Università di Genova

Raphael Zaccone

Associate Professor

EDUCATION AND TRAINING

2017
PhD
PhD in Science and Technology for Electrical Engineering, Naval Engineering, and Complex Mobility Systems, Naval Engineering curriculum obtained at the Department of Naval, Electrical, Electronic, and Telecommunications Engineering (DITEN) of the University of Genoa (XXIX cycle).
Scientific disciplinary sector: ING-IND/02 (new name IIND-01/B).
Thesis title: “Decision Support Systems for Safe and Energy Efficient Navigation.”
Supervisor: Prof. Giovanni Benvenuto.
Università degli Studi di Genova

2013
Master’s Degree in Naval Architecture and Marine Engineering
Grade: 110/110 with honors.
Thesis title: “Monitoring the operation of a gas turbine marine propulsion system using simulation techniques and metamodels.”
Supervisors: Prof. Ugo Campora, Prof. Carlo Cravero.
Thesis awarded the “RINA – d'Amico Student Naval Architect Award 2013.”
Università degli Studi di Genova

2009
Bachelor’s Degree in Naval Architecture and Marine Engineering
Grade: 110/110 with honors.
Thesis title: “Verification of the preliminary design of a 34,000 DWT double-hull bulk carrier.”
Supervisor: Prof. Carlo Podenzana Bonvino.
Università degli Studi di Genova

2006
Scientific High School Diploma P.N.I.
Grade: 100/100.
Liceo Scientifico e Classico M. L. King (Genova)

PROFESSIONAL HISTORY

01/10/2024-Today
Associate Professor
DITEN, Università degli Studi di Genova

01/10/2021 - 30/09/2024
Assistant Professor (Ricercatore a Tempo Determinato Tipo B)
DITEN, Università degli Studi di Genova

01/06/2019 - 30/09/2021

Università di Genova

Research Fellow (Ricercatore a Tempo Determinato Tipo A)
DITEN, Università degli Studi di Genova

01/02/2019 - 31/05/2019
Collaborator
Research activities within the SWAD project concerning the reliability of autonomous naval vessels.
DITEN, Università degli Studi di Genova

01/02/2017 - 31/01/2019
Postdoctoral Researcher
Research activities in the field of developing algorithms and codes for collision avoidance of naval units with applications to autonomous navigation and navigation decision support.
DITEN, Università degli Studi di Genova

01/01/2014 - 31/12/2016
PhD Candidate
Research activities in the field of algorithm development and optimal planning of shipping routes (Weather Routing - Voyage Optimization).
DITEN, Università degli Studi di Genova

ACADEMIC APPOINTMENTS

Dal 2021
Member of PhD Board
Member of the Board of the PhD Program in Marine Science and Technology at the University of Genoa
Centro del Mare, Università degli Studi di Genova

Dal 2019
Member of the Research and Technology Transfer Committee
Member of the Research and Technology Transfer Committee of the Department of Naval, Electrical, Electronic, and Telecommunications Engineering at the Polytechnic School of the University of Genoa
DITEN, Università degli Studi di Genova

Dal 2019
Member of the Quality Assurance Committee
Member of the Quality Assurance Committee for the Naval Architecture and Marine Engineering Degree Program
Naval Architecture and Marine Engineering Program, DITEN, Università degli Studi di Genova

Dal 2024
Member of the Department Council
Member of the Department Council of the Department of Naval, Electrical, Electronic, and Telecommunications Engineering
DITEN, Università degli Studi di Genova

Università di Genova

EXPERIENCE

SCIENTIFIC RESPONSIBILITY FOR RESEARCH PROJECTS

2024-2025 MINERVA (Marinizzazione di Impianto Nucleare per l'Energia a boRdo di Vascelli Armati)
UNIGE Program Manager within the MINERVA PNRM, with the aim of studying the integration of a new generation nuclear reactor for propulsion and electricity generation on board a front-line military vessel. Lead partner: Fincantieri s.p.a., Partners: Fincantieri, Ansalod Nucleare, CETENA, RINA, University of Genoa.
PNRM – Italian Ministry of Defense

