

Giuseppe Silano

Curriculum Vitae

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Education

- Dec 2016 – Today **Ph.D. Program in Information Technologies for Engineering**, *Group for Research on Automatic Control Engineering (GRACE)*, University of Sannio, Benevento, Italy.
- Research topics are in robotics, control, path planning and software-in-the-loop.
 - Supervisor: [Prof. Dr. Luigi Iannelli](#).
- Mar 2019 – Nov 2019 **Visiting Ph.D. student at Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS), Robotics and Interactions (RIS) group**, *Centre National de la Recherche Scientifique (CNRS)*, Toulouse, France.
- Control of full-actuated 6DoFs¹ robots with onboard sensors.
 - Supervisor: [Prof. Dr. Antonio Franchi](#).
- Mar 2016 **Master of Science in Electronic Engineering**, *University of Sannio*, Benevento, Italy.
- Focus on robotics, control, electronics and telecommunication.
- Jul 2012 **Bachelor of Science in Computer Engineering**, *University of Sannio*, Benevento, Italy.
- Focus on robotics, control, software, telecommunication and electronics.
- Feb 2012 – Jun 2012 **Industrial Internship in Systems Engineering**, *Mosaico Monitoraggio Integrato S.r.l.*, Benevento, Italy.
- Design a software production methodology using an Object Oriented (OO) approach for Programmable Logic Controllers (PLCs).

Theses

- On going **Ph.D. Thesis**, *Software-in-the-loop methodologies for the analysis and control design of small UAV² systems*, University of Sannio, Benevento, Italy.
- Show the role and the effectiveness of robotic simulators and Software-in-the-loop methodologies in the flight control system design for multi-rotor aircraft.
 - Advisors: [Prof. Dr. Luigi Iannelli](#).
- Sep 2015 – Mar 2016 **Master Thesis**, *Development of a simulator aimed to detect and track moving objects for UAVs*, University of Sannio, Benevento, Italy.
- Design and develop of a 3D simulator aimed to detect and track arbitrary moving objects for UAVs.
 - Advisors: [Prof. Dr. Luigi Iannelli](#).
- Feb 2012 – Jun 2012 **Bachelor Thesis**, *An Object Oriented approach aimed to the creation of control software for industrial processes*, Mosaico Monitoraggio Integrato S.r.l., Benevento, Italy.

¹ DoFs: Degree of Freedoms.

¹ UAVs: Unmanned Aerial Vehicles.

- Design a software production methodology using an Object Oriented (OO) approach for Programmable Logic Controllers (PLCs).
- Advisors: [Prof. Dr. Luigi Iannelli](#) and Eng. Paolo Rubino.

Professional Affiliation

- Dec 2016 – Today **IEEE (Institute of Electrical and Electronic Engineers)**, *Student Member*.
- Dec 2016 – Today **IEEE Control Systems Society**, *Student Member*.
- Dec 2016 – Today **IEEE Robotics and Automation Society**, *Student Member*.
- Dec 2017 – Dec 2018 **IEEE Power Electronics Society**, *Student Member*.

Academic Appointments

- Dec 2019 – Today **Research Assistant**, *Group for Research on Automatic Control Engineering (GRACE)*, University of Sannio, Benevento, Italy.
 - Supervisor: [Prof. Dr. Luigi Iannelli](#).
- May 2016 – Nov 2016 **Research Assistant**, *Group for Research on Automatic Control Engineering (GRACE)*, University of Sannio, Benevento, Italy.
 - Supervisor: [Prof. Dr. Luigi Iannelli](#).

