Lemuel Puglisi

Computer Scientist

`Medical AI, Generative AI, Computer Vision`

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RESEARCH SUMMARY

My research focuses on **medical AI**, with a particular emphasis on **generative modeling** (e.g., diffusion models) to address key challenges in medical image analysis. I work on tasks such as **disease progression modeling**, specifically on developing digital twins of diseased brains to capture and simulate the spatiotemporal dynamics of brain changes in 3D over time (see my *Brain Latent Progression* model), and **image-to-image translation** across different medical imaging modalities (see the *CoCoLIT* model). Previously, I have conducted research on **deep metric learning** for medical image re-identification (see my *DeepBrainPrint* model), AI-driven **automatic quality control** of medical images, and contrast-agnostic **brain age modeling** (see my *SynthBA* model). I strongly believe in translating research into open-source software to foster the adoption of cutting-edge innovations. Therefore, whenever possible, I publish and maintain my research code on GitHub. For more details and updates, visit my website or my Scholar.

JOBS

2025/25 **Visiting Researcher**, Hawkes Institute (UCL), London, UK
Generative AI for modality transfer & contrast-agnostic brain age estimation

2023/– **AI Researcher**, Queen Square Analytics, London, UK
AI-assisted clinical trials in neurodegenerative diseases
Ongoing

2023/– **Doctoral Researcher**, University of Catania, Italy
Generative AI for neurodegenerative disease progression modeling
Ongoing (exp. graduation date: 08/2026)

2022/23 **Research Internship**, Queen Square Analytics, London, UK
Deep Learning based Quality Assessment and Artifact Detection on MRI data

2022/22 **Computer Science Tutor**, University of Catania, Catania, IT
Tutoring activities for the course "Introduzione al Data Mining" and "Technologies for advanced programming"

2018/21 **Software Engineer**, Freelancer, Catania, IT
SMPP infrastructures; administrative and management softwares

EDUCATION

PhD **Computer Science, University of Catania, ongoing**
Project: "Data-driven neurodegenerative disease progression modeling"

M.S. **Computer Science, Data Science Specialization, University of Catania, 2023**
Thesis: "DeepBrainPrint: A Novel Contrastive Framework for Brain MRI Re-Identification"

Grade: 110/110 cum laude (i.e., with honors)
Won the Archimede Prize (XX edition)

B.S. **Computer Science, University of Catania, 2021**
Thesis: "Autoencoders dimensionality reduction in molecular datasets and subsequent prediction of clinical data"
Grade: 110/110 cum laude (i.e., with honors)
Candidate for the Archimede Prize (XVIII edition)

PUBLICATIONS

Note: † indicates **Joint First Authorship**.

Conference Proceedings

AAAI-26 Sargood, A.†, **Puglisi, L.**†, Cole, J. H., Oxtoby, N. P., Ravì, D., & Alexander, D. C. (2025). CoCoLIT: ControlNet-Conditioned Latent Image Translation for MRI to Amyloid PET Synthesis.

WACV-26 Scardace, A.†, **Puglisi, L.**†, Guarnera, F., Battiato, S., & Ravì, D. (2025). A Novel Metric for Detecting Memorization in Generative Models for Brain MRI Synthesis.

SPIE-25 McMaster, E., **Puglisi, L.**, Gao, C., Krishnan, A. R., Saunders, A. M., Ravi, D., Beason-Held, L. L., Resnick, S. M., Zuo, L., Moyer, D., & Landman, B. A. (2025). A technical assessment of latent diffusion for Alzheimer's disease progression. In *SPIE Medical Imaging: Image Processing*, San Diego, 2025.

MICCAI-24 **Puglisi, L.**, Alexander, D. C., & Ravì, D. (2024). Enhancing Spatiotemporal Disease Progression Models via Latent Diffusion and Prior Knowledge. In *MICCAI* 2024.
★ **Oral presentation (top <5%), Best Paper Award nomination (top <1%)**

MXR-24 **Puglisi, L.**, Rondinella, A., De Meo, L., Guarnera, F., Battiato, S., & Ravì, D. (2024). SynthBA: Reliable Brain Age Estimation Across Multiple MRI Sequences and Resolutions. In *MetroXRAINE* 2024.

