Nicolas Martorell

Machine learning researcher, software engineer, neuroscientist, and author with a passion for applying technical skills and creativity to complex problems.

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Completed University Studies

Bachelor of Science in Biological Sciences, Specialized in Animal Physiology and Neuroscience (Extended Six-Year Program, equivalent to Master's Degree, GPA: 9.26/10), University of Buenos Aires (2014 – 2019).

Ph.D. in Neuroscience, University of Buenos Aires (2020 – 2025).

> *Established a new research line on calcium imaging in zebrafish, focusing on decoding high-dimensional neural representations of multimodal danger stimuli and their effects on escape behavior.*

Current Position

Postdoctoral Researcher at the Applied Artificial Intelligence Laboratory (LIAA), within the Institute of Computer Science (UBA – CONICET) *(August 2025 – present).*

> *Established a new research line on LLM interpretability, focusing on probing, steering, and behavioral evaluation of internal representations, including work on spatial reasoning, introspective abilities, internal-state tracking, and probe validation. Open-sourced a Python library to support this research.*

Selected Research & Writing

"Quantitative Introspection in Language Models: Tracking Internal States Across Conversation" (Martorell & Bianchi, preprint, 2026).

"Qué es (y qué no es) la inteligencia artificial" ("What AI is and isn't") (Martorell, Siglo XXI, 2026).

"Integration of Audiovisual Danger Stimuli in the Zebrafish Tectum is Linked with Premotor and Behavioral Enhancements" (Martorell & Medan, preprint, 2026).

"From Text to Space: Mapping Abstract Spatial Models in LLMs during a Grid-World Navigation Task" (Martorell, XAI World Conference, 2025).

"Audiovisual Integration in the Mauthner cell enhances escape probability and reduces response Latency" (Martorell & Medan, Scientific Reports, 2022).

"Stimulus Contrast Information Modulates Sensorimotor Decision Making in Goldfish" (Otero Coronel, Martorell, Berón de Astranda & Medan, Frontiers in Neural Circuits, 2020).

Selected Awards and Scholarships

Next Generation Award (Society for Neuroscience, 2024).

Creation and production of the podcast "A Todo Neuro" for the Argentinian Neuroscience Society.

Boehringer Ingelheim Fonds Travel Grant (2023)

3-month research stay in Paris, in the laboratory of Germán Sumbre - IBENS.

Friends of Fulbright Scholarship for studying at the University of Alabama, USA (2019).

Scholarship Award for **Best GPA score in the City of Buenos Aires** (2013).

Selected Industry and Teaching Positions

**Lead Developer at TOXI Media* *(2023 – present).*

Creator and maintainer of an open-source Python library for multi-agent system orchestration.

**Software Engineer at Sedal (2024 – present).*

Fine-tuning of open-source diffusion models for an AI hair-transfer application.

**Software Engineer at CasanCrem (2025 – present).*

**Software Engineer at El Perro en la Luna (2025 – present).*

**Teaching Assistant / Lead TA at Neuromatch Academy* *(2020 – 2024).*

Instructor in Computational Neuroscience and Deep Learning, teaching in Spanish and English.

**Member of the Digital Education, Programming, and Robotics Team for the Government of the City of Buenos Aires (2023).*

Government advisor for including generative AI tools in the new primary school curriculum.

**Educator trainer for the Natural Sciences area of primary school for the City Government of Buenos Aires (2021 – 2024).*

Content Creation

** Main content creation advisor for the Buenos Aires AI Safety Hub (2025 – present).*

** Head of the Science Outreach Commission of the Argentine Neuroscience Society (2022 – 2023).*

**Co-founder and coordinator of the science communication channel Xplora (2017 - present).*

Selected Courses

Machine Learning Summer School – MLSS Arequipa, Perú – 2025.

Eastern European Machine Learning Summer School – EEML Novi Sad, Serbia – 2024.

Deep Learning Specialization (2019 – 2020)

Machine Learning - Stanford University - 2018.

Computational Neuroscience – University of Washington – 2018.

Languages

English: C2 level – Cambridge Proficiency Certificate (CPE) (Grade: A) - 2016.

