

MATTEO LAI

Applied AI for Healthcare

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MatteoLai



PROFESSIONAL SUMMARY

Applied AI Scientist with a Ph.D. in Health and Technology, specializing in the development and evaluation of machine learning models for healthcare applications. Proven experience working with complex medical data and building reproducible, scalable ML pipelines, including deep learning and generative models (GANs, diffusion) for imaging and related domains. Author of peer-reviewed publications in international journals and conferences. Strong expertise in Python-based ML development (PyTorch, Docker), with a focus on data quality, model robustness, and scientifically sound evaluation. Motivated to apply AI methods across medical domains, bridging rigorous research practices with real-world deployment and responsible use in healthcare.

EXPERIENCE

Ph.D. researcher — Applied AI for Healthcare

University of Bologna

Nov 2022 – Oct 2025

Cesena, Italy

- Built reproducible end-to-end ML pipelines for medical imaging (2D/3D), covering data preprocessing, model training, and quantitative evaluation.
- Ran large-scale experiments on multi-center medical imaging datasets using local and HPC GPU clusters.
- Mentored junior researchers and co-supervised undergraduate and graduate theses applying AI to medical data.

Visiting Research Student

Masaryk University

Feb 2025 – May 2025

Brno, Czech Republic

- Developed and extended an open-source toolkit for quantitative evaluation of 3D medical images.

Teaching Assistant — Python & ML

University of Bologna

Apr 2022 – Jul 2022

Cesena, Italy

- Supported hands-on lab sessions for the M.Sc. course *Biomedical Signal Processing and Machine Learning*, assisting students with Python-based ML workflows.

Research Fellow

University of Bologna

Apr 2022 – Jul 2022

Bologna, Italy

- Designed and implemented a scalable relational database integrating demographics, genetics, clinical, and imaging data - improving data access and analysis across 19 international centers (ENIGMA-ATAXIA network, coordinated by Telethon).

PUBLICATIONS

Journal articles

- Lai, M. et al., Generating Brain MRI with StyleGAN2-ADA: The Effect of Training Set Size on Synthetic Image Quality. *Journal of Imaging Informatics in Medicine*, 2025.
- Lai, M. et al., High-Resolution Conditional MR Image Synthesis through the PACGAN Framework. *Scientific Reports*, 2025.

Conference proceedings

- Lai, M. et al., Brain MRI Synthesis using StyleGAN2-ADA. *IEEE ISBI*, Athens, 2024.

EDUCATION

Ph.D. in Health and Technology

University of Bologna

Nov 2022 – Oct 2025

Thesis: "Toward standardized evaluation of generative models for synthetic medical imaging" Expected thesis defense: Apr 2026

M.Sc. in Biomedical Engineering

University of Bologna

Sep 2019 – Mar 2022

Final grade: 110/110 with honors
Thesis: "Conditional MR image synthesis with Auxiliary Progressive Growing GANs"

B.Sc. in Biomedical Engineering

University of Cagliari

Sep 2016 – Sep 2019

Final grade: 110/110

LANGUAGES

Italian - Native



English - Advanced



TECHNICAL SKILLS

Programming

Visiting Research Student

University of Essex

Oct 2021 – Dec 2021 Colchester, UK

- Implemented and optimized a conditional GAN-based pipeline for brain MRI synthesis, focusing on training stability and image realism.

SELECTED PROJECTS

SIM Toolkit | Open-source Python Library

University of Bologna

2025

- Designed and released an open-source Python toolkit for automated evaluation of 2D/3D synthetic medical images.
- Enabled automated, reproducible benchmarking of generative models across multiple evaluation metrics.
- GitHub: MatteoLai/Synthetic_Images_Metrics_Toolkit

PACGAN | Conditional GAN Framework

University of Bologna

2022

- Developed a conditional GAN for Alzheimer’s brain MRI synthesis, improving resolution and realism over baseline GAN models.
- Validated synthetic data utility on real clinical datasets for downstream machine learning tasks.
- GitHub: MatteoLai/PACGAN

Additional Projects

University of Bologna

2020–2021

- Additional projects in medical imaging and biomedical signal processing are available at: matteolai.dev.

Python Bash MATLAB C

Frameworks

PyTorch TensorFlow NumPy
Pandas scikit-learn Nibabel

MLOps / Data Tools

Docker GitHub VS Code MySQL
Jupyter LaTeX Reproducible pipelines

Compute, Training & Infrastructure

GPU training (CUDA) Multi-GPU training
HPC clusters SLURM workload manager

Cloud & Remote Environments

INFN Cloud JupyterLab-based workflows
Remote GPU servers

Domains of Expertise

Machine Learning Deep Learning
Generative AI Synthetic data
Quality assessment Medical Imaging

Operating Systems

Linux Windows

AWARDS & HONORS



Best Poster Award

National Forum on Precision Medicine, Palermo (2024).



Merit Scholarship

Awarded for research and thesis development at the University of Essex (UK) during M.Sc. program (2021).