

Mojtaba Alehosseini

+39 351 353 8844 · alehoseini.mojtaba@gmail.com · linkedin.com/in/mojtaba-alehosseini · github.com/Mojtaba-Alehosseini

PROFILE

AI engineer and data analyst who builds machine-learning systems from the data pipeline to the trained model and the dashboard on top. Recent work covers **diffusion transformers, self-supervised representations, U-Net segmentation on geospatial data, retrieval-augmented LLM tools, multi-agent systems in JADE and Prolog, and CUDA kernels**. Works daily with **Claude Code, agent skills and MCP tooling** as part of the engineering workflow. Four years of business-intelligence and systems work in industry, co-founder of a 100-GPU compute operation kept online for 28 months, and co-author of a 2026 review in Advanced Healthcare Materials (Q1). M.Sc. Computer Science, Artificial Intelligence curriculum, University of Genoa.

PUBLICATION

Intelligent Orthopedics: Machine Learning in Diagnosis of Bone Disease, Implants, and Bone Health Monitoring

Advanced Healthcare Materials (Wiley, Q1), 2026, e71447 · doi.org/10.1002/adhm.71447 · peer-reviewed, open access
Kamaei M., Mohammadi H., Golafshan S., **Alehosseini M.**, Mohammadzadeh M., Golshirazi A., Golafshan N., Eufrazio-da-Silva T., Dolatshahi-Pirouz A., Orive G.

My part: co-wrote the machine-learning section, covering problem formulation and learning paradigms, imaging-data identification and preprocessing, model selection and training, and evaluation and interpretability, applied to bone-disease diagnosis, patient-specific implant design and bone-healing prediction.

PROJECTS

RAE-DiT: Diffusion Transformers with Representation Autoencoders · Deep Learning, University of Genoa, 2026

Scaled reproduction of NYU's RAE-DiT (arXiv 2510.11690) on a single P100: frozen DINOv2-B encoder with register tokens, pretrained ViT-XL decoder, and a 196M-parameter DiTDH-S diffusion transformer trained with flow matching on cached $768 \times 16 \times 16$ latents. Implemented the dimension-dependent noise-schedule shift ($\alpha = 6.93$), classifier-free guidance with label dropout, EMA weights and a warm-up plus cosine schedule; verified no overfitting with a paired held-out loss; isolated the schedule claim in a seeded three-way ablation scored by FID (111.99 unguided, 105.83 guided). Side study: SigLIP 2's three-objective recipe (sigmoid contrastive, captioning, EMA self-distillation) reimplemented in PyTorch. 13-page report, every number traceable to a notebook cell.

Scoria-cone detection on digital elevation models · Computational Vision, University of Genoa, 2026

Geospatial computer-vision pipeline that turns single-channel digital elevation models of Etna (2 m) and El Hierro (5 m) into an eight-channel representation (slope, dual-azimuth hillshade, sin/cos aspect, multi-scale curvature, roughness, texture shading), then segments cone bases and crater rims with a ResNet-34 U-Net (Dice plus weighted cross-entropy, rotation augmentation, geographic splits) against a LoG, Hough and watershed baseline, scored with tile-bootstrap confidence intervals and instance-level F1. Recovered per-vent fissure azimuths from predicted craters and validated them against 171 ground-truth azimuths with axial statistics ($p < 1e-5$); Monte Carlo test of field-scale alignments; cross-island transfer. rasterio, GeoPandas, PyTorch, Kaggle GPUs.

Port Command Genova · Symbolic and Distributed AI + Natural Language Processing, 2026 · GitHub: Port-Command

Port-management game commanded in plain English. Ten JADE agents (harbour master, tugs, terminals, customs, weather, assistant) plus vessel agents negotiate through FIPA performatives and Contract-Net auctions; every move is checked against a SWI-Prolog rule base of about 30 rules (berth compatibility, tug escort, weather safety, customs, priority); a Prolog DCG turns negotiation sentences into structured offers with a Rasa intent classifier as fallback; an OWL ontology holds the vocabulary; a local LLM (Phi-4-mini) explains each symbolic decision and is checked so it cannot add facts. Three scored scenarios, save and load, test suite. Java 21, SWI-Prolog with JPL, Python.

Parallel dense matrix multiplication · High Performance Computing, 2026 · GitHub: hpc-gemm-openmp-mpi-cuda

Double-precision GEMM as sequential (three loop orders plus cache blocking), OpenMP, MPI and CUDA (naive and shared-memory tiled) kernels, benchmarked on an i9-12900K, a Tesla T4 and a Tesla P100: MPI 6.47× over the best sequential kernel, CUDA on the P100 27.4×. Traced a 2.43× OpenMP swing on the hybrid P-core/E-core CPU to the scheduling clause, and showed the T4 loses to the CPU because of Turing's 1:32 FP64 rate, with predictions registered before the P100 run. 33-page report with Intel Advisor and Nsight profiles.

