

GABRIELE BELOTTI, PHD

X-Ray research software and system engineer

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WORK EXPERIENCE

X-Ray Image-Processing/Software Engineer

Cefla s.c. 📍 Imola (IT)

📅 Jan 2025 - ongoing

R&D:

- **Image Quality** assurance via algorithms **parametrization**, phantom+clinical **data analysis**, **x-ray exposure** control, and **geometrical validation** techniques
- **After-sales** debugging and assistance for dental and clinical Cone Beam CT machines
- **Production** environment acceptance **testing** and anomalies **investigation** for dental CBCT
- Flat Panel Detectors (FPDs) quality control and comparison using IEC standards
- Requirement and Functional **Design**, **back-end** implementation, cross-team **coordination**, **bug** fixing, and **continuous integration testing** in Gitlab for Neowise suite
- Legacy **tomographic code** maintenance, refactoring, and optimization

X-Ray Tomographic Reconstruction Software Engineer

medPhoton 📍 Salzburg (AT)

📅 Sep 2023 - Dec 2024

Head of interdisciplinary Imaging Core Group (ICG):

- **Lead a group** of 15 people towards **diagnosis and resolution of Image Quality** issues/customer complaints
- **Research and Design** of HW and SW **state-of-the-art** solutions
- Extraction and dissemination of **clinical data know-how**
- Consultation and assistance to Medical Physicists, Clinicians, Software Engineers, Test Engineers, and Product managers

R&D:

- Design and perform **Experimental activities** for prototypes: optical tracking, flexmap calibration, automatic exposure control, room robotic navigation and stereotaxis, MLG detector calibration, Factory Acceptance Test verifications
- Lead **tomographic code** implementation, maintenance, refactoring, and optimization (~5 people)
- **Post Processing filters** implementation and testing on test machines
- Responsible for **software documentation** for the Cone Beam CT Module (CBCT-M)

TECHNICAL SKILLS

Computer literate LaTeX
Open Source Linux Agile
MS Windows System integration

C++ C CUDA Python Git
Medical Images OpenCV DICOM
ITK VTK RTK CMAKE
OpenGATE Geant4 Slurm Jira
Embedded Systems MATLAB/Simulink

LANGUAGES

Italian ● ● ● ● ●
English ● ● ● ● ●
French ● ● ● ● ●

EDUCATION

Ph.D. in Bioengineering

Politecnico di Milano

📅 Nov 2019 – Mar 2024 🎓 cum Laude

📖 Development of technologies for in-room image guidance in hadron therapy

M.Sc. in Biomedical Engineering

Politecnico di Milano

📅 Oct 2016 – Apr 2019 🎓 106 / 110

📖 Image-guided estimation of the grasping tool pose for robotic-assisted surgical needle insertion

B.Sc. in Biomedical Engineering

Politecnico di Milano

📅 Oct 2013 – Sep 2016 🎓 93 / 110

📖 Table bound play robot for motion impaired children

Researcher in Computer Aided Radiation Therapy

Politecnico di Milano 📍 Milan (IT)

📅 May 2019 - August 2023

Design and development of a novel custom robotic C-arm for X-Ray In-Room imaging for CNAO particle therapy center:

- **Full-stack C++ development** for X-ray Patient Positioning Verification suite
- Design, implementation, and verification of a 9 degrees of freedom **Geometrical calibration (Flexmap approach)**
- **Integration of the system** with existing treatment room's infrastructures
- **Clinical Commissioning** of the instrument
- **Tomographic reconstruction** in **Cone Beam** geometry
- **Academical writing** of novel scientific manuscript
- **Public speech:** Oral presentation at CT-meeting 2022

Teaching Assistant at Politecnico di Milano (3 M.Sc. courses)

Electronics Technologies and Biosensors Laboratory, Computer Aided Surgery, Laboratory of Radiotherapy Technologies

Visiting PhD Researcher

INSA Lyon - CREATIS lab 📍 Lyon (FR)

📅 Nov 2021 - Apr 2022

Monte Carlo simulations for particle transport in Cone Beam Computed Tomography

- **Open source** contributions (RTK, OpenGATE)
- **Distributed computing** (Linux based **Slurm** platform for **in2p3**)
- **Scatter simulation** and correction
- Development of novel acquisition geometries

Internship - Research Engineer

ICube Lab 📍 Strasbourg (FR)

📅 Sep 2017 - Mar 2018

Topics: Coding (C++, MATLAB); X-Ray imaging; Computer Vision; Robot Assisted Interventional Radiology

RESEARCH TOPICS

Imaging Ring Mobile (IRm)

📅 Sep 2023 - Dec 2024

- Scatter Correction
- Dual arc CBCT and Saddle trajectories
- Dual energy CBCT
- 3D Subtraction Angiography

Robotic C-arm CBCT system development for CNAO lateral room

📅 Nov 2019 - June 2023

- Cone-Beam CT image reconstruction and FOV extension
- Adaptive Radiotherapy strategies in Hadrontherapy
- Time-correlated (4D) Cone-Beam CT In-Room Imaging
- X-ray and Optical In-Room Imaging for Patient Positioning Verification
- Deep learning strategies for artifact reduction and image quality improvement in CBCT imaging

PUBLICATIONS

📄 Journal Articles

- Belotti, Gabriele, Giovanni Fattori, et al. (2024). "Extension of the cone-beam CT field-of-view using two complementary short scans". In: *Medical Physics* 51.5, pp. 3391–3404.
- Knäusl, Barbara et al. (2024). "A review of the clinical introduction of 4D particle therapy research concepts". In: *Physics and imaging in radiation oncology*, p. 100535.
- Rossi, Matteo et al. (2024). "Feasibility of proton dosimetry overriding planning CT with daily CBCT elaborated through generative artificial intelligence tools". In: *Computer Assisted Surgery* 29.1, p. 2327981.
- Belotti, Gabriele, Matteo Rossi, et al. (2023). "A new system for in-room image guidance in particle therapy at CNAO". in: *Physica Medica* 114, p. 103162.
- Antonioli et al. (2021). "Convolutional Neural Networks Cascade for Automatic Pupil and Iris Detection in Ocular Proton Therapy". In: *Sensors* 21.13, p. 4400.
- Rossi, Belotti et al. (2021). "Image-based shading correction for narrow-FOV truncated pelvic CBCT with deep convolutional neural networks and transfer learning". In: *Medical Physics* 48.11, pp. 7112–7126.

👥 Conference Proceedings

- Belotti, Gabriele, Simon Rit, and Guido Baroni (2022). "Extension of the cone-beam CT field-of-view using two short scans with displaced centers of rotation". In: *Seventh International Conference on Image Formation in X-Ray Computed Tomography* XCT22. SPIE.