2022-2025 SAFENAV
Task leader T8.4 – "Testing on the Nav. Bridge Simulator" of the EU SafeNav project, HORIZON-IA HORIZON Innovation Actions, Grant agreement ID: 101077026, DOI: https://doi.org/10.3030/101077026. The SafeNav project has developed and tested a highly innovative digital decision support system for collision prevention, to reduce the likelihood of collisions, impact damage, and grounding, and to increase navigation safety.
European Union

2021-2022 SINDBAD 2.0
Call for proposals 'Action 1.2.4. - Support for the implementation of complex research and development projects for companies affiliated with Research and Innovation Hubs' under the 2014-2020 Regional Operational Plan (ROP) of the Liguria Region, funded by the European Regional Development Fund (ERDF). Lead partner: ONAIR s.r.l. Study and development of coastal navigation risk indices capable of taking into account maritime traffic and weather and sea conditions, with the aim of creating a decision support system for sailors who, either professionally or for pleasure, operate small vessels in the northern Tyrrhenian Sea.
POR-FESR – Regione Liguria

PARTICIPATION TO RESEARCH PROJECTS

2024-2025 SAFENAV
Main contributor to the development of maneuver planning algorithms described in Task 4.3 "Mathematical Framework for the Obstacle Avoidance Problem" as part of the EU SafeNav project, HORIZON-IA HORIZON Innovation Actions, Grant agreement ID: 101077026, DOI: https://doi.org/10.3030/101077026.
European Union

2024-2025 IPD
The main objective of the project is to develop plant design support tools focused specifically on innovative power/energy generation systems with low (or zero) pollutant and greenhouse gas emissions.
In addition, these design support tools can also be used effectively in the selection and sizing of traditional on-board generation systems.
Fincantieri s.p.a.

2020-2021 VENTuRE
The project (WIDESPREAD-2018-03, Type of Action: CSA, Number: 856887) aims to develop knowledge exchange to enhance the scientific and technological know-how

of Maltese industry, promoting the transfer of essential knowledge from two leading international research institutes, the University of Strathclyde (United Kingdom) and the University of Genoa (Italy), to Malta. Knowledge transfer takes place through planned activities, such as short specialist courses to improve scientific and technological capacity, an electronic platform for training, short-term visits to partners, short-term visits by experts, visits by technicians and laboratory staff, research conferences, student exchanges, student mentoring and joint supervision, secondments to industry, and summer and winter schools.
European Union

2019-2021 ASAMS (Aspetti Specialistici e Approccio Metodologico per la progettazione di Sottomarini di ultima generazione)
The project aims to develop research activities in the field of submarine design, with a view to consolidating and updating national know-how in relevant technical/scientific areas. Significant contribution to the following WPs: WP 8.1 “Development of the electric power generation and propulsion system simulator.” The WP aims to develop an integrated dynamic model of the propulsion and power generation system of a diesel-electric submarine with a fuel cell AIP system, in order to study the behavior and performance of the unit in different mission profiles.
WP 8.3 “Simulation of power generation, propulsion, and steering systems for performance verification even under degraded conditions.” . The WP, whose activities are currently underway, aims to integrate the model developed in WP 8.1 with a
6-degree-of-freedom maneuverability model, and subsequently evaluate, through simulation, the maneuverability, propulsion, and endurance performance of the vessel as a result of the loss of certain components.
Ministero della Difesa (NAVARM)

2017-2018 E-Navigation
The project developed a navigation support system to avoid collisions at sea with the aid of augmented reality (AR) systems. Significant contribution to the following WPs:
WP 3, D3.2: “Optimization algorithms.” The activity focused on the study of logic for determining optimal evasive maneuvers in the presence of fixed and moving obstacles, defining constraints, objective functions, and solution algorithms in relation to the ship's maneuvering characteristics and the characteristics of the control system.
WP 5, D5.1: “Identification of the best implementable control and optimization logic.” The activity focused on testing the collision avoidance logic identified in D3.2 in a simulated environment, integrating it with the control logic studied in the project, in order to study the interaction between the control system and the collision avoidance system and determine the strengths and weaknesses of each solution studied from the perspective of augmented navigation.
Fincantieri s.p.a., Seastema s.p.a.

2016 SWAD
Simulation of the propulsion and maneuverability of an unmanned vessel, with activities involving the analysis of the reliability of navigation and control systems for
autonomous surface vessels.
OTO MELARA s.p.a.

