Nicholas Cartocci

PhD Student

Interests

Nicholas Cartocci's current interests include Biomedical Signals Processing, specifically for Fall Detection, Fall Prediction and Injury Prevention, and Artificial Intelligence (AI), particularly Machine Learning and Deep Learning.

Research Experiences

11/2022 - Ongoing
XoLab, Advanced Robotics, Italian Institute of Technology (IIT).
PhD Student in the research theme: "Data processing using ML techniques for fall detection and prediction".
Tutors: Dr. J. Ortiz, Dr. A.E. Gkikakis. and Prof. D.G. Caldwell

06/2022 - 10/2022
XoLab, Advanced Robotics, Italian Institute of Technology (IIT).
Fellow researcher in the project: "Machine Learning for Fall Detection and Prediction".
Supervisors: Dr. J. Ortiz and Dr. A.E. Gkikakis.

05/2021 - 05/2022
Department of Engineering, University of Perugia.
Research assistant "assegno di ricerca" in the project: "Development and validation of algorithms for the perception, localization, navigation, control and security of electric autonomous vehicles".
Supervisor: Prof. M.L. Fravolini.

05/2020 - 05/2021
Department of Engineering, University of Perugia.
Research assistant "assegno di ricerca" in the project: "Development of tools for the elaboration of time series and video streams with application to the precision farming".
Supervisor: Prof. M.L. Fravolini.

04/2020 - 05/2020
Department of Engineering, University of Perugia.
Research contract for the project: "Models and algorithms for detection and classification of anomalies and faults in time series and signals".
Supervisor: Prof. M.L. Fravolini.

01/2019 - 03/2019
Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University.
Scholarship for the research project: "Data-Driven Residuals and Bayesian Filtering for Robust Aircraft Sensor Fault Isolation applied to Tecnan P92 aircraft".
Supervisor: Prof. M.R. Napolitano.

10/2018 - 12/2018
Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University.
Scholarship for the internship project: "Implementation and comparison of data-based sensor fault isolation techniques for aircraft systems".
Supervisor: Prof. M.R. Napolitano.

Appointments

12/2020 - 05/2022
Subject Expert
Expert from the Scientific Disciplinary Area ING-INF/04 (Automation) to profit examination committees

Publications

2024   *Cartocci N.*, Pitzalis R. F., Ortiz J., Dogan K. M., Yucelen T., Fravolini M. L., "*Directional thrust control of a powered wingsuit for assisted glide*", AIAA Scitech 2024 Forum. January 2024, LINK.

2023   Leomanni M., Ferrante F., *Cartocci N.*, Costante G., Fravolini M. L., Dogan K. M., Yucelen T., "*Robust Output Feedback Control of a Quadrotor UAV for Autonomous Vision-Based Target Tracking*", AIAA 2023-1632. AIAA Scitech 2023 Forum. January 2023, DOI.

2022   *Cartocci N.*, Crocetti F., Costante G., Valigi P., Fravolini M. L., "*Robust Multiple Fault Isolation Based on Partial-Orthogonality Criteria*", International Journal of Control, Automation and Systems, 20, 2148–2158, DOI.

2022   *Cartocci N.*, Napolitano M. R., Crocetti F., Costante G., Valigi P., Fravolini M. L., "*Data-Driven Fault Diagnosis Techniques: Non-Linear Directional Residual vs. Machine-Learning-Based Methods*", Sensors, 22(7), 2635, DOI.

2022   *Cartocci N.*, Napolitano M. R., Costante G., Valigi P., Fravolini M. L., "*Aircraft Robust Data-Driven Multiple Sensor Fault Diagnosis Based on Optimality Criteria*", Mechanical Systems and Signal Processing, 170, DOI.

2022   *Cartocci N.*, Monarca A., Costante G., Fravolini M. L., Dogan K. M., Yucelen T., "*Linear Control of a Nonlinear Aerospace System via Extended Dynamic Mode Decomposition*", AIAA 2022-2046. AIAA Scitech 2022 Forum. January 2022, DOI.

2021   *Cartocci N.*, Crocetti F., Costante G., Valigi P., Napolitano M. R., Fravolini M. L., "*Data-Driven Sensor Fault Isolation Based on Nonlinear Additive Models and Local Fault Sensitivity*", 2021 20th International Conference on Advanced Robotics (ICAR), 2021, pp. 750-756, DOI.

