Mayalen Etcheverry

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Research Interests

Machine Learning • AI for Science • Complex systems • Healthcare • Open-Endedness

Education

INRIA, Flowers team | Poietis company — Bordeaux, FR
Ph.D. in Machine Learning, Advisors: Dr. Pierre-Yves Oudeyer, Dr. Clément Moulin-Frier, Dr. Marc Nicodeme — 2020–2023

- Thesis: *"Curiosity-driven AI for Science: Automated Discovery of Self-Organized Structures"* Defended on November 16, 2023 [Manuscript] [Slides] [Video]

University College of London (distinctions, GPA: 4.0) — London, GB
M.Sc. in Computer Vision, Computer Graphics and Imaging — 2016–2017

- Thesis: *"Making parametric models of buildings easier to edit by predicting future edit patterns in the Open3D platform"*, Thesis Supervisor: Dr. Paul Guerrero

Télécom Paris, Top-ranked French school in digital technologies **(GPA: 3.6)** — Paris, FR
M.Eng. in Computer Graphics (major) and Data Science (minor) — 2014–2017
B.Sc. in Computer Science

Engineering School Preparatory Classes (GPA: 3.8) — Bordeaux, FR
Undergraduate program in mathematics and physics to prepare the national competitive entrance exams to the *Grandes écoles* — 2012–2014

Research Work Experience

Tufts University, Allen Discovery Center The Levin Lab — Boston, USA
Visiting scholar, Advisor: Dr. Michael Levin — aout –dec 2022

- Development of software tools for efficient simulation and optimization of gene regulatory networks models in JAX
- Development of curiosity-driven algorithms to reveal diverse behavioral competencies of gene regulatory networks

Poietis, in the R&D team — Pessac, FR
Doctoral Researcher under CIFRE contract, Supervisor: Dr. Marc Nicodème — 2020 –2023

- Identification of the opportunities afforded by curiosity-driven machine learning approaches for applications in synthetic and regenerative biology, with 3 specific use-cases for Poietis bioprinting technology
- Development of a proof of concept use-case in the SimCells simulator (Python, Java, OpenCL)
- Development of a web platform to gather data collected by biologists during experimental campaigns (Flask)

INRIA, in the Flowers project-team — Bordeaux, FR
Research Engineer, Supervisor: Dr. Pierre-Yves Oudeyer — 2019 –2020

- Unsupervised representation learning for intrinsically-motivated exploration of complex systems in Pytorch

- Development of a modular and dynamic network architecture where a hierarchy of behavioral characterization spaces is progressively constructed, allowing flexible representations and intuitive guidance during the discovery process

Siemens Healthineers, in the R&D team Princeton, USA
Research Scientist Intern, Supervisor: Dr. Bogdan Georgescu and Dr. Sasa Grbic 2017-2018

- Deep Learning for organ segmentation in 3D CT Scans: responsible for implementing the preprocessing/training/evaluation pipeline for 10 organs - practical experience with Pytorch and large databases
- Research and development of a deep reinforcement-learning algorithm for localizing anatomical structures in 3D images

Publications

** stands for equal contributions*

Peer-Reviewed

[1] **M. Etcheverry**, C. Moulin-Frier, P.-Y. Oudeyer, and M. Levin, *AI-driven Automated Discovery Tools Reveal Diverse Behavioral Competencies of Biological Networks*, Accepted at **eLife journal** **[Paper]** **[Executable Paper]** **[Tutorials]** **[Code]**, 2024.

[2] **M. Etcheverry**, M. Levin, C. Moulin-Frier, and P.-Y. Oudeyer, *SBMLtoODEjax: Efficient simulation and optimization of ODE SBML models in JAX*, Accepted at **AI4Science Workshop - NeurIPS 2023** **[Paper]** **[Code]** **[Documentation]** **[Tutorials]**, 2023.

[3] E. Plantec, G. Hamon, **M. Etcheverry**, P.-Y. Oudeyer, C. Moulin-Frier, and B. W.-C. Chan, *Flow-Lenia: Towards open-ended evolution in cellular automata through mass conservation and parameter localization*, Accepted at **ALIFE 2023 with Best Paper Award** **[Paper]** **[Website]** **[Notebook]**, 2023.

[4] **M. Etcheverry**, C. Moulin-Frier, and P.-Y. Oudeyer, *Hierarchically organized latent modules for exploratory search in morphogenetic systems*, Accepted at **NeurIPS 2020 with Oral presentation** **[Paper]** **[Website]** **[Oral]** **[Poster]** **[Code]**, 2020.

[5] C. Reinke*, **M. Etcheverry***, and P.-Y. Oudeyer, *Intrinsically Motivated Discovery of Diverse Patterns in Self-Organizing Systems*, Accepted at **ICLR 2020 with Oral presentation** **[Paper]** **[Blogpost]** **[Website]** **[Oral]** **[Code]**, 2020.

[6] **M. Etcheverry**, P.-Y. Oudeyer, and C. Reinke, *Progressive growing of self-organized hierarchical representations for exploration*, Accepted at **BeTR-RL Workshop - ICLR 2020** **[Paper]** **[Oral]**, 2020.