Extended CV

Academic Work

**Postdoctoral Researcher at the Applied Artificial Intelligence Laboratory* (LIAA), *within the Institute of Computer Science* (UBA – CONICET) *(August 2025 – present).*

Established a new research line on LLM interpretability, focusing on probing, steering and behavioral evaluations to study introspective abilities of LLMs and use them for emotive state tracking and probe validation. Design of an open-source library for this purpose.

Independent research on LLM interpretability, focusing on probing and behavioral evaluations of LLMs during spatial navigation in virtual environments, with the goal of understanding if LLMs represent specific features of space in abstract, prompt-independent ways.

**Student at the Neural Networks Laboratory, within the Institute of Physiology, Molecular Biology, and Neuroscience (IFIBYNE) (UBA – CONICET) (August 2017 – July 2025).*

Established a new research line on calcium imaging in zebrafish, focusing on decoding high-dimensional neural representations of multimodal danger stimuli and understanding their effect on escape behaviors.

Design, setup, and execution of experiments, including the construction of a setup that allows for audiovisual stimulation and recording of neuronal activity in living zebrafish, using transgenic lines, confocal microscopy and specialized software.

Advanced and fluent programming in Python, with extensive experience using Matplotlib, Numpy, OpenCV, Pytorch, and other widely used libraries. Custom software development in MATLAB, R, Java, C++, and Arduino.

Development of custom tracking software from scratch to precisely quantify the behavior of zebrafish. Training, evaluation, and use of deep neural networks with the same goal.

Development of a semi-automatic analysis pipeline to process neuronal recordings, identify individual neurons, and extract time series data. Handling of high-dimensional data, using techniques such as dimensionality reduction, clustering, statistical analysis, etc.

Computational modeling of biological neural systems with the goal of comparing outputs with experimental results.

Planning and teaching the course “Data Analysis of Calcium Imaging Signals in Neural Circuits” during the Congress of the Argentine Society for Neuroscience Research (2023), including the complete writing of the programming exercise guide in Python.

**Intern of the Mosquito Study Group (GEM) from the Faculty of Exact and Natural Sciences (UBA) (March 2017 to September 2017).*

Field work (sample collection).

Laboratory work (identification of different species, sampling of Aedes Aegypti eggs).

Industry Applications

***Lead Developer at TOXI Media** *(2023 – present).*

Spearhead the design and development of advanced chatbot solutions based on multi-agent systems, delivering tailored applications for sectors including real estate, food services, and customer service.

Creator and maintainer of an open-source Python library for multi-agent systems, empowering developers with scalable tools for complex chatbot functionalities.

**Software Engineer at Sedal (2024 – present).*

Fine-tuning of open-source diffusion models (mainly Stable Diffusion using Python) to create a hair-transfer application as a brand engagement experience. Data collection and curation, training using local hardware and cloud services, UI design.

**Software Engineer at CasanCrem (2025 – present).*

Design of a multi-agent system using a custom-built Python library (MAS) as the back-end of a chatbot that interacts with users and finds relevant recipes in a tailored database. Data collection, prompt engineering, complex multi-agent system design and rigorous testing. Local and cloud hosting, user feedback collection.

**Software Engineer at El Perro en la Luna (2025 – present).*

Development of an immersive application (web-based and VR-based) allowing users to explore a 3D-scanned portion of the Delta ecosystem in Entre Rios, Argentina. Photogrammetry and recording of video and sound of designated regions of the ecosystem, construction of a virtual world using Blender, Unity and C#, UI design, web development.

**Audiovisual Producer at Kabradepata (2025 – present).*

Production of 8 music videos for a children's music album. Character design, scripting, storyboarding, use of AI for image and video generation, and for subject-background separation. Video editing in Adobe Premiere.

**Audiovisual Producer at Anda Calabaza (2025 – present).*

Production of a fully animated music video for a version of the Argentinian national anthem tailored for kids. Character design, scripting, storyboarding. Use of AI for image and video generation. Video editing in Adobe Premiere.

**AI Trainer at Scale AI (2024 – present).*

Prompting, evaluation and critique of outputs generated by Large Language Models in tasks specifically related to coding.

