# Francisco M. López

Postdoctoral Research Fellow | Sydney, Australia

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## PROFILE

Computational Cognitive Scientist with a PhD in Physics and an interdisciplinary background spanning artificial intelligence, computational neuroscience, and developmental psychology. Expertise in reinforcement learning, computer vision, and generative modelling, complemented by the development of open-source research software and the collection and analysis of behavioural data. Strong track record of international collaboration and supervision of student theses.

## EDUCATION

**PhD in Physics** | Goethe University Frankfurt, Germany **2026**

- Thesis: Learning Active Perception through Abstraction
- Supervisor: Prof Dr Jochen Triesch • Grade: 1.0 (*Magna cum laude*)
- Topics: Developmental AI, Reinforcement learning, Intrinsic motivations, Variational autoencoders, Generative models, Active Efficient Coding, Aesthetics, Sensorimotor Control

**MSc in Cognitive Science** | Universidad de la República, Uruguay **2021**

- Thesis: On the Spatial Representation of Numbers
- Supervisor: Prof Dr Andrés Pomi • Grade: 11.5/12 (*Summa cum laude*)
- Topics: Decision-making, Drift diffusion, Numerical cognition, Associative memories

**BSc in Physics** | Universidad de la República, Uruguay **2016**

- Thesis: Seismic Wave Propagation in Granular Materials
- Supervisor: Prof Dr Gonzalo Tancredi • Grade: 10.6/12 (*Summa cum laude*)
- Topics: Material physics, Asteroid modelling, Particle-based numerical simulations

## RESEARCH EXPERIENCE

**Postdoctoral Fellow** | UNSW Sydney, Australia **2026–Present**

- Develop developmentally inspired reinforcement learning methods for robotics, including infant-like coloured exploration noise for robot manipulation.
- Develop real-time infant 3D pose estimation for neurodevelopmental assessment.
- Establish international collaborations, contribute to grant proposals, and supervise students.

**Postdoctoral Researcher** | FIAS, Germany **2025–2026**

- Developed computer vision and generative modelling pipelines for analysing infant spontaneous movements and generating synthetic behavioural data in virtual embodiments.
- Applied variational generative models to model human aesthetics through processing fluency.

**Doctoral Researcher** | FIAS, Germany **2021–2025**

- Implemented computational models of self-calibrating active perception combining reinforcement learning and generative models within the Active Efficient Coding framework.
- Co-developed MIMo, an infant simulation platform, and related tools for developmental AI.

**Research Assistant** | Universidad de la República, Uruguay **2019–2021**

- Developed and validated a digital tool for screening mathematical abilities in children.
- Collaborated with school teachers and government stakeholders in interdisciplinary projects.

## SUPERVISION

**Master's Theses** | UNSW Sydney, Australia 2026
- **Computer Science**: Hongkun Yu, Qijia Zhou, Haoyang Feng

**Master's Theses** | Goethe University Frankfurt, Germany 2022–2026
- **Computer Science**: Dustin Eisenhardt, Patrick Melnick, Leon Philipp, Lukas Henssler
- **Physics**: Marcel Raabe, Theresa Lundbeck

**Bachelor's Theses** | Goethe University Frankfurt, Germany 2022–2026
- **Computer Science**: Mitra Hani, Markus Oldenburger, Miles Lenz, Lennart Darge

## TEACHING

**Artificial Intelligence (Master's)** | UNSW Sydney, Australia 2026

**Reinforcement Learning (Master's)** | Goethe University Frankfurt, Germany 2025

**Introductory Physics (Bachelor's)** | Universidad de la República, Uruguay 2017

## ACADEMIC SERVICES

**Competition Chair** | BabyBench Competition, IEEE ICDL 2025

**Workshop organiser** | Development of Embodied Cognition (DECO), IEEE ICDL 2025

**Reviewer** | Frontiers in Neuroinformatics, Machine Learning, Artificial Intelligence Review, IEEE TCDS, IEEE ICDL, IEEE RO-MAN, NeurReps@NeurIPS, CCN

## RESEARCH FUNDING

**Engineering Research Initiative** | UNSW Sydney, Australia 2026
- Co-authored successful grant proposal supporting a short-term postdoctoral fellow position.
- Amount: AUD 64,864 (approx. USD 46,000).

**Graduate Research Scholarship** | ANII, Uruguay 2019
- Authored successful grant supporting a one-year Master's thesis research scholarship.
- Amount: UYU 396,816 (approx. USD 10,000).

