CURRICULUM VITAE DELL'ATTIVITA' SCIENTIFICA E DIDATTICA REDATTO AI SENSI DEGLI ARTT. 46 E 47 DEL D.P.R. 28.12.2000, N. 445 (DICHIARAZIONI SOSTITUTIVE DI CERTIFICAZIONI E DELL'ATTO DI NOTORIETA')

La sottoscritta **FRANCESCA FANTONI**, nata a Brescia, il 21 Luglio 1986, consapevole che chiunque rilasci dichiarazioni mendaci, forma atti falsi o ne fa uso è punito ai sensi del codice penale e delle leggi speciali in materia, dichiara che il curriculum vitae esposto nel seguito descrive fedelmente l'attività scientifica e didattica svolta dalla sottoscritta e di essere in possesso di tutti i titoli in esso riportati.

SCIENTIFIC CURRICULUM VITAE
Francesca Fantoni

Date of birth July 21st, 1986
Place of birth Brescia, Italy

Office address
DICATAM, Università degli Studi di Brescia
Via Branze 43
25123 Brescia, Italy
Phone +390303711330
E-mail francesca.fantoni@unibs.it
Google Scholar: https://scholar.google.it/citations?hl=it&user=-AS7908AAAAJ

EDUCATION

Università degli Studi di Brescia Brescia, Italy

2012 Full-Honors (110/110 cum laude) M. Sc. Degree in Civil, Structural Engineering, January, 2012.

2016 Ph.D. in Mathematical Methods and Models for Engineering, February, 2016.
Thesis: Fracture growth in brittle and embrittled materials: variational formulations and crack tracking algorithms. Advisor: Prof. Alberto Salvadori, Co-Advisor: Prof. Derek H. Warner.

PROFESSIONAL EXPERIENCES

Università degli Studi di Brescia Brescia, Italy

2020-… Assistant Professor in Solid and Structural Mechanics, DICATAM – Civil, Environmental, Architectural Engineering and Mathematics Department (February 5, 2020 – today).

Università degli Studi di Brescia Brescia, Italy

2017-2019 PostDoc student, DICATAM – Civil, Environmental, Architectural Engineering and Mathematics Department (April 1, 2017 – December 31, 2019). Scientific tutors: Prof. Angelo Carini, Prof. Alberto Salvadori

IMT, School for Advanced Studies Lucca, Italy

2016-2017 Research Collaborator, MUSAM, Multi-Scale Analysis of Materials Research Unit, (March 1, 2016 – February 28, 2017). Scientific tutors: Prof. Marco Paggi, Dr. Andrea Bacigalupo.

PARTICIPATION TO RESEARCH PROJECTS

Università degli Studi di Brescia Brescia, Italy

2017-2018 Brescia Smart Living: Energia e servizi integrati per la valorizzazione del benessere SCN_00416, CUP D84G14000240008: Prof. Angelo Carini. Role: Researcher

IMT School for Advanced Studies Lucca Lucca, Italy

2016-2017 ERC Starting Grant Agreement n. 306622 (ERC Starting Grant Multi-field and multi-scale Computational Approach to Design and Durability of PhotoVoltaic Modules - CA2PVM) : Prof. Marco Paggi. Role: Researcher

TEACHING EXPERIENCES

DICATAM, Università degli Studi di Brescia Brescia, Italy

Teaching assistant

in the following courses at the Faculty of Engineering:

- *Scienza delle Costruzioni* (A.A. 2019–2020) undergraduate degree in Civil Engineering (held by Dr. Andrea Panteghini and Prof. Lorenzo Bardella).
- *Scienza delle Costruzioni* (A.A. 2018–2019) undergraduate degree in Civil Engineering (held by Dr. Andrea Panteghini and Prof. Lorenzo Bardella).
- *Scienza delle Costruzioni* (A.A. 2017–2018) undergraduate degree in Civil Engineering (held by Prof. Lorenzo Bardella and Dr. Andrea Panteghini).
- *Scienza delle Costruzioni* (A.A. 2016–2017) undergraduate degree in Civil Engineering (held by Prof. Lorenzo Bardella and Dr. Andrea Panteghini).

Co-tutor of the following bachelor or master theses (in italian):

- Matteo Cominelli, *Modellazione dell'evoluzione di fratture in materiali metallici infragiliti dalla diffusione di idrogeno*, Faculty of Engineering, Università degli Studi di Brescia (graduated in A.A. 2015-2016). Master thesis. Tutor: Prof. Alberto Salvadori. Co-tutor : Dr. Francesca Fantoni.
- Giovanni Zizioli, *Modellazione computazionale della propagazione di fratture in materiali fragili*, Faculty of Engineering, Università degli Studi di Brescia (graduated in A.A. 2012-2013). Master thesis. Tutor: Prof. Alberto Salvadori. Co-tutor: Dr. Francesca Fantoni.
- Edoardo Bergomi, *Fracture mechanics in modeling delamination problems,* Faculty of Engineering, Università degli Studi di Brescia (graduated in A.A. 2012-2013). Master thesis. Tutor: Prof. Alberto Salvadori. Co-tutor: Dr. Francesca Fantoni.