MIDL-23 **Puglisi, L.**, Eshaghi, A., Parker, G., Barkhof, F., Alexander, D. C., & Ravi, D. (2023). DeepBrainPrint: A Novel Contrastive Framework for Brain MRI Re-Identification. In Medical Imaging with Deep Learning (MIDL) 2023.

Journal Articles

2025 **Puglisi, L.**, Alexander, D. C., & Ravi, D. (2025). "Brain Latent Progression: Individual-based spatiotemporal disease progression on 3D Brain MRIs via latent diffusion", *Medical Image Analysis*.
★ **Impact factor of 11.8! Runner-up for MedIA Best Paper Award!!**

2025 Willard C.†, **Puglisi L.**†, Ravi D., Dmitrieva M., Barkhof F., Alexander D.C., Harlow D.E., Piani-Meier D., Eshaghi A. (2025). "Combined magnetic resonance imaging and serum analysis reveals distinct multiple sclerosis types", *Brain*.
★ **Impact factor of 11.7!**

2023 Ravi, D., Barkhof, F., Alexander, D. C., Parker, G. J., **Puglisi, L.**, & Eshaghi, A. (2024). "An efficient semi-supervised quality control system trained using physics-based MRI-artefact generators and adversarial training", *Medical Image Analysis*.
★ **Impact factor of 11.8!**

TECHNICAL SKILLS

As a computer scientist, I have worked extensively with multiple programming languages, including Python, C, C++, Java, PHP, and JavaScript, for both software development and research. My deep learning pipelines are primarily developed and deployed using PyTorch and TensorFlow. I frequently employ containerization tools such as Docker and have experience with real-time data pipelines using frameworks like Apache Spark, Logstash, Kafka, and ElasticSearch (I also taught a course on this here). In addition, I have advanced expertise in medical image processing software such as ANTs, FSL, and FreeSurfer, through which I have developed numerous imaging pipelines.

SCIENTIFIC PRESENTATIONS

2025 **Neuromodeling Seminar**, Hawkes Institute, UCL (UK)
Presenting the Brain Latent Progression model and new results on uncertainty estimation.

2024 **LDTM 2024 Workshop - Oral presentation**, Marrakech (Morocco)
Presenting the Brain Latent Progression model.

2024 **MICCAI 2024 - Oral presentation**, Marrakech (Morocco)
Presenting the Brain Latent Progression model.

2024 **POND 2024**, University College London, London (UK)
Spatiotemporal disease progression models, related challenges and Brain Latent Progression as the proposed solution.

2024 **Hammer and Nail 2024**, Remote
Spatiotemporal disease progression modeling and robust brain ageing.

2023 **Reading Group**, IPLAB, Catania (Italy)
In-detail lecture about Denoising Diffusion Probabilistic Models.

AWARDS

2025 Runner-up position for the MedIA Best Paper Award (MICCAI 2025)

2024 Nominee for the MICCAI 2024 Young Scientist Award

2023 Archimede prize (XX edition), University of Catania

2021 Archimede prize candidature (XVIII edition), University of Catania

2020 2020/2021 Merit award - Scholarship, University of Catania

2019 2019/2020 Merit award - Scholarship, University of Catania

2019/22 2019/20 - 2020/21 - 2021/22 Academic Scholarships, ERSU

WORKSHOPS ORGANIZED

2025 First Workshop on Computer Vision and Generative Models for Medical Imaging
In conjunction with the ICIAP 2025 conference
Visit the workshop website

CONFERENCES ATTENDED

2024 International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI) 2024

2025 International Conference on Image Analysis and Processing (ICIAP) 2025

SUMMER SCHOOLS

2024 UCL Medical Image Computing Summer School (MedICSS) (remote)

REVIEWER FOR CONFERENCES

The 40th ACM/SIGAPP Symposium On Applied Computing (2025)

The FAIMI Workshop - International Conference on Medical Image Computing and Computer-Assisted Intervention (2024)

IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence and Neural Engineering (2024)

International Symposium on Biomedical Imaging (2025)

International Conference on Medical Image Computing and Computer-Assisted Intervention (2025)

CERTIFICATIONS

2021 ESB C1 English certification, English Speaking Board (International) Ltd.

2020 CISCO IT Essential, Cisco Networking Academy

COURSES TAUGHT

University of Catania

Tutor activities - Introduction to Data Mining

Tutor activities - Technologies for advanced programming