Weibin Gu

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CAREER OBJECTIVES

A post-doctoral fellow specialized in autonomous robotic systems, especially powered by artificial intelligence. Equipped with strong problem-solving skills harvested from abundant hands-on experience acquired in research and company projects. Self-motivated, passionate about lifelong learning, and eager to transfer cutting-edge technologies into innovation.

EDUCATION

Politecnico di Torino **Turin, Italy**
Ph.D. in Electrical, Electronics and Telecommunications Engineering *Nov. 2020 - Jan. 2024*
Supervisor: Prof. Dr. Alessandro Rizzo
Research Interests: Nonlinear Control, Machine Learning, Explainable AI, Autonomous Robots
Dissertation: Towards Trustworthy Data-driven Modeling and Control for Unmanned Aerial Vehicles
Highlight: Amazon Research Award in Robotics (2021) – "Physics-Informed Machine Learning for Trustworthy Control of Autonomous Robots"

Politecnico di Torino **Turin, Italy**
M.Sc. in Mechatronic Engineering *Sept. 2015 - July 2017*
Thesis: Fault-Tolerant Adaptive Control Laws for a Small Unmanned Aerial Vehicle

Politecnico di Torino **Turin, Italy**
B.Sc. in Mechanical Engineering (Double-degree Program) *Sept. 2014 - July 2015*
Thesis: Reflective Object Recognition and Custom Classifier Training using OpenCV

Tongji University **Shanghai, China**
B.Sc. in Mechanical Engineering (Double-degree Program) *Sept. 2011 - July 2014*

ACADEMIC EXPERIENCE

Postdoctoral Fellow **Beijing, China**
Institute for AI Industry Research (AIR), Tsinghua University *Jan. 2024 - Present*
- Supporting teaching activities and participating in research projects.

Graduate Student Researcher **Denver, USA**
University of Denver, supervised by Prof. Kimon P. Valavanis *Sept. 2018 - Aug. 2019*
- Carried out a thorough literature review on model-based control (MBC) techniques combined with artificial neural networks (ANNs) for the flight control of unmanned aerial vehicles (UAVs).
- Investigated the real-time performance of ANNs by analyzing the time complexity of feed-forward propagation for networks such as multi-layer perceptron (MLP) and echo state network (ESN).
- Envisaged an MBC-ANN control architecture to get the best of both worlds.

Student Researcher **Turin, Italy**
Politecnico di Torino, supervised by Prof. Alessandro Rizzo *July 2017 - Aug. 2018*
- Designed a networked flight control architecture capable of compensating for package dropouts in both sensing and actuation communication channels for a small fixed-wing UAV.
- Conducted simulations with nonlinear aircraft model in MATLAB/Simulink for performance evaluation under lossy network conditions.
- Performed hardware-in-the-loop (HIL) tests on XMOS XK-1 to emulate real package dropouts.

TEACHING ACTIVITIES

- Teaching Assistant, Undergraduate course:"From Intelligent Micro Aerial Vehicles to Flying Cars: Design and Practice" at Tsinghua University, Feb. 2024 - June 2024
- Lecturer, Institute for AI Industry Research (AIR) Winter Camp, Tsinghua University, Jan. 2024
- Co-supervisor, Final thesis research of M.Sc. students at Politecnico di Torino, Sept. 2021 - Oct. 2022
- Teaching Assistant, Master's course:"Robotics" at Politecnico di Torino, Nov. 2020 - June 2021

ACADEMIC SERVICES

- Senior Reviewer, IEEE Robotics & Automation Society
- Reviewed for conferences: IEEE Conference on Decision and Control (CDC), American Control Conference (ACC), IEEE International Conference on Robotics and Automation (ICRA), International Conference on Unmanned Aircraft Systems (ICUAS).
- Reviewed for journals: IEEE Control Systems Letters (L-CSS), IEEE Robotics and Automation Letters (RA-L), IEEE Transactions on Automation Science and Engineering, IEEE Transactions on Industrial Informatics, IEEE Transactions on Network Science and Engineering, Autonomous Robots, Artificial Intelligence Review, Journal of Intelligent and Robotic Systems.

