

## PERSONAL INFORMATION

## Emanuele De Santis

 [ORCID 0000-0003-1011-9737](#)

 [Google Scholar Emanuele De Santis](#)

## SHORT BIO

Emanuele De Santis was born in 1996 and received his B.Sc degree in Computer and Control Engineering in 2017 and his M.Sc degree in Engineering in Computer Science in 2019, both from Sapienza University of Rome, where he is currently ending his PhD. Currently, he is a Postdoctoral Researcher in Automatic Control at the Department of Computer, Control and Management Engineering (DIAG) "Antonio Ruberti" of the same University. Since 2019, he has participated to 5 EU and ESA funded research projects, and several other applied research studies. He is currently collaborating with the no-profit research consortium CRAT, both as researcher and project manager in the scope of the Horizon Europe and other ESA Programmes. His main research activities are in the field of network control and intelligent systems.

## CURRENT POSITIONS

Nov. 2022 – today

**Research Fellow - Assegnista di Ricerca**

Department of Computer, Control and Management Engineering (DIAG) "Antonio Ruberti" - Sapienza University of Rome

Winner of the grant "Design and development of algorithms based on control theory with application to Federated Learning in the medical field", Cat. A, n. 31 - Rep. 264 - Prot. 2885 - 29/07/2022.

The research grant will be aimed at the study, design and development of control laws and algorithms applied to the topic of Federated Learning. In particular, such work will aim to deepen the research on distributed control theory, usually applied to network control problems (such as smart grids control), in order to apply it to Federated Learning algorithms, so as to be able to analyze their convergence and stability properties. The research activities will be characterized by a multidisciplinary approach, with the main domain of interest being medical.

**Bibliometric Indices:**

**Google Scholar:** number of works = 14, citations = 56 , h-index = 3, i10-index = 1, average number of citations= 4.0

**Scopus:** number of works= 12, citations = 41, h-index = 3, average number of citations = 3.42

Sep. 2019 – today

**Researcher and Project Manager**

Consorzio per la Ricerca nell'Automatica e nelle Telecomunicazioni (CRAT), a **non-profit research consortium** participated by Sapienza University of Rome

Personal responsibilities:

- Researcher in several EU-funded projects mainly in the fields of ICT, AI and Smart Grids.
- Team leader and Task leader in several EU and ESA funded research projects
- Procurement and drafting of several project proposals for both the Horizon Europe Programme, ESA or national funding opportunities.
- Author of 13 technical project deliverables, the most relevant of which are detailed at the end of the publication list.

## RESEARCH AND WORK EXPERIENCE

**Research Projects - University of Rome "La Sapienza" / CRAT**

**HE 6G SNS - NANCY**  
2023–Present

**Task Leader and Researcher in the Horizon Europe - 6G SNS NANCY project**

(An Artificial Intelligent Aided Unified Network for Secure Beyond 5G Long Term Evolution), **total funding 6M€**

- The project aims to introduce a secure and intelligent architecture for the beyond the fifth generation (B5G) radio access network which include the exploitation of Blockchain to provide access security and advanced AI tools to provide optimal and adaptive radio resource management and end-to-end (E2E) network optimisation.
- Personal research activities focused on design, implementation and validation of Federated Learning algorithm for network intelligence, and in particular for self-healing and self-recovery networks.

**ESA HydRON-HyDEMO**  
2022–Present**Local Research Unit Coordinator and Researcher in the HyDEMO project, funded by the European Space Agency (ESA)**

(HydRON Demonstrator System Phase A/B1), **total funding 2M€**

- The project aims at the development of a high-throughput optical network for broadband in space, as part of the ScyLight programme of the European Space Agency (ESA) for developing secure and laser communication technology.
- Personal research activities focused on the design and development of site diversity algorithms for enhancing the availability of the service between Optical Ground Stations and GEO/LEO satellites.

**H2020 - 5G-Solutions**  
2019–2023**Researcher in the EU Project H2020 5G-Solutions**

(5G - Solutions for European Citizens), GA ID: 856691, **total funding 14M€**

- The project aims at developing a set of vertical solutions which are enabled by 5G technologies. In particular Living Lab Smart Energy, aims at developing smart charging and frequency regulation services by the means of charging plug-in electric vehicles by exploiting 5G technologies performances.
- Personal research activities focused on the design, development and testing of distributed optimization algorithms for smart charging and control algorithms for regulation of electricity grid's frequency, and development of high-level and detailed architectures for the use cases.