Professional Experience

- Jun 2014 – Apr 2020 **Technical Writer**, *Writer of technical articles for magazines and web platforms*, i.e., "Win Magazine", "Ridible", "Firmware", "EOS Book" and "Fare Elettronica", Italy.
- Apr 2016 **Junior Software Engineer**, *Software Engine S.r.l.*, Solofra, Avellino, Italy.
 - Web Developer (specialized in front-end development) responsible for the care (maintenance, debugging) and implementation of HTML5 and CSS3 templates (following the mobile-first responsive and cross browsing), javascript (jQuery, Angular-js) and back-end integration (Java), as well as, management and implementation of relational databases and debugging.
 - Projects completed:
 - *Software developer for a management system*. Develop of a software for managing documents presented under the law 219/81 and ss.mm.ii. for the town of Mirabella Eclano.
- Aug 2012 – Jan 2013 **System Integrator**, *Mosaico Monitoraggio Integrato S.r.l.*, Benevento, Italy.
 - Design and implementation of control systems for industrial automation based on PLC (Programmable Logic Controller) and SCADA (Supervisory Control And Data Acquisition).
 - Projects completed:
 - *Storage and loading system of soda autoclaves in autoclaving*. Design and development of the system, and analysis of the control system requirements in accordance to the safety functions.
 - *Leaching process of the blades core for high performance turbines*. Design and development of the system, and analysis of the control system requirements in accordance to the safety functions.

Courses during Ph.D. studies with exams³

- Oct 2018 **Operations Research**, *exam, 6 ECTS*, Prof. Dr. Pasquale Avella, University of Sannio, Benevento, Italy.
- Jul 2018 **Stochastic Process**, *exam, 3 ECTS*, Prof. Dr. Maurizio Di Bisceglie, University of Sannio, Benevento, Italy.
- Jul 2018 **Software Engineering**, *exam, 9 ECTS*, Prof. Dr. Massimiliano Di Penta, University of Sannio, Benevento, Italy.
- Jul 2018 **Deep Learning for Computer Vision**, *exam, 3 ECTS*, Prof. Dr. Luigi Troiano, University of Sannio together with the NVIDIA Deep Learning Institute (DLI), Benevento, Italy.
- Dec 2017 **Probability**, *exam, 3 ECTS*, Prof. Dr. Carmela Galdi, University of Sannio, Benevento, Italy.
- Nov 2017 **Geometric Control**, *exam, 3 ECTS*, Prof. Dr. Navdeep M. Singh, University of Sannio, Benevento, Italy.
- Sep 2017 **Tools and applications of numerical analysis**, *exam, 3 ECTS*, Eng. Dr. Adele Fusco, University of Sannio, Benevento, Italy.
- Jul 2017 **SIDRA⁴ Ph.D. Summer School**, *Italian Control Systems Society (CSS)*, *exam, 4 ECTS*, Bertinoro, Forlì-Cesena, Italy.
 - “Formal methods for the control of large-scale networked nonlinear systems with logic specifications”, coordinated by professors Maria Domenica Di Benedetto and Giordano Pola (University of Aquila).
 - “Port-Hamiltonian modelling and passivity-based control of physical systems. Theory and applications”, coordinated by professors Alessandro Macchelli (University of Bologna) and Cristian Secchi (University of Modena and Reggio).
- May 2017 **Advanced Mathematics**, *exam, 6 ECTS*, Prof. Dr. Giuseppe Cardone, University of Sannio, Benevento, Italy.
- Apr 2017 **Aircraft Pilot’s License**, Remote Piloting Media Vehicles Regulation, VL/Mc class, Aeroclub of Benevento Gen. Nicola Collarile, Benevento, Italy.

Other Activities

- Jul 2018 – Today **Open Source Developer**, *Contributor, author and maintainer of open-source projects*.
 - Among the authors and maintainer of the T_EX repository “europecv”. CTAN (Comprehensive TEX Archive Network) profile available at <https://ctan.org/home/g.silano>.
 - Contributor of the [styles](#), [RotorS](#), [bebop_autonomy](#), [ros-travis-integration](#), [kao-book](#) packages, [templates](#) and [draw examples in L^AT_EX](#).
 - GitHub profile: <https://github.com/gsilano>.
- Apr 2016 **Invited talk**, *Advanced drone applications: opportunities and problems*, Make & Share event, Tech Coffee association, Benevento, Italy.