Education and Teaching

**Teaching Assistant at Neuromatch Academy (2020 – 2024).*

Instructor in the Computational Neuroscience course, based on Python (2020 in Spanish, 2021 in English, 2022, 2023 and 2024 in Spanish and in the role of Lead TA, meaning coordinator of other instructors in addition to being an instructor). Instructor in the Deep Learning course, based on Python and Pytorch (2021, in English).

Capacity for clear and accessible explanation of concepts in machine learning, statistics, computational modeling, linear algebra, dynamical systems, among other things.

**Generative AI instructor (2023 – present).*

Develop and lead talks and workshops related to specific use cases of GenAI. Focus on a practical approach to LLMs, image generation models and other tools. Audiences include large and small corporations, schools, teachers, and government employees.

**Member of the Digital Education, Programming, and Robotics Team for the Government of the City of Buenos Aires (2023).*

Organization of two seminars with members from other teams of the Operational Management of Curriculum, aiming to reflect on the incorporation of generative artificial intelligence tools in educational practices.

Writing and reviewing the new primary curriculum design with a focus on the didactic and pedagogical application of generative artificial intelligence tools.

Specific work with the 16 curricular areas of primary school for linking their contents with generative artificial intelligence tools.

**Educator trainer for the Natural Sciences area of primary school for the City Government of Buenos Aires (2021 – 2024).*

Support for Natural Sciences teachers in primary school, aimed at helping them plan enriching activities for students and to understand complex concepts from areas such as biology, physics, chemistry, or astronomy.

**Private tutor in various areas, for primary, secondary, and university entrance (2013 – 2020).*

Specialized in math, biology, English, and programming classes.

Other subjects taught: chemistry, physics, language, geography, history.

**Planning and Teaching of a Video Game Programming Workshop (Processing, Java) (2018).*

**Coordinator of the Planes institute, for private lessons (2016).*

Content Creation

**Co-founder and coordinator of the science communication channel Xplora (2017 - present).*

Production of a series of 15 three-minute animated shorts for the Encuentro TV station on environment and problematic consumption in collaboration with Planta Alta production company (2021).

Production of weekly science videos for C5N's digital platform (2021 – 2024).

Production of 4 videos on environment for the Argentinian Ministry of Science, Technology, and Innovation, as a result of receiving the "*Ciencia por Contar"* award (2023).

Coordination of a content production team for audiovisual media.

Writing, producing, animating, and editing science communication videos.

Managing social media and advertising for the project.

** Main content creation advisor for the Buenos Aires AI Safety Hub (2025 – present).*

** Head of the Science Outreach Commission of the Argentine Neuroscience Society (2022 – 2023).*

Creation, hosting and production of “A Todo Neuro”, an award-winning neuroscience podcast. Interview research, scripting and hosting, audio editing using Adobe Audition, graphic design for logos and social media.

Audiovisual Producer at Gelatina (2025).

Planning of an animated show designed for kids to be aired through Gelatina. Production of a fully-animated pilot, including scripting, storyboarding, use of AI for image, video and music generation, video editing in Adobe Premiere.

All Awards and Scholarships

Next Generation Award (Society for Neuroscience) for the creation and production of the podcast series “A Todo Neuro” for the Argentinian Neuroscience Society (SAN) (2024).

“Ciencia por Contar” Award for the work at the *Xplora* science communication channel, for the production of 4 audiovisual shorts about environment and society, from the Argentinian Ministry of Science, Technology and Innovation (2023).

Boehringer Ingelheim Fonds Travel Grant for a 3-month research stay in Paris, in the laboratory of Germán Sumbre - IBENS, Ecole Normale Superieure (2023).

Ph.D. Scholarship (CONICET) – Topic: Multimodal Integration in Zebrafish – Director: Violeta Medan, Co-Director: Lidia Szczupak (2020 – 2025).

“Estímulo” Scholarship (UBACyT) - Topic: Multimodal Integration - Director: Violeta Medan (September 2018 to March 2020).

Friends of Fulbright Scholarship for studying at the University of Alabama, USA (2019).

Scholarship Award for **Best GPA score in the City of Buenos Aires** (2013).

Scholarship Award for **Best GPA score in School District 14** in Primary School (2008).

