

PERSONAL INFORMATION

Carlo Giovanni LAI



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Current Position Professor of Geotechnical Engineering

RESEARCH INTERESTS

Synopsis

My main research interests are in earthquake geotechnical engineering and engineering seismology with special regard to stochastic ground response analyses, probabilistic and deterministic seismic hazard assessment, theoretical modeling of seismic wave propagation in geomaterials, dynamic soil-structure interaction and definition of the design earthquake at critical construction sites. I have been coordinator of several research projects on various subjects of earthquake geotechnical engineering and engineering seismology funded by public and private agencies in Italy and abroad. Recently I was the technical lead of LiquefACT, a three and a half years H2020 European research project on the assessment and mitigation of soil liquefaction potential across Europe. I authored/co-authored more than 240 scientific publications including two books and one software package tool for the geotechnical characterization of soil deposits via surface Rayleigh wave analysis.

Citation metrics

Scopus: h-index 24, citations 2101, documents 101  
Google Scholar: h-index 31, citations 4412, i10-index 83

JOB EXPERIENCE

From 01/10/2016 to present

Professor of Geotechnical Engineering

Department of Civil Engineering and Architecture – University of Pavia, Italy

- Research and education

From 29/12/2010 to 30/09/2016

Associate Professor of Geotechnical Engineering

Department of Civil Engineering and Architecture – University of Pavia, Italy

- Research and education

From 01/09/2003 to 28/12/2010

Associate Researcher of Geotechnical Engineering

European Centre for Training and Research in Earthquake Engineering – Pavia, Italy

- Principal investigator in research projects in earthquake geotechnics and engineering seismology
- Lecturer at the University of Pavia of courses in geotechnical engineering

From 01/08/1998 to 30/08/2003

Scientific Consultant in Geotechnical Engineering

Studio Geotecnico Italiano Ltd Milano (Italy) – Private Sector, Civil (Geotechnical) Engineering

- Scientific consultant in several projects in the field of earthquake geotechnical engineering
- Lecturer at Politecnico di Torino of courses of geotechnical engineering

From 01/01/1993 to 20/12/1993

Team Leader and Project Manager in a Cooperation Programme in Ethiopia

Institute for University Cooperation on behalf of Italian Ministry of Foreign Affairs – Public Sector

- Team leader of the cooperation programme “Primary Health Care in Arsi Region” in Ethiopia
- Elaboration of the strategies and methodologies of intervention of the cooperation project
- Management of funds and technical resources of the programme. Coordination of project activities

From 01/07/1992 to 31/12/1992

Consulting Engineer in Geotechnical Engineering

Studio Geotecnico Italiano Ltd Milano (Italy) – Private Sector, Civil (Geotechnical) Engineering

- Geotechnical design of the high-speed railway line Milano – Genova

From 26/03/1990 to 05/06/1992

**Civil Engineer Volunteer in a Cooperation Programme in Ethiopia**

Institute for University Cooperation on behalf of Italian Ministry of Foreign Affairs – Public Sector

- Design and construction of 15 health facilities and restoration of 7 rural hospitals
- Implementation of small projects in environmental and sanitary engineering
- Organization of training courses in environmental engineering for local land surveyors

From 01/09/1988 to 15/03/1990

**Consulting Engineer in Structural and Geotechnical Engineering**

I.C.I.S. Ltd Torino (Italy) and I.G.E.A.S. Ltd Torino (Italy) – Private Sector, Civil Engineering

- Structural design of reinforced and prestressed concrete viaducts and bridges
- Structural and geotechnical design of reinforced concrete and masonry structures

**ACADEMIC TITLES**

1998

**PhD in Civil Engineering**

Georgia Institute of Technology – Atlanta, USA

- Dissertation title: “Simultaneous inversion of Rayleigh phase velocity and attenuation for near-surface site characterization”

