



Politecnico di Milano University

Giovanni Di Luzio, Ph.D

**CONTACT
INFORMATION**

Associate Professor
Department of Civil and Environmental Engineering
Politecnico di Milano
Piazza Leonardo da Vinci, 32
20133 Milan Italy

**RESEARCH
INTERESTS**

Computational and applied mechanics of concrete and reinforced concrete structures: linear and nonlinear fracture mechanics, nonlinear constitutive modeling of quasi-brittle materials, mechanical behavior of concrete under variable hygro-thermal conditions, concrete creep and rate effect, moisture and heat transfer in porous materials, concrete-steel interface behavior, anchors in reinforced concrete structures, fiber-reinforced cementitious materials, thermally damaged concrete, alkali-silica reaction and chemical degradation in concrete structures, and self-healing in cementitious materials.

**ACADEMIC
APPOINTMENTS**

- Associate Professor**, Politecnico di Milano September 2016 to present
Department of Civil and Environmental Engineering
- Affiliations:
 - School of Architecture Urban Planning Construction Engineering
 - Architecture - Built environment - Interiors
 - Building architecture
 - Architectural design and history @ Mantua
 - School of Civil, Environmental and Geomatic Engineering
- Assistant Professor**, Politecnico di Milano January 2014 to September 2016
Department of Civil and Environmental Engineering
- Assistant Professor**, Politecnico di Milano April 2006 to January 2014
Department of Structural Engineering
- Visiting Scholar**, Northwestern University, Evanston, IL, USA March 2012 to May 2012
Department of Civil and Environmental Engineering
- Host: Professor Gianluca Cusatis
- Visiting Scholar**, Rensselaer Polytechnic Institute, Troy, NY, USA June 2006 to August 2006
Department of Civil and Environmental Engineering
- Host: Professor Gianluca Cusatis
- Associate Research Fellow**, Politecnico di Milano April 2003 to April 2006
Department of Structural Engineering
- Supervisors: Professor Luigi Cedolin and Professor Giandomenico Toniolo
- Postdoctoral Scholar**, Politecnico di Milano March 2002 to April 2003
Department of Structural Engineering
- Supervisor: Professor Luigi Cedolin
- Visiting Scholar**, Northwestern University, Evanston, IL, USA October 2000 to August 2001
Department of Civil and Environmental Engineering
- Supervisor: Professor Zdeněk P. Bažant

EDUCATION	<p>Politecnico di Milano, Milan, Italy</p> <p>Ph.D., Department of Structural Engineering, March 2002</p> <ul style="list-style-type: none"> • Thesis Title: <i>A new nonlocal microplane model for fracture and damage in concrete</i> • Advisors: Professor Luigi Cedolin and Professor Zdeněk P. Bažant • Area of Study: Structural Engineering <p>M.S. ("Laurea" summa cum laude), Politecnico di Milano, Milan, Italy</p> <ul style="list-style-type: none"> • Thesis Title: <i>The microplane model for concrete under dynamic loading. (in Italian).</i> • Advisor: Professor Luigi Cedolin • Area of Study: Structural Engineering
PROFESSIONAL REGISTRATION	<p>Professional habilitation since February 1999</p> <p>Member of the Pescara Order of Engineers (n. 1280) since January 2002</p>
AWARDS AND RECOGNITIONS	<p>Outstanding reviewer recognition award from Journal of Engineering Mechanics (ASCE), year 2013</p> <p>Outstanding reviewer recognition award from Engineering Fracture Mechanics, Jan. 2017</p> <p>Outstanding reviewer recognition award from Construction and Building Materials, Aug. 2018</p> <p>Outstanding reviewer recognition award from Cement and Concrete Composites, July 2018</p> <p>National habilitation as Associate Professor of Structural Mechanics, December 2014</p> <p>National habilitation as Full Professor of Structural Mechanics, May 2019</p>
SCIENTIFIC COMMITTEES	<p>Voting member of the Joint ACI-ASCE Committee 446 – Fracture Mechanics of Concrete since October 2010</p> <p>Voting member of ACI Subcommittee 209-0D, Numerical Methods and 3D Analyses since April 2014</p> <p>Voting member of IA-FraMCoS</p> <p>Secretary in the Board of Directors of IA-ConCreep</p> <p>Management Committee (MC) substitute member for Italy to COST Action CA15202 SAR-COS: Self-healing As preventive Repair of COncrete Structures since November 2016</p> <p>Full Individual Membership in EMMC, (European Materials Modelling Council) ASBL, since June 2020</p> <p>Member of fib TG4.5 - Time-dependent Behavior of Concrete, since January 2021</p>
RESEARCH EVALUATION ACTIVITY	<p>Member of REPRISE – Register of expert Peer-Review for the scientific evaluation of Italian Ministry research of the Italian of Education, University and Research (MIUR)</p> <p>Expert for the Marie Skłodowska-Curie Individual Fellowships H2020-MSCA-IF-2020</p>
SELECTED SPONSORED RESEARCH PROJECTS	<p>U.E. anchor project: anchorages in normal and high performance concretes subjected to medium and high strain rates. European Union research project. Mar. 1998 to Mar. 2001 (PI L. Cedolin 20%).</p> <p>Adhesive fastener project. Hilti Corporation. November 2001 to April 2003 (PI L. Cedolin).</p> <p>Metal anchors in high and ultra-high performance fiber-reinforced concretes. CTG-Italcementi Group. December 2001 to March 2003 (PI: L. Cedolin 50%).</p>