³ ECTS: European Credit Transfer and Accumulation System.

⁴ SIDRA: Italian Society of Automatic Control.

Teaching Experience

Teaching Assistance

- Sep 2017 – Dec 2019 **Teaching Assistant for Discrete Systems**, *University of Sannio*, Benevento, Italy, Supervisor: [Prof. Dr. Luigi Iannelli](#).
- Mar 2016 – Jun 2019 **Teaching Assistant for Automatic Control**, *University of Sannio*, Benevento, Italy, Supervisor: [Prof. Dr. Luigi Iannelli](#).
- Sep 2018 – Dec 2018 **Teaching Assistant for Advanced Controls**, *University of Sannio*, Benevento, Italy, Supervisor: [Prof. Dr. Luigi Glielmo](#).

Co-supervisor Scientific Activity

- 2020 **MIT Independent Activity Program of Ria Sonecha**, *Software- and hardware-in-the-loop methodologies aimed to test and validate the open-source simulation platform CrazyS*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).
- 2018 **MIT Independent Activity Program of Benjamin Rodriguez**, *Crazyflie 2.0 model and control for Gazebo 3D simulator*, *University of Sannio*, Benevento, Italy, Advisors: [Prof. Dr. Luigi Glielmo](#), [Prof. Dr. Luigi Iannelli](#) and [Dr. Davide Liuzza](#).

Student Supervisor

- 2017 **Bachelor Thesis of Emanuele Aucone**, *Hovering control for a nano quad-rotor*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).
- 2017 **Bachelor Thesis of Francesco Mariano D'Andrea**, *Adaptive control of the vertical dynamics of a drone*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).
- 2017 **Bachelor Thesis of Olga Napolitano**, *State estimation for a quad-rotor*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).
- 2017 **Bachelor Thesis of Susanna Maio**, *Analysis of the vertical control of a quad-rotor in the V-REP simulation environment*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).
- 2016 **Bachelor Thesis of Andrea Mascia**, *Study of the algorithm for the position estimation of a micro UAV*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).
- 2016 **Bachelor Thesis of Luca De Vincentis**, *Experimental characterization of the flight control system of a micro UAV*, *University of Sannio*, Benevento, Italy, Advisor: [Prof. Dr. Luigi Iannelli](#).

Scientific Activity⁵

Edited books reviewer

- 2019 Koubaa, Anis (Ed.), "Robot Operating System (ROS) - The Complete Reference (Volume 5)", Springer International Publishing, 2020.
- 2018 Koubaa, Anis (Ed.), "Robot Operating System (ROS) - The Complete Reference (Volume 4)", Springer International Publishing, 2019.

⁵ Link to the Publons profile: <https://publons.com/researcher/1667164/giuseppe-silano>.

International Journal Reviewer

- 2019 – 2020 IEEE Transactions on Control Systems Technology
- 2019 Springer Journal of Intelligent & Robotic Systems

International Conference Reviewer

- 2020 International Conference on Unmanned Aircraft Systems (ICUAS)
- 2020 IEEE International Workshop on Metrology for Aerospace (MAS)
- 2019 IEEE European Control Conference (ECC)
- 2019 IEEE Conference on Decision and Control (CDC)
- 2018 – 2019 IEEE American Control Conference (ACC)
- 2018 IEEE Conference on Control Technology and Applications (CCTA)

Research Projects

- [RP1] **Participation within H2020-2018-2-RIA-two-stages – ECSEL, *Comp4Drones, Software Components For Drones***, research project agreement 826610, Project Advisor for the University of Sannio: [Prof. Dr. Luigi Iannelli](#), Role: participant.
- [RP2] **Participation within the Mohamed Bin Zayed International Robotic Challenge (MBZIRC) 2020**, Project Advisor: [Prof. Dr. Antonio Franchi](#), Role: member of the Laboratoire d'Analyse et d'Architecture des Systemes (LAAS) team.
- [RP3] **Participation within H2020-2017-2-RIA-two-stages – ECSEL, *AFar-Cloud, Aggregate Farming in the Cloud***, research project agreement 783221, Project Advisor for the University of Sannio: [Prof. Dr. Luigi Glielmo](#), Role: participant.

