BELÉN MARTÍN-URCELAY

Last-year Ph.D. student in computer engineering, eager to pursue a career in academia. My research focuses on provably efficient active learning. Namely, I 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 95% 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 state-reward pairs from which to learn a reward model.

Master Thesis
Advisors: Prof. Iñaki Esnaola

February 2020 - July 2020
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
Advisor: Dr. Andreas Niedermeier

September 2018 - December 2018
Fraunhofer IIS, Erlangen, Germany

· Created a detector of transient signals for audio compression with Deep Neural Networks (DNN) in Python with TensorFlow.

Bachelor Thesis
Advisor: Prof. Ainhoa Rezola

January 2018 - July 2018
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.

Undergraduate Research Assistant
Advisor: Prof. Leticia Zamora

June 2016 - July 2016
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 1st 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

· Third poster presentation at the Georgia Tech Machine Learning Student Conference. September 2025
· Best oral presentation 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

· *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 mm-Wave Multi-Gigabit Transmitters,*
A. Rezola, J. F. Sevillano, D. del Río, **B. Martin-Urcelay**, I. Gurutzeaga, I. Vélez, R. Berenguer.
IEEE Transactions on Microwave Theory and Techniques, vol. 68, no. 1, pp. 340-352, Jan. 2020.

Under Review

· *From Words To Rewards: Leveraging Natural Language For Reinforcement Learning,*
B. Martin-Urcelay, A. Krause, G. Ramponi.

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

In preparation

· *Maximizing Information Rate in Active Learning through Rich Human Queries,*
B. Martin-Urcelay, C. Rozell, M. Bloch.

· *Representation Fragility in Reward Models: Detection and Mitigation via Sparse Autoencoders,*
S. Liu, X. Chen, **B. Martin-Urcelay**, A. Krause.

Invited Talks

· *The Art of Prompt Engineering: Converting Language to Rewards in Reinforcement Learning with ChatGPT,*
B. Martin-Urcelay.
Amazon - Georgia Tech 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

· *Teaching a Word Classifier based on Human's Perception of Valence,*
B. Martin-Urcelay, C. Rozell, M. Bloch.
North American 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.