Theoretical and numerical study of post-installed anchorages for high and ultra-high performance fiber reinforced concrete under combined loads. CTG-Italcementi Group. April 2004 to June 2005 (PI: L. Cedolin).

Fiber-reinforced concrete for tough, durable, and inexpensive structures and infrastructure. Italian Ministry of education, university and scientific research. January 2005 to December 2006 (PI M. di Prisco).

Concrete cracking modeling at early-ages. CTG-Italcementi Group. February 2006 to August 2006 (PI L. Cedolin).

Determination of creep and shrinkage effects in large span bridge. Lombardi Reico Ingegneria S.R.L. and Astaldi S.P.A. Corporation. July 2010 to July 2011 (CoPI G. Di Luzio).

High Strain Rate Behavior of Dam Concrete: Experiments and Multiscale Modeling. Department of Homeland Security USA (DHS). September 2010 to September 2012 (CoPI G. Di Luzio).

Self-healing of cementitious materials. Department grant "Progetto giovani ricercatori 2011". April 2012 to April 2013. (PI L. Ferrara)

Reshealience - Rethinking coastal defense and green-energy Service infrastructures through enhanced-durable high-performance cement-based materials. This project has received funding from the European Union's Horizon H2020 research and innovation program under grant agreement N. 760824. January 2018 to December 2022. (CoPI G. Di Luzio)

TEACHING AND
UNIVERSITY
ACTIVITY

Politecnico di Milano University, Milan, Italy

Instructor **AY 2004/2005 to 2006/2007**

- Laboratory course of Design of Structures. School of Civil and Environmental Engineering.

Instructor **AY 2006/2007 to 2010/2011**

- Laboratory course of Design of Structures. Mantova School of Architecture.

Instructor **AY 2006/2007**

- Design of Structures. School of Architecture and Society.

Instructor **AY 2013/2014 to 2014/2015**

- Building and Construction Techniques. Mantua School of Architecture.

Instructor **AY 2007/2008 to present**

- Laboratory course of Design of Structures. School of Architecture and Society.

Instructor **AY 2015/2016 to AY 2018/2019**

- Design of Masonry and Timber Structures. School of Architecture Urban Planning Construction Engineering - Architectural Design and History in Mantua.

Instructor **AY 2019/2020 to present**

- Final Workshop Antico e Nuovo - Strengthening and Seismic Design. School of Architecture Urban Planning Construction Engineering - Architectural Design and History in Mantua.

Instructor **AY 2016/2017 to present**

- Structural Numerical Modeling. School of Architecture Urban Planning Construction Engineering - Building Architecture.

Academic Service

- Coordinator of the Stage and Placement Office of Mantova School of Architecture. From April 2009 to present.
- Member of the admission committee to the Mantova School of Architecture. From September 2007 to September 2009
- Member of the Teaching Committee of the Department of Civil and Environmental Engineering. From March 2013 to December 2016.
- Member of the adjudicating board of the State Exam for Civil and Environmental Engineers. AY 2019/2020 to present.

ORGANIZATION ACTIVITY IN CONFERENCES AND WORKSHOPS

EMI 2010, ASCE Engineering Mechanics Institute Conference, 8-11 August, 2010, Los Angeles (CA), USA. Mini-symposium on "Constitutive and Fracturing Behavior of Quasi-Brittle Materials Computation and Experiments" in honor of Prof. L. Cedolin. Mini-symposium co-organizer and session Chairman.

EMI 2013, ASCE Engineering Mechanics Institute Conference, 4-7 August, 2013, Evanston (IL), USA. Session Chairman.

