

Mattia Ricchi

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I'm a Physics Master's degree graduate, currently attending the Italian National PhD in AI & Society, with a study grant founded by the INFN. My main field of research is magnetic resonance imaging, in particular diffusion weighted MRI and MR fingerprinting. In general, I have a solid foundation in radiological physics, medical imaging, radiation therapy.

My current research focuses on applying Artificial Intelligence, specifically Deep Learning techniques, in Magnetic Resonance Imaging (MRI) for reconstructing quantitative health-related maps. The project involves redesigning two Neural Networks (FCNN and CNN) using Field Programmable Gate Arrays (FPGAs) to accelerate processing. The team aims to compare FPGA performance with CPUs and GPUs, emphasizing speed and energy efficiency. The research, conducted at the Italian National Institute for Nuclear Physics and the University of Bologna, combines expertise in medical AI and electronic skills developed for high-energy physics experiments. The goal is to enhance the efficiency of MRI data processing, making AI applications more feasible in clinical settings and potentially enabling mobile device use for telemedicine.

Education

2023 – Present

University of Pisa, Italy

Italian National PhD in Artificial Intelligence

Supervisors: Prof. Claudia Testa, Prof. Alessandra Retico

May 2024

**Deep Learning for Biomedical Applications Course –
University of Rome Tor Vergata**

18 hours course on deep learning and artificial intelligence applied to medical physics, held by Dr. Matteo Ferrante

2021 – 2023

Alma Mater Studiorum – University of Bologna, Italy

Master's degree in physics (curriculum of Applied Physics)

Thesis: "Assessment of the repeatability and stability of NODDI diffusion modelling using phantoms and *in vivo* acquisitions"

Supervisor: Prof. Claudia Testa, Dr. James Grist

Final Degree Mark: 110/110 cum Laude

2018 – 2021

University of Modena and Reggio Emilia, Italy

Bachelor's degree in physics

Thesis: "Stimolazione meccanica periodica di cellule in coltura"

Supervisor: Prof. Andrea Alessandrini

Final Degree Mark: 110/110 cum Laude

2013 – 2018

Liceo Scientifico Willigelmo, Modena (MO), Italy

High school diploma.

Final Mark: 83/100

Honors and awards		2024	Nomination for the Best Talk Award at the 1 st FPGA Developers' Forum meeting, held on 11-13 June at CERN.
		2024	Grant awarded by the GIDRM for the participation to the XXVI Italian National School of Nuclear Magnetic Resonance – University of Turin The grant covers the registration fee in the amount of 150€.
		2024	Trainee Stipend awarded by the ISMRM Annual Meeting & Exhibition The stipend include the six-day registration to the conference (Value: US\$475.00) with an additional cash stipend in the amount of US\$200.00.
		2024	BANDO PER L'ATTRIBUZIONE DI ATTIVITA' DI TUTORATO - A.A. 2023/24 – Università di Bologna Winner of two Tutoring positions at the University of Bologna
		2023	Bando A.A. 2022/23 - Borse Di Studio Per La Preparazione All'estero Della Tesi Di Laurea Magistrale – Dipartimento di Fisica e Astronomia – Università di Bologna Awarded by the University of Bologna (1000 €)
Conferences	Oral	Oct 2024	M. Ricchi, C. Marella, F. Alfonsi, M. Barbieri, A. Retico, A. Gabrielli, C. Testa. Fast accelerating approaches for Deep Learning in quantitative imaging. <i>INFN next_AIM workshop on XAI techniques for medical data analysis, Bari, Italy.</i>
	Poster	Oct 2024	M. Ricchi, C. Marella, F. Alfonsi, M. Barbieri, A. Retico, A. Gabrielli, C. Testa. Hardware acceleration for ultra-fast Neural Network training on FPGA for MRF map reconstruction. <i>27th International Conference on Discovery Science 2024 – Doctoral Consortium, Pisa, Italy</i>
	Oral	Oct 2024	M. Ricchi, C. Marella, F. Alfonsi, M. Barbieri, A. Retico, A. Gabrielli, C. Testa. Hardware acceleration for ultra-fast Neural Network training on FPGA for MRF map reconstruction. <i>2024 International Conference of the Society for Design and Process Science on Advances and Challenges of Applying AI/GenAI in Design and Process Science, Bologna, Italy.</i>
	Poster	Sept 2024	M. Ricchi, G. Campani, A. Nagmutdinova, V. Bortolotti, D. Greco, L. Brizi, C. Testa. Connectivity and microstructural properties of the Cingulum Bundle and its subdivisions in Alzheimer's progression. <i>51st National Conference On Magnetic Resonance, GIDRM, Firenze, Italy.</i>
	Invited Speaker	Jul 2024	Physics for a Better Planet: Summer school on Physical Sensing & Processing – VI EDITION. Contribution title: "Laboratory for Brain Connectomics". <i>Department of Physics and Astronomy, University of Bologna, Italy.</i>