All Courses and Additional Training

Machine Learning Summer School – MLSS Arequipa, Perú – 2025.

Eastern European Machine Learning Summer School – EEML Novi Sad, Serbia – 2024.

Machine Learning Explainability - Kaggle – 2023.

Topics in Neuroscience – UBA – 2022.

Data Science – UBA – 2021.

Nervous System Physiology – UBA – 2021.

Dynamical Systems and Artificial Intelligence Applied to Data Modeling – UBA – 2020.

History of Science – UBA – 2020.

Training Course for the Use of Animals in Experimentation – UBA – 2020.

Deep Learning Specialization (2019 – 2020)

Neural Networks and Machine Learning – DeepLearning.ai – 2019.

Improving Deep Neural Networks – DeepLearning.ai – 2019.

Structuring Machine Learning Projects – DeepLearning.ai – 2019.

Convolutional Neural Networks – DeepLearning.ai – 2020.

Sequence Models – DeepLearning.ai – 2020.

Machine Learning - Stanford University - 2018.

Computational Neuroscience – University of Washington – 2018.

Neurobiology of Drug Addiction - University of Córdoba - 2018.

Design Oriented to Science Communication - FADU, UBA - 2018.

All Scientific Publications

"Quantitative Introspection in Language Models: Tracking Internal States Across Conversation" (Martorell & Bianchi, preprint, 2026).

"Integration of Audiovisual Danger Stimuli in the Zebrafish Tectum is Linked with Premotor and Behavioral Enhancements" (Martorell & Medan, preprint, 2026).

"From Text to Space: Mapping Abstract Spatial Models in LLMs during a Grid-World Navigation Task" (Martorell, XAI World Conference, 2025).

"Auditory stimuli enhance visual responses in the optic tectum of zebrafish" (Martorell, Marachlian, Sumbre & Medan, Congress of the Argentine Society of Neuroscience 2024).

"Auditory stimuli enhance visual responses in the optic tectum of zebrafish" (Martorell, Marachlian, Sumbre & Medan, Society for Neuroscience Meeting, 2024).

"Pose Estimation and Behavior Recognition in Freely Swimming Zebrafish" (Martorell, Agullo & Medan, Eastern European Machine Learning Summer School, 2024).

"Representation of multisensory stimuli in the zebrafish optic tectum" (Martorell, Agullo & Medan, Congress of the Argentine Society of Neuroscience, 2023).

"Automated clustering of larval zebrafish motor behavior reveals two different modes of fast escapes" (Agullo, Martorell & Medan, Congress of the Argentine Society of Neuroscience, 2023).

"The anti-social network: Larval zebrafish raised in social isolation show lower response thresholds for threat detection but reduced multisensory integration" (Azar, Martorell, Agullo & Medan, Congress of the Argentine Society of Neuroscience, 2023).

"Neural coding of multisensory integration in the larval zebrafish brain" (Martorell & Medan, Congress of the Argentine Society of Neuroscience, 2022).

"Development of a categorization algorithm for behavioral patterns of zebrafish in response to danger stimuli" (Agulló, Martorell & Medan, Congress of the Argentine Society of Neuroscience, 2022).

"Audiovisual Integration in the Mauthner cell enhances escape probability and reduces response Latency" (Martorell & Medan, Scientific Reports, 2022).

"Neuromatch Academy: a 3-week, online summer school in computational neuroscience" (Hart et al., Journal of Open Source Education, 2022).

"Audiovisual Integration in the Mauthner Cell Enhances Escape Probability and Reduces Response Latency" (Martorell & Medan, Congress of the Argentine Society of Neuroscience, 2021).

"Stimulus Contrast Information Modulates Sensorimotor Decision Making in Goldfish" (Otero Coronel, Martorell, Berón de Astranda & Medan, Frontiers in Neural Circuits, 2020).

"Stimulus salience and spatial correspondence determine enhancement or depression of multisensory integration in fish" (Martorell, Perara & Medan, Society for Neuroscience Meeting, 2019).

"When senses work together: How multimodal integration helps you stay alive" (Martorell & Medan, Congress of the Argentine Society of Neuroscience, 2018).