MEMBERSHIPS

- Member of the Mathematical Physics National Group ("Gruppo Nazionale per la Fisica Matematica", GNFM) of the National Institute for Advanced Mathematics ("Istituto Nazionale di Alta Matematica", INdAM).

SHORT RESEARCH STATEMENT

The definition of advanced analytical and computational tools capable of describing and treating the complex mechanical behavior of materials, due to the presence of internal structures and phases with non-linear behavior, is of fundamental importance both for the safety and durability of existing structural components and for the design of ultra-performance composite materials for innovative applications.

To this purpose, in these years, the research efforts of Francesca Fantoni have been mainly focused on:

- Variational formulations for three-dimensional fracture propagation problems in brittle and embrittled materials. The crack velocity in each point of the crack front has been defined as the minimum of constrained quadratic functionals, exploiting the analogy between Linear Elastic Fracture Mechanics and plasticity theory. Crack tracking algorithms have been formulated, both in terms of weight functions and exploiting a viscous regularization, providing the finite elongation of the crack front based upon the increment of the external load.
- Computational hydraulic fracture mechanics in applied geoscience
- Multi-field asymptotic homogenization theory for periodic Cauchy materials, with the goal of determining the overall constitutive properties in a consistent analytic closed form. Applications to thermo-piezoelectric and thermo-diffusive media.
- Multi-scale mechanical modeling of complex materials and of coupled multi-field problems in mechanics. Effect of temperature variation and of thermo-diffusion on the overall constitutive properties has been investigated in order to optimize the structural performance of Solid Oxide Fuel Cell and the design of piezoelectric bending actuators.

- Analysis of acoustic dispersive wave propagation within micro-structured solids through the investigation of the complex Floquet-Bloch spectrum (frequency band-structure and frequency band-gaps).

SCIENTIFIC PUBLICATIONS

Publications in international journals

- Fantoni F., Bacigalupo A., Paggi M., Reinoso J., *A phase field approach for damage propagation in periodic mictrostructured materials,* International Journal of Fracture, pag 1-24 (2019)

- Salvadori A., Wawrzynek P., Fantoni F., *Fracture propagation in brittle materials as a standard dissipative process: Effective crack tracking algorithms based on a viscous regularization,* Journal of the Mechanics and Physics of Solids, Volume 127, pag 221-238 (2019)

- Fantoni F., Bacigalupo A., Paggi M., *Design of thermo-piezoelectric microstructured bending actuators via multi-field asymptotic homogenization,* International Journal of Mechanical Sciences, Volume 146-147, pag 319-336 (2018)

- Fantoni F., Bacigalupo A., Paggi M., *Multi-field asymptotic homogenization of thermopiezoelectric materials with periodic microstructure,* International Journal of Solids and Structures , Volume 120, pag 31-56 (2017)

- Zammarchi M., Fantoni F., Salvadori A., Wawrzynek P., *High Order Boundary and Finite Elements for 3D Fracture Propagation in Brittle Materials,* Comput. Methods Appl. Mech. Engrg. , Volume 315, pag 550–583 (2017)

- Salvadori A., Fantoni F., *Fracture propagation in brittle materials as a standard dissipative process: general theorems and crack tracking algorithms,* Journal of the Mechanics and Physics of Solids , Volume 95, pag 681-696 (2016)

- Salvadori A., Fantoni F., *On a 3D crack tracking algorithm and its variational nature,* J. European Ceramic Society, Volume 34, pag 2807-2821 (2014)

- Salvadori A., Fantoni F., *Weight function theory and variational formulations for three dimensional plane elastic cracks advancing,* International Journal of Solids and Structures, Volume 51, pag 1030-1045 (2014)

- Salvadori A., Fantoni F., *Minimum theorems in 3D incremental linear elastic fracture mechanics,* International Journal of Fracture, Volume 184(1), pag 57-74 (2013)

Publications in conference proceedings

- Zammarchi M., Fantoni F., Salvadori A., *High order triangular boundary elements for 3D fracture mechanics,* XXII AIMETA, Genova (2015)

- Fantoni F., Salvadori A., *Three dimensional fracture growth as a standard dissipative system: some general theorems and numerical simulations,* ECF20, Trondheim (Norway)

(2014)

- Fantoni F., Salvadori A., *Minimum theorems in 3D incremental linear elastic fracture mechanics*, XXI Congresso AIMETA, Torino (2013)