Università di Genova

EDITORSHIP OR PARTICIPATION IN EDITORIAL BOARDS OF JOURNALS, PUBLISHING SERIES, ENCYCLOPAEDIAS AND TREATISES

from 01/03/2025 Deputy Editor
Ocean Engineering (Elsevier)

PARTICIPATION IN THE CREATION OF NEW BUSINESS ENTITIES (SPIN-OFFS), DEVELOPMENT, USE AND COMMERCIALISATION OF ACADEMIC PATENTS

2023 European Patent EP3907470B1
European patent EP3907470B1 for industrial invention entitled “System and method for supporting an operator for navigation.” Applicant: FINCANTIERI S.P.A. Inventors: Sebastiani Luca, Di Summa Maria, Vigano’ Giovanni Paolo, Sacco Marco, Cassarà Pietro, Gotta Alberto, Figari Massimo, Martelli Michele, Zaccone Raphael. https://worldwide.espacenet.com/patent/search/family/071784446/publication/EP3907470B1?q=pn%3DEP3907470B1%3F

SCIENTIFIC PAPERS

PUBLICATIONS ON SCOPUS-INDEXED INTERNATIONAL JOURNALS

1. Ponzini, F., Zaccone, R., & Martelli, M. (2025). LiDAR target detection and classification for ship situational awareness: A hybrid learning approach. Applied Ocean Research, 158, 104552.

2. Basciu, F., Casali, G., Maloberti, L., Pais, T., Vergassola, G., & Zaccone, R. (2025). Sustainable yacht refits: Structural solutions in methanol-powered conversion. Ocean Engineering, 323, 120618.

3. Maloberti, L., Zaccone, R., De Gaetano, J., & Campora, U. (2025). A comparison among innovative hybrid propulsion systems to reduce the environmental impact of a small passenger ship. Sustainable Energy Technologies and Assessments, 75, 104194.

4. Maloberti, L., & Zaccone, R. (2025). An environmentally sustainable energy management strategy for marine hybrid propulsion. Energy, 316, 134517.

5. Zaccone, R. (2024). A dynamic programming approach to the collision avoidance of autonomous ships. Mathematics, 12(10), 1546.

6. Longo, G., Martelli, M., Russo, E., Merlo, A., & Zaccone, R. (2024). Adversarial waypoint injection attacks on Maritime Autonomous Surface Ships (MASS) collision avoidance systems. Journal of Marine Engineering & Technology, 23(3), 184-195.

7. Gallo, M., Kaza, D., D’Agostino, F., Cavo, M., Zaccone, R., & Silvestro, F. (2023). Power plant design for all-electric ships considering the assessment of carbon intensity indicator. Energy, 283, 129091.

8. Martelli, M., Žuškin, S., Zaccone, R., & Rudan, I. (2023). A COLREGs-compliant decision support tool to prevent collisions at sea. TransNav: International Journal on Marine Navigation and Safety of Sea Transportation, 17.

9. Altosole, M., Campora, U., Mocerino, L., & Zaccone, R. (2023). An Innovative variable layout steam plant for waste heat recovery from marine dual-fuel engines. Ships and Offshore Structures, 18(3), 429-437.

10. Zaccone, R., Campora, U., & Martelli, M. (2021). Optimisation of a diesel-electric ship propulsion and power generation system using a genetic algorithm. Journal of Marine Science and Engineering, 9(6), 587.

11. Zaccone, R. (2021). COLREG-compliant optimal path planning for real-time guidance and control of autonomous ships. Journal of Marine Science and Engineering, 9(4), 405.

12. Zaccone, R., & Martelli, M. (2020). A collision avoidance algorithm for ship guidance applications. Journal of Marine Engineering & Technology, 19(sup1), 62-75.

13. Altosole, M., Benvenuto, G., Zaccone, R., & Campora, U. (2020). Comparison of saturated and superheated steam plants for waste-heat recovery of dual-fuel marine engines. Energies, 13(4), 985.

14. Altosole, M., Campora, U., Laviola, M., & Zaccone, R. (2019). Deterioration effects on the performance of a steam plant for the waste heat recovery from a marine diesel engine. Ships and Offshore Structures, 14(8), 867-878.

