

Ali Aouf

Machine Learning Engineer & Researcher — Generative AI

Mol, Belgium | ali.aouf.ab@gmail.com | linkedin.com/in/40uf411 | github.com/40uf411 | [Google Scholar](https://scholar.google.com/citations?user=40uf411)

PROFILE

Machine learning engineer and researcher finishing a PhD in deep generative models (diffusion, flow matching, GANs), with five years building and shipping ML systems across materials science, medical imaging and oil & gas. Author of nine peer-reviewed publications. Comfortable owning a problem end to end — research design, production engineering and full-stack delivery — and leading a small team through it.

EXPERIENCE

Doctoral Researcher — Deep Generative Models

Apr 2023 — Present

SCK CEN, in collaboration with UCLouvain

Mol, Belgium

- Built deep generative models that synthesise 3D microstructures from 2D cross-sections, removing the need for costly 3D tomography in porous-media characterisation.
- Designed two generative methods: a diffusion-adversarial model scoring denoising transitions, and a flow-matching model whose decomposed noise prior enables cross-volume diversity, spatial porosity control, and reference-quality sampling in 8 function evaluations via two-stage reflow.
- Wrote a Numba-accelerated D3Q19 lattice-Boltzmann solver for permeability and diffusivity benchmarking — validated to within 0.2% of the analytic square-duct solution, roughly 220× faster than a naive implementation.
- Ran a unified benchmark across five materials (clays, a carbonate, a sandstone), standardising an evaluation protocol that had been inconsistent across the literature.
- Built GPU-cluster training pipelines with Weights & Biases / Comet ML logging, and a 3D tool for visualising flow-matching ODE trajectories.

Team Lead — Machine Learning

Jul 2022 — Mar 2023

Smart Drilling Operations

Algiers, Algeria

- Built **SmartWells** from scratch and maintained it throughout: a role-based web platform for logging drilling, workover and snubbing operations, with daily activity and cost entry, an interactive well map, a well schematic viewer, a KPI dashboard, and a generator producing seven report types. Designed for offline entry at the rig with automatic sync to central servers.
- Ran the rate-of-penetration optimisation work end to end — feasibility study, model development, and supervision of interns delivering supporting components.
- Supervised and code-reviewed the **Gazoil** fuel-monitoring product, extended from the SmartWells codebase: tank-level tracking, refill history, consumption analysis over noisy sensor data, and forecasting.
- Led a small engineering team: technical direction, code review, and mentoring interns through their first production work. Represented the company at industry events, including the Social and Economic Forum in Algiers (Feb 2023), as the main technical contact for client demonstrations.

Machine Learning Engineer

Oct 2021 — Feb 2023

Alpha Computers SPA

Algiers, Algeria

- Built a real-time drilling data acquisition and processing system: ingestion and storage of rig data, standardisation of LAS/DLIS and legacy formats to WITSML 2.0, and streaming to clients over the Energistics ETP protocol.
- Led a joint project with **CERIST** (Algiers) on a sensory-substitution navigation aid for visually impaired users, based on my own research into neuroplasticity. Built the models converting visual input into auditory and haptic modalities and acted as the technical link between the company and the lab. The software worked; hardware availability was the blocker.
- Delivered conversational ML systems for insurance clients, including a Rasa-based claims and policy-advisory assistant handling guided and open-ended dialogue.

Research Intern — Medical Imaging

Feb — Oct 2021

CDTA, Centre for Development of Advanced Technologies

Algiers, Algeria

- Designed **O-Net**, a convolutional architecture for automatic segmentation of COVID-19 lesions in chest CT — U-Net with a second upsampling channel, minus the costly inter-channel skip connections. 476K parameters against U-Net's 31M, converging in a quarter of the epochs, at Dice 0.866 and better cross-scanner generalisation.
- Owned model implementation and evaluation across three public CT corpora; work published in *Computers & Graphics* and at IEEE ISPA.

EDUCATION

PhD in Artificial Intelligence — Deep Generative Models for 3D Microstructure Synthesis

2023 — 2026

UCLouvain, in collaboration with SCK CEN
Thesis submitted; public defence October 2026.

Louvain-la-Neuve, Belgium

MSc, Smart Computational Systems — graduated with honours

2019 — 2021

USTHB, University of Science and Technology Houari Boumediene

Algiers, Algeria

BSc, Computer Science — top 5 of class

2016 — 2019

University of Constantine 2 Abdelhamid Mehri

Constantine, Algeria

TECHNICAL SKILLS

Generative & deep learning	Diffusion (DDPM/DDIM), flow matching, GANs, VAEs, transformers, LLMs
Frameworks	PyTorch, TensorFlow, Keras, Hugging Face, scikit-learn, OpenCV
LLM engineering	Fine-tuning, RAG, agentic workflows, vLLM, self-hosted inference
Engineering & MLOps	Python, Go, Java, JavaScript/React, FastAPI, Docker, Keycloak/OIDC, GPU-cluster training, W&B / Comet ML, model serving
Data	PostgreSQL, MySQL, Redis, Apache Spark, Numba/CUDA

LANGUAGES

Arabic (native) | English (fluent, IELTS) | French (fluent) | Spanish (intermediate) | Dutch (elementary, improving)

SELECTED PUBLICATIONS

Aouf A, Laloy E, Rogiers B, De Vleeschouwer C. *Reconstruction of 3D multiphase microstructures using denoising diffusion models*.

Computational Geosciences, Springer Nature, 2026.

Aouf A, Laloy E, Rogiers B, De Vleeschouwer C. *3D clay microstructure synthesis using denoising diffusion probabilistic models*.

Applied Computing and Geosciences, 2025.

Zahrán H, Zinovev A, Terentyev D, Aouf A, Wahab MA. *Low cycle fatigue life prediction for neutron-irradiated and non-irradiated RAFM steels via machine learning*.

Fusion Engineering and Design, 2025.

Amara K, Aouf A, Kennouche H, et al. *COVID-19: A virtual rendering of a novel NN architecture O-Net for COVID-19 CT-scan automatic lung lesions segmentation*.

Computers & Graphics, Elsevier, 2022. — 39 citations

Amara K, Aouf A, Kerdjidi O. *Augmented reality for COVID-19 aid diagnosis: CT-scan segmentation based on deep learning*.

IEEE ISPA, 2022. — 19 citations

Aouf A. *Basic Arabic Vocal Emotions Dataset (BAVED)*.

2019. — 11 citations

Nine publications, approx. 90 citations. Talks and posters at InterPore 2026, GeoStats 2024 and RFIAP 2024. Full list on Google Scholar.

SELECTED PERSONAL PROJECTS

MOVET / NewsForge — Multilingual news-to-narrative platform. LLM pipeline ingesting 405 sources across 37 languages, structured through an Article → Claim → Event → Thread ontology with cross-document event coreference and cross-lingual merging.

Document OCR service — Entity extraction from phone-camera photographs of official identity documents in mixed Arabic and Latin script, with an image-quality gate, per-document JSON schemas, and self-hosted vLLM inference under a data-residency constraint.

SaharaAI — ML-as-a-service platform for data-sovereign deployment: self-hosted inference and multi-tenant service design on FastAPI, Keycloak, PostgreSQL and React.