**Allena-Mente**  
2021–2022**Researcher in the Allena-Mente project**

Allena-Mente is a joint action with the pediatric hospital “Bambino Gesù” and the Istituto Superiore di Sanità (ISS), **total funding 300k€**

- The project aims at the development of a set of serious games tailored for the rehabilitation of pediatric patients with cognitive disorders.
- Personal research activities focused on the support to the development of the project platform, with a focus on software architecture identification and user interface requirements.

**ARTES 4.0 - ARIES**  
2020–2022**WP Leader and Researcher in the ARIES project, funded by the European Space Agency (ESA)**

(Advanced multi-Rat Integrated multi-sensors solution for Emergency prevention, detection and response operationS, Contract Number: 4000133127/20/NL/AF, **total funding 200k€**)

- The project plans to provide the end users, i.e. the Municipality of L'Aquila/Abruzzo Region, and in particular the Italian Fire Brigades and the Regional Civil Protection Service, with an efficient service for prevention, monitoring and management of emergencies (fires, landslides, etc.) in the rural territory of L'Aquila.
- Personal research activities focused on leading Work Package 4100 on Simulation and Validation and focused on the design and simulation of multi-connectivity algorithms for remote signaling during emergencies in 5G networks.

**H2020 - 5G-ALLSTAR**  
2019–2021**Researcher in the EU-Korea Project H2020 5G-ALLSTAR**

(5G AgiLe and flexible integration of SaTellite And cellulaR, GA ID: 815323 and MSIT No. 2018-0-00175, **total funding 2M€** for the EU side)

- The project, a joint EU-Korea action, aims at enabling seamless multi-connectivity between the 5G and the satellite Networks, by means of traffic-flow control for load balancing and spectrum sharing solutions.
- Personal research activities focused on the design and development of network control systems for dynamic load balancing in heterogeneous multi-RAT networks, based on Control Theory, Reinforcement Learning and Game Theory.

## Other Experience

Jul. 2018 – Jul. 2019 **Software Engineer**

Applied Research To Technologies (ARES2T)

Software maintenance and implementation of new functionalities in ChargeAdvisor electric vehicle smart charging platform. Development of an Android app for remote reservation of charging stations and remote start of smart charging sessions

## TEACHING EXPERIENCE

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A.A. 2022/2023

Assistant Lecturer in BSc and MSc courses in Engineering at **Sapienza University of Rome:**

- Automatic Control (BSc in Computer and Control Engineering)
- Modelling and Simulation (BSc in Computer and Control Engineering)
- Control of Communication and Energy Networks (MSc in Control Engineering)
- Control of Autonomous Multi-Agent Systems (MSc in Control Engineering)

A.A. 2021/2022

Assistant Lecturer in BSc and MSc courses in Engineering at **Sapienza University of Rome:**

- Automatic Control (BSc in Computer and Control Engineering)
- Modelling and Simulation (BSc in Computer and Control Engineering)
- Control of Communication and Energy Networks (MSc in Control Engineering)
- Control of Autonomous Multi-Agent Systems (MSc in Control Engineering)

A.A. 2020/2021

Assistant Lecturer in BSc and MSc courses in Engineering at **Sapienza University of Rome:**

- Control of Communication and Energy Networks (MSc in Control Engineering)
- Control of Autonomous Multi-Agent Systems (MSc in Control Engineering)

A.A. 2019/2020

Assistant Lecturer in BSc and MSc courses in Engineering at **Sapienza University of Rome:**

- Control of Communication and Energy Networks (MSc in Control Engineering)
- Control of Autonomous Multi-Agent Systems (MSc in Control Engineering)

Sep. 2019 – present

Advisor and Co-Advisor in BSc and MSc Thesis and Students Projects in Engineering at **Sapienza University of Rome:**

- Co-Advisor of 7 Thesis in Control Engineering (MSc) and Computer and Control Engineering (BSc) on intelligent systems and network control.
- Advisor in about 15 Students Projects in Control of Communication and Energy Networks (MSc in Control Engineering) and Control of Autonomous Multi-Agent Systems (MSc in Control Engineering)

