

University Academic Curriculum Vitae

Personal information Name: Federica Morandi

Education since leaving school

- Master Degree in Architecture and Building Engineering (European Standard 4/S), University of Bologna, 2012
Advisor: Prof. Massimo Garai
Thesis title: Acoustical characterization and study of sound radiation from stages: a comparison between the theatres of Cesenatico and Longiano. Grade: 110/110 with honors.
- Visiting PhD Student at the OU (Milton Keynes, UK)
1st September 2014 – 31st December 2014
Supervisors: Dr. Shahram Taherzadeh, Prof. Keith Attenborough
Topic: Experimental measurements on sonic crystals and implementation of semi-analytical tools related to sound propagation in periodic media.
- PhD in Energy, Nuclear and Environmental Control Engineering, University of Bologna, 2016
Supervisor: Prof. Massimo Garai
Thesis title: Theoretical and experimental investigation into stop-band properties of sonic crystals.
- Visiting research fellow at the GAUS (Sherbrooke, Canada), 2018.
Supervisor: Prof. Patrice Masson
15th September 2018 – 15th December 2018
Topic: Application of optimized NDT techniques for the detection of anomalous moisture content in timber structures.
- Post-Doctoral Research Fellow at the Department of Industrial Engineering, University of Bologna
1st January 2016 – 31st May 2019
Supervisor: Dr. Luca Barbaresi.
Title of the project: Experimental analysis of flanking transmission on innovative junction systems for CLT panels.
- Research Assistant at the Faculty of Science and Technology, Free University of Bozen-Bolzano
1st June 2019 – 31st May 2020
Supervisors: Prof. Andrea Gasparella, Dr. Giovanni Pernigotto
Title of the project: E2I@NOI: Definition of a system of laboratories for the development, characterization and technology transfer for smart energy efficient buildings.

Present appointment

- Research Assistant at the Faculty of Science and Technology, Free University of Bozen-Bolzano
June 1st 2020 - present
Supervisor: Prof. Andrea Gasparella
Title of the project: BIGWOOD: reduction of barriers and prejudices on multi-storey wooden buildings through the creation of design

awareness.

Research and scholarships

CURRENT RESEARCH ACTIVITY

- Multi-domain comfort
Investigation of the interaction between different domains of comfort (thermal, acoustical, visual and air quality). Development of an integrated questionnaire. Experimental activities in the unibz living lab and in the Margherita Hack high school in Morlupo (Rome): collection of questionnaires and study of the correlation between subjective responses and objective measurements of the IEQ parameters.
- Sound insulation of timber buildings
Sound insulation properties of lightweight timber structures. Investigation of the acoustic insulation provided by CLT floors through laboratory testing. Characterization of the vibration reduction indices in CLT junctions in laboratory conditions and on site. Resilient interlayers for CLT junctions. Use of the EN 12354 model on timber buildings. Characterization of the propagation of bending waves in mass timber elements.

PAST RESEARCH ACTIVITY

- Identification of water uptake in wood through acoustic analysis
Use of imaging techniques for the detection of water in wood, caused by condensation or water uptake from the ground. Analysis of wave propagation in plywood and implementation of algorithms for the reconstruction of the waterfront.
- Environmental impact assessment of NRD
Environmental impact of noise barriers in relation to the acoustic sound insulation properties.
- Sonic crystal noise barriers
Study on sound propagation through periodic arrays of scatterers. Analytical and numerical investigation (Plane Wave Expansion method, Multiple Scattering Theory and FEM) on optimized configurations and validation of the performance of the sonic crystal through experimental measurements.
- Acoustical characterization of Italian Opera Houses
Measurement campaign carried out on 12 Italian opera houses, aimed at studying the peculiar acoustic quality of this typology through the comparison of measured and simulated data. Analysis of the contribution of the sound radiation from timber stages and on its relevance for the public and the musicians.

Awards and grants

- ICA-ASA-DEGA Young Scientist Conference Attendance Grant (Aachen, 2019).
- Best paper award at the 6th International Conference on Building Physics (Turin, 2015).
- Co-winner of the 1st edition of the UNIBO LaunchPad Program, the first Italian incubator of entrepreneurial ideas deriving from academic research (2015).

Thesis advising

Advisor of the following Bachelor Degree theses:

- 2020-2021: Braiato T. Industrialization of timber buildings: an

insight into design, manufacturing, and construction process.