Research Activities

Control algorithms for autonomously managing the production and coordinating the farming operations

Within the AFarCloud [\[RP3\]](#) European project, control techniques aimed to autonomously managing the production and coordinating the farming operations have been investigated, i.e., hierarchical planning algorithms (e.g., RRT, A*, etc.). Specifically, algorithms to coordinate the operations within the farming autonomous activity, thus enhancing productivity and cost reduction, gradually shifting towards a high-level autonomy [\[C3\]](#).

Flight control of Unmanned Aerial Vehicles

Recently some activities dealing with Unmanned Aerial Vehicles (UAVs), in particular multi-rotor drones, [\[J1\]](#), [\[BC1\]](#), [\[C2\]](#), [\[C4\]](#) and [\[C5\]](#) have been carried out. Software-in-the-loop (SIL) simulation has been investigated as an effective tool for analyzing the behavior of the closed control loop [\[BC1\]](#) and for helping in the design of control strategies [\[C2\]](#).

- o **CrazyS:** CrazyS is an extension of the ROS (Robot Operating System) package [RotorS](#), aimed to model, develop and integrate the [Crazyflie 2.0 nano quad-rotor](#) in the physics based simulation environment [Gazebo](#). Such simulation platform allows to understand quickly the behavior of the flight control system by comparing and evaluating different indoor and outdoor scenarios, with a details level quite close to reality. The proposed extension, running on Kinetic Kame and Melodic Morenia versions of ROS but fully compatible with the Indigo Igloo one, expands the RotorS capabilities by considering the Crazyflie 2.0 physical model, its flight control system and the Crazyflie's onboard IMU (Inertial Measurement Unit), as well. The code has been released as open-source under Apache license (<https://github.com/gsilano/CrazyS>) and at the same time a pull request was opened on the RotorS repository with the aim to share the obtained results with other researchers who already use such tools and would like to use the platform [BC1], [C4].
- o **BebopS:** The repository contains the ROS code developed for the “Aerial robotics control and perception challenge”, the Industrial Challenge of the 26th Mediterranean Conference on Control and Automation (MED'18) [A2]. The code aims to simulate the dynamics of the [Parrot Bebop 2](#) together with the flight controller (both high and low level) when external disturbances (e.g., wind gusts) acting on it. The control algorithms were designed in MATLAB/Simulink and validated in Gazebo by using the MathWorks Robotics System Toolbox (RST). Therefore, the repository contains both ROS nodes and launch files needed to simulate the drone behavior when a tracking algorithm is run. Also, on GitHub the glue code written during the challenge to tackle the tracking problem with the real platform is available. Such code allows to send control commands and to receive data from the aircraft and the Motion Capture (MoCap) systems, i.e., Vicon. Finally, the repository contains the developed ROS code to connect the control algorithm to the [Parrot Sphinx simulator](#) including the Parrot Bebop onboard firmware in the loop. In this way, details like synchronization, timing issues, fixed point computation, overflow, divisions-by-zero, can be isolated and investigated in detail [C2]. The code has been released as open-source under Apache license at the link <https://github.com/gsilano/BebopS>.
- o **MAT-Fly:** MAT-Fly is a numerical simulation platform for multi-rotors aircraft characterized by the ease of use and control development. The platform is based on MATLAB and the MathWorks Virtual Reality (VR) Toolbox that work together to simulate the behavior of a drone in a 3D environment while tracking a car that moves along a non trivial path. The VR toolbox has been chosen due to the familiarity that students have with MATLAB and because it allows to move the attention to the classifier, the tracker, the reference generator and the trajectory tracking control thanks to its simple structure. The overall architecture is quite modular so that each block can be easily replaced with others by simplifying the development phase and by allowing to add even more functionalities. The code is released under Apache license and made available at the link <https://github.com/gsilano/MAT-Fly>, thus making the numerical platform available for scientific and educational activities [J1], [C5].