## EDITORIAL EXPERIENCE

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2022 **Technical Program Committee member**

**International Conference on Information and Communications Technology Convergence, ICTC 2022**

2021 **Technical Program Committee member**

**International Conference on Information and Communications Technology Convergence, ICTC 2021**

## AWARDS

Dec. 2021 **Best Paper Award**

ETRI Journal

Winning paper: 6G in the sky: On-demand intelligence at the edge of 3D networks

Feb. 2019 – Jun. 2019 **Honours Programme for Master Degree**

Sapienza University of Rome

Mainly focused on compilers architecture and GCC plugin development for memory access tracking

Feb. 2017 – Jun. 2017 **Cyberchallenge.IT 2017 contestant**

Sapienza University of Rome

Cybersecurity challenge organized by Sapienza University of Rome together with IBM and CISCO

Feb. 2016 – Jun. 2017 **Honours Programme for Bachelor Degree**

Sapienza University of Rome

Mainly focused on NUMA architectures and their support in Linux systems

## EDUCATION AND TRAINING

Nov. 2019 – Jan 2023 **PhD in Automatic Control, Bioengineering and Operational Research**

Final grade: Excellent

Sapienza University of Rome

Curriculum in Automatic Control.

Thesis Title: "Control methods and applicative scenarios for next-generation cellular telecommunication networks".

Sep. 2017 – Jul. 2019 **Master of Science in Engineering in Computer Science**

Final grade: 110 cum laude / 110, GPA: 29.64/30

Sapienza University of Rome

Thesis Title: 'Enabling electric vehicles smart charging to power systems frequency regulation functions using a web-service-based infrastructure and 5G technology.'

Sep. 2017 – Jul. 2019 **Bachelor of Science in Computer and Control Engineering**

Final grade: 110 cum laude / 110, GPA: 29.52/30

Sapienza University of Rome

Study plan in Control Engineering - Thesis Title: 'Control of an Energy Storage System for active power regulation in a distribution grid'

Sep. 2009 – Jul. 2014 **High School**

Final grade: 100 / 100

Liceo Scientifico Lazzaro Spallanzani, Tivoli (RM)

## CERTIFICATIONS AND QUALIFICATIONS

2020 **Professional Computer Engineer Qualification**

"Abilitazione all'esercizio della professione di Ingegnere Informatico - Sezione A"

issued by “Ordine degli Ingegneri di Roma”

## 2020 Certificate of Training

issued by **OPAL-RT Technologies**

Recognised to those who complete the following training modules relative to the Real-Time Hardware-in-the-Loop Simulator of the company (OP4510):

- **OP-101** Real-Time Simulation Fundamentals with RT-LAB Software, Models & Hardware.
- **OP-203** Power Systems Real-Time Simulation with eMEGAsim.
- **OP-204** Electro-Mechanical RT Simulation with ePHASORSIM.

## PERSONAL SKILLS

Mother tongue Italian

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C1	C1	C2
French	A2	A2	A2	A1	A1

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user  
[Common European Framework of Reference for Languages](#)

Digital competences

SELF-ASSESSMENT				
Information Processing	Communication	Content creation	Safety	Problem solving
Proficient user	Proficient user	Proficient user	Proficient user	Proficient user

[Digital competences - Self-assessment grid](#)

**Computer skills**

- Proficient in many programming languages like C, Python, Assembly x86 and x86\_64, Java, C++, PHP, HTML, Javascript, C#, Visual Basic, Matlab, etc.
- Proficient in Windows and Linux Operating Systems.
- Proficient in Microsoft Office Suite and  $\LaTeX$

**Other skills** Studying piano since 2004, now enrolled in Preparatory Courses organized by Conservatory A. Casella of L'Aquila, 3rd level (of 3)

