



Giulia Colombini

Personal Info

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Education and Work experience

Since 1 Nov 2024

PhD Candidate in Automotive Engineering for Intelligent Mobility, Alma Mater Studiorum – University of Bologna, in collaboration with the University of Modena and Reggio Emilia, Italy.

Research focus: Engineering methods for design, materials, and manufacturing, and their impact on sustainable mobility.
Supervisor: Prof. Elena Bassoli

16 Dec 2023 – 31 Oct 2024

Research Fellow, Department of Engineering "Enzo Ferrari," University of Modena and Reggio Emilia, Italy.

Project: Innovative inspection of additively manufactured components using non-destructive techniques based on thermography and tomography (INTACT), within the PNRR – Mission 4 "Education and Research" – Component C2 Investment 1.1 "Fund for the National Research Programme and Projects of Significant National Interest (PRIN)."

16 Apr 2023 – 15 Dec 2023

Research Fellow, INTERMECH – Interdepartmental Center for Applied Research and Services in Advanced Mechanics and Motor Engineering, University of Modena and Reggio Emilia, Italy.

Project: Study of lattice structures produced via Additive Manufacturing for thermal exchange applications.

2020–2023

M.Sc. in Mechanical Engineering – Industry 4.0 Curriculum

Department of Engineering "Enzo Ferrari,"
University of Modena and Reggio Emilia, Italy.
Thesis: "Environmental Impact and Productivity Analysis of an L-PBF Process."
Final grade: 110/110 cum laude

2017–2020

B.Sc. in Vehicle Engineering

Department of Engineering "Enzo Ferrari,"
University of Modena and Reggio Emilia, Italy.
Thesis: "Mechanical Analysis and Noise Evaluation of HCR Gears."
Final grade: 105/110

2012–2017

High School Diploma
High School "A. Tassoni," Modena, Italy.

Additional Qualifications

Licensed Professional Industrial Engineer – 2023 session

Research Activity

Research activities focus on Laser Powder Bed Fusion (L-PBF) technology for the production of metallic components, with particular emphasis on productivity and environmental impact evaluated through Life Cycle Assessment (LCA) to promote more sustainable manufacturing compared to traditional processes. Parallel investigations address innovative applications of L-PBF, including the study of thermal and electrical properties of metallic materials produced through this technology, supported by tensile, hardness, and density testing.

Further work includes the development of advanced non-destructive inspection methods based on thermography and tomography, with assessment of their economic sustainability.

Research Fellowship and PhD Activities	• Consolidation of expertise in the productivity and environmental impact of L-PBF and conventional manufacturing processes. Activities include the development of an experimental methodology for recording raw material and electricity consumption during production for LCA purposes, the creation of a SimaPro model based on experimental data, and carbon footprint assessment through multiple calculation approaches. • Ongoing participation in the project "Development of Innovative Inspection Methods for Additively Manufactured Components Using Non-Destructive Techniques Based on Thermography and Tomography (INTACT)", within the PNRR – Mission 4 "Education and Research" – Component C2 Investment 1.1 (PRIN), in collaboration with the group led by Prof. Iuliano at Politecnico di Torino, Italy. • Feasibility study on the use of lattice structures manufactured through L-PBF (ongoing), in collaboration with the Ferrari S.p.A. • Ongoing participation in the project "I-AM-EM: Innovative Additive Manufacturing for Electrical Machines: Greater Efficiency and Sustainability through Design Flexibility", regarding the investigation of magnetic properties of ferromagnetic materials produced with PBF technologies, the identification of potential designs and manufacturing strategies for optimizing magnetic paths and performance, together with the integration of Life Cycle Assessment tools to assess environmental impact. • Mechanical characterization of L-PBF parts made with different materials, carried out in collaboration with HPE-COXA S.p.A. (Modena, Italy), with extensive use of instrumentation for tensile testing, hardness assessment, and density evaluation.
Technical Skills and Competences	Extensive experience has been developed in the use of instrumentation for the mechanical characterization of metallic samples produced through additive manufacturing. Specific competencies include: • INSTRON universal testing machine (with contact extensometer) • Rockwell and Brinell hardness testers • Optical microscopy and image analysis software • Archimedes balance for density measurement • Manual and automatic polishing systems and dedicated equipment for metallographic, morphological, and microstructural sample preparation
Language Skills Italian English French	Native Advanced Basic