EMI 2015 Engineering Mechanics Institute Conference (EMI 2015). 16-19 June 2015. Stanford, United States. Mini-symposium on "Modeling time-dependent behavior of deteriorating concrete structures". Mini-symposium co-organizer and session Chairman.

CONCREEP 2015, 10th International Conference on Creep, Shrinkage, and Durability Mechanics, Austria, Vienna, 21-23 September 2015. Mini-symposium on "Modeling time-dependent behavior of deteriorating concrete structures". Co-organizer and session Chairman.

EMI 2016 Engineering Mechanics Institute Conference 2016, May 22-25, 2016, Vanderbilt University, TN USA. Mini-symposium on "Modeling time-dependent behavior of deteriorating concrete structures". Mini-symposium co-organizer and session Chairman.

FraMCoS 2016 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures, May 28-June 1, 2016, Berkeley, California (USA). Member of the Scientific Committee.

FraMCoS 2016 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures, May 28-June 1, 2016, Berkeley, California (USA). Mini-symposium on "Nonlocal model for the simulation of fracture in concrete". Mini-symposium co-organizer and session Chairman.

FraMCoS 2016 9th International Conference on Fracture Mechanics of Concrete and Concrete Structures, May 28-June 1, 2016, Berkeley, California (USA). Mini-symposium on "Modeling time-dependent behavior of deteriorating concrete structures". Mini-symposium co-organizer and session Chairman.

CONSEC 2016 8th International Conference On Concrete Under Severe Conditions-Environment and Loading, Sept. 12-Sept. 14, 2016, Lecco, Italia. Member of the Organizing Committee and Session Chairman.

EMI 2017 - IC 3rd EMI International Conference, 19-22 March 2017, Rio de Janeiro, Brazil, Mini-Symposium on "Experimental analysis and computational modeling of concrete time-dependent behavior and deterioration". Mini-symposium co-organizer and session Chairman.

ICF14 - The 14th International Conference on Fracture (ICF14), Rhodes, Greece, June 18-23, 2017, Mini-Symposium on "Modeling time-dependent behavior and deterioration of concrete". Mini-symposium co-organizer.

ECCM-ECFD 2018 - 6th European Conference on Computational Methods, 11-15 June, 2018, Glasgow, UK, Mini-Symposium on "Numerical simulation of self-healing processes in cementitious materials". Mini-symposium co-organizer and session co-chairman.

ITALIAN CONCRETE DAYS - Giornate aicap 2018 - Congresso CTE, Milan 13 June / Lecco 14-15 June 2018, Member of the Organizing Committee.

EMI2018 - Engineering Mechanics Institute Conference, M.I.T. campus, Cambridge, MA, USA, May 29-June 1, 2018. Mini-Symposium on "Modeling the time-dependent behavior of deteriorating concrete structures (MS10)". Mini-symposium co-organizer.

IALCCE2018 - 6th International Symposium on Life-Cycle Engineering, Ghent, Belgium, October 28-31, 2018. Mini-Symposium on "Modeling the time-dependent behavior of deteriorating concrete structures". Mini-symposium co-organizer.

EMI18IC - Engineering Mechanics Institute 2018 International Conference, Tongji University, Shanghai, China, November 2-4, 2018, Mini-Symposium on "Modeling the time-dependent behavior of deteriorating concrete structures (MS2)". Mini-symposium co-organizer.

FraMCoS 2019 10th International Conference on Fracture Mechanics of Concrete and Concrete Structures, June 24-26 2019, Bayonne, France. Member of the Scientific Committee.

The Biot-Bažant Conference on Engineering Mechanics and Physics of Porous Materials. A One-time Fusion of Concreep and the Biot Conference on Poromechanics, June 1-3 2021, Northwestern University, Evanston Campus, IL, USA. Member of the Scientific Committee.

