Tomàs Ortega

Curriculum Vitae

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LinkedIn profile

I am currently studying distributed optimization with communication compression, with a focus 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 organize a group to learn mathematical proofs in Lean for people in the greater LA area.

Education

2021 – now **PhD in Electrical Engineering and Computer Science**, *UC Irvine*, Irvine.

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 (link to publication)*, Pasadena.

Winter 2019 **Research Project Collaborator at HP**, *Design of a ultrasound positioning system for mobile printers, with an emphasis on 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

- Computer: Python, PyTorch, TensorFlow, C++, Java, HTML, LaTeX, Git, Lean.

- Languages: Catalan (native), Spanish (native), English (proficient – Cambridge Proficiency certificate), French (conversational – Delf certificate).

Publications

[1] S. Ball and **Ortega, Tomàs**. "Practical implementation of geometric quasi-cyclic LDPC codes". In: *arXiv preprint arXiv:2405.20524* (2024).

[2] **Ortega, Tomàs** and H. Jafarkhani. "Decentralized Optimization in Networks with Arbitrary Delays". In: *Accepted at IEEE ICC 2024* (Jan. 2024). URL: https://arxiv.org/abs/2401.11344.

[3] **Ortega, Tomàs** and H. Jafarkhani. "Decentralized Optimization in Time-Varying Networks with Arbitrary Delays". In: *arXiv preprint arXiv:2405.19513* (2024).

[4] **Ortega, Tomàs** 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.

[5] **Ortega, Tomàs** et al. "Communication Compression for Distributed Learning without Control Variates". In: *arXiv preprint arXiv:2412.04538* (Dec. 2024).

[6] **Ortega, Tomàs** 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.

[7] **Ortega, Tomàs** 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.

[8] **Ortega, Tomàs**, 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.

[9] **Ortega, Tomàs** 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.

[10] **Ortega, Tomàs** 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

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.

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*, 171th, 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 Experience

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.