BELÉN MARTÍN-URCELAY

Last-year Ph.D. student in computer engineering, eager to pursue a career in academia. My research focuses on provably efficient machine teaching. Namely, we leverage knowledgeable teachers (human experts or powerful machine learning networks) to enhance learning algorithm performance and reduce sample complexity.

Research Interests: Active learning, human feedback, machine teaching, reinforcement learning, Bayesian decision making.

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EDUCATION

Georgia Institute of Technology (GT) *Atlanta, U.S.A.*
Ph.D. Computer Engineering August 2022 - May 2026
- Advisors: Prof. Christopher Rozell and Prof. Matthieu Bloch.
- Topic: Efficiently teaching machine learning algorithms. Design data-efficient interactive learning systems that combine machine teaching, posterior-matching search, and rich human feedback, with robustness guarantees and provable sample-complexity improvements.
- Research Visit at ETH Zurich with Prof. Andreas Krause. *Fall 2023*

M.Sc. Electrical and Computer Engineering August 2020 - August 2022
- GPA: 4.0/4.0.
- Specialization: Signal Processing.
- Minor: Industrial and Systems Engineering (ISyE).
- Relevant Coursework: Online Decision Making in ML, Statistical Signal Processing, Convex Optimization.

Universidad de Navarra (UNAV) *San Sebastián, Spain*
M.Sc. Telecommunications Engineering January 2019 - July 2020
- Grade: 9.13/10.
- Master Thesis at the University of Sheffield with Prof. Iñaki Esnaola. *Spring 2020*

B.Sc. Telecommunication Systems Engineering August 2014 - July 2018
- Grade: 8.93/10.
- Exchange semester at the University of Hong Kong. GPA: 3.94/4. *Fall 2017*

RESEARCH EXPERIENCE

Graduate Research Assistant September 2020 - Present
Advisors: Prof. Christopher Rozell and Prof. Matthieu Bloch *Georgia Institute of Technology, U.S.A.*

· Expanded online machine teaching to account for learner uncertainty by simultaneously inferring the learner's state while guiding its gradient-based learning, and proved robustness guarantees under model uncertainty.
· Improved the efficiency of knowledge transmission in human-in-the-loop learning by designing and analyzing richer forms of feedback beyond binary labels.
· Developed an interactive graph search algorithm based on posterior matching that achieves lower theoretical sample complexity bounds and implemented tree pruning achieving up to 90% runtime reduction.

Guest Graduate Researcher August 2023 - December 2023
Advisors: Prof. Andreas Krause *Eidgenössische Technische Hochschule (ETH), Switzerland*

· Conducted research on Reinforcement Learning with Human Feedback (RLHF).
· Explored ways for Large Language Models (LLM) to interpret natural language into actionable reward functions for agents to effectively optimize their performance.

Master Thesis February 2020 - July 2020
Advisors: Prof. Iñaki Esnaola *University of Sheffield, United Kingdom*

- Developed sensor placement guidelines that guarantee robustness in the information collected in a smart city environment.
- Accurately estimated missing entries employing a matrix completion technique: The Singular Value Thresholding (SVT) algorithm. This led to a 7-12% error reduction for recovered entries.
- Thesis awarded distinction of Excellence by Universidad de Navarra.

Research Assistant September 2018 - December 2018
Advisor: Dr. Andreas Niedermeier *Fraunhofer IIS, Erlangen, Germany*

- Created a detector of transient signals for audio compression with Machine Learning (ML). A computationally less expensive way than the state-of-the-art algorithm the department was employing.
- Designed, implemented and analyzed Deep Neural Networks (DNN) in Python with TensorFlow.

Bachelor Thesis January 2018 - July 2018
Advisor: Prof. Ainhoa Rezola *Ceit - IK4, Spain*

- Conducted research on temperature dependence of frequency-selective IQ imbalance in Ultra-Wide-Band multi-Gbps transmitters for point-to-point communications.
- Programmed an encoder to compensate for temperature drifts in the antenna to avoid system degradation.
- Thesis awarded distinction of Excellence by Universidad de Navarra.
- Contributed to a paper on IEEE Transactions on Microwave Theory and Techniques.

Undergraduate Research Assistant June 2016 - July 2016
Advisor: Prof. Leticia Zamora *Universidad de Navarra, Spain*

- Contributed to a monitoring system using wearable sensors to detect and alert caregivers of unusual behavior in elderly patients, such as lack of movement or falls.
- Processed the data gathered by the accelerometers to detect falls.

