PERSONAL INFORMATION   Andrea Wrona

SHORT BIO

I graduated with honors both in Computer and Control Engineering (Bachelor Degree) in October, 2018 and in Control Engineering (Master Degree) in October, 2020 at University of Rome "La Sapienza", together with the achievement of the diploma of Excellence. Since November 2020, winner of a scholarship, I have been attending the PhD Program in Control, Bioengineering and Operations Research at the same university. My research topics rely on: control of terrestrial and satellite telecommunication and decision-making autonomous systems based on data-driven control, especially handled through Reinforcement and Deep Reinforcement Learning strategies.

EDUCATION

November 2020– October 2023
PhD in Automatic Control, Bio-engineering and Operations Research

University of Rome "La Sapienza"

Curriculum: Automatic Control

Supervisor: Alessandro Di Giorgio

Research Topics:

– Quality of Service and Quality of Experience satisfaction in terrestrial communication networks.
– Multi-Agent and distributed systems for site diversity and path control in satellite communication systems operated through GEO and LEO satellites.
– Deep Reinforcement Learning.

PhD Courses:

– SIDRA 2022 PhD Summer School, July 2022, Bertinoro (FC). Held by Prof. Andrea Serrani and Francesco Bullo;
– La scrittura tecnico–scientifica, February 2022, Rome (RM). Held by Prof. Emilio Matricciani;
– SIDRA 2021 PhD Summer School, July 2021, Bertinoro (FC). Held by Prof. Giacomo Como, Fabio Fagnani, Antonio Bicchi, Alessandro De Luca, Bruno Siciliano, Cosimo Della Santina, Stanislao Grazioso;
– EECI Multi-Agent Distributed Optimization and Learning over Wireless Networks, June 2021. Held remotely by Prof. Luca Schenato and Ruggero Carli, Università di Padova.
– Numerical Methods for Optimal Control, May 2021. Held remotely by Prof. Mario Zanon, IMT School of Advanced Studies;
– Model Predictive Control, April 2021. Held remotely by Prof. Alberto Bemporad, IMT School of Advanced Studies.

Conferences:

– Limassol (CYPRUS), The 31st Mediterranean Conference on Control and Automation (MED2023), June 26-29, 2023.

The final exam is scheduled on January 30, 2024.

2018–2020
Master of Science in Control Engineering

University of Rome "La Sapienza"

110 cum laude/110

I completed my master studies with a comprehensive average of 29.91/30. In february, 2020 I have been admitted to the Students Honors Program, reserved to the most valuable students. The matter of the Program is: networked systems and consensus dynamics. The Master thesis concerned the active debris removal problem and space manipulator systems modeling and control, with particular focus on the dynamic couplings between the base platform and the robotic arm.

2019 Trieste NEXT

In September, 2019 I joined the scientific research festival "Trieste NEXT", held in the Italian city of Trieste. I attended three visits to industrial and medical companies in the Friuli Venezia Giulia region and eleven conferences on Artificial Intelligence and Big Data.

2019 TESP Robotics

Tohoku University, Sendai, Japan

In May, 2019, after succeeding in an internal selection in my University, I have been admitted to the Summer School organized by the Tohoku University in Sendai, Japan. The program took place from July, 26 to August, 12 in Sendai. During these days I joined the Space Robotics Laboratory, working on a project involving autonomous navigation through obstacles of a wheeled mobile robot.

2015–2018 Bachelor's Degree in Computer and Control Engineering

University of Rome "La Sapienza"

110 cum laude/110

With a total of 9 *laudes*, I joined the Students Honors Program, reserved for the most deserving student. As bachelor thesis I have developed a deep study and analysis of power systems, with focus on voltage control.

2010–2015 Classical High School

Liceo Scientifico–Classico Giuseppe Stampacchia, Tricase (LE)

100/100

I participated to Latin and ancient Greek *certamina* at local and national level and also to mathematical and physical contests, qualifying at the national final of the Mathematical Games at the Bocconi University (Milan).

RESEARCH AND WORK EXPERIENCE

January 2023 – Present Researcher in NANCY

An Artificial Intelligent Aided Unified Network for Secure Beyond 5G Long Term Evolution (NANCY). Project granted by the EU Commission under the call HORIZON-JU-SNS-2022-STREAM-A-01-06, grant agreement No. 101096456, funding 6 mln€.

Design of AI algorithms for autonomous anomaly detection and self-healing in beyond 5G terrestrial networks.

July 2022 – Present Researcher in CADUCEO

Italian project funded by Ministero dello Sviluppo Economico (MISE)

The research activity aim is the study and development of AI-based decision support systems related to the early detection and classification of diseases linked to three clinical case studies, namely:

1. Eosinophilic esophagitis, chronic immune-mediated disease of the esophagus;

2. Inflammatory bowel disease (IBD), such as Crohn's disease, ulcerative colitis and Inflammatory Bowel Disease (IBD). These are the family of diseases affecting the intestinal tract, triggered by abnormal immune responses;

3. Portal hypertension, which is liver disease characterized by high pressure in the portal vein, often caused by cirrhosis of the liver.

January 2022 – Present Researcher in HyDEMO

HydRON-Demonstration System (DS) PHASE A/B1"in following shortened in HyDEMO. Contract 1550007580, funding 100000 €.

Development of DRL-based control algorithms for the switching problem in satellite optical communication networks, in the framework of site diversity with a geostationary satellite.

March 2021 – Present ## Participation in EU Info Days and Brokerage Events

Contacts with leading companies and universities in the fields of health, telecommunications, transport, energy and agriculture for the formation of consortia which have the ultimate goal of submitting a project proposal to the European Commission.

