Gabriele Albertini

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Education

Cornell University

2016 – 2021	Doctor of Philosophy in Structural Engineering
2016 – 2019	Master of Science in Structural Engineering

École Polytechnique Fédérale de Lausanne – EPFL

2014 – 2016	Master of Science in Civil Engineering
2011 – 2014	Bachelor of Science in Civil Engineering

University of New South Wales – UNSW Sydney

2013 – 2014	Undergraduate Exchange Program

Research Experience

Cornell University

2016 – 2021   **Doctoral Researcher Assistant**, Advisor: Prof. David S. Kammer
Numerical and theoretical study of dynamic fracture of heterogeneous materials. Using 3D simulations, demonstrated that experimentally observed slip fronts at frictional interfaces can be described by dynamic fracture mechanics, independently of their propagation speed. Numerical study of dynamic ruptures at frictional interfaces within a heterogeneous solid revealed that reflected waves lead to abrupt changes of rupture speed.

Eidgenössische Technische Hochschule – ETH Zürich

2019 – 2021   **Visiting Researcher** with Prof. David S. Kammer
Theoretical and numerical study of nucleation of slip fronts at frictional interfaces with random strength profiles showed that that the effective strength increases with smaller correlation length.

Sorbonne Université

Fall 2018   **Visiting Researcher** with Laurent Ponson at Institut Jean le Rond d'Alembert
Experimental study of dynamic fracture of heterogeneous materials. Specimen are made of multi-material 3D-printed polymers. Crack dynamics are studied based on displacement fields measurements, acquired by Digital Image Correlation using high-speed photography. Revealed that cracks instantaneously adapt their speed when facing a fracture energy heterogeneity, which leads to toughening.

École Polytechnique Fédérale de Lausanne – EPFL

Fall 2014   **Master Student Researcher** with Prof. Christian Louter
Experimental study of ultimate flexural strength of post-tensioned steel reinforced glass beams.

Research Interests

Solid Mechanics, Fracture Mechanics, Friction, Mechanics and Physics of Earthquakes, Mechanical Metamaterials, Heterogeneous Media, Nonlinear Physics, Non-equilibrium Statistical Mechanics, Scientific Computing

Publications

Work in Progress

7 **Albertini, G.**, Ke, C.Y. and Kammer, D.S., "A Novel Convolution Algorithm and Parallel Implementation for Spectral Boundary Integral Method for Solving the Elastodynamic Wave Equation in an Infinite Half-Space", *under preparation.*

6 **Albertini, G.**, Elbanna, A. and Kammer, D.S., "A Three Dimensional Hybrid Finite Element-Spectral Boundary Integral Approach: Applications to Dynamic Earthquake Rupture Modeling in unbounded domains", *under preparation.*

Refereed Journals

5 **Albertini, G.**, Karrer, S., Grigoriu, M. D., Kammer, D. S., 2020., "Stochastic Properties of Static Friction", *under review.*

4 **Albertini, G.**, Lebihain, M., Hild, F. Ponson, L. and Kammer, D.S., 2020. "Effective toughness of periodic heterogeneous materials: the role of rate-dependent fracture energy", *under review.*
arXiv:2003.13805 [cond-mat.soft]

3 Svetlizky, I.*, **Albertini, G.***, Cohen, G., Kammer, D.S. and Fineberg, J., 2020. "Dynamic fields at the tip of sub-Rayleigh and supershear frictional rupture fronts", *Journal of the Mechanics and Physics of Solids* 137, 103826. https://doi.org/10.1016/j.jmps.2019.103826
*Equally Contributed

2 Ma, X., Hajarolasvadi, S., **Albertini, G.**, Kammer, D.S., Elbanna, A.E., 2019. "A hybrid finite element-spectral boundary integral approach: Applications to dynamic rupture modeling in unbounded domains", *International Journal for Numerical and Analytical Methods in Geomechanics* 43, 1, 317-338. https://doi.org/10.1002/nag.2865

1 **Albertini, G.**, Kammer, D.S., 2017. "Off-fault heterogeneities promote supershear transition of dynamic mode II cracks", *J. Geophys. Res. Solid Earth* 122, 2017JB014301.
https://doi.org/10.1002/2017JB014301

Presentations at Conferences and Workshops

(presenter underlined)

2019 Albertini, G., Lebihain, M., Hild, F. Ponson, L. and Kammer, D.S., "Effective toughness of periodic heterogeneous materials: the role of rate-dependent fracture energy". *Society of Engineering Science (SES) 56th Annual Technical Meeting.* October 13-15, 2019, St. Louis, Missouri.