Co-advisor of the following Master Degree theses:

- 2018-2019: Angino G. Cristalli sonici: applicazione al controllo del rumore. Advisor: Prof. Massimo Garai.
- 2016-2017: Vanzini E. Analisi delle prestazioni energetiche annuali di un edificio in legno realizzato secondo diverse tipologie costruttive. Advisor: Prof. Gian Luca Morini.
- 2016-2017: Vagnini F. Vibro-acoustic characterization of CLT plates: analytical model and experimental measurement. Advisor: Prof. Massimo Garai.
- 2016-2017: Bagnaresi A. La trasmissione laterale del rumore negli edifici in X-lam. Advisor: Prof. Luca Barbaresi.
- 2016-2017. Lupo M.C. Sustainability assessment of the production of CLT panels: a comparison between an Italian and Chilean case study. Advisor: Prof. Massimo Garai.
- 2016-2017. D'Alessandro C. Life cycle assessment of photovoltaic technologies: a case study of a solar farm in New Orleans. Advisor: Prof. Massimo Garai.
- 2014-2015. Sgarzi F. Determinazione della trasmissione laterale di giunti strutturali innovativi per strutture in CLT. Advisor: Prof. Luca Barbaresi.

Editorial and organizational activities

- Member of the scientific committee of the *Congreso Latinoamericano de Estructuras de Madera* (CLEM) 2019, Montevideo (UY).
- Member of the organization committee of the 8th International Symposium on Temporal Design (Bologna, 2017).
- 2017-2018: Management of the program of technology diffusion "Proyectar, manufacturar y construir de forma sostenible con sistema de madera contralaminada - 17PDT-73489", co-funded by CORFO, granted to the University of Concepción (Chile) and co-executed by the University of Bologna and Rothoblaas GmbH.
- Reviewer for: *European Journal of Wood and Wood Products, Building and Environment, Journal of Architectural Engineering, Sensors, Building Acoustics, Acoustics, Acta Acustica*.
- Participation to the activities of IEA-EBC Annex 79 "Occupant-Centric Building Design and Operation".
- Chair or co-chair of structured sessions at national conferences on acoustics: AIA 2016, 2017, 2019, 2021.
- Chair or co-chair of structured sessions at international conferences on acoustics: ICA 2019, Euronoise 2021.

Teaching activities

- Co-teacher of the course "High Performance Buildings – Energy efficiency and comfort" at the Free University of Bozen-Bolzano, Bachelor in Wood Engineering, with a teaching load of 50 hours. Academic Year 2020/2021.
- Co-teacher of the course "High Performance Buildings – Energy efficiency and comfort" at the Free University of Bozen-Bolzano, Bachelor in Wood Engineering, with a teaching load of 50 hours. Academic Year 2019/2020.
- Guest teacher at the Postgraduate Diploma in "Diseño, cálculo y construcción de estructuras en madera" in the subject "Building Science and Envelope design", Universidad ORT, Montevideo, Uruguay, 2019. 20 hours of teaching + 10 hours of laboratory activities.
- Guest teacher at the Master in Timber Construction, Universidad

del Bío-Bío, Concepción, Chile, 2017.

Seminars and courses

- Guest speaker at the online course “Industrialization of timber facades for energy retrofit”, organized by Eurac, October 2021.
- Guest speaker at the “Mass Timber Seminar”, Figueira da Foz, Portugal, 2021.
- Speaker at the series of webinars “Aspettando Matera”, organized by the Italian Association of Acoustics (AIA), on the topics of global comfort (16.10.2020) and wave propagation (19.03.2021).
- Online course “Diseño y construcción en CLT”, organized by Eligemadera (Chile) on the topic “Acoustic design of CLT buildings”, November 2020.
- Speaker at the BIGWOOD webinar 24,09.2020 on the topic “Sound insulation in timber buildings”.
- Courses to Professional Associations of Engineers. Last one: “Acoustics in timber buildings”, held in Turin on October 24th, 2019.
- Guest speaker at the Universidad ORT with a talk titled “Acoustics in timber buildings: challenges, solutions and interaction with structural design”, Montevideo, 2019.
- Guest speaker at the “Mass Timber Seminar”, London, 2019.
- Guest speaker at the final seminar of the program “Proyectar, manufacturar y construir de forma sustentable con sistema de madera contralaminada”, Concepción, Chile, 2018.
- Rothschoo professional courses on acoustics in timber buildings, Cortaccia (BZ), 2016-2018.
- Guest speaker at the seminar “Acoustics in timber buildings”, ARIA, Fano, 2017.
- Guest speaker at the seminar “Acoustics in the rehabilitation of buildings and in urban regeneration”, AIA, Ascoli Piceno, 2017.
- Guest speaker at the international workshop “Edificación en madera – tendencias”, Concepción, Chile, 2017.
- Guest speaker at the International Symposium on Advanced Research in Timber Construction: Acoustic Quality, Environment and Safety, AIA-ICA, Bolzano, 2017.
- Guest speaker at the seminar “Acoustic design of timber buildings: theoretical models and technical solutions”, Cortaccia (BZ), 2016.
- Guest speaker at the seminar “Noise barriers: regulation, technological innovation and testing”, AIA, Bologna, 2016.