November 2020 – October 2023 ## Researcher in VADUS

Virtual Access and Digitalization for Unreachable Sites (VADUS). IAP-5G for L'ART Thematic Call: Cultural Heritage. ESA Contract 4000132720/20/NL/AF, funding 785300 €.

Design of Multi-RAT algorithms based on optimal control, Q-Learning and DRL for the network selection and resource allocation in heterogeneous networks with mobile VR/AR applications rebuilding cultural sites not open to visitors.

November 2020 – January 2022 ## Researcher in ARIES

Advanced multi-Rat Integrated multi-sensors solution for Emergency prevention, detection and response operationS (ARIES). IAP 5G for L'ART Feasibility Study in response to the ITT ESA AO10064 - Law Enforcement and Emergency Response - Area L'Aquila/the Abruzzo Region. ESA Contract 4000133127/20/NL/AF, funding 200000 €.

Development of Multi-RAT algorithms based on optimal control for the communication between ground sensors and drone-based access points for forest fires' monitoring and early intervention strategies.

November 2020 – Present ## Researcher for the Consortium for the Research in Automation and Telecommunications (CRAT)

Personal activities related to procurement and drafting of several project proposals for the Horizon Europe Program, ESA 5G Programs, IPCEI Salute, PNRR, Contratti di sviluppo MISE.

2019 – 2021 ## Writer for Close–Up Engineering

Scientific dissemination activities on mathematics and physics, with more than 30 articles written on various blogs belonging to the online magazine "Close-Up Engineering".

REVIEWER EXPERIENCE

April 2022 – Present ## Control Engineering Practice

October 2022 ## American Control Conference - San Diego 2023

December 2023 ## European Control Conference - Stockholm 2024

TEACHING

June 2021 – Present ## Assistant Lecturer

- **Fondamenti di Automatica**. Bachelor's Degree in Electrical Engineering, University of Rome "La Sapienza", course code: 1015384, ECTS: 9. Course practitioner;
- **Fondamenti di Automatica**. Bachelor's Degree in Electronic and Communication Engineering, University of Rome "La Sapienza", course code: 1015384, ECTS: 9. Course practitioner;
- **Control of Autonomous Multi-Agent Systems**. Master in Control Engineering, University of Rome "La Sapienza", course code: 1041427, ECTS: 3. Seminars on Deep Reinforcement Learning algorithms for network selection and resource allocation in heterogeneous networks;
- **Control of Communications and Energy Networks**. Master in Control Engineering, University of Rome "La Sapienza", course code: 1041429, ECTS: 6. Four seminars on ARIES, VADUS HyDEMO research activities;
- **Controlli Automatici**. Bachelor in Computer and Control Engineering, University of Rome "La Sapienza", course code: 1021946, ECTS: 9. Seminars on data driven control techniques based on Reinforcement Learning with application on 5G communication networks.

March 2021 – Present

Assistant Supervisor

I have served as an assistant supervisor of 10 bachelor theses, 2 master theses and 2 Student Honors Program's related activities.

SCHOLARSHIPS AND CERTIFICATES

2022

Laureato Eccellente - Control Engineering graduates A.A. 2020

2015 – 2020

Bonus Studenti Meritevoli "La Sapienza"

2017

CLAD: Certificate LabVIEW Associate Developer

Certification obtained by National Instruments on December, 2017, after attending a practical course at the University of Rome "La Sapienza" during the Bachelor's Degree.

PERSONAL SKILLS

Mother tongue   Italian

Languages   In–depth knowledge of English language, both in written and in oral form. In order to improve my language skills I attended for two consecutive years summer schools in Liverpool and Birmingham. During these study trips I was admitted to the B2–level class.

Computer skills
- in–depth knowledge of Windows, Unix–like and Mac OS
- advanced expertise with Microsoft Office programs
- MATLAB, Python, LabVIEW expert
- experience with C, C++, Java

Organizational / managerial skills   Since the beginning of my PhD Program I have been organizing meetings and calls with industrial and non–industrial partners to channeling strategies on research projects.

Driving license   A1, B.

Attitudes   Accurate, precise, with a remarkable ability in problem solving and strong attitude to team–working. I am always looking for new stimuli and goals to pursue.

PUBLICATIONS

[1] Tantucci, A., **Wrona, A.**, & Pietrabissa, A. (in press). Precise Orbit Determination on LEO Satellite Using Pseudorange and Pseudorange-Rate Measurements . *In 2023 30th Mediterranean Conference on Control and Automation (MED) - IEEE*.

[2] Giuseppi, A., Pio Lo Porto, L., **Wrona, A.**, & Menegatti, D. (in press). Landslide Susceptibility Prediction from Satellite Data through an Intelligent System Based on Deep Learning. *In 2023 30th Mediterranean Conference on Control and Automation (MED) - IEEE*.

[3] **Wrona, A.**, De Santis, E., Delli Priscoli F., & Lavacca F. G. (in press). An Intelligent Ground Station Selection Algorithm in Satellite Optical Communications Via Deep Learning. *In 2023 30th Mediterranean Conference on Control and Automation (MED) - IEEE.*

[4] **Wrona, A.**, & Tantucci, A. (2023). Artificial Intelligence–Based Data Path Control in LEO Satellites–Driven Optical Communications. Authorea Preprints.

[5] Baldisseri, F., **Wrona, A.**, Menegatti, D., Pietrabissa, A., Battilotti, S., Califano, C., ... & Delli Priscoli, F. (2023, September). Deep Neural Network Regression to Assist Non-Invasive Diagnosis of Portal Hypertension. In Healthcare (Vol. 11, No. 18, p. 2603). MDPI.

[6] **Wrona, A.** et al. (submitted). An Intelligent Deep Reinforcement Learning Framework for Medical Image Classification. *IEEE Access*.