Malo de Pastor

Paris, France | depastorm@gmail.com
malodept.github.io | github.com/malodept

Research interests

World models, robot learning, mathematical foundations of representation learning, physical reasoning and transfer across tasks and embodiments.

Research experience

European Space Agency (ESA), Phi-lab Explore Office, ESRIN Mar. - Aug. 2026

Research intern in onboard AI and Earth observation, Frascati, Italy

Supervisors: Gabriele Meoni and Nicolas Longépé.

PhiSatNet: Designed the decision layer of a shared-encoder, multi-decoder architecture to select tasks using scene evidence, geographic priors, mission objectives and onboard resource constraints. Integrated dynamic inference with the NanoSat MO Framework and OpenVINO on Intel Myriad 2 hardware. Co-first-author journal manuscript in preparation.

Phiesta: Developed a Python API for satellite products, sensor geometry and dataset preparation, and a cross-sensor registration pipeline for PhiSat-2 and Sentinel-2.

SARLAND: Led a benchmark on spatial detail in radar representations. First-author contribution accepted at the **NeurIPS 2026 REO-2 workshop**.

Independent research in world models 2026 - present

Representation learning, physical control and decision-making

Predictive representations and decision sufficiency. Mathematical bounds for JEPA-style prediction and nonlinear examples separating predictive performance from decision sufficiency.

Decision-oriented memory and physical mechanisms. Compact memory for contact-rich control under partial observability; regret analysis and controlled MuJoCo experiments.

Adaptive world-model planning. Paired exact-reset protocols, action-conditioned prediction, adaptive computation and active observation acquisition. Experiments with JEPA-WM and DINO-WM under matched planning protocols.

Independent mathematical research 2026 - present

Constrained invertibility and multiparameter persistence

Structural rank, support-graph expansion and algebraic and combinatorial problems related to the stability of persistence module decompositions. Formalization of selected reductions in Lean 4/Mathlib.

Education

Télécom SudParis, Institut Polytechnique de Paris 2023 - 2026

Engineering degree programme (MSc equivalent), High-Tech Imaging

Machine learning, computer vision, optimization and systems programming. Final project: Mamba-based models for 3D brain MRI segmentation (Nicolas Rougon).

Chinese University of Hong Kong Fall 2024

Academic exchange

Nonlinear Control Systems (Jie Huang), Design for Additive Manufacturing, Remote Sensing Image Analysis and Theoretical Astrophysics.

Lycée Pasteur, Neuilly-sur-Seine 2020 - 2023

CPGE MPSI/MP, computer science option

Selected graduate coursework

MVA, ENS Paris-Saclay (external auditor): Geometry Processing and Geometric Deep Learning; Optimal Transport for Machine Learning.

Sorbonne Université (external auditor): Algebraic Topology of Manifolds I (Ilia Itenberg). **Université Paris Cité (independent study):** Homotopy II (Najib Idrissi).

Selected publications and manuscripts

M. de Pastor, K. Pillalamarri and V. Marsocci. *SARLAND: When Spatial Detail Matters in Very-High-Resolution SAR.* REO-2, **NeurIPS 2026** workshop. Accepted. Workshop.

M. de Pastor. *Paired Exact-Reset Evaluation of a Prediction-Derived Medium-to-Full World-Model Cascade.* arXiv:2608.14650, 2026.

PhiSatNet: Enhanced Onboard Autonomy, Versatility and Performance for EO Mission by Geospatial Foundation Models. Journal manuscript in preparation; co-first author.

Selected presentation

Ambipolar Diffusion and Turbulence in Molecular Clouds. One-hour presentation on ion-neutral decoupling, magnetohydrodynamic turbulence and magnetic-field measurements in M17 and NGC 6334, CUHK, December 2024.

Additional professional experience

French Transport Regulatory Authority (ART) (Jun. - Aug. 2024): Data engineering intern; Python/SQL workflows.

Mathematics tutor (2022 - present): Individual and group mathematics tutoring.

Technical skills and interests

Scientific computing: Python, PyTorch, NumPy, DINO, V-JEPA, MuJoCo, PyBullet, CEM/iCEM, MPC, Lean 4, GPU/HPC. **Software:** C/C++, Java, SQL, Git, Linux, OpenVINO, NanoSat MO Framework, Jetson Nano, Arduino, Raspberry Pi.

Languages: French (native), English (advanced). **Interests:** Competitive tennis, trail running, FPV drones, piano and judo.