Mohamed Bin Zayed International Robotics Challenge (MBZIRC) 2020

- The Mohamed Bin Zayed International Robotics Challenge (MBZIRC) is a biennial international robotics competition that provides an ambitious and technologically demanding set of challenges and is open to all teams from all countries. Also, the MBZIRC competition aims to inspire future robotics through innovative solutions and technological excellence. Within the competition, specifically the “challenge 2” of the 2020 edition, autonomous aerial and ground robots have been carried out for navigation and manipulation tasks, in unstructured, outdoor and indoor environments. In particular, a team of UAVs and a UGV (Unmanned Ground Vehicle) collaborating to autonomously locate, pick, transport and assemble different types of brick shaped objects to build pre-defined structures, in an outdoor environment. The challenge is motivated by construction automation and autonomous robot based 3D printing of large structures. This research activities has been carried out during the visiting period spent at LAAS-CNRS in Toulouse [A1], [C1].

Awards

- [A1] **Among the participants of LAAS team [RP2], finalist of the “Mohamed Bin Zayed International Robotics Challenge (MBZIRC)”**, *International Robotics Competition*, organized by the Khalifa University, Abu Dhabi, United Arab Emirates, Webpage: <http://mbzirc2020team.laas.fr/>, <http://mbzirc.com/> Video: <https://youtu.be/OuWvDbA7Eug>.
- [A2] **Finalist of the “Aerial robotics control and perception challenge”**, *26th Mediterranean Conference on Control and Automation (MED'18) Industrial Challenge*, organized by the University of Zagreb, Croatia, ISSN: 1066–033X, DOI: [10.1109/MCS.2018.2888719](https://doi.org/10.1109/MCS.2018.2888719), URL: <http://dx.doi.org/10.1109/MCS.2018.2888719>.

Conference Contributions

- Jun 2018 **26th Mediterranean Conference on Control and Automation (MED'18)**, *CrazyS: a software-in-the-loop platform for the Crazyflie 2.0 nano-quadcopter*, Zadar, Croatia, Oral Presentation.
- Sep 2017 **Automatica.it 2017**, *national meeting held by SIDRA⁴, An educational simulation platform for Unmanned Aerial Vehicles aimed to detect and track moving objects*, Milan, Italy, Interactive Session.

Publications

Referred Journals

- [J1] **G. Silano**, and L. Iannelli. “*MAT-Fly: an educational platform for simulating Unmanned Aerial Vehicles aimed to detect and track moving objects*”, URL: <https://arxiv.org/abs/1904.00378>. UNDER REVIEW.

Book Chapters

- [BC1] **G. Silano**, and L. Iannelli. “*CrazyS: a software-in-the-loop simulation platform for the Crazyflie 2.0 nano-quadcopter*”. In *Robot Operating System (ROS): The Complete Reference (Volume 4)*, Ed. by Koubaa, Anis, Springer International Publishing, 2020, pp. 81–115, ISBN: 978-3-030-20190-6, DOI: [10.1007/978-3-030-20190-6_4](https://doi.org/10.1007/978-3-030-20190-6_4), URL: https://doi.org/10.1007/978-3-030-20190-6_4.