The Price of Europe · Data Visualization, 2026 · GitHub: The-Price-of-Europe

Scroll-driven data essay on the cost of living in Europe, 2019 to 2025: nine chapters and eleven hand-built D3 v7 charts (drag-to-compare choropleth, heatmap, waffle, race chart, diverging bars, box plot) on a reproducible Eurostat pipeline whose currency and unit filters catch silently stacked series; offline scripts recompute every figure the text claims; Playwright screenshot regression, Lighthouse and WCAG checks, dark theme, reduced motion. No framework, no build step.

The Augmented Museum · Augmented Reality, 2026

Unity 6 and AR Foundation app: multi-image tracking of five paintings, plane detection to stand a virtual guide on the floor beside each work facing the visitor, proximity-gated activation, information panels; XR Simulation, ARCore-ready. C#.

Applied ML portfolio · personal projects, 2026 · GitHub: Mojtaba-Alehosseini

NL-to-SQL with schema-aware retrieval and read-only guardrails (60 tests); LoRA fine-tuning with execution-accuracy evaluation; RAG with reranking (context precision 0.87 to 0.98); demand forecasting with rolling-origin backtests (WAPE 17% against 44% naive); recommender at 4× the popularity baseline; ONNX INT8 serving 2.6× faster than PyTorch; A/B-testing toolkit with CUPED; DVC, MLflow and GitHub Actions pipeline with a promotion gate.

SKILLS

Deep learning: diffusion models (DDPM, flow matching, classifier-free guidance, dimension-dependent noise schedules), diffusion transformers and adaLN conditioning, representation autoencoders, self-supervised learning (SimCLR, MoCo, BYOL, DINOv2), vision-language contrastive training (SigLIP), LoRA fine-tuning, U-Net segmentation, CNNs, RNN/LSTM, Transformers, model debiasing; mixed precision, EMA, FID evaluation; PyTorch, TensorFlow/Keras

Computer vision: geospatial raster representations (slope, hillshade, curvature), classical detection (LoG, Hough, watershed, SLIC), semantic segmentation, change detection and tracking, image matching (SIFT), 3D vision; OpenCV, scikit-image, rasterio

LLMs, NLP, agents: retrieval-augmented generation with vector search and reranking, LoRA fine-tuning, NL-to-SQL with guardrails, local LLMs (Ollama), agentic workflows with Claude Code, MCP servers and custom skills; HMM tagging, TF-IDF, seq2seq, attention, Rasa; JADE and FIPA Contract-Net, BDI, SWI-Prolog rule bases and DCGs, OWL, STRIPS planning

Data and analytics: time-series forecasting with rolling-origin backtests (LightGBM, SARIMA), recommender systems, A/B testing (power, SRM, CUPED, sequential tests), SHAP, D3 v7 data storytelling, Power BI and Power Query, SQL (PostgreSQL, SQLite), Eurostat and GitHub API pipelines

Systems, HPC, AR: CUDA (shared-memory tiling, roofline), OpenMP, MPI, Intel Advisor and Nsight; FastAPI, Docker, ONNX Runtime INT8, MLflow, DVC, GitHub Actions, Prometheus and Grafana, Linux; Unity 6, AR Foundation, ARCore

Languages: Python, SQL, Java, C/C++, CUDA C, C#, JavaScript, Prolog, MATLAB

EXPERIENCE

Setare Talae Co. (Patris Carpet), Delijan, Iran 2021 – 2025

Carpet and yarn manufacturer. Two roles, on site and then remote.

Business Technology Analyst (part-time; remote from 2024) 2023 – 2025

- Designed the Power BI reporting layer for sales, finance and supply chain on SQL and Power Query data models; routine reporting time fell by about 25%
- Replaced the manual spreadsheet demand forecast with a SQL and Power Query model; turned managers' questions into agreed KPIs and trained non-technical staff

IT Systems Administrator 2021 – 2022

- Ran the company's servers and office network on site

Riggosaurus, Iran 2020 – 2025

Self-founded GPU compute operation for Ethereum mining. Co-founder and infrastructure operator.

- Built and ran 20+ open-air rigs with 100+ NVIDIA and AMD GPUs across 11 models, kept online around the clock for 28 months with remote monitoring and alerting
- Tuned each GPU model for performance per watt and modelled electricity, hardware and pool economics

Pinfopedia, Iran 2018 – 2020

Co-founded start-up: a Persian-language product encyclopedia. Co-founder and software developer.

- Built the platform: relational schema, Flask back end and REST API, Celery and RabbitMQ background jobs, QR-code product labels

EDUCATION

M.Sc. Computer Science, Artificial Intelligence curriculum 2024 – Feb 2027 (expected)

University of Genoa (DIBRIS), Italy

Courses: Machine Learning, Deep Learning, Computational Vision, Digital Signal and Image Processing, Distributed Computing, High Performance Computing, NLP, Symbolic and Distributed AI, Data Visualization, Augmented Reality

B.Sc. Computer Science 2017 – 2022

Yazd University, Iran

Top 2% of nearly 500,000 candidates in the national entrance exam (2017); 3rd in the department (2021). Teaching assistant for Advanced Programming (2020) and Introduction to Programming (2019); secretary of the Computer Science Scientific Association (2018 – 2020)

Languages: Persian (native) · English (C1; TOEFL iBT 99, 2022) · Italian (A2, in progress)

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