Federico Salerno

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Academic and research background

01/11/2025 – present **Postdoctoral Researcher**, *Politecnico di Torino*, Turin, Italy.
Augmented surgery, optical tracking optimization, patient-specific templates, gesture-based interaction for AR, real-time pose estimation.

01/11/2022 – gg/12/2025 **Doctor of Philosophy (PhD)**, *Politecnico di Torino*, Turin, Italy, *Cum Laude*.
Thesis: "Augmented Surgery Solutions". AR registration, optical tracking benchmarking, AR-assisted osteotomies and custom patient-specific templates, augmented surgical platforms.

01/05/2022 – 31/10/2022 **Pre-doctoral Research Fellowship**, *Politecnico di Torino*, Turin, Italy.
Dimensional and mechanical validation of bio-printed surgical guides; introduction to AR-assisted surgery and 3D virtual surgical planning.

01/10/2019 – 31/07/2022 **Master's Degree in Mechanical Engineering**, *Politecnico di Torino*, Turin, Italy, Specialization in Mechanical Production.
Thesis: "Methodology for the Dimensional and Geometric Evaluation of Surgery and Validation of Cutting Guides in Maxillofacial Field".

01/09/2016 – 30/09/2019 **Bachelor's Degree in Mechanical Engineering**, *Politecnico di Torino*, Turin, Italy.
Thesis: "3D Modeling of Aids for Maxillofacial Surgery".

Research visits

01/10/2024 – 31/03/2025 **Visiting PhD Researcher**, *Technische Universität Wien (TU Wien)*, Vienna, Austria.
Virtual and Augmented Reality Research Group (Prof. Hannes Kaufmann), Institute of Visual Computing and Human-Centered Technology. Design and development of a hybrid physical-AR surgical cutting guide for osteotomies, integrating head-mounted AR tracking with a physically adjustable device.

Publications

Journal articles

2026 **F. Salerno,** A. Contenti, L. Ulrich, S. Moos, A. Fiandrotti, E. Vezzetti, A low-cost benchmarking platform for tracking systems to enable augmented surgery tools in clinical practice, *SN Computer Science*, DOI: 10.1007/s42979-026-05071-9.
Open access. Accessible, low-cost benchmarking platform for tracking systems, lowering the barrier to clinical adoption of augmented-surgery tools.

2026 **F. Salerno,** L. Ulrich, G. Maculotti, S. Moos, G. Genta, E. Vezzetti, M. Galetto, A metrological approach for Augmented Reality tooltip tracking assessment, *Computers in Industry*, DOI: 10.1016/j.compind.2025.104430.
Open access. Rigorous metrological methodology for quantifying AR tooltip tracking accuracy; methodological basis for the benchmarking protocol of the proposed project.

2026 **F. Salerno,** L. Ulrich, G. Marullo, S. Moos, E. Vezzetti, Advancing surgical cutting guide flexibility: A hybrid physical and Augmented Reality solution for cranio-maxillofacial surgery, *Journal of Cranio-Maxillofacial Surgery*, DOI: 10.1016/j.jcms.2026.104480.
Open access. Proof of concept for hybrid physical and AR cutting guides, demonstrating transfer of the approach across procedures.

2026 L. Ulrich, A. De Luca, R. Miraglia, E. Mulassano, G. Marullo, C. Innocente, **F. Salerno**, E. Vezzetti, A 3D Camera-Based Approach for Real-Time Hand Configuration Recognition in Italian Sign Language, *Sensors*, DOI: 10.3390/s26031059.

2025 **F. Salerno,** A. Contenti, L. Ulrich, G. Marullo, S. Moos, E. Vezzetti, MOTT modular optical tool tracking framework enabling efficient benchmarking, *Scientific Reports*, DOI: 10.1038/s41598-025-21044-z.
Open access. First open, modular benchmarking framework for optical tracking systems in augmented surgery; direct methodological predecessor of the proposed registration infrastructure.