	Oral	Jun 2024	M. Ricchi, C. Marella, F. Alfonsi, M. Barbieri, A. Retico, A. Gabrielli, C. Testa. Hardware acceleration for fast Magnetic Resonance Fingerprinting map reconstruction: FPGA porting of a deep learning algorithm. <i>FPGA Developer's Forum (FDF) meeting, CERN, Switzerland.</i>
	Poster	May 2024	M. Ricchi, C. Marella, F. Alfonsi, M. Barbieri, A. Retico, A. Gabrielli, C. Testa. Hardware acceleration for fast MRF map reconstruction: FPGA porting of a deep learning algorithm. <i>PSMR2024 10th Conference on PET, SPECT, and MR Multimodal Technologies, Total Body, and Fast Timing in Medical Imaging, Isola d'Elba, Italy.</i>
	Poster	May 2024	N. Sgambelluri, M. Ricchi, D.J. Tyler, C. Testa, and J.T. Grist. Fostering Confidence: Evaluating the Reproducibility and Reliability of Bingham-NODDI Model Measures on Different 3.0 T MRI Scanners. <i>ISMRM & ISMRT Annual Meeting & Exhibition, Singapore.</i>
	Poster	May 2024	M. Ricchi, A. Axford, J. McGing, A. Shinozaki, K. Yeung, S. Birkhozeler, R. Mills, F. Zaccagna, D.J. Tyler, C. Testa, J.T. Grist. Assessment of the repeatability and stability of NODDI diffusion modelling using phantom and in vivo acquisitions. <i>ISMRM & ISMRT Annual Meeting & Exhibition, Singapore.</i>
Summer Schools		Sept 2024	Scuola dell'Equinozio – Neural Networks in Medical Imaging: from theory to practical applications <i>Fondazione UNISER E.T.S. Pistoia, Italy</i>
		Jul 2024	GIDRM XXVI Italian National School of Nuclear Magnetic Resonance – University of Turin, Italy <i>Advanced NMR and MR Imaging techniques.</i>
		Jul 2024	AI & Society Summer School organized by the Italian National PHD program in Artificial Intelligence, Tropea, Italy. <i>Lectures, panel, poster sessions and proactive project work.</i>
Work Experience		Feb 2024 – Present	Tutor activity at the University of Bologna Exercises lectures and written and oral examinations for the course FISICA GENERALE T-1 [cod. 27996] - [Module 1] Module 1 with Prof. Alessandro Gabrielli
		Oct 2022 – Aug 2024	Electronics teacher at professional Italian high school <i>Istituto Superiore Piero Gobetti, Scandiano (RE), Italy.</i>
		Apr 2023 – Jun 2023	Trainee Research activity at OCMR, University of Oxford, on Diffusion Magnetic Resonance Imaging for personal training and in view of writing the Master's degree Thesis. <i>Oxford Centre for Clinical Magnetic Resonance Research (OCMR) – OXFORD, United Kingdom.</i>
		Apr 2021 – Jul 2021	Trainee Support in the research activities carried out at the Biophysics research laboratory of the University of Modena and Reggio Emilia for personal training and in view of the drafting of the Bachelor's degree thesis. <i>Università degli Studi di Modena e Reggio Emilia (UNIMORE) – MODENA (MO), Italy.</i>

Professional affiliations	2023 – Present	Department of Computer Science, University of Pisa, Pisa, Italy. PhD student
	2023 – Present	National Institute of Nuclear Physics (INFN), Division of Bologna, Bologna, Italy. PhD student
	2023	Oxford Centre for Clinical Magnetic Resonance Research (OCMR), University of Oxford, Oxford, UK. Visiting student
Languages	Italian	Native language
	English	Advanced Listening, Reading, and Writing, Intermediate Speaking.
	French	Basic overall knowledge.
Computer skills	Programming	Advanced: Python Intermediate: MATLAB, C/C++, RStudio Basic: VHDL for FPGA hardware programming
	Applications	Word, Latex, PowerPoint, Excel, Fiji, Git.
	Platforms	GitHub, Overleaf, Vivado
References	Prof. Claudia Testa	Associate Professor, Department of Physics and Astronomy (DIFA), University of Bologna, & INFN Bologna, Italy. Email: claudia.testa@unibo.it
	Prof. Alessandro Gabrielli	Full Professor, Department of Physics and Astronomy (DIFA), University of Bologna, & INFN Bologna, Italy. Email: alessandro.gabrielli@unibo.it
	Dr. James T. Grist	Postdoctoral Researcher, Oxford Centre for Clinical Magnetic Resonance Research (OCMR), University of Oxford, UK. Email: james.grist@cardiov.ox.ac.uk