[7] **M. Etcheverry**, B. Georgescu, B. Odry, T. J. Re, S. Kaushik, B. Geiger, N. Mariappan, S. Grbic, and D. Comaniciu, *Nonlinear adaptively learned optimization for object localization in 3d medical images*, Accepted at **DLMIA Workshop - MICCAI 2018**, as well as **MED-NeurIPS Workshop - NeurIPS 2018** **[Paper]** **[Poster]**, 2018.

Preprints

[8] G. Hamon*, **M. Etcheverry***, B. W.-C. Chan, C. Moulin-Frier, and P.-Y. Oudeyer, *Discovering sensorimotor agency in cellular automata using diversity search*, **In Submission** **[Paper]** **[Blogpost]** **[Website]** **[Notebook]** **[Code]**, 2023.

[9] **M. Etcheverry**, B. W.-C. Chan, C. Moulin-Frier, and P.-Y. Oudeyer, *Meta-diversity search in complex systems, a recipe for artificial open-endedness?*, **GECCO 2021 Competition, Runner-up Prize** **[Video]** **[Blogpost]**, 2021.

Patents

[10] **M. Etcheverry**, B. Georgescu, S. Grbic, D. Comaniciu, B. L. Odry, T. Re, S. Kaushik, B. Geiger, and M. S. Nadar, *Adaptive nonlinear optimization of shape parameters for object localization in 3d medical images*, **[US Patent App. 16/270,918]**, 2019.

Communications

- Ph.D. Defense - *"Curiosity-driven AI for Science: Automated Discovery of Self-Organized Structures"* (Bordeaux) **[Video]**
  Jury: Pr. Alan Aspuru-Guzik, Pr. Sebastian Risi, Pr. Melanie Mitchell, Pr. Jeff Clune, Dr. Nicolas Brodu — nov 2023
- Invited talk - From Cells to Societies, Collective Learning across Scales - ICLR Workshop (online) **[Video]**
  Panel Discussion with Alexander Mordvinstev and Pr. Richard A. Watson — april 2022
- Interview with Dr. Nicholas Guttenberg about my work (online) **[Transcripts]** — feb 2022
- Oral presentation and poster, NeurIPS 2020 (online) **[Video]** **[Poster]** — dec 2020
- Oral presentation - Beyond "tabula rasa" in reinforcement learning - ICLR 2020 Workshop (online) **[Video]** — april 2020
- Poster - Deep Learning in Medical Image Analysis - MICCAI 2018 Workshop (Granada) **[Poster]** — sep 2018

Grants and Awards

- Jean Walter Zellidja Mobility Research Scholarship, given by French Academy (Prize: 3700€) — 2022
- UBGRS Mobility Research Scholarship, given by Bordeaux University (Prize: 4000€) — 2022
- Runner-up prize at the Minecraft open-endedness challenge holded at GECCO 2021 (Prize: 500$) — 2021
- "Coup de coeur" prize for poster submission at stereotype busters national competition (Prize: 100€) — 2016

Open-source Projects

- **Sketch-Transformer**: tutorial about augmenting and training a decoder-only transformer network architecture, from scratch in Pytorch, to learn to generate human-like sketches as a sequence of strokes
- **AutoDiscJax**: software for automated exploration of biological network models in JAX, together with associated tutorials
- **SBMLtoODEjax**: software for converting SBML models in python classes written end-to-end in JAX, together with associated documentation and tutorials
- **AdTool**: interactive software for automated discovery of patterns in the exploration of complex systems
- **EvoCraftSearch**: source code fo my participation to the MineCraft open-endedness challenge in GECCO 2021
- **HOLMES**: source code fo the NeurIPS 2020 paper, together with the associated webpage
- **Automated Discovery of Patterns in Lenia**: source code for the ICLR 2020paper, together with the associated webpage

Academic Services

- Co-organized the second Agent Learning in Open-Endedness Workshop at NeurIPS 2024 [Website]
- Reviewer
  - ICML 2024 (reviewed 3 workshop proposals)
  - ALife 2024 (reviewed 1 paper)
  - NeurIPS 2023 ALOE workshop (reviewed 2 papers)
  - Applied Intelligence journal (reviewed 2 papers)

Skills

- **Programming:**
  - Python, PyTorch, Jax
  - C++, OpenGL, Matlab, Qt
  - Flask, HTML, CSS, JavaScript
  - Bash, Slurm
  - Git
- **Typesetting:** LaTex
- **Operating Systems:** Linux / macOS

Languages

- **French:** native speaker
- **English:** advanced
  - **TOEFL:** score of 102/120
- **Spanish:** advanced
  - **OIB:** International Option Baccalaureate with Honors
- **Serbo-Croatian:** elementary

Mentorship

- Supervision of master-level 6 months research internships (Gautier Hamon, Erwan Plantec)
- Supervision of license-level 3 months research internships (Marion Schaeffer, Lucie Galland, Théo Goix)
- Scientific mediation and mentoring for high-school student girls