

Giulia Fratoni

BUILDING ENGINEER AND ARCHITECT

ACOUSTIC TECHNICIAN (n. 10250)

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EDUCATION

- 2022 **Visiting Post-doc Researcher, Architecture and Building Technology, TU Delft (NL)**
Topic: additive manufacturing for acoustic metamaterials, multiphysics approach and numerical models.
- 2021 **PhD in Applied Acoustics, Course in Mechanics and Advanced Engineering Sciences DIMSAI, Department of Industrial Engineering DIN, University of Bologna**
Research project: Standardization of procedures and calculation models for the numerical simulation of the acoustics of enclosed spaces. Supervisor: Prof. Massimo Garai. Advisor: Dario D'Orazio. Co-advisor: Brian Hamilton.
- 2019 **Visiting Researcher, Acoustics and Audio Group, Edinburgh College of Art, ECA, University of Edinburgh, UK**
Topic: Finite-Difference Time-Domain (FDTD) applications to performance spaces and ordinary rooms.
- 2016 **MSc in Building Engineering and Architecture, Single cycle degree, University of Bologna**
Grade: 110/110 with honours.
Thesis title: Acoustic and lighting design of a multi-purpose hall inside a former church using innovative analysis methods.

PUBLICATIONS

- 2025 **G. Fratoni**, D. D'Orazio, Boundary conditions for wave-based simulations in a rectangular environment with sound-absorbing ceiling, under review in Applied Acoustics – Forum Acusticum 2023 Special Issue.
- 2025 **G. Fratoni**, D. De Salvio, V. Tardini, M. Garai, P. Valdiserri, C. Biserni, D. D'Orazio, Student Activity in Suboptimal Thermal and Acoustic Conditions: An In-Field Study in Active Classrooms. Applied Sciences, 15(6), 3119.
- 2025 **G. Fratoni**, M. Tenpierik, M. Turrin, M. Garai, D. D'Orazio Acoustic performance of multi-resonator screens in a virtually reconstructed open-plan office, Applied Acoustics 229, 110381. <https://doi.org/10.1016/j.apacoust.2024.110381>
- 2025 D. D'Orazio, **G. Fratoni**, V. Tardini, The Italian Standard on Classroom Acoustics UNI 11532-2:2020 explained through case studies, Applied Acoustics 231, 110498. <https://doi.org/10.1016/j.apacoust.2024.110498>
- 2024 **G. Fratoni**, D. D'Orazio, M. Ducceschi, & M. Garai, Acoustic analysis of a well-preserved Renaissance music space: the Odeo Cornaro in Padua, Acta Acustica 8, 25. <https://doi.org/10.1051/aacus/2024017>
- 2023 **G. Fratoni**, M. Garai, D. D'Orazio, Assessment of modal density and free path distribution in central-planned halls. J. Acoust. Soc. Am., 154(6), 3604-3614. <https://doi.org/10.1121/10.0022569>
- 2022 **G. Fratoni**, B. Hamilton, D. D'Orazio, Feasibility of a finite-difference time-domain model in large-scale acoustic simulations, J. Acoust. Soc. Am., 152(1), 330-341. <https://doi.org/10.1121/10.0012218>
- 2022 M. Cingolani, G. Fusaro, **G. Fratoni**, M. Garai, Influence of thermal deformations on sound absorption of three-dimensional printed metamaterials. J. Acoust. Soc. Am., 151(6), 3770-3779. <https://doi.org/10.1121/10.0011552>
