quantized and Asynchronous Federated Learning". In: *IEEE Transactions on Communications* (2024), pp. 1–1. ISSN: 1558-0857. DOI: 10.1109/TCOMM.2024.3471996. URL: https://ieeexplore.ieee.org/document/10705319.

[7] **T. Ortega** et al. *Communication Compression for Distributed Learning without Control Variates*. 2024. arXiv: 2412.04538 [cs.LG].

[8] **T. Ortega** and H. Jafarkhani. "Asynchronous Federated Learning with Bidirectional Quantized Communications and Buffered Aggregation". In: *2023 International Conference on Machine Learning* Federated Learning and Analytics in Practice Workshop (July 2023). URL: https://openreview.net/pdf?id=DORg4vHAIV.

[9] **T. Ortega** and H. Jafarkhani. "Gossiped and Quantized Online Multi-Kernel Learning". In: *IEEE Signal Processing Letters* 30 (2023), pp. 468–472. DOI: 10.1109/LSP.2023.3268988.

[10] **T. Ortega**, A. Pascual-Iserte, and O. Muñoz. "LOS/NLOS Estimators for mmWave Cellular Systems With Blockages". In: *IEEE Wireless Communications Letters* 11.1 (2022), pp. 121–125. DOI: 10.1109/LWC.2021.3122090.

[11] **T. Ortega** et al. "Acquisition and tracking of high dynamics Doppler profiles for space applications". In: *2021 IEEE Aerospace Conference (50100)*. 2021, pp. 1–20. DOI: 10.1109/AERO50100.2021.9438418.

[12] **T. Ortega** et al. "Adaptive-Sweep Algorithm for Spacecraft Carrier Acquisition and Tracking: System Analysis and Implementation". In: *2021 IEEE Aerospace Conference (50100)*. 2021, pp. 1–9. DOI: 10.1109/AERO50100.2021.9438340.

Patents & Intellectual Property

2024 **SYSTEMS AND METHODS FOR QUANTIZED MACHINE LEARNING, FEDERATED LEARNING AND BIDIRECTIONAL NETWORK COMMUNICATION**, *USPA link*, pending.

2023 **QUASI-CYCLIC LDPC CODES BASED ON GENERALISED QUADRANGLES**, *WIPO link*, national phase pending.

Open-Source Software

- **FLSim: Federated Learning Simulator** github.com/TomasOrtega/FLSim Reproduces experiments from "Quantized and Asynchronous Federated Learning" [6, 8]. Built in Python; supports custom compression and async aggregation.
- **DT-GO Decentralized Optimization** github.com/TomasOrtega/DT-GO Implements algorithms from "Decentralized Optimization in Time-Varying Networks with Arbitrary Delays" [5]. Python prototype with performance benchmarks for decentralized logistic regression and FL tasks.
- **Noisy Lattice Denoising** github.com/TomasOrtega/Noisy-lattice-problem MATLAB, Python and AMPL solver for a noisy lattice point recovery problem.
- **JavaSnake** github.com/TomasOrtega/JavaSnake Classic Snake game implemented in Java.

Merits and Awards

2024 **Engineering Student Council at UCI**, *EECS Graduate Student of the Year*, awarded.

2023 **IEEE Signal Processing Society**, *Signal Processing Scholarship*, awarded.

2023 **ICML Federated Learning Workshop**, *Early Career invitation*, awarded.

2023 **Catalan Society of Mathematics**, *Évariste Galois prize for best MSc thesis in Catalonia*, honorable mention.

2022 **NASA's Jet Propulsion Laboratory**, *JPL Graduate Fellowship*, awarded.

2021 **UCI**, *Electrical Engineering and Computer Science department fellowship*, awarded.

2021 **Balsells program**, *Balsells graduate fellowship*, awarded.

2020 – 2018 **Google Hash Code**, *Respectively, 2nd, 1st and 1st team Spain*, 171st, 75th, and 53rd global.

2018 **Kernel Analytics Datathon**, *2nd place*, Accuracy when classifying Parkinson's Disease onset of symptomatology using sensor data.

2015 **CFIS**, *CFIS scholarship*, awarded.

Teaching

Winter 2024 **Probability for Engineers**, *EECS 55*, Irvine.

Winter 2025 **Probability for Engineers**, *EECS 55*, Irvine.

Leadership and Service

2023 – 2024 **Graduate Student Representative at the UCI Council on Planning and Budget**, *Representing the Graduate students at the UCI Council on Planning and Budget*, Irvine.

2023 – 2024 **Graduate Student Representative at the UCI Samueli School of Engineering Graduate Studies Committee**, *Representing the Graduate students at the Graduate Studies Committee*, Irvine.

2023 – 2024 **Council member for the School of Engineering at UCI's AGS**, *Representing the School of Engineering at the elected Associated Graduate Students council*, Irvine.