Publications

Conference papers

- *Morandi F.*, Pittana I., Cappelletti F., Gasparella A., Tzempelikos A. Assessing the overall indoor environmental comfort and satisfaction: evaluation of a questionnaire proposal by means of statistical analysis of responses. Proc of IAQ Conference, Athens, 2022.
- *Pittana I.*, Morandi F., Cappelletti F., Gasparella A., Tzempelikos A. Understanding the effects of environmental factors on human perception by means of surveys and in field measurements. Proc of IAQ Conference, Athens, 2022.
- *Morandi F.*, Gasparella A., Garai M., Quaegebeur N., Masson P. Detection of high moisture content in multilayered timber elements by means of non-destructive imaging techniques. Proc. of Euronoise, Madeira (online), 2021.

- *Morandi F.*, Robin O., Barbaresi L., Garai M. Atalla N., Quaegebeur N. and Masson P. "Benchmarking of methods for the identification of flexural wavenumbers in wooden plates". Proc. of ICA, Aachen, 2019 (invited paper).
- *Thies A.*, Morandi F., Barbaresi L., Garai M., Hübelt J. and Kumer N. "Development of a quick and non-invasive measurement method for the extraction of the dispersion relation in CLT plates for the evaluation of the elastic parameters". Proc. of ICA, Aachen, 2019.
- *Fausti P.*, Santoni A., Brighenti A., Caniato M., Barbaresi L., Morandi F. and Semprini G. "Evaluation of the impact noise reduction by using thin flooring solutions". Proc. of ICSV, Montreal, June 2019.
- *Speranza A.*, Morandi F., Barbaresi L. and Kumer N. "Direct and flanking transmission in CLT buildings: on site measurements, laboratory measurements and standards", Proc. of WCTE 2018, Seoul, August 2018.
- *Di Bella A.*, Granzotto N., Quartaruolo G., Speranza A. and Morandi F. "Analysis of airborne sound reduction index of bare CLT walls", Proc. of WCTE 2018, Seoul, August 2018.
- *Barbaresi L.*, Morandi F., Di Nocco F., Speranza A. and Kumer N. "Sound insulation and flanking transmission in CLT buildings: a comparison between experimental measurements and predictions", Proc. of Euronoise, Heraklion (Crete), May 2018 (invited paper).
- *Di Bella A.*, Mastino C.C., Barbaresi L., Granzotto N., Baccoli R. and Morandi F. "Comparative study of prediction methods and field measurements of the acoustic performances of buildings made with CLT elements", Proc. of Internoise, Hong Kong, August 2017.
- *Barbaresi L.*, Morandi F., Belcari J. and Zucchelli A. "Optimizing the mechanical characterization of a resilient interlayer for the use in timber construction", Proc. of ICSV24, London, July 2017.
- *Garai M.*, De Cesaris S., D'Orazio D. and Morandi F. "Sound energy distribution in Italian historical theatres", Proc. of Meetings on Acoustics 28, ICA 2016, Buenos Aires, September 2016. DOI: 10.1121/2.0000434.
- *Barbaresi L.*, Morandi F., Garai M. and Speranza A. "Experimental measurements of flanking transmission in CLT structures", Proc. of Meetings on Acoustics 28, ICA 2016, Buenos Aires, September 2016. DOI: 10.1121/2.0000433.
- *Speranza A.*, Barbaresi L. and Morandi F. "Experimental analysis of flanking transmission of different connection systems for CLT panels", Proc. of WCTE 2016, Vienna, August 2016.
- *Garai M.*, D'Orazio D., De Cesaris S. and Morandi F. "An attempt to rank Italian historical opera houses; considerations about measurement in eleven theatres", Proc. of ISTD-07, Tokyo, November 2015.
- *Morandi F.*, De Cesaris S., D'Orazio D. and Garai M. "Energy criteria in Italian historical opera houses: a survey over 11 theatres", Proc. Auditorium Acoustics, Paris, October 2015.
- *Garai M.*, Guidorzi P. and Morandi F. "Sound reflection and sound insulation measurement on a sonic crystal noise barrier according to the new European methodology", Proc. of Internoise15, San Francisco, August 2015 (invited paper).
- *Garai M.*, D'Orazio D., De Cesaris S., Morandi F. and Ito K. "The