REFEREED
JOURNAL
PUBLICATIONS

- [1] Z. P. Bažant and G. Di Luzio. Nonlocal microplane model with strain-softening yield limits. *International Journal of Solids and Structures*, 41(24-25):7209–7240, 2004.
- [2] G. Di Luzio and Z. P. Bažant. Spectral analysis of localization in nonlocal and over-nonlocal materials with softening plasticity or damage. *International Journal of Solids and Structures*, 42(23):6071–6100, 2005.
- [3] G. Di Luzio and L. Cedolin. Concrete response under dynamic loading. *Studies and researches*, 25:155–176, 2005.
- [4] G. Di Luzio. A symmetric over-nonlocal microplane model M4 for fracture in concrete. *International Journal of Solids and Structures*, 44(13):4418–4441, 2007.
- [5] G. Di Luzio. Numerical model for time-dependent fracturing of concrete. *Journal of Engineering Mechanics, ASCE*, 135(7):632–640, 2009.
- [6] G. Di Luzio and G. Cusatis. Hygro-thermo-chemical modeling of high performance concrete. I: Theory. *Cement and Concrete Composites*, 31(5):301–308, 2009.
- [7] G. Di Luzio and G. Cusatis. Hygro-thermo-chemical modeling of high performance concrete. II: Numerical implementation, calibration, and validation. *Cement and Concrete Composites*, 31(5):309–324, 2009.
- [8] G. Di Luzio, G. Muciaccia and L. Biolzi. Size effect in thermally damaged concrete. *International Journal of Damage Mechanics*, 19(5):631–656, 2010.

- [9] G. Cusatis, G. Di Luzio and L. Cedolin. Meso-scale simulation of concrete: blast and penetration effects and AAR degradation. *Applied Mechanics and Materials*, 82:75–82, 2011. E. Cadoni and M. di Prisco (eds).
- [10] G. Di Luzio and G. Cusatis. Solidification-Microprestress-Microplane (SMM) theory for concrete at early age: Theory, validation and application. *International Journal of Solids and Structures*, 50(6):957–975, 2013.
- [11] G. Di Luzio and L. Biolzi. Assessing the residual fracture properties of thermally damaged high strength concrete. *Mechanics of Materials*, 64:27–43, 2013.
- [12] L. Biolzi, G. Di Luzio, and J. F. Labuz. Mechanical properties of photocatalytic white concrete subjected to high temperatures. *Cement and Concrete Composites*, 39:73–81, 2013.
- [13] M. Alnaggar, G. Cusatis, and G. Di Luzio. Lattice Discrete Particle Modeling (LDPM) of Alkali Silica Reaction (ASR) deterioration of concrete structures. *Cement and Concrete Composites*, 41:45–59, 2013.
- [14] G. Muciaccia, G. Rosati and G. Di Luzio. Compressive failure and size effect in plain concrete cylindrical specimens. *Construction and Building Materials*, 137:185–194, 2017.
- [15] M. Alnaggar, G. Di Luzio, and G. Cusatis. Modeling Time-Dependent Behavior of Concrete Affected by Alkali Silica Reaction in Variable Environmental Conditions. *Materials*, 10(5):417, 2017.
- [16] G. Di Luzio, L. Ferrara, and V. Krelani. Numerical modeling of mechanical regain due to self-healing in cement based composites. *Cement and Concrete Composites*, 86:190–205, 2018.
- [17] E. Masoero, G. Cusatis, G. Di Luzio. C–S–H gel densification: the impact of the nanoscale on self desiccation and sorption isotherms. *Cement and Concrete Research*, 109:103–119, 2018.
- [18] I. Boumakis, G. Di Luzio, M. Marcon, J. Vorel, R. Wan-Wendner. Discrete element framework for modeling tertiary creep of concrete in tension and compression. *Engineering Fracture Mechanics*, 200:263–282, 2018.
- [19] G. Di Luzio, G. Cusatis. Cohesive crack analysis of size effect for samples with blunt notches and generalized size effect curve for quasi-brittle materials. *Engineering Fracture Mechanics*, 204:15-28, 2018.
- [20] M. Pathirage, D.P. Bentz, G. Di Luzio, E. Masoero, G. Cusatis. The ONIX model: a parameter-free multiscale framework for the prediction of self-desiccation in concrete. *Cement and Concrete Composites*, 103:36-48, 2019.
- [21] L. Shen, W. Li, X. Zhou, J. Feng, G. Di Luzio, Q. Ren, G. Cusatis. Multiphysics Lattice Discrete Particle Model for the simulation of concrete thermal spalling. *Cement and Concrete Composites*, 106:103457, 2020.
- [22] G. Di Luzio, L. Cedolin, C. Beltrami. Tridimensional Long-Term Finite Element Analysis of Reinforced Concrete Structures with Rate-Type Creep Approach. *Applied Sciences*, 10(14):4772, 2020.
- [23] E. Masoero, G. Di Luzio. Nanoparticle simulations of logarithmic creep and micro-prestress relaxation in concrete and other disordered solids. *Cement and Concrete Research*, 137:106181, 2020.