2024 L. Ulrich, **F. Salerno**, S. Moos, E. Vezzetti, How to exploit Augmented Reality (AR) technology in patient customized surgical tools: a focus on osteotomies, *Multimedia Tools and Applications*, DOI: 10.1007/s11042-023-18058-y.

2023 P. Piazzolla, G. Marullo, C. Innocente, **F. Salerno**, L. Ulrich, S. Moos, E. Vezzetti, F. Porpiglia, Development of Bleeding Artificial Intelligence Detector (BLAIR) System for Robotic Radical Prostatectomy, *Journal of Clinical Medicine*, DOI: 10.3390/jcm12237355.

Conference proceedings

2026 **F. Salerno,** L. Ulrich, G. Marullo, E. Zavattero, G. Ramieri, S. Moos, E. Vezzetti, Experimental design and performance optimization of an AR-guided hybrid cutting guide for mandibular resection, *ADM 2026 – Under review*.

2026 L. Ulrich, **F. Salerno**, C. Innocente, E. Pelosin, G. Marullo, D. Orto, P. Rossi, G. Ramieri, E. Zavattero, S. Moos, E. Vezzetti, An End-to-End XR Framework for Augmented Surgery, *IEEE Smart World Congress 2026 – Under review*.

2024 **F. Salerno,** S. Moos, L. Ulrich, A. Novaresio, E. Vezzetti, A Methodology for the Dimensional and Mechanical Analysis of Surgical Guides, *Lecture Notes in Mechanical Engineering*, DOI: 10.1007/978-3-031-52075-4_22.

PhD thesis

2025 **F. Salerno**, Augmented Surgery Solutions, Politecnico di Torino, DOI: 10.13121/polito/porto/3006041.
Open access (institutional repository).

Patents

2025 **F. Salerno**, C. Innocente, E. Pelosin, L. Ulrich, S. Moos, E. Vezzetti, Device and Kit for Osteotomy Guidance and Functional Assembly Method, Method and System for Device Configuration and Assistance for Osteotomies, Patent application filed, Politecnico di Torino, 2025.

2025 G. Marullo, C. Innocente, **F. Salerno**, L. Ulrich, E. Vezzetti, Methodology for the Evaluation of Athletes' Performance in Artistic Gymnastics, Patent granted, Politecnico di Torino, 2025.

Research projects

2025 – present **HumanOps: Human-Centered Operational Ecosystem for Advanced Manufacturing**, *CAMBIERI.IT S.R.L. / Politecnico di Torino (DIGEP)*, Active.
Regional grant (Bando SWIch – Programma Regionale Piemonte F.E.S.R. 2021/2027, EU co-funded). Duration: 24 months. Human-centered multimodal interfaces, gesture and posture recognition, AR-based training for advanced manufacturing. Scientific PI (DIGEP unit): Prof. Enrico Vezzetti.

2025 – present **AI-SURG: Human-Centric AI – Behaviour Modeling for Smart Surgery Ecosystem**, *Blue Engineering S.R.L. / Politecnico di Torino*, Active.
Regional grant (Legge Regionale n. 84/1993, Bando Ricerca 2025). Duration: 24 months. AI-based behaviour modeling for smart surgical ecosystems. Scientific PI: Prof. Enrico Vezzetti.

2025 – present **PERSEUS: Patient-specific Engineering of smart Responsive wound dresSings for Enhanced diabetic foot Ulcers management through AI- and XR-technologieS**, *Politecnico di Torino*, Active.
Internal grant, Politecnico di Torino (Proposal ID: 10609). Duration: 18 months. AI- and XR-based platform for patient-specific wound care. Role: researcher (WP3, WP5 – 3D LAB unit, PI: Prof. Enrico Vezzetti).

