

# University Academic Curriculum Vitae

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**Personal information** Name: Federica Morandi  
Place of birth: Bologna  
Date of birth: April 19<sup>th</sup>, 1987  
Nationality: Italian

## 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)  
1<sup>st</sup> September 2014 – 31<sup>st</sup> 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 Applied Acoustics, 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  
15<sup>th</sup> September 2018 – 15<sup>th</sup> 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  
1<sup>st</sup> January 2016 – 31<sup>st</sup> May 2019  
Supervisor: Dr. Luca Barbaresi.  
Title of the project: Experimental analysis of flanking transmission on innovative junction systems for CLT panels.

## Present appointment

- Post-Doctoral Research Fellow at the Faculty of Science and Technology, University of Bozen  
June 1<sup>st</sup> 2019 - present  
Title of the project: E2I@NOI: Definition of a system of laboratories for the development, characterization and technology transfer for smart energy efficient buildings.  
Supervisors: Prof. Andrea Gasparella, Dr. Giovanni Pernigotto

## Research and scholarships

### CURRENT 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 water front after the panel has been dipped into water.
- *Analysis of the vibro-acoustical behavior of mass timber elements*  
Characterization of the propagation of bending waves through the comparison of several signal processing techniques (TOF and pluri-spectral analysis) for the estimate of the elastic and shear moduli. Evaluation of the radiation efficiency of orthotropic CLT plates through analytical modelling and experimental measurements.

### PAST RESEARCH ACTIVITY

- *Flanking transmission in CLT junctions*  
Characterization of the vibration reduction indices in CLT junctions. Evaluation of the influence of the kind and number of screws and of the kind and number of hold-down and angle brackets; analysis of the effectiveness of several resilient interlayers used at the wall-floor junction.
- *Sound insulation properties of mass timber floors*  
Investigation of the acoustic insulation provided by CLT floors through the testing of over 20 different configurations - including wet/dry substrates, polyurethane or fibrous resilient layers, wet/dry screeds and false ceiling fixed with hangers, timber studs or omega profiles.
- *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 6<sup>th</sup> International Conference on Building Physics (Turin, 2015).
- Co-winner of the 1<sup>st</sup> edition of the UNIBO LaunchPad Program, the first Italian incubator of entrepreneurial ideas deriving from academic research (2015).

## Academic responsibilities

- 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.

## Thesis advising

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.

## Memberships

- 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).
- Reviewer for *Building and Environment*, *Journal of Architectural Engineering*, *Sensors*, *Building Acoustics*.

## Teaching activities

- 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.
- Guest teacher at the Master in Timber Construction, Universidad del Bío-Bío, Concepción, Chile, 2017.
- Rothschooll professional courses on acoustics in timber buildings, Cortaccia (BZ), 2016-2018.

## Seminars

- Guest speaker in the final seminar of the program “Proyectar, manufacturar y construir de forma sustentable con sistema de madera contralaminada”, Concepción, Chile, 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

- *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.*, 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:

- AIA National Conference, Pesaro, 2019.
- World Conference on Timber Engineering, Seoul, Korea, 2018.
- Euronoise Conference, Crete, 2018.
- AIA National Conference, Aosta, 2018.
- 8<sup>th</sup> 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

**Driving license**

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