1997

**Master of Science in Engineering Science and Mechanics**

Georgia Institute of Technology – Atlanta, USA

1995

**Master of Science in Civil Engineering**

Georgia Institute of Technology – Atlanta, USA

1988

**Master Degree in Civil Engineering (five years programme)**

Politecnico di Torino – Torino, Italy

**SPOKEN LANGUAGES**

Mother tongue  
Other languages

Italian

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1

Levels: A1/2: Basic user - B1/2: Independent user - C1/2 Proficient user  
Common European Framework of Reference for Languages

**INSTITUTIONAL NOMINATIONS**

**International appointments**

2024 – 2029

Adjunct faculty at the Department of Civil Engineering at the Indian Institute of Technology Madras

2020 – 2025

Member of PIANC (World Association for Waterborne Transport Infrastructure) WG 225 “Seismic design guidelines for port structures”. Appointed by Maritime Navigation Commission (MarCom)

2010 – 2017

Member of the executive group of technical committee TC 202 “Transportation Geotechnics” of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE)

**National appointments**

2015 – 2020

Member of WG for the revision and update of “Seismic hazard map of Italian territory”. Appointment assigned by the Italian Institute of Geophysics and Volcanology (INGV)

2014 – 2017

Member of Italian national committee for the update of “Commentary of the Italian building code” for WG on geotechnical engineering. Decree of CSLP n. 8570 of 19/12/2014

2010 – 2012

Member of Italian national committee for the revision of “Italian building code” Ministerial Decree 14/01/2008. WG n. 1 (seismic design of structures) and WG n. 8 (geotechnical engineering)

### Institutional service at the University of Pavia

- 2019 – present Member of the executive committee of the Faculty of Engineering
- 2015 – present Member of university library commission and of scientific council for the library of engineering
- 2015 – present Erasmus representative for the Bachelor and Master programmes in Civil Engineering
- 2018 – 2022 Coordinator of the Master Programme in Civil Engineering

### Other institutional appointments

- 2023 – present Member for the University of Pavia in the scientific committee under the framework agreement between the Italian Institute of Geophysics and Volcanology (INGV) and the University of Pavia
- 2018 – present Advisor of the Department of Risk Scenarios of the European Centre for Training and Research in Earthquake Engineering (Eucentre) Foundation, Pavia, Italy
- 2011 – present Member of the academic board of the International Doctoral Research Programme in Understanding and Managing the Extremes at the University Institute for Advanced Studies (IUSS) Pavia, Italy

### RELEVANT NATIONAL AND INTERNATIONAL GRANTS (last 10 years as PI)

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- 2022 – 2024 Scientific coordinator for University of Pavia of national project “GIANO: Geo-Risks Assessment and Mitigation for the Protection of Cultural Heritage” funded by Italian Ministry of Education, University and Research through PRIN 2020 Call. No. of research units: 5; unit research funds: € 240.000.
  - 2021 Project coordinator for Eucentre Foundation of research project funded by Government of Cayman Islands on “Probabilistic Seismic Hazard Assessment at Cayman Islands”. Project funds: € 50.000.
  - 2019 – 2023 Project coordinator for the University of Pavia of research project funded by the Italian Department of Civil Protection through the RELUIS Consortium. WP18 on “Ground response analysis and liquefaction” and WP16 on “Building code contribution on seismic action”. Project funds: € 125.000.
  - 2016 – 2019 Technical lead of European Research Project “Assessment and Mitigation of Liquefaction Potential across Europe: a Holistic Approach to Protect Structures/Infrastructures for Improved Resilience to Earthquake-Induced Liquefaction Disasters” (LIQUEFACT). Horizon 2020 – Call: H2020-DRS-2015; Topic: DRS-13-2015; Project No. 700748. No. of research units: 11; unit research funds: € 445.000.
  - 2011 – 2014 Scientific coordinator for Eucentre Foundation of European Research Project “Strategies and Tools for Real Time Earthquake Risk Reduction” (REAKT). FP7 Collaborative Project Large-scale integrating project. Work programme topic ENV.2011.1.3.1-1 Towards Real-Time Earthquake Risk Reduction. Project number 282862. No. of research units: 23; unit research funds: € 250.000.

