Thibaut CHAUFFIER

ML Research Engineer | Generative AI · Diffusion Models · Physics-Informed ML

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Profile

> ML Research Engineer who builds research-grade generative AI and ships it to millions of users. A decade turning the state of the art — *Latent Diffusion Models*, *3D Gaussian Splatting*, *self-supervised foundation models* — into production systems, backed by an engineering-physics foundation that shows in the work. **ICCV 2025 Oral** co-author and technical lead.
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> **Research interests** — generative models, 3D scene representations, physics-informed ML, and AI-accelerated simulation.

Publications & Patents

- *Locally Controlled Face Aging with Latent Diffusion Models*. **ICCV 2025 P13N (Personalisation) Workshop, Oral.** Co-author. arXiv:2507.21600
- **5 granted patents** in ML-driven robotics (Gaussian-process active-learning self-calibration), automated data acquisition, and computer vision for cosmetic applications.

Experience

Senior ML Research Engineer — Technical Lead, AI & Computer Vision

Jan 2022 -- Present

L'Oréal · Paris, FR

Generative Models & 3D Scene Representations

- Designed and trained a custom **Latent Diffusion Model** for spatially controllable face aging with efficient spatial conditioning; enables real-time generation on iPad Pro. **(ICCV 2025 P13N Workshop, Oral)**
- Developed a **self-supervised foundation model** for semantically rich facial representations, enabling zero-shot transfer across downstream tasks including attribute recognition, skin segmentation, and age estimation.
- Built a novel **2D/3D Gaussian Splatting + FLAME** pipeline for high-fidelity facial capture and reconstruction, combining a physics-based parametric face model with learnable Gaussian primitives, optimised for production deployment.

Physics-Informed ML & Surrogate Modelling

- Deployed low-latency **ViT/CNN-based** skin tone detection and optical shade matching (*eShadefinder*) globally across 9 L'Oréal brands on mobile and web, serving millions of users.
- Designed and deployed **Kubelka–Munk physics-based ML surrogate models** for targeted colour formulation across lipstick, hair colour, and foundation. Coupled optical physics equations with neural predictors to replace costly iterative lab experiments with real-time, ML-guided inverse design — validated against industry colour-science standards.

Data Pipelines, Production & MLOps

- Built and maintained large-scale **automated data generation and curation pipelines** for model training and evaluation across multiple product lines.
- Architected a high-performance **model serving pipeline** (FastAPI, Docker, ONNX) achieving sub-100 ms inference for real-time product recommendations at global scale.

ML Engineer — ML Systems & Robotics

Aug 2017 -- Jan 2022

L'Oréal · Paris, FR

- Designed an **ML-powered self-calibration system** for a formulation robot using **Gaussian Process Regression**

with active learning and iterative surrogate modelling to minimise experimental campaign cost. Reduced material waste by **71%** and machine downtime by **83%**.

- Restructured the embedded software team and led safety compliance certification for robotic systems under strict industrial constraints.

ML Engineer — UAV Systems Jan 2016 -- Aug 2017
Civic Drone · Paris, FR

- Engineered a real-time fall and tilt detection system for UAVs using **multi-sensor fusion (Kalman filtering)** for fault-tolerant flight control.
- Boosted UAV propulsion efficiency by **44%** and cut power usage by **10%** through **ML-based optimisation and mechanistic aerodynamic modelling** — an early application of surrogate-driven system optimisation.

Selected Open-Source Projects

- diffusion-pytorch — **LDM and Flow Matching models** implemented from scratch in PyTorch, trained on AFHQ. **FID 33.9 (LDM) and 34.4 (Flow Matching)** at 50 DDIM steps, CFG = 3. Live in-browser demo via ONNX Runtime WebAssembly — no backend required.
- ChessTransformer — **11.7M-parameter Transformer** (Grouped Query Attention, chess-geometry relative position bias, AlphaZero-style 64×73 policy head) trained on elite Lichess games; paired with Monte Carlo Tree Search (MCTS). Reaches ~**2100 Elo** (1200 sim/move vs Stockfish, 100-game gauntlet). Full-stack deployment: FastAPI + Next.js, Dockerised.
- rust-raytracer — Physically-based path tracer in Rust with three backends: CPU, offline GPU (compute shaders, 10–100× over CPU), and real-time GPU (30–60 FPS). BVH acceleration, HDR environment maps, progressive denoising; compiled to WebGPU/WASM for in-browser rendering. **87 GitHub stars**.
- medium.com/@thibaut.chauffier — Technical articles on generative AI and applied ML.

Education

Université de Technologie de Compiègne (UTC) · Sorbonne University Alliance Sept 2010 -- Aug 2015
Engineering degree in **Mechanical & System Engineering** (MSc equivalent)

Relevant coursework — Finite Element Analysis (FEA), Structural Mechanics, Multi-Physics Modelling, Computational Methods, Mathematics, Statistics, Mechatronics.

Skills

Generative AI	Latent Diffusion Models (LDM, DDPM/DDIM), Flow Matching, Score-based Models, Classifier-Free Guidance (CFG), VAEs, GANs, ControlNet-style conditioning, fine-tuning (LoRA, DreamBooth, PEFT).
ML / AI	Transformers, Self-Supervised Learning, Foundation Models, Multimodal Models, Representation Learning, Zero-shot Transfer.
DL Frameworks	PyTorch, TensorFlow, HuggingFace (Transformers, Diffusers).
3D & Geometry	3D Gaussian Splatting, FLAME morphable models, mesh-based geometry, 3D generative models, digital twins.
Performance & MLOps	CUDA (basics), ONNX, model serving, edge inference, distributed training, model distillation, quantisation / pruning, GCP / VertexAI, Docker, CI/CD.
Systems & Infra	Linux, Python (expert), Rust (intermediate).
Management	Research project management, client communications, team leadership, cross-functional collaboration, Agile.
Languages	French (native), English (fluent).