

Ph.D. programme in Mathematics and Computer Science

Title: Artificial Intelligence in Robots for a safer surgery:
challenges and opportunities

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Abstract: Robots have started entering the surgical room since mid '90s. They allow the surgeon to perform the intervention reducing the invasiveness, thus shortening recovery time, and sparing functional area, thus decreasing the risk of post-operative complications. The talk presents the research in the field of robotic surgery, where the Neuroengineering and Medical Robotics Lab (www.nearlab.polimi.it) of Politecnico di Milano has been working from 10 years. The used robotic devices span from anthropomorphic serial arms, to the well-known Da Vinci system and to flexible miniaturized catheters, which allow performing curvilinear trajectories in soft tissues. Computer vision techniques are used to process in real-time the intra-operative images coming from endoscopic stereo-cameras and to interpret the current surgical scene (e.g. preventing the robot motion towards functional areas or suggesting the best action on the surgeon). With this respect, Artificial Intelligence has recently entered into play, allowing for a better and tailored control of the robotic tools to increase the safety of the intervention.

Short Biography: Elena De Momi, MSc in Biomedical Engineering in 2002, PhD in Bioengineering in 2006, currently Associate Professor in the Electronic Information and Bioengineering Department (DEIB) of Politecnico di Milano. She is co-founder of the Neuroengineering and Medical Robotics Laboratory, in 2008, being responsible of the Medical Robotics section. IEEE Senior Member, she is currently Associate Editor of the Journal of Medical Robotics Research, of the International Journal of Advanced Robotic Systems, Frontiers in Robotics and AI and Medical & Biological Engineering & Computing. From 2016 she has been an Associated Editor of IEEE ICRA, IROS and BioRob, Area Chair of MICCAI and she is currently Publication Co-Chair of ICRA 2019. She is responsible for the lab course in Medical Robotics and of the course on Clinical Technology Assessment of the MSc degree in Biom. Eng. at Politecnico di Milano and she serves in the board committee of the PhD course in Bioengineering. Her academic interests include computer vision and image-processing, artificial intelligence, augmented reality and simulators, teleoperation, haptics, medical robotics, human robot interaction. She participated to several EU funded projects in the field of Surgical Robotics (ROBOCAST, ACTIVE and EuRoSurge, where she was PI for partner POLIMI). She is currently PI for POLIMI of the EDEN2020 project, aimed at developing a neurosurgery drug delivery system and of the ATLAS MSCA-ITN-2018-EJD, and coordinator of the MSCA-IF-2017 - Individual Fellowships. She has been evaluator and reviewer for the European Commission in FP6, FP7 and H2020.