CONFERENCE PARTICIPATION (AS PRESENTING AUTHOR)

International

- Barcelona, Spain, September 2019, COMPLAS 2019, 16th International Conference on Computational Plasticity, *An explicit in time crack tracking algorithm based on a viscous regularization of the quasi-static 3D fracture propagation problem;*

- Catania, Italy, June 2016, ECF21, 21st European Conference on Fracture, *3D crack tracking algorithms based on weight function approximation schemes*;

- Barcelona, Spain, July 2014, WCCM XI, 11th World Congress on Computational Mechanics, *Three dimensional fracture growth as a standard dissipative system: some general theorems and numerical simulations*;

- Trondheim, Norway, July 2014, ECF20, 20th European Conference on Fracture, *Three dimensional fracture growth as a standard dissipative system: some general theorems and numerical simulations*;

- Parma, Italy, September 2014, 12th ESG, *Fracture growth modeled as a standard dissipative system: weight function theory revisited towards simulations and applications*;

- Trento, Italy, July 2013, CERMODEL 2013, *Three dimensional fracture growth as a standard dissipative system: some general theorems and preliminary numerical analysis*;

- Prague, Czech Republic, June 2013, CFRAC 2013, *Minimum theorems in 3D incremental LEFM. Theory and numerical tests*.

National

- Rome, Italy, September 2019, XXIV AIMETA, *Thermodiffusion in periodic materials:dynamic asymptotic homogenization and complex frequency band structure;*

- Rome, Italy; September 2019, XXIV AIMETA, *Predicting the constitutive response of heterogeneous materials via machine learning;*

- Ferrara, Italy, September 2018, XXII GIMC, IX GMA, *Fracture propagation induced by gas storage operations: novel crack tracking algorithms based on a visco-plastic regularization;*

- Salerno, Italy, XXIII AIMETA, *Characterization of thermo-piezoelectric bending actuators through a multi-field asymptotic homogenization technique;*

- Lucca, Italy, June 2016, XXI GIMC, VIII GMA, *Multi-field asymptotic homogenization of periodic thermo-piezoelectric materials*;

- Genova, Italy, September 2015, XXII AIMETA, *Crack tracking algorithms for 3D LEFM based on weight function approximation schemes*;

- Torino, Italy, September 2013, XXI AIMETA, *Minimum theorems in 3D incremental linear elastic fracture mechanics*;

- Lucca, Italy, April 2012, XX GIMC,VI GMA, *Minimum theorems in 3D incremental linear elastic fracture mechanics*;

INVITED TALKS

- IMT, School for Advanced Studies Lucca, Italy, March 11 2019, *Crack tracking algorithms based on a viscous regularization of the quasi-static 3D fracture propagation problem*, Host: Prof. Marco Paggi

- IMT, School for Advanced Studies Lucca, Italy, October 26 2015, *Crack growth as a standard dissipative system*, Host: Prof. Marco Paggi

- Institut für Mechanik (Bauwesen) Stuttgart, Germany, December 2 2015, *Crack growth as a standard dissipative system*, Host: Prof. Christian Miehe

VISITING

- 02/2019-04/2019 : Visiting Research Fellow at IMT, School for Advanced Studies, Lucca, Italy, Activity : Computational multi-scale methods for fracture mechanics, Host : Prof. Marco Paggi

- 11/2017 : Visiting Research Fellow at IMT, School for Advanced Studies, Lucca, Italy, Activity : Computational methods for micromechanics and fracture mechanics, Host : Prof. Marco Paggi

- 1/2015-6/2015: Visiting scholar at Civil and Environmental Department of Cornell University, Ithaca, N.Y. Host : Prof. Derek H. Warner.

- 1/2014-6/2014: Visiting scholar at Mechanical Department of TU/e, Eindhoven, The Netherlands. Host : Dr. Joris Remmers.

AWARDS

- GIMC (Italian Group of Computational Mechanics) award for the best oral presentation in the GIMC minisymposium at XXIV AIMETA, Rome 15-19 September 2019

- Fellowship to attend the summer school “Coupled Processes in Fracture Propagation in Geo-

Materials: from Hydraulic Fractures to Earthquakes", CISM Udine, 2019

- Fellowship to attend the summer school " School on computational mechanics for moving boundaries and interfaces", Barcelona (Spain), October, 2013
- ESIS support for researchers to participate to the 20th European Conference on Fracture Mechanics, Trondheim (Norway), 1st-4th July, 2014
- IACM, WCCM 2014 support for researchers to participate to the 11th World Congress on Computational Mechanics (WCCM XI)-5th European Conference on Computational Mechanics (ECCM V), Barcelona (Spain), 20th-25th July, 2014

Brescia, April 9, 2019

Yours faithfully
Francesca Fantoni