AWARDS AND ACHIEVEMENTS

- Shuimu Tsinghua Scholar, Tsinghua University, 2024
- PhD graduation with distinction (cum laude), Politecnico di Torino, 2024
- Agile Explorer, Badge issued by IBM SkillsBuild, Mar. 2023
- Ente Regionale per il Diritto allo Studio Universitario del Piemonte (EDISU) Scholarship, AY 2016-2017
- Compagnia di San Paolo – Politecnico Scholarship, The Winner (among 6) in the Engineering Area for Master of Science Level, AY 2015-2016
- Second Price, Tongji University Undergraduate Innovation Program, June 2014

KEY SKILLS

- Programming Language: C/C++, Python, HTML, CSS, JavaScript
- Technical Skills: MATLAB, Simulink, ROS, PyTorch, LaTeX
- CAD Tools: SolidWorks, AutoCAD, PTC Creo

LANGUAGES

- Chinese: Native Proficiency
- English: Professional Proficiency (IELTS 7.5)
- Italian: Elementary Proficiency (B1-B2)

WORKING EXPERIENCE

Shanghai FOIA Co., Ltd **Shanghai, China**

Flight Control Engineer & Project Lead *Sept. 2019 - Oct. 2020*

- Led the team of autonomous quadrotor project for wind turbine inspection, including conducting marketing research, identifing customer needs, leading product strategies, and overseeing product development from conception to completion.
- Developed on-board control system including flight control and vision-based navigation algorithms.
- Validated and refined the developed system through extensive simulations and field testings.
- Claimed intellectual property (e.g., patents and research papers).
- Our developed system demonstrated very promising performance in the real-world flight, being the first who was capable of showcasing fully-autonomous wind turbine inspection with minimal restrictions in China at that time.

Shanghai Electric Group Co., Ltd **Shanghai, China**
Summer Intern *July 2012 - Aug. 2012*

- 2D/3D modeling of mechanical and electrical components in PTC Creo (formerly known as ProE) and Siemens NX (formerly known as UG).

EXTRACURRICULAR ACTIVITIES

Innovation 4 Change (2023 Edition) **Turin, Italy & Geneva, Switzerland**
Participant of the Leading Italian Innovation Project *Feb. 2023 – July 2023*

- Selected as one of the 21 PhD researchers from top doctoral schools, participated in the 5-month programme organized by Collège des Ingénieurs, Politecnico di Torino and CERN Ideasquare together with 41 MBA managers to develop innovative and scalable business ideas and practical solutions to respond to the key challenges posed by industrial partners.
- Worked closely with our challenge owner, DSM (a global purpose-led, science-based company specializing in health and nutrition), on the problem: How might we empower the usage of innovation enabling small-medium farmers to cope with complexity?
- Developed and showcased our solution on the European Leaders Summit: FarmifAI, a simple-to-use digital companion with large language model (LLM) at its core through which livestock farmers can interact directly via voice, assisting them in navigating through this ever-changing and complex world without sacrificing their time and efforts on their beloved animals.

PUBLICATIONS

Weibin Gu, Carlos Perez-Montenegro, Elisa Capello and Alessandro Rizzo. "An Integrated Control Architecture for a Cloud-based Unmanned Aerial Vehicle System with Lossy Networks." *2019 18th European Control Conference (ECC)* (2019): 3538-3543.

Weibin Gu, Kimon P. Valavanis, Matthew J. Rutherford and Alessandro Rizzo. "A Survey of Artificial Neural Networks with Model-based Control Techniques for Flight Control of Unmanned Aerial Vehicles." *2019 International Conference on Unmanned Aircraft Systems (ICUAS)* (2019): 362-371.

Weibin Gu, Dewen Hu, Liang Cheng, Yabing Cao, Alessandro Rizzo and Kimon P. Valavanis. "Autonomous Wind Turbine Inspection using a Quadrotor." *2020 International Conference on Unmanned Aircraft Systems (ICUAS)* (2020): 709-715.

Weibin Gu, Kimon P. Valavanis, Matthew J. Rutherford and Alessandro Rizzo. "UAV Model-based Flight Control with Artificial Neural Networks: A Survey." *Journal of Intelligent & Robotic Systems* 100 (2020): 1469 - 1491.

Weibin Gu, Stefano Primatesta, Alessandro Rizzo. "Physics-informed Neural Network for Quadrotor Dynamical Modeling." *Robotics and Autonomous Systems* (2024).

Weibin Gu, Alessandro Rizzo. "Online Residual Learning using Interpretable Reservoir Computing for Quadrotor Control." *2024 International Conference on Unmanned Aircraft Systems (ICUAS)* (2024): 23-30.

Weibin Gu, Stefano Primatesta, Alessandro Rizzo. "Robust adaptive control for aggressive quadrotor maneuvers via so(3) and backstepping techniques." *Robotics and Autonomous Systems* (2025), 104942, ISSN 0921-8890, https://doi.org/10.1016/j.robot.2025.104942.

Weibin Gu, Jiance Zhao, Alessandro Rizzo. "Learning Uncertainties Online for Quadrotor Flight Control: A Comparative Study." *Journal of Intelligent & Robotic Systems* (2024): Under Review.

PATENTS

Yuchuan Zhang, **Weibin Gu**, Guodong Liang, Liang Fan. 2020. An Unmanned Aerial Vehicle Platform for Autonomous Thorough Inspection for Wind Turbines under Collaborative Scheme. China Patent Application 202022241054.0, filed October 2020.