Alberto ROTA

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EDUCATION

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

WORK EXPERIENCE

Ongoing FEB 2023	**Ph.D Student researcher** - ASENSUS SURGICAL INC. 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 • 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 feameworks [NDA] • Worked in structured teams, both in a contributing and leading position. Mastered project management, time management and DevOps skills
Ongoing SEP 2023	**Teaching Assistant** - NEARLab MRS Subject: Technologies for Motor Behavior Analysis and Virtual Modelling • Mastered communication and public speaking skills

TECH STACK

Coding	Python, C++, C, C#, MATLAB	*CAD*	Autodesk Inventor, Blender
ML	PyTorch, Lighting, SciKit	*WebDev*	HTML5, Wordpress 🔗
DevOps	Git, Docker, Slurm	*Office*	LaTeX, MS Office Suite
MLOps	WandB	*Graphics*	Figma, Inkscape
Misc	ROS, OpenFOAM, Unity		

TECHNICAL PROJECTS

JUL 2022 MAR 2020	**μVES** - ACADEMIC RESEARCH A fully automated algorithm for the topo-morphological analysis of 3D microvascular networks images from confocal microscopy, with DL-based confocal image segmentation [3] ⌂ • 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 FEB 2022	**STEVE** - MASTER THESIS Surgical Training Enhanced Virtual Environment: 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 ⌂ • 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 [2] • Supervised MSc students on the development and integration of surgical tasks with morpho-adaptive difficulty [4] and visual feedback for grasping force training
JAN 2022 OCT 2021	**CT Image SuperResolution** - ACADEMIC DIDACTIC PROJECT A Deep Learning Model for denoising and super-resoution of CT scans. The model is a convolutional residual architecture trained with a self-supervised routine ⌂

Jan 2022 Oct 2021	**ECG Heartbeat LSTM Classifier** - Academic didactic project A data-driven classifier for Normal, Sopraventricular and Ventricular heartbeats from ECG signals based on LSTMs, reaching an F1 score of 96% on the test set ⬡ • Learned and applied Deep Learning architectures for multivariate time series data • Applied team-working skills
WIP May 2024	**Torchprint** - Open-source Python Package A Python library for pretty-printing and insightful visualization of Torch tensors ⬡

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 Compliancy Assessment for Extra-Corporeal Centrifual Blood Pumps ⬡

Selected Papers

[1] Fu, J., Rota, A., Li, S., Zhao, J., Liu, Q., Iovene, E., Ferrigno, G., and De Momi, E. Recent advancements in augmented reality for robotic applications: A survey. In *Actuators* (2023), vol. 12, MDPI, p. 323.

[2] Rota, A., Fan, K., and De Momi, E. Implementation and assessment of an augmented training curriculum for surgical robotics. In *2023 IEEE International Conference on Robotics and Automation (ICRA)* (2023).

[3] Rota, A., Possenti, L., Offeddu, G. S., Senesi, M., Stucchi, A., Venturelli, I., Rancati, T., Zunino, P., Kamm, R. D., and Costantino, M. L. A three-dimensional method for morphological analysis and flow velocity estimation in microvasculature on-a-chip. *Bioengineering & Translational Medicine* (2023).

[4] Rota, A., Sun, F. X., and De Momi, E. 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).

Disclosures

GDPR	I authorize the processing of personal data according to EU Regulation 679/2016 or according to the reader's local regulations if not in the EU
Accessibility	I authorize the publication and the complete accessibility of this CV according to the italian D. Lgs n. 33 of March 14 2013
NDA	Research work in this CV tagged with [NDA] has been carried out under IP protection policies and a Non-Disclosure Agreement. Details available upon request and on a subject basis.