Wild Mosquito Monitoring Report (Mosquito Study Group, FCEyN, UBA, 5 reports total, from April to August 2017).

Other Publications

"Qué es (y qué no es) la inteligencia artificial" ("What AI is and isn't") (Martorell, Ciencia que Ladra, Siglo XXI, 2026).

"Teaching and Learning with Artificial Intelligence: Perspectives for a Primary School Teacher" (Martorell, A Construir, Conexión Docente, 2023).

Science Outreach Activities

Presenter in the science talk series "Pint Of Science" – 2023 and 2024.

Presenter in the science talk series "La Maison Divulga" at the Argentine House in Paris - 2023.

Producer and host of the institutional podcast of the Argentine Society for Neuroscience Research, "A Todo Neuro" - 2022.

Creator and organizer of the monthly scientific film debate series "Ciencia POP" from the Institute of Physiology, Molecular Biology and Neuroscience (IFIBYNE) - 2022.

Presenter at the Biology Week in the School of Exact and Natural Sciences, UBA - 2022.

Coordinator of the Scientific Dissemination Commission of the Argentine Society for Neuroscience Research – 2022.

Panelist in the science talk series "Ciencia y Vinito" – 2022.

Presenter at the Brain Week, National University Arturo Jauretche - 2018.

Presentation of the Xplora startup at the Futuro Fair, Lanús University - 2018.

Participation in Educating the Brain, University of Córdoba - 2018.

Programming and Software Skills

Programming languages

Proficiency in Java, Android, Python, MATLAB, R, JavaScript, Processing, C++.

Machine Learning for scientific and statistical purposes (Pytorch, Keras, Tensorflow).

Statistical analysis (R and Python).

Video game design (Android, Processing, JavaScript).

Web design with HTML/CSS/JavaScript.

General software proficiency

Professional video editing in Adobe Premiere.

Professional video animation and FX in Adobe After Effects.

Professional Audio editing in Cubase, Nuendo and Adobe Audition.

Complex image editing and illustration in Adobe Photoshop and Adobe Illustrator.

Advanced 3D modeling in Blender.

Advanced data analysis in Excel.

Generative AI

Advanced prompt engineering for software development.

Local execution of open-source models and API usage of closed-source LLMs and diffusion models to build complex content generation and data analysis pipelines.

Development of multi-agent systems with carefully tailored prompts which can interact with APIs and other tools to perform complex tasks better than a simple LLM-based chatbot.

High School Education

Overall GPA score: 9.26/10.

Degree: High School Diploma with an Orientation in Arts and Media, Specialized in Media. School of Secondary Education 3, School District 7 (2009 – 2013).

Special subjects of the Certificate: Audiovisual Arts, Animation, Multimedia Arts.

Other relevant subjects of the Orientation: Communication, Sociology of Culture, Philosophy of Culture, Cultural Management I, Cultural Management II, Media Theory and Analysis I, Media Theory and Analysis II.

University Studies (not completed)

Film Making Degree at ENERC (March 2014 to December 2014).

Personal Activities

Theater (2001-2011) – Film and Animation Workshop (2008) – Singing (2009-2011) – Drums (2011-2012) – Guitar (2011-2013) – Piano (2013) - Study of musical reading, audio perception, musical composition and digital sound editing (2011-2013).

Annex: Courses taken during the Bachelor/Master's degree in Biological Sciences

Subject	Grade (out of 10 points)
Mathematical Analysis	9
Introduction to Botany	9
General and Inorganic Chemistry	10
Introduction to Molecular and Cellular Biology	9
Introduction to Zoology	8
Organic Chemistry	9
Linear Algebra	10
Biometry (Probability and Statistics)	9
Biological Chemistry	9
Introduction to Molecular Physiology	9
Physics I	10
Physics II	10
Genetics	8
Ecology	9
Intro. to Cognitive and Computational Neuroscience	10
Biometry II (Advanced Statistical Anlaysis)	9
Evolution	9
Nonlinear Dynamics	10
Animal Behavior Physiology	9
Animal Development (Embriology)	9
Neurobiology of Learning and Memory	9
Integrative Neurophysiology	10
Master's Thesis	10
Average GPA	**9,26**