- 2022 **G. Fratoni**, D. D'Orazio, M. Ducceschi, M. Garai, The coupled rooms of Odeo Cornaro (1534) as support for Renaissance musicians and soloists, Proc. of the 24th International Congress on Acoustics (ICA), 1-8.
- 2022 **G. Fratoni**, D. D'Orazio, L. Barbaresi, M. Garai, L. Cappellini, Mixing materials in false ceilings to increase sound diffusion in education spaces, Proc. of the Inter-Noise and Noise-Con Congress and Conference, 265(2), 5002-5006, Institute of Noise Control Engineering.
- 2022 D. De Salvio, **G. Fratoni**, D. D'Orazio, M. Garai, Assessing human activity noise in workspaces using machine learning and numerical models, Proc. of the Inter-Noise and Noise-Con Congress and Conference, 265(2), 5259-5269, Institute of Noise Control Engineering.
- 2021 **G. Fratoni**, B. Hamilton, D. D'Orazio, Rediscovering the Acoustics of a XII-Century Rotunda through FDTD Simulation. In 2021 Immersive and 3D Audio: from Architecture to Automotive (I3DA) 1-8, IEEE.
- 2021 M. Cingolani, **G. Fratoni**, L. Barbaresi, D. D'Orazio, B. Hamilton, M. Garai, A trial acoustic improvement in a lecture hall with MPP sound absorbers and FDTD acoustic simulations. Appl. Sciences, 11(6), 2445. doi.org/10.3390/app11062445
- 2020 D. D'Orazio, **G. Fratoni**, A. Rovigatti, M. Garai, A virtual orchestra to qualify the acoustics of historical opera houses. Build. Acoust., 27(3), 235-252, 2020. <https://doi.org/10.1177/1351010x20912501>
- 2020 **G. Fratoni**, The Sound of a Monumental Architecture. J. Can. Acoust. Ass., 48(2), 5-14, 2020.
- 2020 D. D'Orazio, **G. Fratoni**, E. Rossi, M. Garai, Understanding the acoustics of St. John's Baptistery in Pisa through a virtual approach. J Build. Perform. Simul., 13(3), 320-333, 2020. <https://doi.org/10.1080/19401493.2020.1728382>
- 2020 D. D'Orazio, **G. Fratoni**, M. Garai, Enhancing the strength of symphonic orchestra in an opera house. Appl. Acoust., 170, 107532, 2020. <https://doi.org/10.1016/j.apacoust.2020.107532>
- 2019 **G. Fratoni**, D. D'Orazio, A. Rovigatti, B. Hamilton. Numerical simulations of Italian opera houses using geometrical and wave-based acoustics methods. Proc. of the 23rd International Congress on Acoustics (ICA), Aachen, 9-13 September, 2019.
- 2019 B. Hamilton, **G. Fratoni**, M. Newton, D. D'Orazio, On the Acoustics of St Cecilia's Hall: Measurements and Comparison of Wave-based and Geometrical Acoustics Modelling, Proc. of the International Symposium on Room Acoustics (ISRA), Amsterdam, 15 -17 September, 2019.
- 2019 **G. Fratoni**, D. D'Orazio, L. Barbaresi, Acoustic design of a worship space in cross laminated timber, Build. Acoust., 26(2), 2019. <https://doi.org/10.1177/1351010X19826250>
- 2019 **G. Fratoni**, D. D'Orazio, D. De Salvio, M. Garai, Predicting speech intelligibility in university classrooms using geometrical acoustic simulations, Proc. of 16th International Conference & Exhibition Building Simulation 2019 (IBPSA), Rome, Italy, 2-4 September, 2019. <https://doi.org/10.26868/25222708.2019.211161>
- 2017 D. D'Orazio, **G. Fratoni**, M. Garai, Acoustics of a chamber hall inside a former church by means of sound energy distribution, J. Can. Acoust. Ass., 45(4) 7-16, 2017.