Teaching Experience	
From 2023 to 2025	Lectures within “Women in Transport” Summer School (MUNER) Delivered a lecture during the several editions on additive manufacturing techniques and on productivity and environmental impact assessment of Laser Powder Bed Fusion (L-PBF) technology for the production of metal components.
10 May 2023	Lecture, “Additive Manufacturing” Course (M.Sc. in Mechanical Engineering) Department of Engineering “Enzo Ferrari,” University of Modena and Reggio Emilia Delivered an in-depth lecture on productivity analysis and environmental impact assessment of Laser Powder Bed Fusion technology for metal component manufacturing. Course instructor: Prof. Elena Bassoli
26 Feb 2023 – Present	Teaching and Laboratory Support, “Sustainable Process Design” Course (M.Sc. in Sustainable Industrial Engineering), Tecnopolo di Carpi, Department of Engineering “Enzo Ferrari,” University of Modena and Reggio Emilia. Development of teaching materials and laboratory activities for this newly introduced course, including syllabus definition, creation and selection of instructional materials, and delivery of practical sessions. Course instructor: Prof. Elena Bassoli
08 Nov 2024 – Present	Faculty Advisor, Cost & Manufacturing Division, Formula Student MoRe Modena Racing, University of Modena and Reggio Emilia Providing supervision and organizational support to students in data collection and validation, development of cost and environmental impact analyses, and preparation of documentation for the competition event. Faculty contacts: Prof. Elena Bassoli, Prof. Matteo Giacomini
Subject-Matter Expert	Subject-matter expert for the “Sustainable Process Design” course (M.Sc. in Sustainable Industrial Engineering), Tecnopolo di Carpi, Department of Engineering “Enzo Ferrari,” University of Modena and Reggio Emilia Course focus: Analysis of major manufacturing processes for mechanical components, with emphasis on sustainability aspects—energy and resource consumption—and on criteria for selecting lower-impact production solutions.
Conference Participation	
07/04/2025–09/04/2025	Participation and dissemination at the 32nd CIRP Conference on Life Cycle Engineering (LCE2025), Manchester (UK). Presentation of the paper titled: “Effect of Cell Size on Sustainability of Gyroid Lattice Structures”.

Publications

Orcid	https://orcid.org/0009-0005-7198-1066
Scopus h index	3

- 2025 - Article in an international journal
G. Colombini, S. Defanti, L. Denti, E. Bassoli, "Asymptotic pathways to carbon minimization in laser powder bed fusion", Carbon Res. 4, 67 (2025). <https://doi.org/10.1007/s44246-025-00236-2>.
- 2025 - Article in an international journal
S. Defanti, S. De Giorgi, G. Rizza, et al. "Detection of sub-superficial defects by infrared thermography in parts made by powder bed fusion with electron beam." Prog Addit Manuf 10, 10533-10547 (2025). <https://doi.org/10.1007/s40964-025-01313-z>
- 2025 - Article in an international journal
M. Galati, S. De Giorgi, G. Rizza, et al. "A Review of Ex-situ, In situ and Artificial Intelligence-based Thermographic Measurements in Additively Manufactured Parts." J Nondestruct Eval 44, 68 (2025). <https://doi.org/10.1007/s10921-025-01195-9>
- 2025 - Conference Paper
F. Torri, F. Berni, L. Martoccia, A. Marini, et al., "Numerical Comparison of TPMS Structures for the Design of an Automotive Engine Oil Cooler," SAE Technical Paper 2025-01-8155, 2025, <https://doi.org/10.4271/2025-01-8155>.
- 2025 - Conference Paper
G. Colombini, M. Giacalone, F. Torri, F. Berni, et al. "Effect of cell size on the environmental impact of gyroid lattice structures", Procedia CIRP, Volume 135, 2025, <https://doi.org/10.1016/j.procir.2024.12.013>.
- 2025 - Conference Paper
M. Hosseini, S. Mohammad, F. Depaoli, et al. "Inspecting Defects of EB-PBF Components with Active Thermography and Deep Learning: A Feasibility Study", IEEE International Conference on Emerging Technologies and Factory Automation, ETFA, 10.1109/ETFA65518.2025.11205639
- 2025 - Conference Paper
S. Defanti, S. De Giorgi, G. Rizza, et al. "Detection of sub-superficial defects by infrared thermography in parts made by powder bed fusion with electron beam", Materials Research Proceedings, Vol. 57, pp 38-46, 2025, <https://doi.org/10.21741/9781644903735-5>
- 2024 - Article in an international journal
F. Torri, F. Berni, M. Giacalone, S. Mantovani, S. Defanti, G. Colombini, E. Bassoli, A. Merulla, S. Fontanesi, "A methodology to reduce the computational effort in 3D-CFD simulations of plate-fin heat exchangers," Appl Therm Eng, vol. 245, p. 122843, May 2024, doi: 10.1016/j.applthermaleng.2024.122843.
- 2023 - Article in an international journal
G. Colombini, R. Rosa, A. M. Ferrari, S. Defanti, and E. Bassoli, "Life cycle assessment of lattice structures: Balancing mass saving and productivity," J Clean Prod, vol. 445, p. 141390, Mar. 2024, doi: 10.1016/j.jclepro.2024.141390.
- 2023 - Conference Paper
F. Torri, F. Berni, S. Fontanesi, S. Mantovani, M. Giacalone, S. Defanti, E. Bassoli, G. Colombini, "Evaluation of TPMS Structures for the Design of High Performance Heat Exchangers," Aug. 2023. doi: 10.4271/2023-24-0125.

Dott. Giulia Colombini