TEACHING EXPERIENCE

Instructor of Record Georgia Institute of Technology

- ECE 3077 - Introduction to Probability and Statistics for ECE January 2025 – May 2025
  - Biweekly lectures followed by interactive problem-solving sessions for 60 third-year undergraduate engineering students.
  - Developed course materials:
    - A module on linear regression, logistic regression, and neural networks.
    - Lectures, exams, and homework problems designed to reinforce key concepts.

Graduate Teaching Assistant *Georgia Institute of Technology*

- ECE2020 - Digital System Design May 2021 - August 2021
  - Conducted office hours four hours per week.
  - Independently graded assignments for a class of 37 students, providing detailed feedback to foster learning.
- Opportunity Research Scholars (ORS) Program August 2020 - May 2021
  - Managed undergraduate research groups effectively.
  - Collaborated with students on fellowship applications and conference proposals.

Undergraduate Teaching Assistant *Universidad de Navarra*

- Microcontrollers and Microprocessors January 2018 - May 2018
  - Facilitated lab sessions twice a week.
  - Explained Assembly language to 15 Junior Engineering students.

· Calculus and Algebra — August 2015 and August 2016
  · Supported review sessions for 200 1^{st} year engineering students.

WORK EXPERIENCE

Software Developer — July 2019 - January 2020
San Sebastián, Spain — *Developair*

· Contributed to the development of a tool for automatic adjustment of simulation parameters used in the railway sector.
· Implemented a user interface with JavaScript.

Technological Development Intern — June 2017 - August 2017
Hernani, Spain — *Orona*

· Executed comprehensive validation protocols for a new user interface for elevator screens.
· Collaborated with cross-functional teams to provide actionable feedback leading to user interface improvements.

Member of the Tractive System Team — June 2017 - August 2017
San Sebastián, Spain — *Formula Student*

· Engineered a real-time wireless communication system for a competition-grade electric single-seater, contributing to the team's qualification in *Formula Student Germany 2017*.

TECHNICAL SKILLS

Languages: Spanish (native), English (bilingual, C2), Basque (medium, B1), German (basic, A2-B1)

Programming Languages:
· Python — Advanced (5 years; research projects in optimization and machine learning).
· MATLAB — Proficient (8 years; academic and research projects).
· LaTeX — Proficient (6 years; regularly used for typesetting academic papers and reports).
· C++ — Familiar (Visual Studio; coursework applications).

AWARDS

Scholarships

· Rafael del Pino Excellency Fellowship. — 2022 - 2024
· Fulbright Scholarship. — 2020 - 2022
· P.E.O. International Peace Scholarship. — 2020 - 2022
· Georgia Tech Electrical and Computer Engineering (ECE) Scholarship. — 2020 - 2021
· International Mobility Program Connecting Talent Fellowship. — 2020
· UR2PhD Technical Conference Travel Award. — August 2025
· Women in Electrical and Computer Engineering (ECE) Travel grant. — October 2022 and July 2025
· Travel grant by the National Science Foundation (NSF). — June 2022 and June 2023

Honors

· Best presentations at the Georgia Tech Machine Learning Student Conference. — September 2024
· Best Academic Record Prize by Kutxabank. — 2018
· Special End of Studies Award by Universidad de Navarra. — 2018
· A+ (Special mention - Top of the class) in 22 courses, 42% of the credits (ECTS). — 2014 - 2020
· Summa Cum Laude
  · Graduated top of the class for master's degree. — 2020
  · Graduated top of the class for bachelor's degree. — 2018

SCHOLARLY CONTRIBUTIONS

Peer-Reviewed Publications

- "Online Machine Teaching under Learner's Uncertainty: Gradient Descent Learners of a Quadratic Loss," **B. Martin-Urcelay**, C. Rozell, M. Bloch. SIAM Journal on Mathematics of Data Science. June 2025.
- "MANGO: Learning Disentangled Image Transformation Manifolds with Grouped Operators," B. Ancelin, Y. Chen, A. Saad-Falcon, P. Guan, C. Kaushik, N. Singh, **B. Martin-Urcelay**. SampTA '25 [Oral]: Sampling Theory and Applications. July 2025.
- "Enhancing Human-in-the-Loop Learning for Binary Sentiment Word Classification" **B. Martin-Urcelay**, C. Rozell, M. Bloch. CDC 2024. Conference on Decision and Control. December 2024.
- "Reinforcement Learning from Human Text Feedback: Learning a Reward Model from Human Text Input," **B. Martin-Urcelay**, A. Krause, G. Ramponi. ICML 2024 Workshop on Models of Human Feedback for AI Alignment. July 2024.
- "Temperature-Dependent I/Q Imbalance Compensation in Ultra-Wideband Millimeter-Wave Multi-Gigabit Transmitters," A. Rezola, J. F. Sevillano, D. del Río, **B. Martin-Urcelay**, I. Gurutzeaga, I. Vélez, R. Berenguer. in IEEE Transactions on Microwave Theory and Techniques, vol. 68, no. 1, pp. 340-352, Jan. 2020.

