

Fabrizio Romanelli

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About

Senior research engineer with extensive expertise in robotics, deep learning, autonomous systems, and computer science, gained through experience in both industry and research institutions. Specialized in developing and deploying advanced visual object detection models, including YOLOv8, and in leveraging large language models (LLMs) to create industry-grade solutions for real-world applications. Proficient in multi-sensor fusion for autonomous resilient perception, utilizing both classical and deep learning techniques, as well as synthetic sensor data generation with deep learning. Expert in the DTT (Divertor Tokamak Test facility) project for nuclear fusion, focusing on the control architecture of the ECRH (Electron Cyclotron Resonant Heating) control unit and power supplies. Technical leader with a strong background in guiding project technical vision, analyzing risks and requirements, and communicating clearly and effectively. Experienced software manager, adept at coordinating teams of 10+ people, managing resources, and ensuring the delivery of effective solutions.

Education

PhD Computer Science, Control and Geoinformation – University of Rome Tor Vergata	2020 – 2024
MSc Computer Science (with distinction) – University of Rome – Tor Vergata [110/110 cum laude]	2003 – 2005
BSc Computer Science – University of Rome – Tor Vergata	1998 - 2003

Professional experiences

AI & Robotics Engineer – Almaviva

Design and development of industry-grade solutions for visual object detection in cluttered environments. Design, development and deploy of industry-grade solutions leveraging large language models (LLMs) to create project analysis and insights. Mentoring team members on software versioning, best practices in software development, and object-oriented programming (OOP). 05.2024 – present

Senior Software Engineer – Agrivol

Development of industry-grade solutions for agricultural robotics using deep learning techniques for sensor data generation, image segmentation and resilient navigation. Responsible of the company business strategy development. 06.2021 – 05.2024

Researcher – CNR-ISTP

Research fellowship on ECRH (Electron Cyclotron Resonance Heating): study and analysis to design a system for gyrotrons management and remote control for DTT (Divertor Tokamak Test facility) in controlled Thermonuclear Fusion. 12.2022 – 05.2024

Training Specialist on industrial robotics – IN.SI.

Trainer in industrial robotics. Overview of robot control systems, robot kinematics, dynamics, programming and interfacing with PLCs through fieldbuses. Robot programming for Universal Robots and ABB robots with interactive simulations. 03.2021 – 12.2023

Senior Cloud Engineer – Applaudart

Software backend engineer for cloud AWS platform and leading the team for backend development and cloud computing through Amazon Web Services. Extensive knowledge of the major cloud AWS services (Lambda, DynamoDB, Elasticsearch, AppSync, EC2). Expert-level experience with the integration of highly-complex, diverse, enterprise-class systems. Self-motivated, working independently and as part of a team. Professional knowledge of CI/CD practices. 03.2019 – 01.2021

Robotics Specialist – University of Rome Tor Vergata

Design of ROS 2 distributed software architecture for autonomous systems. State of the art investigation on VSLAM techniques and deep learning techniques for sensor data generation. 01.2020 – 05.2020

Integration of ORBSLAM2 algorithm in testing environment, development of high-level wrapper for RGB-D camera drivers in C++. Functional testing of the algorithm and optimization. Integration of the algorithm in real indoor and outdoor environments with computational benchmarks for monocular, stereo and RGB-D cameras.

Senior Software Engineer – Istituto Italiano di Tecnologia

Member of the Advanced Robotics Research Line. Management of software engineering team and students' supervision. Development and maintenance of robot real-time control frameworks and communication systems. Software architecture design for legged robots, management and maintenance of CI/CD pipelines on GitLab. Locomotion, manipulation and GUI software development. Open-source code adaptation, ROS and ROS packages integration on the robots. Test evaluation, report analysis.

12.2017 – 02.2019

Software Development Manager – Comau

Responsible for the technical software design and development of Comau next generation robotics platform. Within this position I am focusing on the research and design of robot software both on the PC, mobile environment and robot system controller. As per my role I also have a strong focus on people management to let them develop their own capabilities and skills and to lead them towards reaching targets effectively.

03.2016 – 10.2017

Software Engineer Specialist in Motion Planning and Robotics – Comau

Design, programming and study of motion control for Comau Robots. Management of C4G/C5G robot motion control system with use of real time operating systems. Development of software in C/C++. Active in EU Projects (ROBOFOOT, SMErobotics, X-Act) and related developments of C4G/C5G Open and Open realistic Robot Library to support motion in open Linux platforms. Head of the eMotion internal project to improve robot movement both for quality and velocity. Active support for customers on Conveyor Tracking features and Interference Regions.

03.2007 – 02.2016

Software Engineer Specialist in Motion Planning and Robotics – Comau

Integrator of highly automated systems for applications in Automotive sector. Programming of Comau and ABB robots in robotized areas. Design of systems for computer vision in Visual Basic language. Management and programming of productive process with Allen-Bradley PLC. Programming of security devices (Pilz).

