


Ilaria Fontana

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 [ilaria-fontana](#) • [ResearchGate](#)

CURRENT POSITION

Visiting Assistant Professor, Northwestern University
Department of Engineering Science and Applied Mathematics

2022–present

EDUCATION

Ph.D. degree, University of Montpellier and EDF Lab Paris-Saclay ([CIFRE agreement](#)) 2018–2022
Mathématiques et Modélisation (Mathematics and Modelisation) Palaiseau (France)

- Thesis title: *Interface problems for dam modeling (Problèmes d'interfaces pour les ouvrages hydrauliques)*
- Topics: Finite element approximation methods for PDEs, Modeling of hydraulic structure joints with cohesive zone model, A posteriori error estimate techniques for contact problems via equilibrated stress reconstruction
- Supervisors: Prof. Daniele A. Di Pietro (University of Montpellier), Eng. Kyrlo Kazymyrenko (EDF Lab Paris-Saclay)
- Research units: [IMAG - Institut Montpelliérain Alexander Grothendieck](#), and [IMSIA - Institute of Mechanical Sciences and Industrial Application](#)
- Defense date: March 31st 2022

Master degree, University of Udine
Applied Mathematics

2016–2018

Udine (Italy)

- Thesis title: *Numerical Bifurcation of Equations with Infinite Delay via Pseudospectral Collocation*
- Topics: DDEs with infinite delay, Dynamical systems generated by DDEs, Orthogonal polynomials
- Supervisor: Prof. Rossana Vermiglio
- Final grade: 110/110 cum laude

Bachelor degree, University of Udine
Mathematics

2013–2016

Udine (Italy)

- Thesis title: *Il teorema del passo di montagna (Mountain Pass Theorem)*
- Supervisor: Prof. Rodica Toader
- Final grade: 110/110 cum laude

EXCELLENCE SCHOLARSHIPS

Thesis Research fellowship

2018

Three months of Master thesis research at the Department of Mathematics and Statistics of the University of Helsinki (Finland) in collaboration with prof. Mats Gyllenberg and with the Biomathematics research group.

“Scuola Superiore” (School for Advanced Studies) fellowship

2013–2018

The [School for Advanced Studies](#) of the University of Udine is an institution for higher education beside the university. Admitted students follow additional courses and are examined every year in two occasions. The school covers university student fees and provides a residence for five years (Bachelor and Master degrees).

TEACHING EXPERIENCES

MATH 228-2: Multiple Integration and Vector Calculus, Northwestern University

Winter 2023

Person in charge of two sections (Lectures, Homework, Exams)

WORK & OUTREACH EXPERIENCES

Ph.D. Research Engineer, EDF (main French electric company)

2018–2022

R&D Division Lab Paris-Saclay

- Development of a posteriori error estimation applied to mechanical problems modeled with PDEs, and introduction of a **fully adaptive algorithm** including stopping criteria for the nonlinear solver and automatic tuning of some parameters. Implementation with FreeFem++.
- Development of models for the materials and their cohesive zones, both from a theoretical point of view, and with the creation of tailored FEA tools for the industry. Implementation with Python, Fortran and the numerical simulation tool code_aster.
- Collaboration between different divisions (also outside R&D) in order to provide customer-focused solutions to the final users. This taught me how to be autonomous, organized and willing to interact and work closely with diverse audiences.
- Presentation of the results in several international conferences, including the *6th U.S. National Congress on Computational Mechanics* in Chicago.

Student tutor, University of Udine

2017–2018

Student tutor for Bachelor and Master degree in Mathematics of the University of Udine. In charge of teaching assistance and outreach activities.

- Effective communicator, advertising university programs in person and on social media to diverse audiences.
- Improving the customer experience, specifically in the Mathematics Department, by identifying bottlenecks in the course load and by proposing solutions to the department directors.

Student representative, University of Udine

2014–2018

Student representative for Bachelor and Master degree in Mathematics of the University of Udine.

PUBLICATIONS

Articles

- D. A. Di Pietro, I. Fontana, K. Kazymyrenko, *A posteriori error estimates via equilibrated stress reconstructions for contact problems approximated by Nitsche's method*. Comput. Math. Appl., 2022, **111**:61–80. DOI: [10.1016/j.camwa.2022.02.008](https://doi.org/10.1016/j.camwa.2022.02.008).
- Preprint: [arXiv](#), [Hal](#)
- I. Fontana, K. Kazymyrenko, D. A. Di Pietro, *Hyperelastic nature of the Hoek–Brown criterion*.
- Submitted. Preprint: [Hal](#)
- I. Fontana, K. Kazymyrenko, *A interface model for dams with cohesive zone model coupling damage and plasticity*.
- In preparation.
- I. Fontana, R. Vermiglio, *An experimental investigation on weighted orthogonal polynomials for equations with infinite delay*.
- In preparation.

Thesis.....

- I. Fontana, *Interface Problems for Dam Modeling (Problèmes d'interface pour les ouvrages hydrauliques)*, Ph.D Thesis. [Hal these](#)

CONFERENCES TALKS & SEMINARS

Seminar in the Department of Mathematics at Purdue University December 2022
Dam modeling: Application of a posteriori error analysis to contact problems West Lafayette (IN)
Invited seminar

EFEF2020, 18th European Finite Element Fair September 2021
A Posteriori Error Estimation via Equilibrated Stress Reconstruction for Unilateral Contact Problems Paris (France)
Abstract selected for oral presentation

USNCCM16, 16th U.S. National Congress on Computational Mechanics July 2021
A Posteriori Error Estimation via Equilibrated Stress Reconstruction for Unilateral Contact Problems Online
Abstract selected for oral presentation

ADMOS 2021, 10th International Conference on Adaptive Modeling and Simulation June 2021
A Posteriori Error Estimation via Equilibrated Stress Reconstruction for Unilateral Contact Problems Online
Abstract selected for oral presentation

Seminar in the CDLab of the University of Udine June 2021
A Posteriori Error Estimation via Equilibrated Stress Reconstruction for Unilateral Contact Problems Online
Invited seminar

Congrès Français de Mécanique August 2019
Lois mécaniques pour les ouvrages hydrauliques (Behavioral laws for hydraulic structures) Brest (France)
Abstract selected for oral presentation

Seminar in the CDLab of the University of Udine October 2018
Numerical Bifurcation of Equations with Infinite Delay via Pseudospectral Collocation Udine (Italy)
Master student seminar

Seminar in the CDLab of the University of Udine September 2018
Laguerre-type orthogonal polynomials and transformation of the Chebyshev nodes Udine (Italy)
Master student seminar

Seminar in the CDLab of the University of Udine July 2018
A model describing vapour and droplets Udine (Italy)
Master student seminar

Conferences Posters.....

Journées scientifiques du GdR MaNu

October 2021

A posteriori error estimates via equilibrated stress reconstructions for contact problems approximated by Nitsche's method

Le Croisic (France)

Colloque National MECAMAT 2019 – Rupture des Matériaux et des Structures

January 2019

A model describing vapour and droplets

Aussois (France)

COMPUTER SKILLS

Programming languages

Python, C/C++, FreeFem++, R, Fortran, MATLAB, Mathematica

Other

L^AT_EX, Beamer, code_aster, Linux

LANGUAGES

Italian

Mother tongue

English

Workplace - Daily

French

Workplace - Daily

Spanish

High-school