2021   *Cartocci N.*, Napolitano M. R., Costante G., Valigi P., Crocetti F., Fravolini M. L., "*A Robust Data-Driven Fault Diagnosis scheme based on Recursive Dempster-Shafer Combination Rule*", 2021 29th Mediterranean Conference on Control and Automation (MED), 2021, pp. 1070-1075, DOI.

2021   *Cartocci N.*, Fravolini M. L., Napolitano M. R., Costante G., "*A Comprehensive Case Study of Data-Driven Methods for Robust Aircraft Sensor Fault Isolation*", Sensors, 21(5), 1645, DOI.

2021   Fravolini M. L., *Cartocci N.*, Dogan K. M., Yucelen T., "*A Safe Learning Model Reference Adaptive Controller for Uncertain Aircrafts Models*", AIAA 2021-0532. AIAA Scitech 2021 Forum. January 2021, DOI.

2020   *Cartocci N.*, Napolitano M. R., Costante G., Valigi P., Crocetti F., Fravolini M. L., "*PCA Methods and Evidence Based Filtering for Robust Aircraft Sensor Fault Diagnosis*", 2020 28th Mediterranean Conference on Control and Automation (MED), Saint-Raphaël, France, 2020, pp. 550-555, DOI.

2020   Fravolini M. L., *Cartocci N.*, Dogan K. M., Yucelen T., "*Quantification of Tolerable Parametric and Dynamic Uncertainty for Robust MRAC Systems*", AIAA 2020-1338. AIAA Scitech 2020 Forum. January 2020, DOI.

Scientific Talks

2023	*Cartocci N.*, Gkikakis A.E., Caldwell D.G., Ortiz J., "*Deep Learning-based wearable device to prevent fall from height injuries*", 2023 5th Italian Conference on Robotics and Intelligent Machines (IRIM), 2023.
2023	*Cartocci N.*, Pitzalis R.F., Ortiz J., Fravolini M.L., "*Bidirectional assistive logic for longitudinal glide dynamics of a wingsuit*", 2023 5th Italian Conference on Robotics and Intelligent Machines (IRIM), 2023.
2023	*Cartocci N.*, Gkikakis A.E., Caldwell D.G., Ortiz J., "*Artificial intelligence-based wearable solution to prevent fall from heights injuries for the next generation of workers*", 2023 Slips, Trips and Falls (STF) International Conference, LINK.
2022	*Cartocci N.*, Gkikakis A. E., Caldwell D. G., Ortiz J., "*Real-time Fall Prevention system for the Next-generation of Workers*", Workshop on Assistive Robotic Systems for Human Balancing and Walking: Emerging Trends and Perspectives @IROS 2022, LINK.
2022	Leomanni M., Ferrante F., *Cartocci N.*, Costante G., Fravolini M.L., "*Output feedback control of a UAV for vision-based target tracking*", 2022 4th Italian Conference on Robotics and Intelligent Machines (IRIM), 2022, DOI.
2021	*Cartocci N.*, Napolitano M. R., Costante G., Crocetti F., Valigi P., Fravolini M. L., "*A Robust Data-Driven Fault Diagnosis scheme based on Recursive Dempster– Shafer Combination Rule*", AUTOMATICA.IT 2021, LINK.
2020	Bellocchio E., Bruni A., *Cartocci N.*, Costante G., Crocetti G., Longhi A., Pacicco L., Palliotti A., Petacchi R., Radicioni F., Rinaldi M., Santucci G., Sdoga A., Tosi G., Valigi P., Bisio M., "*Agrobot: autonomous robots to support economic growth and environmental sustainability of Umbria's agriculture*", 2020 2nd Italian Conference on Robotics and Intelligent Machines (IRIM), 2020, DOI.

Reviews

Journal:	Control Engineering Practice, Aerospace, Automatica, Electronics, Engineering Applications of Artificial Intelligence (EAAI), IEEE Robotics and Automation Letters (RA-L), IET Control Theory & Applications, Journal of Experimental & Theoretical Artificial Intelligence (JETAI), Mechanical Systems and Signal Processing (MSSP).
Conference:	2023 International Conference on Artificial Intelligence of Things and Systems (AIoTSys), 2023 International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), 2023 Mediterranean Conference on Control and Automation (MED), 2023 IEEE International Conference on Robotics and Automation (ICRA), 2022 ICECCME, 2022 European Control Conference (ECC), 2021 American Control Conference (ACC).