WORK AND RESEARCH PROJECTS

- 2024-current **Postdoctoral Research fellow at the University of Bologna**
Research project: Wave-based simulations in the presence of acoustic diffraction (with or without Kirchoff-Fresnel simplification) for learning spaces or open-plan offices applications
- 2023 **Postdoctoral Research fellow at the University of Bologna**
Research project: Optimization of innovative materials for the acoustic comfort in the built environment.
- 2021-2022 **Postdoctoral Research fellow at the University of Bologna (PRIN 2017)**
Research project: Theoretical modelling and experimental characterization of sustainable porous materials and acoustic metamaterials for noise control.
- 2020-2021 **Acoustic design of a restored large lecture hall, Industrial Chemistry, University of Bologna**
Design, GA simulation, test of acoustic treatments, with the Department of Industrial Engineering, University of Bologna
- 2018-2019 **Improvement of speech intelligibility in 12 university classrooms, School of Foreign Languages and Literature, University of Bologna**
Design, GA simulation, test of acoustic treatments, with the Department of Industrial Engineering, University of Bologna
- 2018 **Contract work as Acoustic Consultant (Mercato di mezzo, Bologna)**
Noise impact prediction, acoustic measurements and GA simulations of outdoor machineries
- 2018 **Improvement of acoustic comfort in a large foodcourt (Elnós Shopping Center, Brescia)**
Acoustic measurements, GA simulation of absorbing baffles as acoustic treatment
- 2018 **Contract work as Acoustic Consultant (QB Quanto Basta Association, Bologna)**
Acoustic design of a multipurpose open plan hall through acoustic measurements and GA simulations of scattering and absorbing furniture
- 2016-2018 **Acoustic design of a worship space (Church Resurrezione di Nostro Signore, Viareggio), TAMassociati**
Design and GA simulation, in collaboration with Department of Industrial Engineering, University of Bologna
- 2017 **Professional services in Computational Acoustics**
Acoustic simulations in timber structures, Building and Construction *CIRI*, University of Bologna
- 2016 **Acoustic consultant in the refurbishment of the former Cinema Fulgor, New Fellini Museum, Rimini**
GA simulation of the sound quality, in collaboration with Department of Industrial Engineering, University of Bologna
- 2016 **International Round Robin on room acoustical simulation (Technical University of Berlin, Institute of Technical Acoustics)**
Acoustic simulations of defined scenes, in collaboration with Department of Industrial Engineering, University of Bologna

AWARDS AND GRANTS

- 2025 **2025 ICA Young Scientist Conference Attendance** at "ASA/ICA meeting" held in New Orleans (US), 18-23 May.
- 2023 **FA 2023 - Summer School Grant** at "Forum Acusticum 2023" held in Turin (Italy), 11-15 September.
- 2022 **Best Poster Award** at the Symposium "The Acoustics of Ancient Theatres" held in Verona (Italy), 6-8 July.
- 2021 **Travel Grants for Young Professionals** at the Internoise 2022, Glasgow (UK), 24-28 August.
- 2020 **EAA Attendance Grant** at the Forum Acusticum (FA2020), Lyon (France), 7-11 December.

TEACHING ACTIVITIES

- 2022-Current **Tutoring activity** in Thermophysics and Acoustics of Constructions, Civil Engineering, University of Bologna.
- 2023-2024 **Lecturer** in Acoustics, Department of Physical Sciences, Earth and Environment, University of Siena.
- 2021-2023 **Tutoring activity** in Technical Physics and Systems, Building Engineering, University of Bologna.
- 2017-Current **Co-supervisor** of 12 master's degree theses and 6 bachelor's degree theses.

QUALIFICATIONS

- 2022 Profession of Architect, Planner, Landscaper and Conservationist.
- 2019 Enrolled to the list of Italian Acoustic Technicians (ENTECA code n. 10250).
- 2016 Profession of Engineer.

CHAIR

- 2023 Co-chair of "Accuracy in room acoustics modeling" session at FA2023 held in Turin (Italy), 11-15 September 2023.
- 2023 Co-chair of "Numerical Acoustics" session at the 49° AIA National Congress held in Ferrara (Italy), 7-9 June 2023.
- 2018 Co-chair of "Architectural Acoustics" session at the 45° AIA National Congress held in Aosta (Italy), 20-22 June 2018.

E-SKILLS

- Basics Microsoft Office Suite, LaTeX, Adobe Creative Suite, Matlab, DIALux.
- 3D modeling Autocad, 3DS Max, Rhinoceros, Grasshopper, SketchUp.
- Acoustics Odeon Room Acoustics, Raven, Dirac, Reaper, Ocenaudio, Soundvision, dBTrait, COMSOL Multiphysics.

LANGUAGES

- Italian** Mother tongue
- English** C1 Advanced Cambridge (19/03/2022)
- French** Elementary