10.2006 – 03.2007

Activities, achievements & certifications

- Associate Editor Online Journal of Robotics & Automation Technology (OJRAT)
- Editorial Board Member Sciencefather
- Graduated with highest honors from Rome University of Tor Vergata
- Reviewer: IEEE Sensors Journal, ICRA 2023, IEEE Journal of Radio Frequency Identification, Elsevier Computers & electrical engineering, Elsevier Digital signal processing
- Second prize winner at EUnited Robotics Technology Transfer Award 2014
- Finalist at EUROP/EURON Technology Transfer Award 2009
- Second prize at Altran 'Campus' Award 2006
- Fundamentals of accelerated computing with CUDA Python – NVIDIA certification
- Disaster risk monitoring using satellite imagery – NVIDIA certification
- Getting started with AI on Jetson Nano – NVIDIA certification
- Building Video AI applications at the edge on Jetson Nano – NVIDIA certification
- Develop, Customize, and publish in Omniverse with extensions – NVIDIA certification

Skills and competences

Research interests: deep learning for synthetic sensor data generation, hybrid techniques for sensor fusion, LLMs.

Programming languages: Python, C, C++, Matlab, JavaScript, Perl, FORTRAN.

Frameworks and libraries: TensorFlow, Keras, PyTorch, LangChain, OpenCV, Pandas, NumPy, ROS, ROS2

Languages: Italian (native), English (Full professional proficiency), Spanish (Full professional proficiency), French (Limited working proficiency)

Selected publications

Romanelli, F., & Martinelli, F. (2023). *Synthetic sensor measurement generation with noise learning and multi-modal information*. IEEE Access, doi: 10.1109/ACCESS.2023.3323038.

Romanelli, F., & Martinelli, F. (2023). *Synthetic Sensor Data Generation Exploiting Deep Learning Techniques and Multi-Modal Information*. IEEE Sensors Letters, vol. 7, no. 7, pp. 1-4, July 2023, Art no. 7003404, doi: 10.1109/LENS.2023.3290209.

Romanelli, F., Martinelli, F., & Mattogno, S. (2023). *Resilient simultaneous localization and mapping fusing Ultra Wide Band range measurements and Visual Odometry*. Journal of Intelligent & Robotic Systems. (Accepted for publication)

Navone, A., Romanelli, F., Ambrosio, M., Martini, M., Angarano, S., & Chiaberge, M. (2023). *Lavender Autonomous Navigation with Semantic Segmentation at the Edge*. arXiv preprint arXiv:2309.06863.

Bianchi, L., Carnevale, D., Del Frate, F., Masocco, R., Mattogno, S., Romanelli, F., & Tenaglia, A. (2023). *A novel distributed architecture for unmanned aircraft systems based on Robot Operating System 2*. IET Cyber-Systems and Robotics, 5(1), e12083.

Martinelli, F., Mattogno, S., & Romanelli, F. (2023). *A resilient solution to Range-Only SLAM based on a decoupled landmark range and bearing reconstruction*. Robotics and Autonomous Systems, 160, 104324.

Bianchi, L., Carnevale, D., Masocco, R., Mattogno, S., Oliva, F., Romanelli, F., & Tenaglia, A. (2023, May). *Efficient visual sensor fusion for autonomous agents*. In 2023 International Conference on Control, Automation and Diagnosis (ICCAD) (pp. 01-06). IEEE.

Romanelli, F., Martinelli, F., & Di Giampaolo, E. (2022). *Robust simultaneous localization and mapping using range and bearing estimation of radio ultra high frequency identification tags*. IEEE Transactions on Control Systems Technology, 31(2), 772-785.

Fenucci, A., Indri, M., & Romanelli, F. (2014, September). *A real time distributed approach to collision avoidance for industrial manipulators*. In Proceedings of the 2014 IEEE Emerging Technology and Factory Automation (ETFA) (pp. 1-8). IEEE.

Michieletto, S., Tosello, E., Romanelli, F., Ferrara, V., & Menegatti, E. (2014). *ROS-I interface for COMAU robots*. In Simulation, Modeling, and Programming for Autonomous Robots: 4th International Conference, SIMPAR 2014, Bergamo, Italy, October 20-23, 2014. Proceedings 4 (pp. 243-254). Springer International Publishing.

Bascetta, L., Ferretti, G., Magnani, G., Rocco, P., Abba, F., Gerio, G. P., & Romanelli, F. *Towards an industrial implementation of the walk-through programming technique for robotic manipulators*. ICRA 2012 IEEE International Conference on Robotics and Automation.

Patents

- Method for controlling at least two robots having respective working spaces including at least one region in common - US US20130110288 A1 · Issued May 2, 2013
- Robot system - EU EP 2194434 (A1) · Issued Dec 5, 2008 and US US 8,412,379 B2 · Issued Apr 2, 2013