- acoustics of Bayreuth Festspielhaus”, Proc. of ICSV22, Florence, July 2015.
- *De Cesaris S.*, Morandi F., Loreti L., D’Orazio D. and Garai M. “Notes about the early to late transition in Italian theatres”, Proc. of ICSV22, Florence, July 2015.
 - *F. Morandi*, P. Guidorzi, M. Miniaci, A. Marzani and M. Garai, “Acoustic measurements on sonic crystal barriers”, Proc. of 6th IBPC, Turin, June 2015.
 - *F. Morandi*, S. De Cesaris, M. Miniaci, A. Marzani and M. Garai, “Experimental evidence of band gaps in periodic structures”, Proc. of Euronoise 2015, Maastricht, June 2015 (invited paper).
 - *Morandi F.*, D’Orazio D., De Cesaris S., Barbaresi L. and Garai M. “Sound radiation from stages in the theatres of Cesenatico and Longiano”, Proc. of AIA-DAGA International Conference, Meran, March 2013.

Journal articles in refereed academic journals

- *Morandi F.*, Santoni A., Fausti P., Garai M. Determination of the dispersion relation in cross-laminated timber plates: Benchmarking of time- and frequency-domain methods. *Applied Acoustics* **185**, 108400, 2022.
- *Morandi F.*, Prato A., Barbaresi L. and Schiavi A. “On the diffuseness of the vibrational field of a cross-laminated timber plate: Comparison between theoretical and experimental methods”, *Appl. Acoust.* **159**, 107104, 2020.
- *Morandi F.*, De Cesaris S., Garai M. and Barbaresi L. “Measurement of flanking transmission for the characterisation and classification of cross laminated timber junctions”, *Appl. Acoust.* **141**, 312-222, 2018.
DOI: 10.1016/j.apacoust.2018.07.009
- *D’Orazio D.*, De Cesaris S., Morandi F. and Garai M. “The aesthetics of the Bayreuth Festspielhaus explained by means of acoustic measurements and simulations”, *J. Cul. Her.*
DOI: 10.1016/j.culher.2018.03.003, 2018.
- *Morandi F.*, Marzani A., De Cesaris S., D’Orazio D., Barbaresi L. and Garai M. “Sonic crystals as tunable noise barriers”, *RIA* **40** (4), 1-19, 2016.
- *Morandi F.*, Miniaci M., Marzani A., Barbaresi L. and Garai M. “Standardised acoustic characterisation of sonic crystals noise barriers: Sound insulation and reflection properties”, *Appl. Acoust.* **114**, 294-306, August 2016.
DOI: 10.1016/j.apacoust.2016.07.028.
- *De Cesaris S.*, D’Orazio D., Morandi F. and Garai M. “Extraction of the envelope from impulse responses using pre-processed energy detection for early decay estimation”, *J. Acoust. Soc. Am.* **138** (4), 2513-2523, October 2015. DOI: 10.1121/1.4931904.
- *Garai M.*, Morandi F., D’Orazio D., De Cesaris S. and Loreti L. “Acoustic measurements in eleven Italian opera houses: correlations between room criteria and considerations on the local evolution of a typology”, *Build. and Environ.* **94P2**, 900-912, 2015.
DOI: 10.1016/j.buildenv.2015.07.026.

Further data

Presentations at scientific conferences over past 5 years:

- Euronoise Conference, Madeira (online), 2021.
- CLEM Conference, Montevideo, 2019.

- ICA Conference, Aachen, 2019.
- BSA Conference, Bolzano, 2019.
- AIA National Conference, Pesaro, 2019.
- World Conference on Timber Engineering, Seoul, 2018.
- Euronoise Conference, Crete, 2018.
- AIA National Conference, Aosta, 2018.
- 8th International Symposium on Temporal Design, Bologna, 2017.
- AIA National Conference, Pavia, 2017.
- International Congress on Acoustics, Buenos Aires, 2016.
- AIA National Conference, Alghero, 2016.
- Auditorium Acoustics Conference, Paris, 2015.
- Euronoise Conference, Maastricht, 2015.

**Language
competence**

ENGLISH: Writing C1, Speaking C1
SPANISH: Writing B2, Speaking B2
GERMAN: Writing A2, Speaking A2

Bozen, October 28th 2021

Signature