15. Altosole, M., Campora, U., Donnarumma, S., & Zaccone, R. (2019). Simulation techniques for design and control of a waste heat recovery system in marine natural gas propulsion applications. Journal of Marine Science and Engineering, 7(11), 397.

16. Campora, U., Cravero, C., & Zaccone, R. (2018). Marine gas turbine monitoring and diagnostics by simulation and pattern recognition. International journal of naval architecture and ocean engineering, 10(5), 617-628.

17. Zaccone, R., Ottaviani, E., Figari, M., & Altosole, M. (2018). Ship voyage optimization for safe and energy-efficient navigation: A dynamic programming approach. Ocean engineering, 153, 215-224.

18. Altosole, M., Benvenuto, G., Campora, U., Laviola, M., & Zaccone, R. (2017). Simulation and performance comparison between diesel and natural gas engines for marine applications. Proceedings of the Institution of Mechanical Engineers, Part M: Journal of Engineering for the Maritime Environment, 231(2), 690-704.

19. Zaccone, R., & Figari, M. (2017). ENERGY EFFICIENT SHIP VOYAGE PLANNING BY 3D DYNAMIC PROGRAMMING. Journal of Ocean Technology, 12(4).

20. Campora, U., Capelli, M., Cravero, C., & Zaccone, R. (2015). Metamodels of a gas turbine powered marine propulsion system for simulation and diagnostic purposes. Journal of Naval Architecture and Marine Engineering, 12(1), 1-14.

PUBLICATIONS IN SCOPUS-INDEXED INTERNATIONAL CONFERENCE PROCEEDINGS

1. Zaccone, R., Donnarumma, S., & Martelli, M. (2024, November). A structured metric approach to compare marine collision avoidance algorithms. In Conference Proceedings of iSCSS (Vol. 2024).

2. Martelli, M., Žuškin, S., Cellerino, E., & Zaccone, R. (2024, June). Ship Collision detection and classification employing AIS data. In ISOPE International Ocean and Polar Engineering Conference (pp. ISOPE-I). ISOPE.

3. Belvisi, D., Maloberti, L., Zaccone, R., & Figari, M. (2024, November). Battery energy storage system sizing strategy for naval vessels through multi-objective optimisation. In Conference Proceedings of iSCSS (Vol. 2024).

4. Zaccone, R., & Martelli, M. (2023, October). Interaction between COLREG-compliant collision avoidance systems in a multiple MASS scenario. In Journal of Physics: Conference Series (Vol. 2618, No. 1, p. 012006). IOP Publishing.

5. Ponzini, F., Zaccone, R., & Martelli, M. (2023, October). A multi-sensor indoor tracking system for autonomous marine model-scale vehicles. In Journal of Physics: Conference Series (Vol. 2618, No. 1, p. 012008). IOP Publishing.

6. Maloberti, L., Zaccone, R., Gualeni, P., & Mazzucchelli, P. (2022). A zero-emission ferry for inland waterways. In Technology and Science for the Ships of the Future (pp. 162-169). IOS Press.

7. Belvisi, D., Zaccone, R., Figari, M., Simone, S., & Spanghero, B. (2022). Bess-based hybrid propulsion: An application to a front line naval vessel preliminary design. In Technology and Science for the Ships of the Future (pp. 154-161). IOS Press.

8. Zaccone, R., Figari, M., & Martelli, M. (2022, June). A simulation based tool to assess the propulsion performance of modern conventional submarines. In 2022 International Symposium on Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM) (pp. 628-633). IEEE.

9. Longo, G., Martelli, M., Russo, E., & Zaccone, R. (2022, September). Collision-avoidance capabilities reduction after a cyber-attack to the navigation sensors. In Conference Proceedings of iSCSS (Vol. 2022).

10. Martelli, M., Faggioni, N., & Zaccone, R. (2019). Development of a navigation support system by means of a synthetic scenario. In Sustainable Development and Innovations in Marine Technologies (pp. 481-487). CRC Press.

11. Donnarumma, S., Figari, M., Martelli, M., & Zaccone, R. (2019, October). Simulation of the guidance and control systems for underactuated vessels. In International Conference on Modelling and Simulation for Autonomous Systems (pp. 108-119). Cham: Springer International Publishing.