2024 – 2026 **DAS: Design for Augmented Surgery**, *Quintetto S.R.L. / Politecnico di Torino*, Completed.
Regional grant (Legge Regionale n. 84/1993, Bando Aggregazioni RandS – Salute). Duration: 24 months. AR-assisted surgical design for cranio-maxillofacial applications. Scientific PI: Prof. Enrico Vezzetti.

Peer review activity

Journals Reviewer for several international peer-reviewed journals (2025–2026): *Scientific Reports* and *Communications Engineering* (Nature Portfolio); *Advanced Engineering Informatics* and *International Journal of Human-Computer Studies* (Elsevier); *Virtual Reality*, *Signal, Image and Video Processing* and *Discover Computing* (Springer).

Record Reviews for more than 10 manuscripts, recorded via ORCID and publisher reviewer portals.

Teaching and academic dissemination

Apr 2026 **Technology Fair**, *Politecnico di Torino*, Turin, Italy.
Exhibition of an augmented reality intraoperative demonstrator for maxillofacial surgery at the *Biennale Tecnologia 2026*.

Jan 2026 **Scientific Congress**, Aosta, Italy.
Participation in the *Smart Health Design Congress*, focused on intelligent technologies and AI-driven methodologies for healthcare innovation.

Nov 2025 – present **Supervision of PhD student**, *Politecnico di Torino*, Turin, Italy.
Artificial Intelligence and Extended Reality models for digital twins in medical applications.

2025 **Supervision of Master's Thesis**, *Politecnico di Torino*, Turin, Italy.
Augmented Reality application for guided mandibular reconstruction surgery. Master's Degree in Biomedical Engineering.

2025 **Supervision of Master's Thesis**, *Politecnico di Torino*, Turin, Italy.
Markerless surgical tracking: synthetic data generation pipeline for 6DOF pose estimation of surgical instruments. Master's Degree in Biomedical Engineering.

2024 **Supervision of Master's Thesis**, *Università degli Studi di Torino*, Turin, Italy.
Optical tracking of surgical instruments: implementation and evaluation of 6DOF pose estimation algorithms. Master's Degree in Computer Science.

Sep 2024 **Technology Fair**, Novara, Italy.
Exhibition of research activities and technological demonstrators at the *Festival della Salute*.

Sep 2023 **Academic Conference**, *University of Florence*, Florence, Italy.
Presentation of a scientific paper at the *ADM International Conference*.

2022 – present **Teaching Assistant**, *Politecnico di Torino*, Turin, Italy.
Assistance during Industrial Technical Drawing laboratory sessions and written examinations.

2022 – 2025 **Project Mentor**, *ITS Biotecnologie e Nuove Tecnologie del Piemonte*, Turin, Italy.
Design and supervision of applied project proposals within post-diploma vocational courses, including:
- *2D/3D CAD Modelling* – Course instructor
- *Design Thinking* – Course instructor
- *Packaging Design* – Course instructor

Supervised student projects on: smart sensorized cast prototype; 3D-printed tactile maps for visually impaired users; medical device visualization prototypes; packaging design for biomedical devices.

May 2021 **Video Lecturer**, *Sin Tesi Forma S.R.L.*, Turin, Italy.
Production of a 3-hour pre-recorded training course on additive manufacturing for industry, delivered for the accredited training provider Sin Tesi Forma S.R.L.

Oct 2019 – Jan 2020 **Teaching Support Assistant**, *Politecnico di Torino*, Turin, Italy.
Teaching assistant for Industrial Technical Drawing laboratory sessions.

Technical Skills

Programming	Python, MATLAB, C#, C++
XR and 3D	Unity, Blender, SolidWorks, CloudCompare
3D Printing	FDM/SLA prototyping, design for additive manufacturing, material selection
AI/ML	Deep learning for medical image analysis (in progress); use of ML and large-language-model tooling for research and development
Graphics and Media	Inkscape, GIMP, Photoshop, Illustrator
Web	HTML
Other	LaTeX, Microsoft Office Suite

Languages

Italian	Native speaker
English	Professional working proficiency
French	Intermediate