Seminars

02/2021	From Data to Decisions: the Scenario Approach (with Applications to Systems, Control and Machine Learning) 21h EECI 2021 International Graduate School on Control Instructors: Professor M.C. Campi and Professor S. Garatti.

Projects

2022-2023	Falling from Heights	Link

The project aims to design and develop novel strategies and solutions aimed at preventing accidents and protecting workers working at heights. The project will focus on advancements in wearable sensing & actuation technologies, including technologies for fall impact reduction, intelligent monitoring and new paradigms in immersive training for workers.
Sponsor: Italian Workers' compensation Authority (INAIL), project: EPTR0007

2022 Digital Value Chain (DVC): Research and application of machine learning solutions for the digitization of retail spaces

2022 SEAL: Smart&safe Energy-aware Assisted Living, The Learning Meters Network — Link

The SEAL project aims to develop new knowledge, products and services to put domotic systems on the market that implement services aimed at safety and sustainability. SEAL is related to the Smart Cities initiative, which involves the integration of units that each operate intelligently.
Executive project: SCN_00398, social innovation projects: SIN_00968

2020-2021 Agrobot: autonomous robots to support economic growth and environmental sustainability of Umbria's agriculture — Link

The AGROBOT project aims to realize and validate an autonomous robot to support innovative agricultural approaches on fields located in hilly areas belonging to small farms. It is based on state-of-the-art methods for perception, control and navigation.
Project funded by the Umbria Region PSR program 2014-2020.

Awards

2023 "Advancing Technology for Humanity – Most Promising Researcher in Robotics and AI" award finalist — Link

The award was announced by the Fondazione Mondo Digitale and the Rome Campus Bio-Medico University.

2020 "Renato Mariani" award participant

The award was announced by the Italian Association of Electrical, Electronics, Automation, Information and Communication Technology (AEIT).

2017 UniPG - Student contribution

50% reduction of fees for the first year of the master's degree program.

Education

2022-... PhD in Bioengineering and Robotics — University of Genoa
Advanced and Humanoid Robotics.

2020 Professional title of Engineer — MUR
Information Engineer.

2017-2019 Master's degree with vote 110/110 cum laude — University of Perugia
Computer Engineering and Robotics.

2013-2016 Bachelor's degree with vote 107/110 — University of Perugia
Computer Science and Electronic Engineering.

2007-2012 High school — ITIS "Galileo Galilei" Arezzo
Specialization in Electronics, Information Technology and Telecommunications.

Thesis

Master	*Data-Driven Residuals and Bayesian Filtering for Robust Aircraft Fault Isolation* LINK
	Supervisors: Prof. M. L. Fravolini & Prof. M. R. Napolitano.
	Examiner: Prof. A. Moschitta.
Bachelor	*Design and Assembly of a UAV below 300 grams with a fixed budget* LINK
	Supervisor: Prof. P. Valigi.

Technological knowledge

Base	Computer Hardware, C++, R, Java, JavaScript, Adobe Photoshop, Apache Giraph, Apache Hadoop, Apache Spark, MySQL, NoSQL databases (Riak, MongoDB, Cassandra, Neo4j), Node-RED, OpenDayLight and OpenStack.
Medium	Linux OS, MacOS, Simulink, Robot Operating System (ROS), Programmable Logic Controller (PLC) languages, Python, PyTorch, and LaTeX.
Advanced	MATLAB, Microsoft Office and Microsoft Windows.

Experiences

09/2023	Next Tech
	Social media manager for Next Tech
04/2020-01/2022	iCrewPlay.com
	COO of iCrewPlay with management and coordination responsibilities;
	PR Executive for iCrewPlay's Tech division with international PR tasks;
	Editor for iCrewPlay's Tech newsroom with over 200 articles and reviews.
2014-2020	Nital (iRobot), Canon, TomTom, Alcatel, Bayer
	Technical consultant in intelligent sensors, smart devices, computers, wearable technology, phones, and crop science.
2016-2020	Editanet S.r.l.
	Delegate for the supervision of public tenders for third parties.
2016-2017	Casio
	Technical consultant and demonstrator for Eastern Tuscany on projectors, smart cameras and high-quality cameras.
2012-2013	Sacchi Giuseppe S.p.A. - Arezzo branch
	Technical consultant and seller in the following areas: electrical distribution, lighting, electrical and electronic components, wiring, industrial automation and special systems (e.g., photovoltaic).

Languages

Italian	Native language.
English	Advanced.
French	Studied at secondary school.