Peer-Reviewed Conference Papers

- [C1] A. Afifi, **G. Silano**, M. Tognon, G. Oriolo, and A. Franchi. “*A General Control Architecture for Visual Servoing and Physical Interaction Tasks for Aerial Vehicles*”, MBZIRC Symposium 2020, the First International Robotic Challenges Symposium. Abu Dhabi, United Arab Emirates, February 2020, TO BE PRESENTED.
- [C2] **G. Silano**, P. Oppido, and L. Iannelli, *Software-in-the-loop simulation for improving flight control system design: a quadrotor case study*, 2019 IEEE International Conference on Systems, Man, and Cybernetics (SMC). Bari, Italy, October 2019, pp. 466–471, ISBN: 978-1-7281-4569-3, DOI: [10.1109/SMC.2019.8914154](https://doi.org/10.1109/SMC.2019.8914154), URL: <http://dx.doi.org/10.1109/SMC.2019.8914154>.
- [C3] P. Daponte, L. De Vito, L. Glielmo, L. Iannelli, D. Liuzza, F. Picariello, and **G. Silano**⁶, *A review on the use of drones for precision agriculture*, 2018 1st Workshop - Metrology for Agriculture and Forestry (MetroAgriFor). Ancona, Italy, October 2018, pp. 1–10, DOI: [10.1088/1755-1315/275/1/012022](https://doi.org/10.1088/1755-1315/275/1/012022), URL: <http://dx.doi.org/10.1088/1755-1315/275/1/012022>.
- [C4] **G. Silano**, E. Aucone, and L. Iannelli, *CrazyS: a software-in-the-loop platform for the Crazyflie 2.0 nano-quadcopter*, 2018 26th Mediterranean Conference on Control and Automation (MED). Zadar, Croatia, June 2018, pp. 352–357, ISBN: 978-1-5386-7891-6, DOI: [10.1109/MED.2018.8442759](https://doi.org/10.1109/MED.2018.8442759), URL: <http://dx.doi.org/10.1109/MED.2018.8442759>.
- [C5] **G. Silano**, and L. Iannelli, *An educational simulation platform for GPS-denied Unmanned Aerial Vehicles aimed to the detection and tracking of moving objects*, 2016 IEEE Conference on Control Application (CCA). Buenos Aires, Argentina, September 2016, pp. 1018–1023, ISBN: 978-1-5090-0755-4, DOI: [10.1109/CCA.2016.7587947](https://doi.org/10.1109/CCA.2016.7587947), URL: <http://dx.doi.org/10.1109/CCA.2016.7587947>.

Posters

- [P1] **G. Silano**, P. Oppido, and L. Iannelli, “*Software-in-the-loop simulation for improving flight control system design: a quadrotor case study*”. In *SIDRA*⁴ National Meeting, Ancona, Italy, September 2019. DOI: [10.13140/RG.2.2.31583.61603](https://doi.org/10.13140/RG.2.2.31583.61603), URL: <http://dx.doi.org/10.13140/RG.2.2.31583.61603>
- [P2] **G. Silano**, and L. Iannelli, “*An educational simulation platform for Unmanned Aerial Vehicles aimed to detect and track moving objects*”. In *SIDRA*⁴ National Meeting, Milan, Italy, September 2017. DOI: [10.13140/RG.2.2.14878.43849](https://doi.org/10.13140/RG.2.2.14878.43849), URL: <http://dx.doi.org/10.13140/RG.2.2.14878.43849>.

⁴ The authors are reported in alphabetic order.

References

Prof. Dr. Luigi Iannelli, Department of Engineering, University of Sannio, Piazza Roma, 21, 82100 Benevento, Italy, luigi.iannelli@unisannio.it.

Prof. Dr. Antonio Franchi, Faculty of Electrical Engineering, Mathematics & Computer Science, University of Twente, Carré 3609, P.O. Box 217, 7500 AE Enschede, Netherlands, a.franchi@utwente.nl.

Dr. Davide Liuzza, ENEA (National Agency for new technologies, energy and sustainable economic development), Lungotevere Thaon di Revel, 76, 00196 Rome, Italy, davide.liuzza@enea.it.

Prof. Dr. Luigi Glielmo, Department of Engineering, University of Sannio, Piazza Roma, 21, 82100 Benevento, Italy, glielmo@unisannio.it.