12. Ottaviani, E., Gjeci, N., Novellino, A., D'Angelo, P., Brotto, P., De Leo, F., ... & Magaldi, M. (2019). SINDBAD: a new operational service for a safer leisure and boating navigation. In IMEKO TC-19 International Workshop on Metrology for the Sea.

13. Zaccone, R., Martelli, M., & Figari, M. (2019, June). A colreg-compliant ship collision avoidance algorithm. In 2019 18th European Control Conference (ECC) (pp. 2530-2535). IEEE.

14. Zaccone, R., & Martelli, M. (2018, October). A random sampling based algorithm for ship path planning with obstacles. In Conference Proceedings of iSCSS (Vol. 2018).

15. Zaccone, R., Figari, M., & Martelli, M. (2018, June). An optimization tool for ship route planning in real weather scenarios. In ISOPE International Ocean and Polar Engineering Conference (pp. ISOPE-I). ISOPE.

16. Altosole, M., Campora, U., Laviola, M., & Zaccone, R. (2018). High efficiency waste heat recovery from dual fuel marine engines. In Technology and Science for the Ships of the Future (pp. 21-28). IOS Press.

17. Campora, U., Laviola, M., & Zaccone, R. (2016, July). An overall comparison between natural gas spark ignition and compression ignition engines for a ro-pax propulsion plant. In Proceedings of the 3th International Conference on Maritime Technology and Engineering, MARTECH, Lisbon, Portugal (pp. 4-6).

18. Zaccone, R., Figari, M., Altosole, M., Ottaviani, E., Soares, C., & Santos, T. (2016, July). Fuel saving-oriented 3D dynamic programming for weather routing applications. In Proceedings of the 3rd International Conference on Maritime Technology and Engineering, MARTECH (pp. 183-189).

19. Altosole, M., Michele, L., Raphael, Z., & Ugo, C. (2017). Waste heat recovery from dual-fuel marine engines. In Maritime Transportation and Harvesting of Sea Resources (pp. 79-86).

20. Benvenuto, G., Lavitola, M., Zaccone, R., & Campora, U. (2016). Comparison of a natural gas engine with a diesel engine for marine propulsion. Maritime Technology and Engineering, 3, 725-734.

21. Zaccone, R., Altosole, M., Figari, M., & Campora, U. (2015, September). Diesel engine and propulsion diagnostics of a mini-cruise ship by using artificial neural networks. In Towards Green Marine Technology and Transport—Proceedings of the 16th International Congress of the International Maritime Association of the Mediterranean, IMAM.

22. Benvenuto, G., Campora, U., Laviola, M., & Zaccone, R. (2015). Comparison of Waste Heat Recovery Systems for the Refitting of a Cruise Ferry. Proceedings of the NAV.

PUBLICATIONS IN NON SCOPUS-INDEXED INTERNATIONAL CONFERENCE PROCEEDINGS

1. Massimo Figari, Raphael Zaccone, Gabriele Boeris, and Michele Martelli. “Ship voyage optimisation: a comparison between forecast and real route selection”. 2nd International conference on Modelling and Optimisation of Ship Energy Systems - MOSES2019. 2019, pp. 99–206.

2. Michele Martelli and Raphael Zaccone. “Ship propulsion plant performance assessment using an artificial neural network”. SMATECH 2019 - 2nd International Conference on Smart & Green Technology for Shipping and Maritime Industries (Including Ballast Water Management). 2019.

3. Michele Martelli, Federico Silvestro, Raphael Zaccone∗ , and Ugo Campora. “Optimal management of a diesel-electric propulsion plant with either constant or variable

diesel generators speed". SMATECH 2019 - 2nd International Conference on Smart & Green Technology for Shipping and Maritime Industries (Including Ballast Water Management). 2019.

4. Marco Altosole, Giovanni Benvenuto, Ugo Campora, Michele Laviola, Alessandro Trucco, and Raphael Zaccone. "Design and Simulation of Combined Gas Turbine-Steam or Diesel-Steam Plants for Marine Applications". Proceedings of the 12th International Symposium on Experimental Computational Aerothermodynamics of Internal Flows, ISAIF12. 2015, pp. 1–13.