




Alberto ROTA

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EDUCATION

<i>Ongoing</i>	Ph.D in Bioengineering - POLITECNICO DI MILANO & ASENSUS SURGICAL INC., MILAN, IT
FEB 2023	Focus: Computer Vision applications for enhanced spatial context awareness in surgical robotics
DEC 2022	MSc in Bioengineering - POLITECNICO DI MILANO, MILAN, IT
SEP 2020	Focus: AI and Computer Vision methods for 3D data in bioengineering; Virtualization of teleoperated surgical robotic environments
JUN 2022	Visiting Student - UNIVERSITÉ DE LIÈGE, LIÈGE, BE
FEB 2022	Focus: Finite Element Analysis, Robotics




WORK EXPERIENCE



<i>Ongoing</i>	Ph.D Student researcher - ASENSUS SURGICAL INC.
FEB 2023	Focus: Computer Vision Deep Learning methods for enhancing the spatial and contextual informative content of endoscopic image data, with focus on 3D reconstruction and occlusion restoration <ul style="list-style-type: none">• Learned, applied and deployed state-of-the-art models, frameworks and pipeline targeted at recovering 3D information from 2D endoscopic image data, with strong focus on self-supervised frameworks [NDA]• Worked in structured teams, both in a contributing and leading position. Mastered project management, time management and DevOps skills
<i>Ongoing</i>	Teaching Assistant - NEARLAB MRS
SEP 2023	Subject: Technologies for Motor Behavior Analysis and Virtual Modelling <ul style="list-style-type: none">• Mastered communication and public speaking skills

TECH STACK



<i>Coding</i>	Python, C++, C, C#, MATLAB	<i>CAD</i>	Autodesk Inventor, Blender
<i>ML</i>	PyTorch, Lighting, SciKit	<i>WebDev</i>	HTML5, Wordpress 
<i>DevOps</i>	Git, Docker, Slurm	<i>Office</i>	L ^A T _E X, MS Office Suite
<i>MLOps</i>	WandB	<i>Graphics</i>	Figma, Inkscape
<i>Misc</i>	ROS, OpenFOAM, Unity		

TECHNICAL PROJECTS

JUL 2022	μVES - ACADEMIC RESEARCH
MAR 2020	A fully automated algorithm for the topo-morphological analysis of 3D microvascular networks images from confocal microscopy, with DL-based confocal image segmentation [2]  <ul style="list-style-type: none">• Built and trained a 3D U-Net for segmentation of 3D images from confocal microscopy.• Developed a complete pipeline for quantitative analysis inclusive of segmentation, skeletonization, and morphological measurement• Primarily contributed and lead a team of 4 researchers, mastering problem-solving and leadership skills
DEC 2020	STEVE - Surgical Training Enhanced Virtual Environment - MASTER THESIS
FEB 2022	A virtual training environment targeting teleoperated surgical robotics for learning key surgical skills, enhanced with visuo-haptic assistance-as-needed guidance, personalized adaptive difficulty and visual feedback for haptic force training  <ul style="list-style-type: none">• Built and validated a VR simulator for surgical robotics in Unity, connected via ROS to a teleoperation console. Developed haptic assistance-as-needed guidance algorithms [3]• Supervised MSc students on the development and integration of surgical tasks with morpho-adaptive difficulty [4] and visual feedback for grasping force training
<i>Maintainer</i>	Ground Control - OPEN-SOURCE PYTHON PACKAGE
DEC 2024	A Terminal-based package for monitoring system hardware in real time with rich plots and graphics in the terminal. Aimed for multi-GPU machines and ML development.  & PyPI

JAN 2022	CT Image SuperResolution - ACADEMIC DIDACTIC PROJECT
OCT 2021	A Deep Learning Model for denoising and super-resolution of CT scans. The model is a convolutional residual architecture trained with a self-supervised routine 
JAN 2022	ECG Heartbeat LSTM Classifier - ACADEMIC DIDACTIC PROJECT
OCT 2021	A data-driven classifier for Normal, Supraventricular and Ventricular heartbeats from ECG signals based on LSTMs, reaching an F1 score of 96% on the test set  <ul style="list-style-type: none"> • Learned and applied Deep Learning architectures for multivariate time series data • Applied team-working skills

AWARDS

JUN 2023	Best Application Award - HAMLYN SURGICAL ROBOTICS CHALLENGE 2023 Haptic assistance for improving skill transfer in surgical robotics training 
APR 2022	Best Development Award - POLIMI CAPSTONE PROJECTS 2022 SPINTEST - Data-Driven Compliance Assessment for Extra-Corporeal Centrifugal Blood Pumps 

SELECTED RESEARCH PAPERS

- [1] Alberto Rota, Uriya Levy, Gal Weizman, Stefano Pomati, and Elena De Momi. Self-supervised semantic adaptation for feature matching in endoscopic surgical images. *Medical Image Analysis*, 2025 - **Ongoing Work - Pending Submission**.
- [2] Alberto Rota, Luca Possenti, Giovanni S Offeddu, Martina Senesi, Adelaide Stucchi, Irene Venturelli, Tiziana Rancati, Paolo Zunino, Roger D Kamm, and Maria Laura Costantino. A three-dimensional method for morphological analysis and flow velocity estimation in microvasculature on-a-chip. *Bioengineering & Translational Medicine*, 2023.
- [3] Alberto Rota, Ke Fan, and Elena De Momi. Implementation and assessment of an augmented training curriculum for surgical robotics. In *2023 IEEE International Conference on Robotics and Automation (ICRA)*, 2023.
- [4] Alberto Rota, Federica Xianyi Sun, and Elena De Momi. Performance-driven tasks with adaptive difficulty for enhanced surgical robotics training. In *2023 IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, 2023.
- [5] Junling Fu, Alberto Rota, Shufei Li, Jianzhuang Zhao, Qingsheng Liu, Elisa Iovene, Giancarlo Ferrigno, and Elena De Momi. Recent advancements in augmented reality for robotic applications: A survey. In *Actuators*, volume 12, page 323. MDPI, 2023.

DISCLOSURES

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