Driving licence B

## PUBLICATIONS

- [1] Alessandro Di Giorgio, **Emanuele De Santis**, Lucia Frettoni, Stefano Felli, and Francesco Liberati. “Electric Vehicle Fast Charging: A Congestion-Dependent Stochastic Model Predictive Control Under Uncertain Reference”. In: *Energies* 16.3 (2023). URL: <https://www.mdpi.com/1996-1073/16/3/1348>.
- [2] **E. De Santis**, A. Giuseppi, Pietrabissa A., M. Capponi, and F. Delli Priscoli. “Satellite Integration into 5G: Deep Reinforcement Learning for Network Selection”. In: *Machine Intelligent Research* 19 (2022), pp. 127–137. URL: <https://link.springer.com/article/10.1007/s11633-022-1326-3>.
- [3] Roberto Germanà, Francesco Liberati, **Emanuele De Santis**, Alessandro Giuseppi, Francesco Delli Priscoli, and Alessandro Di Giorgio. “Optimal Control of Plug-In Electric Vehicles Charging for Composition of Frequency Regulation Services”. In: *Energies* 14.23 (2021). URL: <https://www.mdpi.com/1996-1073/14/23/7879>.

- [4] F. Delli Priscoli, **E. De Santis**, A. Giuseppi, and A. Pietrabissa. “Capacity-constrained Wardrop equilibria and application to multi-connectivity in 5G networks”. In: *Journal of the Franklin Institute* 358.17 (2021), pp. 9364–9384. URL: <https://www.sciencedirect.com/science/article/pii/S0016003221005743>.
- [5] Emilio Calvanese Strinati, Sergio Barbarossa, Taesang Choi, Antonio Pietrabissa, Alessandro Giuseppi, **Emanuele De Santis**, Josep Vidal, Zdenek Becvar, Thomas Haustein, Nicolas Cassiau, Francesca Costanzo, Junhyeong Kim, and Ilgyu Kim. “6G in the sky: On-demand intelligence at the edge of 3D networks (Invited paper)”. In: *ETRI Journal* 42.5 (2020), pp. 643–657. eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.4218/etrij.2020-0205>. URL: <https://onlinelibrary.wiley.com/doi/abs/10.4218/etrij.2020-0205>.
- [6] **Emanuele De Santis**, Francesco Liberati, and Alessandro Di Giorgio. “Optimal Control of a Grid-connected Service Area for Plug-in Electric Vehicles Fast Charging under uncertain Power Demand”. In: *2022 30th Mediterranean Conference on Control and Automation (MED)*. 2022, pp. 49–55.
- [7] Nicolas Cassiau, Ilgyu Kim, Emilio Calvanese Strinati, Gosan Noh, Antonio Pietrabissa, Fabrice Arnal, Guido Casati, Taesang Choi, You-Jun Choi, Heesang Chung, Sylvain Colombero, Pierre Dal Zotto, **Emanuele De Santis**, Jean-Baptiste Doré, Alessandro Giuseppi, Jean-Michel Houssin, Junhyeong Kim, Marc Laugeois, Federico Pigni, Xavier Popon, Leszek Raschkowski, Marjorie Thary, and Seok Ho Won. “5G-ALLSTAR: Beyond 5G Satellite-Terrestrial Multi-Connectivity”. In: *2022 Joint European Conference on Networks and Communications and 6G Summit (EuCNC/6G Summit)*. 2022, pp. 148–153.
- [8] Roberto Germanà, **Emanuele De Santis**, Francesco Liberati, and Alessandro Di Giorgio. “On the Participation of Charging Point Operators to the Frequency Regulation Service using Plug-in Electric Vehicles and 5G Communications”. In: *2021 IEEE International Conference on Environment and Electrical Engineering and 2021 IEEE Industrial and Commercial Power Systems Europe (EEEIC / I CPS Europe)*. 2021, pp. 1–6.
- [9] Francesco Liberati, Roberto Germanà, **Emanuele De Santis**, and Alessandro Di Giorgio. “Optimal Control of an Energy Storage System and Plug-in Electric Vehicles Fast Charging in a Grid-connected Service Area”. In: *2021 29th Mediterranean Conference on Control and Automation (MED)*. 2021, pp. 202–207.
- [10] A. Giuseppi, **E. De Santis**, F. Delli Priscoli, S. H. Won, T. Choi, and A. Pietrabissa. “Network Selection in 5G Networks Based on Markov Games and Friend-or-Foe Reinforcement Learning”. In: *2020 IEEE Wireless Communications and Networking Conference Workshops (WCNCW)*. 2020, pp. 1–5.
- [11] A. Giuseppi, S. Maaz Shahid, **E. De Santis**, S. Ho Won, S. Kwon, and T. Choi. “Design and Simulation of the Multi-RAT Load-balancing Algorithms for 5G-ALLSTAR Systems”. In: *2020 International Conference on Information and Communication Technology Convergence (ICTC)*. 2020, pp. 594–596.
- [12] Andrea Tortorelli, Alessandro Giuseppi, Federico Lisi, **Emanuele De Santis**, and Francesco Liberati. “Operations Management of Satellite Launch Centers”. In: *Proceedings of the Ka and Broadband Communications (Ka conference)*. 2019.
- [13] Alessandro Giuseppi, **Emanuele De Santis**, and Alessandro Di Giorgio. “Model Predictive Control of Energy Storage Systems for Power Regulation in Electricity Distribution Networks”. In: *2019 IEEE International Conference on Systems, Man and Cybernetics (SMC)*. 2019, pp. 3365–3370.
- [14] Stefano Carnà, Serena Ferracci, **Emanuele De Santis**, Alessandro Pellegrini, and Francesco Quaglia. “Hardware-Assisted Incremental Checkpointing in Speculative Parallel Discrete Event Simulation”. In: *2019 Winter Simulation Conference (WSC)*. 2019, pp. 2759–2770.