### ACADEMIC TEACHING ACTIVITY

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- 2004 – present **Tenured and untenured courses taught at the University of Pavia**
    - “Propagation of Mechanical Waves in Deformable Solids” for doctoral students (3 credits)
    - “Geotechnical Earthquake Engineering” for graduate students in civil engineering (6 credits)
    - “Foundations and Earth-Retaining Structures” for graduate students in civil engineering (6 credits)
    - “Geotechnical Engineering” for undergraduate students in civil-environmental engineering (9 credits)
  - 1995 – 2018 **Untenured courses taught at other Universities**
    - “Earthquake Geotechnical Engineering” for graduate students in civil engineering (6 credits) at the University School for Advanced Studies (IUSS Pavia) in Pavia, Italy. Three academic years.
    - “Wave Propagation in Elastic Solids” for graduate students in civil engineering (6 credits) at the University School for Advanced Studies (IUSS Pavia) in Pavia, Italy. Two academic years.
    - “Geotechnical Engineering” for undergraduate students in civil engineering (5 credits) at the II Faculty of Engineering of Politecnico di Torino in Vercelli, Italy. One academic year.
    - “Introduction to Rigid Body Dynamics” for undergraduate students in civil engineering (3 credits) at the Georgia Institute of Technology, Atlanta, USA. Two academic years.

AWARDS AND TITLES

- 2016 Visiting Erskine Fellowship, University of Canterbury, College of Engineering, Christchurch, New Zealand, August 29 – December 28, 2016
- 2003 Bishop Medal for the best research article in Geotechnical Engineering published by the British Institution of Civil Engineers in 2002. London, UK, November 4, 2003
- 1998 Outstanding Ph.D. Graduate Award, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, USA, May 27, 1998
- 1994 Domenica Rea D'Onofrio Fellowship, Georgia Institute of Technology, Atlanta, USA, March 23, 1994
- 1988 Habilitation for practicing the profession of civil engineer in Italy

INVITED SPEAKER AT INTERNATIONAL CONFERENCES (last 10 years)

- 2023 Keynote speaker at the 9<sup>th</sup> Conference of the Croatian Geotechnical Society on the 2020 Petrinja earthquake (SISAK 2023). Presentation title: "Multi-scale zoning of a territory for earthquake-induced soil liquefaction". Sisak, Croatia, May 4-6, 2023
- 2019 Keynote speaker at the International Symposium on Geotechnical Aspects of Heritage Structures (ISGHS-2019). Presentation title: "Geotechnical modeling and design earthquake at archaeological and cultural heritage sites". Chennai, India, September 16-18, 2019
- 2018 Keynote speaker at the XXV International Conference of Geotechnics of Torino (CGT 2018) on "Analyses and Design of Geotechnical Systems in Seismic Areas". Presentation title: "Seismic microzonation for liquefaction risk". Torino, November 8-9, 2018
- 2015 Keynote speaker at the 6<sup>th</sup> International Conference on Earthquake Geotechnical Engineering (6ICEGE). Presentation title: "Non-conventional methods for measuring dynamic properties of geomaterials". Christchurch, New Zealand, November 1-4, 2015
- 2015 Invited speaker at the Rapid-Fire Conference at Massachusetts Institute of Technology. Presentation title: "Damping in soils by inversion of dispersion of bulk waves". Boston, USA, October 26, 2015
- 2015 Keynote speaker at the 2<sup>nd</sup> International Conference Continuous Media with Microstructure (CMwM2015). Presentation title: "Measurement of damping in soils from exact solution of Kramers–Kronig equations of linear viscoelasticity". Łagów, Poland, March 2-5, 2015
- 2013 Invited speaker at the ALERT-Geomaterials Workshop 2013 on Soil-Structure Interaction. Presentation titles: "Soil-structure interaction under earthquake loading: theoretical framework" and "Advanced numerical modeling of soil-structure interaction: peculiarities, examples and case studies". Aussois, France, October 3-5, 2013

