Guglielmo Cappellini

Rome, Italy | guglielmo.cappellini@gmail.com | 366 535 9028 | guglielmo-cappellini
gcappellini | 0000-0002-4247-8980 | Guglielmo-Cappellini-2 | Google Scholar

Education

PhD **National PhD Program, PON R&I 2014-2020**, AI for Healthcare — Rome, IT — Jan 2022 – Dec 2024

"AI-based solution methods for PDEs with application to Oncological Hyperthermia". Tutored by prof. M. Vendittelli (Medical Robotics), co-funded by Medlogix Srl.

- Non-invasive temperature estimation in hyperthermia (HT) treatment for decision support;
- Research on Radiation Oncology, Control Engineering, and Deep Learning;
- Visiting period at Department of Radiation Oncology, Amsterdam UMC;
- Two-papers work presented at IEEE CDC 2023, Singapore;
- Tutor of "Foundamentals of Automation", and "Medical Robotics";
- PhD thesis defence will be on May 30th, 2025.

MSc **Sapienza Università di Roma**, Nuclear Engineering — Rome, IT — Jan 2018 – May 2021

Thesis: "Study and characterization of radiolabeled nanovectors for application in precision molecular medicine", EQF 7, 108/110.

- Studies on Nuclear Physics, Thermodynamics, and Radiation Protection;
- Thesis on a joint project between Department of Nuclear Medicine of Policlinico Umberto I and Nano-Bio Photonics Lab of Sapienza Università di Roma;
- Supervised by prof. R. Remetti (Radiation Protection for Nuclear Medicine).

BSc **Sapienza Università di Roma**, Energy and Nuclear Engineering — Rome, IT — Sept 2015 – Nov 2017

Thesis: "Radionuclides production and medical applications", EQF 6.

- Supervised by prof. L. Ferroni (Nuclear Energy Applications).

Experience

Department of Computer, Automation and Management Engineering (DIAG), Sapienza Università di Roma, PostDoc — Rome, IT — Jan 1st, 2025

Development, innovation and certification of medical and non-medical devices for healthcare (Rome Technopole Spoke 6, FP4). Supervised by prof. M. Vendittelli (Medical Robotics).

- Extending the research on AI-based solution methods for PDEs with application to Oncological Hyperthermia;
- AI-based methods for real-time simulation of deformable tissues with application to interactive virtual reality models for medical training;
- Future projects involve the use of AI on Big Data to find correlations between minimally invasive screening tests and the onset of cancer.

Department of Radiation Oncology, Amsterdam UMC Hospital, Visiting PhD Student — Amsterdam, NL — Dec 2023 – May 2024

Research activities related to the study of hyperthermia (HT) techniques and its clinical application, to investigate and validate new solutions to improve the real time controls and to estimate temperature at depth in superficial HT, and to participate in other ongoing projects in the same research area.

- Experimental emulation of HT treatment: a system to simulate perfusion, a muscle-equivalent phantom, a superficial EM applicator, and the thermometry system;
- Collaboration with the engineer R. Zweije and the PhD student J. A. Groen;
- Supervised by Research Physicist H. Crezee and Associate Professor H. P. Kok.

Department of Nuclear Medicine, Policlinico Umberto I, Rome, MSc Thesis Intern — Rome, IT
"ITLC study of KerAuNP labelled with 99mTc-DTPA: data evaluation, results interpretation, drawing of relevant conclusions" — Dec 2020 – May 2021

- Research on Radiopharmacology, Nanomedicine, and Nanophotonics;
- Modeling and simulation of microfluidic devices for radiolabeled nanoparticles;
- Supervised by Prof. G. De Vincentis, and Associate Prof. V. Frantellizzi.

Skills

Programming & Scientific Computing: Expert in Python for scientific computing and AI (PyTorch, NumPy, SciPy), specifically with PINNs, GNN, and LSTM; proficient in MATLAB for numerical methods; working knowledge of C++; version control with Git/GitHub; familiar with reinforcement learning, containerization (Docker), and high-performance computing environments; good understanding of Web, app development, and DevOps

Mathematics: Specialized in computational methods for partial differential equations; strong foundation in numerical analysis, calculus, linear algebra, and optimization techniques for machine learning applications

Languages: English (fluent, IELTS Academic: 7.5), Spanish, Italian (native)

Teaching & Mentorship: Passionate educator with formal pedagogical training (Percorso formativo 24 CFU in anthropological-psychological-pedagogical disciplines and teaching methodologies); committed to clear communication of complex technical concepts across disciplines

Professional Qualifications: Licensed Professional Industrial Engineer (Abilitazione per l'esercizio della professione di Ingegnere Industriale, Esame di Stato Sez. A)

Interests: Experienced in coordinating people with different backgrounds on the same goal; active in the academic community with a focus on AI applications for healthcare; interdisciplinary research background bridging engineering and medical physics

Publications

Adaptive Estimation of the Pennes' Bio-Heat Equation - I: Observer Design — Dec 2023
Cristofaro, A., Cappellini, G., Staffetti, E., Trappolini, G., Vendittelli, M.
10.1109/CDC49753.2023.10383905 (2023 62nd IEEE Conference on Decision and Control (CDC), Singapore)

Adaptive Estimation of the Pennes' Bio-Heat Equation - II: A NN-Based Implementation for Real-Time Applications — Dec 2023
Cappellini, G., Trappolini, G., Staffetti, E., Cristofaro, A., Vendittelli, M.
10.1109/CDC49753.2023.10384113 (2023 62nd IEEE Conference on Decision and Control (CDC), Singapore)

Real-time simulation of deformable tissues using PINNs
De Santis, E., Cappellini, G., Vendittelli, M.
submitted to RO-MAN25

Adaptive Estimation of Pennes' Bio-Heat Equation: Observer Design and PINNs-based Implementation
Cappellini, G., Cristofaro, A., De Santis, E., Staffetti, E., Trappolini, G., Vendittelli, M.
submitted to IEEE Transactions on Control Systems Technology

Extracurricular Activities

- Professional drummer and musical director with extensive performance background across multiple genres;
- Early experiences in orchestra; co-founded bands including "Subba and the Roots" and "La Situa"; secured national touring grant (NuovoIMAIE 2018, €15k); formal jazz studies with renowned drummers (M. Guiliana, R. Gatto, M. Campanale, D. Panza, G. de Rienzo, F. Mendolia);
- current member of "Dimensione Brama," a multidisciplinary ensemble combining theatrical and musical performance (12th place finalists in XFactor18, 2024);
- more than 500 concerts and 3 albums released; experience in studio recording and production.