## PROJECT DELIVERABLES

<b>H2020 5G-Solutions</b> 2022	<b>D5.2C “LL2/LL3 field trials (phase 3)”</b> Author of the deliverable that details setup, research and implementation activities for living lab 2 (Smart Energy) in the third cycle of the project
<b>H2020 5G-Solutions</b> 2022	<b>D5.3C “LL performance evaluation and lessons learned (v3)”</b> Author of the deliverable that details results obtained in living lab 2 (Smart Energy) in the third cycle of the project
<b>H2020 5G-Solutions</b> 2022	<b>D5.2B “LL2/LL3 field trials (phase 2)”</b> Author of the deliverable that details setup, research and implementation activities for living lab 2 (Smart Energy) in the second cycle of the project
<b>H2020 5G-Solutions</b> 2022	<b>D5.3B “LL performance evaluation and lessons learned (v3)”</b> Author of the deliverable that details results obtained in living lab 2 (Smart Energy) in the second cycle of the project
<b>ESA ARIES</b> 2021	<b>D2 “Technical Feasibility Assessment”</b> Author of the deliverable that details the algorithms developed for the fire management system and defines the overall architecture of the project tools
<b>ESA ARIES</b> 2021	<b>D4 “Proof of Concept”</b> Author of the deliverable that details the proof of concept to be implemented and tested for the project
<b>H2020 5G-ALLSTAR</b> 2021	<b>D4.3 “Implementation of the multi-RAT load balancing algorithms and technical specifications of the relevant interfaces”</b> Author of the deliverable that details the control algorithms for the 5G network multi-connectivity and reports their implementation details on the project demonstrator
<b>H2020 5G-Solutions</b> 2021	<b>D5.2A “LL2/LL3 field trials (phase 1)”</b> Author of the deliverable that details setup, research and implementation activities for living lab 2 (Smart Energy) in the first cycle of the project
<b>H2020 5G-Solutions</b> 2021	<b>D5.3A “LL performance evaluation and lessons learned (v1)”</b> Author of the deliverable that details results obtained in living lab 2 (Smart Energy) in the first cycle of the project
<b>H2020 5G-Solutions</b> 2020	<b>D2.4A “LLs planning, setup, operational management handbook (initial version)”</b> Author of the deliverable that details preliminar planning and setup for living lab execution in the three cycles of the project
<b>H2020 5G-Solutions</b> 2020	<b>D1.1B “Definition and analysis of use cases/scenarios and corresponding KPIs based on LLs (v2.0)”</b> Author of the updated version of the deliverable that details use cases and scenarios KPIs to be tested during the three cycles of the project

- H2020 5G-ALLSTAR** 2019 **D4.2, “Design and simulation of the multi-RAT load balancing algorithms”**  
Author of the deliverable in which the network controller developed in the Work-Package 4 were reported.
- H2020 5G-Solutions** 2019 **D1.1A “Definition and analysis of use cases/scenarios and corresponding KPIs based on LLs (v1.0)”**  
Author of the deliverable that details use cases and scenarios KPIs to be tested during the three cycles of the project

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