FURTHER RELEVANT SCIENTIFIC ACTIVITIES

Student guidance of PhD theses  
Student guidance of MSc theses

- Supervisor/co-supervisor of 14 doctoral dissertations (11 completed)
- Supervisor/co-supervisor of over 50 completed master theses

Research visits at foreign academic institutions

- Visiting professor at the University of Canterbury, New Zealand to carry out research and teaching activities (20 hours) on earthquake geotechnical engineering. Christchurch, New Zealand. Period: August 29, 2016 – December 28, 2016
- Visiting professor at the School of Civil and Environmental Engineering of the Georgia Institute of Technology, Atlanta, USA to carry out research activities on near-surface geotechnical characterization using Rayleigh waves. Period: July 25 – August 15, 2011
- Visiting scholar at the Department of Civil and Environmental Engineering, Faculty of Engineering of the University of Waterloo, Canada to carry out research activities on dynamic characterization of geomaterials using non-resonant methods. Waterloo. Period: July 15 – August 14, 2007
- Visiting scholar at the Weierstrass Institute for Applied Analysis and Stochastics, Berlin (Germany) to carry out research activities on Biot's model, its admissibility and testing of granular by means of acoustic measurements. Period: May 6 – June 5, 2002

Teaching activities at foreign universities

- Lecturer at the Indian Institute of Technology Madras to deliver a two-week course (30 hours) on "Advances in seismic hazard analysis and soil-structure interaction" within the "Global Initiative for Academic Networks (GIAN) in Higher Education". Chennai (India). Period: July 18-31, 2016

- Lecturer of the module “Seismicity and seismic risk” at the Master Programmes in Civil Engineering at the Aristotle University of Thessaloniki (Greece), Instituto Superior Técnico of Lisbon (Portugal) and the University of Cantabria at Santander (Spain) for 12 hours. European project Erasmus – Lifelong Learning Programme Safety and Sustainability in Civil Engineering (SASICE) 2010 – 2013
  - Lecturer of the module “Ground response analyses” (8 hours) at the course on mitigation of seismic risk organized at An-Najah National University in Nablus (Palestinian Territories). European project SASPARM – Call ID FP7-INCO.2011-6.2). Nablus, May 2-4, 2013
- Coordinator of Summer Schools**
  - “Propagation of Mechanical Waves in Deformable Solids and Meta-Materials”. Intensive School for Advanced Graduate Studies, University of Pavia (Italy). September 5 – 9, 2022
  - “Surface Waves in Geomechanics: Direct and Inverse Modeling for Soils and Rocks”. International Centre for Mechanical Sciences, Udine (Italy). September 27 – October 1, 2004 with K. Wilmanski
- Participation at relevant missions**
  - Member of the team of experts in post-earthquake investigation in Blenheim region (New Zealand) struck by the November 14, 2016 Kaikoura earthquake. Period: November 17-19, 2016
  - Member representing the scientific committee of institutional mission of municipality of Milan at the Caribbean Islands for the promotion of candidacy of Milan for EXPO 2015. February 21–29, 2008
  - Member of the team of experts of the Italian Civil Protection Department and Ministry of Cultural Heritage for a post-earthquake investigation at the archaeological site of Bam in Iran struck by the December 26, 2003 earthquake. February 13 – 19, 2004
- Affiliation to editorial boards**
  - Member of editorial board of “Italian Geotechnical Journal” (Pátron). Period: 2016 to present
  - Member of editorial board of “Seismic Design” (IUSS Press). Period: 2008 to present
  - Member of editorial board of “Transportation Geotechnics” (Elsevier). Period: 2013 – 2018
- Affiliation to scientific associations**
  - Member of International Society for Interaction of Mechanics and Mathematics (ISIMM). Since 2003
  - Member of Italian Geotechnical Association (AGI). Since 2003
  - Member of Geotechnical Extreme Events Reconnaissance Association (GEER). Since 2011
- Review and refereeing activities**
  - Peer reviewer of scientific articles for over 20 international journals
  - Peer reviewer for the evaluation of 7 Italian and international research proposals
  - Peer reviewer and external referee for the evaluation of over 20 doctoral dissertations
- Development of software**
  - Co-author of software package tools SWAN and SWAMI for the processing and analysis of surface wave data for geotechnical characterization. Technology transfer (<http://www.geostudiatier.it/>)
  - Co-author of software package tool ONDA for computing the nonlinear seismic response of soils (*Journal of Geotech. Geoenviron. Eng., ASCE, Vol. 132, No.2, pp. 223-236*)
- Scientific consultancy**
  - Consultant in several national and international projects worldwide in engineering seismology, earthquake engineering and geotechnical engineering. Since 2003 to present