2018 Albertini, G. and Kammer, D.S., "Properties of Three Dimensional Supershear Mode II Ruptures", *Workshop: MEchanics and Physics of STrechable Objects (MEPHiSTO).* August 7-17, 2018, Cargese, France.

2018 Albertini, G. and Kammer, D.S., "Properties of Three Dimensional Supershear Mode II Ruptures", *18th U.S. National Congress for Theoretical and Applied Mechanics (USNCTAM).* June 4-9, 2018, Chicago, Illinois.

2017 Albertini, G. and Kammer, D.S., "Propagation Speed Instability in Rapid Mode II Fracture in Heterogeneous Media", *Society of Engineering Science (SES) 54th Annual Technical Meeting.* July 25-28, 2017, Boston, Massachusetts.

2016 Albertini, G. and Kammer, D.S., "Supershear transition of dynamic mode II fracture in heterogeneous elastic media", *Society of Engineering Science (SES) 53rd Annual Technical Meeting.* October 2-5, 2016, College Park, Maryland.

Mentoring

Master Theses (co-supervised with Prof. David S. Kammer)

Spring 2017   Thibault Roch, Civil Engineering, Cornell University

Semester Projects (co-supervised with Prof. David S. Kammer)

| Fall 2019 | Simon Karrer, Civil Engineering, ETH Zürich |
| Spring 2020 | Styfen Schär, Civil Engineering, ETH Zürich |

Teaching Experience

Cornell University

Spring 2020	Introduction to the Behavior of Steel Structures (CEE 4740) – Teaching Assistant Designed in-class activities and homeworks.
Spring 2019	Differential Equations for Engineers (MATH 2930) – Teaching Assistant Taught weekly discussion section and designed worksheets and in-class activities
Spring 2018	Differential Equations for Engineers (MATH 2930) – Teaching Assistant Taught weekly discussion section and designed worksheets and in-class activities

École Polytechnique Fédérale de Lausanne – EPFL

Fall 2015	Geothechincs and Rock Mechanics (Master) – Teaching Assistant
Spring 2013	Mathematics and Geometry (Undergraduate) – Teaching Assistant
Spring 2012	Mathematics and Geometry (Undergraduate) – Teaching Assistant

Industry Experience

| Summer 2015 | Engineer Intern at AF-Consult Switzerland AG. Project: Nant de Drance Pumped Storage Power Plant. Local site management. |
| Summer 2014 | Engineer Intern at Repower AG. Project: Renovation of Silvaplana Hydro Power Plant. Feasibility Study. |

Awards

2018 3rd Place for Oral Presentation. Tenth Annual Civil and Environmental Engineering Graduate Research Symposium. Cornell University.

2017 2nd Place for Oral Presentation. 9th Annual Civil and Environmental Engineering Graduate Research Symposium. Cornell University.

University Service

| | Reviewer for *Journal of the Mechanics and Physics of Solids* |
| 2017 – 2018 | Treasurer of the Civil and Environmental Engineering Graduate Student Association (CEE GSA), Cornell University. Managed the yearly budged dedicated to events and activities organized by the CEE GSA, which include the Graduate Student Research Symposium and academic talks by professors of the CEE department and invited speakers. |

Languages

Italian (native), English (fluent), French (fluent) & German (fluent)

Technical Skills

Programming

Python, Matlab, C, C++, High Performance Computing, MPI, OpenMP

Numerical Modeling Methods

Finite Element Method, Spectral Boundary Integral Method, Cohesive Element Model for Fracture

Experimental Methods

Experimental Fracture Mechanics, Integrated Digital Image Correlation, Signal Processing