Under Review

- "TAPAS: Team Agreement via Pairwise Active Selection," N. Nadagouda, **B. Martin-Urcelay**, D. Bao, G. Hessler, C. Hung, B. Ancelin, C. May.

Invited Talks

- "The Art of Prompt Engineering: Converting Language to Rewards in Reinforcement Learning with ChatGPT," **B. Martin-Urcelay**. Georgia Tech – Amazon Supply Chain Research Day. February 2024, Atlanta, Georgia.
- "Human in Machine Teaching: Human and Mathematically Interpretable Query Selection," **B. Martin-Urcelay**, C. Rozell, M. Bloch. Computer Research Association's IDEALS workshop. March 2023, Honolulu, Hawaii.

Poster Presentations

- "From Words to Rewards: Leveraging Natural Language for Reinforcement Learning," **B. Martin-Urcelay**, A. Krause, G. Ramponi. The Exploration in AI Today Workshop at ICML. July 2025. Vancouver, Canada.
- "Efficient Bayesian Learning from Pairwise Comparisons by Humans," **B. Martin-Urcelay**, C. Rozell, M. Bloch. ETH Institute for Machine Learning Symposium. September 2023, Malbun, Liechtenstein.
- "Teaching a Word Classifier based on Human's Perception of Valence," **B. Martin-Urcelay**, C. Rozell, M. Bloch. Northamerican School of Information Theory (NASIT). June 2023, Philadelphia, Pennsylvania.
- "Online Machine Teaching under Learner Uncertainty," **B. Martin-Urcelay**, C. Rozell, M. Bloch. CRA-WP Grad Cohort for Women. April 2023, San Francisco, California.
- "Online Machine Teaching with Uncertainty in Initial State" **B. Martin-Urcelay**, C. Rozell, M. Bloch. North American School of Information Theory (NASIT). August 2022, Los Angeles, California.
- "Iterative Machine Teaching to an Unknown Learner," **B. Martin-Urcelay**, C. Rozell, M. Bloch. CRA-WP Grad Cohort for Women. April 2022, New Orleans, Louisiana.

[SELECTED] LEADERSHIP AND PUBLIC OUTREACH

Workshop Organizer July 2025
ICML Workshop on Models of Human Feedback for AI Alignment *ICML 2025*

- Main organizer of MoFA workshop which brings together experts in machine learning, cognitive science, behavioral psychology, and economics to explore human-AI alignment by examining human (and AI) feedback mechanisms, their mathematical models, and practical implications.
- 60 accepted papers.

Founding Graduate Chair May 2021 - Present
Women in Electrical and Computer Engineering (WECE) *Georgia Institute of Technology*

- Founded the Graduate Chair role to reach 180 graduate women in ECE; led academic and wellness initiatives that strengthened support and belonging.
- Created volunteering opportunities to empower and promote STEM fields among local girls.

Volunteer Tutor September 2024 - Present
Learn to be

- Provide weekly tutoring to non-English-speaking high school students from underserved communities

Graduate Student Mentor Training Course September 2024 - December 2024
Computer Research Association (CRA)

- Learned about principles and best practices to provide effective mentorship in a research setting.

Program Coordinator May 2021 - May 2023
Clarkston Futures Mentorship Program *Georgia Institute of Technology*

- Organized STEM workshops to foster academic interest among refugee students at Clarkston High School.
- Provided after school academic support and tutoring to 20 refugee students.

Fundraiser October 2019 - August 2023
PSE - Pour un Sourire d'Enfant

- Developed proposal strategies and forged partnerships with public and private entities to increase funding avenues.
- Successfully pitched and secured €18,995 from Fundación Pelayo, contributing to a total of €40,995 raised in 2021 for NGO projects supporting underprivileged children.

Weekly Volunteer September 2014 - February 2020
Aspace

- Provided consistent support and companionship to individuals with cerebral palsy, improving their social integration and well-being.

Seminar on People Management and Leadership November 2019
IESE Business School

- Cultivated problem diagnosis and decision making skills in professional settings through pragmatic business cases.

Robotics Instructor February 2019
Gautena

- Prepared and taught a robotic workshop tailored for the unique learning needs of eight autistic teenagers.

Class President September 2015 - June 2017
Telecommunication Engineering Cohort *Universidad de Navarra*

- Effectively served as a liaison between the student body and faculty, advocating for student interests and contributing to administrative decision making.