**Personal data**

According to law 679/2016 of the Regulation of the European Parliament of 27<sup>th</sup> April 2016, I hereby express my consent to process and use my data provided in this CV

Date: June 3, 2024

Signature:


**Selection of 10 relevant journal articles published in the last 5 years**

1. Bozzoni, F., Misiano, G., Lai, C.G. (2023). A multi-scale tool for assessing the seismic risk of small dams during emergency preparedness and response phase. *Natural Hazards*, <https://doi.org/10.1007/s11069-023-06081-z>.
2. Bozzoni, F., Furioli, A., Lai, C.G. (2023). Probabilistic assessment of the earthquake-induced soil liquefaction hazard at national scale: macrozonation of the Italian territory. *Natural Hazards*, 115:2237–2255.
3. Parolai, S., Lai, C.G., Dreossi, I., Ktenidou, O.-J., Yong, A. (2022). A Review of Near-Surface  $Q_s$  Estimation Methods using Active and Passive Sources. *Journal of Seismology*, Vol. 26, pp. 823–862, doi:10.1007/s10950-021-10066-5.
4. Bozzoni, F., Cantoni, A., De Marco, M.C., Lai, C.G. (2021). ECLiq: European Interactive Catalogue of Earthquake-Induced Soil Liquefaction Phenomena. *Bulletin of Earthquake Engineering*, Vol. 19, No. 12, pp. 4719–4744.
5. Bozzoni, F., Boni, R., Conca, D., Lai, C.G., Zuccolo, E., Meisina, C. (2021). Megazonation of Earthquake-Induced Soil Liquefaction Hazard in Continental Europe. *Bulletin of Earthquake Engineering*, Vol. 19, S.I.: The H2020 European Project LIQUEFACT, pp. 4059–4082.
6. Lai, C.G., et al. (2021). Technical Guidelines for the Assessment of Earthquake Induced Liquefaction Hazard at Urban Scale. *Bulletin of Earthquake Engineering*, Vol. 19, S.I.: The H2020 European Project LIQUEFACT, pp. 4013–4057.
7. Lai, C.G., Poggi, V. et al. (2020). “An Inter-Disciplinary and Multi-Scale Approach to Assess the Spatial Variability of Ground Motion for Seismic Microzonation: the Case Study of Cavezzo Municipality in Northern Italy”. *Engineering Geology*, Vol. 274, pp. 105722.
8. Conca, D., Bozzoni, F. and Lai, C.G. (2020). “Interdependencies in Seismic Risk Assessment of Seaport Systems: Case Study at Largest Commercial Port in Italy”. *Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*, Vol. 6, No. 2, pp. 04020006.
9. Zuccolo, E., Bozzoni, F., Crempien, J. and Lai, C.G. (2020). Nonlinear broadband simulation of the Mw 6.0 May 29, 2012 Emilia earthquake in Northern Italy. *Soil Dynamics and Earthquake Engineering*, Vol. 129, pp 105931.
10. Andreotti, G. and Lai, C.G. (2019). Use of Fragility Curves to Assess the Seismic Vulnerability in the Risk Analysis of Mountain Tunnels. *Tunnelling and Underground Space Technology*, Vol. 91, pp. 103008.