- [24] J. Vorel, M. Marcon, G. Cusatis, F. Caner, G. Di Luzio, Roman Wan-Wendner. A comparison of the state of the art models for constitutive modelling of concrete. *Computers & Structures*, 244:106426, 2021.
- [25] Y. Zhang, G. Di Luzio, M. Alnaggar. Coupled multi-physics simulation of chloride diffusion in saturated and unsaturated concrete. *Construction and Building Materials*, 292:123394, 2021.
- [26] M. Alnaggar, G. Cusatis, R. Wan-Wendner, L. Yang, G. Di Luzio. Mesoscale modeling of concrete time-dependent behavior. *Beton i Zhelezobeton [Concrete and Reinforced Concrete]*, 2(604):24-48, 2021. (In Russian).
- [27] L. Shen, F. Lo Monte, G. Di Luzio, G. Cusatis, W. Li, R. Felicetti, F. Lombardi, M. Lualdi, M. Cao, Q. Ren. On the moisture migration of concrete subject to high temperature with different heating rates. *Cement and Concrete Research*, 146:106492, 2021.
- [28] L. Shen, G. Di Luzio, D. Zhu, X. Yao, G. Cusatis, M. Cao, H. Yang, Y. Wang, Q. Ren. Mechanical responses of steel fiber reinforced concrete after exposure to high temperature: experiments and mesoscale discrete modeling. *ASCE's Journal of Engineering Mechanics*, 147(11):04021084, 2021.
- [29] L. Yang; M. Pathirage, H. Su, M. Alnaggar, G. Di Luzio, G. Cusatis. Computational modeling of temperature and relative humidity effects on concrete expansion due to alkali-silica reaction. *Cement and Concrete Composites*, 124:104237, 2021.
- [30] L. Yang; M. Pathirage, H. Su, M. Alnaggar, G. Di Luzio, G. Cusatis. Computational modeling of expansion and deterioration due to alkali-silica reaction: effects of size range, size distribution, and content of reactive aggregate. *International Journal of Solids and Structures*, 234-235:111220, 2022.

SUPERVISION OF STUDENTS AND RESEARCHERS

17 Graduate students in Civil and Environmental Engineering, Politecnico di Milano.

20 Undergraduate students in Civil and Environmental Engineering, Politecnico di Milano.

Ph.D. advisor-ship

Mr. Antonio Cibelli, thesis entitled "Computational modelling of long-term and degradation of concrete and reinforced concrete structures"

Mr. Jintao He, thesis entitled "Mechanical Behavior and Numerical Modeling of Interfacial Transition Zone in Concrete" supported by the China Scholarship Council (CSC)

Postdoc and Research fellowship

Dr. Lin Wan-Wendner, visiting researcher for 12 months (15 April 2018 to 14 April 2019);

Prof. Enrico Masoero, visiting researcher for 1 months (24 March to 23 April 2017);

Prof. Enrico Masoero, visiting researcher for 2 months (4 September to 10 November 2017);

Prof. Enrico Masoero, visiting researcher for 5 months (1 February to 30 June 2019);

Ph.D. thesis evaluation

Member of Ph.D. thesis examining committee (1 USA, 1 Italy);

Ph.D. thesis reviewer (1 Austria, 1 Italy);

REVIEW AND REFEREE SERVICE

- **AIMS:** *AIMS Material Science*
- **ASCE:** *Journal of Engineering Mechanics, Journal of Bridge Engineering, Journal of Materials in Civil Engineering, Journal of Structural Engineering.*
- **Elsevier:** *Journal of the Franklin Institute, International Journal of Solids and Structures, Computer and Structures, Composites Part B: Engineering, Cement and Concrete Composites, Applied Mathematical Modelling, Construction and Building Materials, Engineering*

Failure Analysis, Engineering Fracture Mechanics, Engineering Structures, Finite Elements in Analysis & Design

- **ICE:** *Proceedings of the ICE - Structures and Buildings*
- **MDPI:** *Materials*
- **MSP:** *Journal of Mechanics of Materials and Structures*
- **Sciendo:** *Die Bodenkultur: Journal of Land Management, Food and Environment*
- **Springer:** *KSCE - Journal of Civil Engineering*
- **Taylor & Francis:** *International Journal for Computational Methods in Engineering Science and Mechanics, European Journal of Environmental and Civil Engineering*
- **Wiley:** *International Journal for Numerical and Analytical Methods in Geomechanics, Computer-Aided Civil and Infrastructure Engineering*
- Special Issue titled *Long-term fracture propagation and healing in porous construction materials* for journal of Engineering Fracture Mechanics by Roman Wan-Wendner, Giovanni Di Luzio, Jan Vorel, Nele De Belie