## HONOURS AND AWARDS

**Early Career Researcher Award** | Architecting Intelligence (AI:CogDev) 2026

**BabyBot Paper Award winner** | IEEE ICDL 2026

**BabyBot Paper Award winner** | IEEE ICDL 2025

**Travel grant** | Southern Workshop on Granular Materials, Chile 2015

## TECHNICAL SKILLS

**Machine learning** | Reinforcement learning, deep learning, generative modelling, unsupervised representation learning, computer vision, pose estimation, motion retargeting

**Scientific Computing** | Python, PyTorch, Tensorflow, JAX, OpenCV, Matlab, Julia, R

**Simulation & Experimentation** | MuJoCo, Gymnasium, Isaac Sim, Blender, jsPsych

**Research** | Linux, Bash, Git, High-performance computing (SLURM/PBS), LaTeX

**Languages** | Spanish (native), English (fluent), French (fluent), Portuguese (fluent)

## SELECTED PUBLICATIONS

**López, F. M.**, Shi, B.E, & Triesch, J. (2026). How Self-Generated Action Shapes Perception. Under review in *Current Opinion in Neurobiology*.
**López, F. M.** & Triesch, J. (2026). Beauty is in the ELBO of the Beholder: A Variational Account of Processing Fluency in Face Perception. In *Proceedings of Machine Learning. Symmetry and Geometry of Neural Representations*. In press.
**López, F. M.**, & Cruz, F. (2026). Can Hindsight Critics Guide Delayed Actors? In *2026 Australasian Joint Conference on Artificial Intelligence*. In press.
**López, F. M.**, Ernst, M.R., Cruz, F., Hoffman, M., & Triesch, J. (2026). Infant Spontaneous Movement Noise Improves Exploration in Deep RL. In *2026 IEEE International Conference on Development and Learning*. In press.
**López, F. M.**, Kanazawa, H., Fiala, O., Balashov, Y., Marcel, V., Rustler, L., Lenz, M., Kim, D., Kuniyoshi, Y., Triesch, J., & Hoffmann, M. (2026). Simulating Infant First-Person Sensorimotor Experience via Motion Retargeting from Babies to Humanoids. In *2026 IEEE International Conference on Development and Learning*. In press.
**López, F. M.**, Shi, B.E, & Triesch, J. (2026). Efficient Coding in Active Perception: A Developmental Perspective on Autonomous Control. *Advances in Child Development and Behavior*, 70, 117-156.
**López, F. M.**, Lenz, M., Fedozzi, M. G., Aubret, A., & Triesch, J. (2025). MIMo grows! Simulating body and sensory development in a multimodal infant model. In *2025 IEEE International Conference on Development and Learning*. 1-6.
**López, F. M.**, & Triesch, J. (2025). Hierarchical Residuals Exploit Brain-Inspired Compositionality. In *2025 European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning*. 237-242.
**López, F. M.**, & Pomi, A. (2024). Inhibitory dynamics in dual-route evidence accumulation account for response time distributions from conflict tasks. *Cognitive Neurodynamics*, 18(4), 1507-1524.
**López, F. M.**, de León, D., Díaz-Simón, N., & Maiche, A. (2022). Development of Mathematical Cognition: The Role of Technology in Low-SES Populations. In *Cognitive Sciences and Education in Non-WEIRD Populations: A Latin American Perspective*, 169-184.

## SELECTED PRESENTATIONS

**López, F. M.** & Hoffmann, M. (2026). Miminko: A Physics-Grounded Synthetic Infant Video Generator. In workshop *Architing Intelligence (AI:CogDev)*. Contributed talk.
**López, F. M.** & Triesch, J. (2025). Leveraging Touch-Based Exploration in a Multimodal Infant Model. In workshop *Gaining Control of the Hands for Goal-directed Action: Development and learning*. Invited talk.
**López, F. M.** & Triesch, J. (2025). The Beauty of Compression: Explaining Attractiveness and Other Human Facial Judgments with Unsupervised Learning. In *2025 European Conference on Visual Perception*. Contributed talk.
**López, F. M.**, Massmann, J., & Triesch, J. (2023). A computational model of accommodation control exploiting chromatic aberration. In *2023 European Conference on Visual Perception*. Contributed poster.

## ACADEMIC REFERENCES

**Prof Jochen Triesch**, Frankfurt Institute for Advanced Studies, triesch@fias.uni-frankfurt.de
**Prof Matej Hoffmann**, Czech Technical University in Prague, matej.hoffmann@fel.cvut.cz
**Prof. Bertram E. Shi**, Hong Kong University of Science and Technology, eebert@ust.hk
**Dr Francisco Cruz**, University of New South Wales, f.cruz@unsw.edu.au