

Diane Guignard — CV

Assistant Professor, University of Ottawa, Department of Mathematics and Statistics
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Research interests

Numerical approximation of partial differential equations, finite element methods, *a priori* and *a posteriori* error analysis, adaptive algorithms, uncertainty quantification, reduced order modeling

Education

Ecole Polytechnique Fédérale de Lausanne <i>PhD in Mathematics</i> Thesis advisers: Prof. F. Nobile and Prof. M. Picasso Subject: <i>A posteriori</i> error estimation for PDEs with random input data	Lausanne, Switzerland 09/2012–11/2016
California Institute of Technology <i>Master thesis</i> Thesis advisers: Prof. T.Y. Hou (Caltech) and Prof. A. Quarteroni (EPFL) Subject: Adaptive data analysis methods for nonlinear and nonstationary data	Pasadena, CA, USA 02/2012–07/2012
Ecole Polytechnique Fédérale de Lausanne <i>Master of Science in Applied Mathematics</i>	Lausanne, Switzerland 09/2010–07/2012
Ecole Polytechnique Fédérale de Lausanne <i>Bachelor of Science in Mathematics</i>	Lausanne, Switzerland 09/2006–07/2010

Grants

2. NSERC Discovery Grant. Title: *Linear and nonlinear reduced models for the numerical approximation of high-dimensional functions*. Evaluation group: 1508 - Mathematics and Statistics. \$115,000 (\$23,000 per year), 2021-2026
1. NSERC Discovery Grant - Launch Supplement. Title: *Linear and nonlinear reduced models for the numerical approximation of high-dimensional functions*. Evaluation group: 1508 - Mathematics and Statistics. \$12,500, 2021-2022

Awards

- 2019:** Travel Award to attend the 2nd Annual Meeting of SIAM Texas-Louisiana Section
- 2018:** Travel Award to attend the 13th World Congress on Computational Mechanics
- 2017:** Postdoc fellowship awarded by the Swiss National Science Foundation (1.5 years)
- 2017:** ECCOMAS award for the two best PhD theses of 2016 in Europe on Computational Methods in Applied Sciences and Engineering
- 2017:** Award for the best PhD thesis of 2016 in Switzerland on Computational Methods in Applied Sciences and Engineering (Swiss nomination to the ECCOMAS Award)
- 2016:** Nomination for the best EPFL PhD thesis in mathematics
- 2016:** Special premium as a reward for services of exceptional value for teaching
- 2012:** Prize for the poster of my master thesis carried out at Caltech

Publications

Submitted.....

2. A. Bonito, D. Guignard, and W. Lei. *Numerical Approximation of Gaussian random fields on Closed Surfaces*.
1. D. Guignard and P. Jantsch. *Nonlinear approximation of high-dimensional anisotropic analytic functions*.

Accepted.....

11. A. Bonito, D. Guignard, and A. Morvant. *Numerical approximations of thin structure deformations*. Comptes Rendus Mécanique, Online first:1–37, 2023.
10. A. Bonito, D. Guignard, R.H. Nochetto, and S. Yang. *Numerical analysis of the LDG method for large deformations of prestrained plates*. IMA Journal of Numerical Analysis, 43(2):627-662, 2023
9. A. Bonito, D. Guignard, R.H. Nochetto, and S. Yang. *LDG approximation of large deformations of prestrained plates*. Journal of Computational Physics, 448:110719, 2022
8. A. Bonito, V. Girault, D. Guignard, K.R. Rajagopal, and E. Süli. *Finite Element Approximation of Steady Flows of Colloidal Solutions*. ESAIM: Mathematical Modelling and Numerical Analysis, 55(5):1963-2011, 2021
7. A. Bonito, A. Cohen, R. DeVore, D. Guignard, P. Jantsch, and G. Petrova. *Nonlinear methods for model reduction*. ESAIM: Mathematical Modelling and Numerical Analysis, 55(2):507-531, 2021
6. A. Bonito, R. DeVore, D. Guignard, P. Jantsch, and G. Petrova. *Polynomial Approximation of Anisotropic Analytic Functions of Several Variables*. Constructive Approximation, 53:319-348, 2021
5. A. Bonito, D. Guignard, and A.R. Zhang. *Reduced basis approximations of the solutions to spectral fractional diffusion problems*. Journal of Numerical Mathematics, 28(3):147-160, 2020
4. D. Guignard. *Partial Differential Equations with Random Input Data: A Perturbation Approach*. Archives of Computational Methods in Engineering, 26:1313-1377, 2019
3. D. Guignard and F. Nobile. *A Posteriori Error Estimation for the Stochastic Collocation Finite Element Method*. SIAM Journal on Numerical Analysis, 56(5):3121-3143, 2018
2. D. Guignard, F. Nobile and M. Picasso. *A posteriori error estimation for the steady Navier-Stokes equations in random domains*. Computer Methods in Applied Mechanics and Engineering, 313:483-511, 2017
1. D. Guignard, F. Nobile and M. Picasso. *A posteriori error estimation for elliptic partial differential equations with small uncertainties*. Numerical Methods for Partial Differential Equations, 32(1):175-212, 2016

Theses.....

2. D. Guignard. *A posteriori error estimation for partial differential equations with random input data*. PhD Thesis N°7260, Ecole Polytechnique Fédérale de Lausanne, 2016
1. D. Guignard. *Adaptive data analysis methods for nonlinear and nonstationary data*. Master Thesis, California Institute of Technology, California, USA, 2012

Software

1. A. Bonito and D. Guignard. *Deal.ii tutorial step 82: Solving the fourth-order biharmonic equation using a lifting operator approach*. DOI: 10.5281/zenodo.5598180, 2021

Contributor: Sparse Grid toolkit (<https://sites.google.com/view/sparse-grids-kit>); The deal.ii Finite Element Library (<https://www.dealii.org>)

Professional Experience

Vocational.....

University of Ottawa <i>Assistant Professor</i>	Ottawa, ON, Canada 07/2020–
Texas A&M University <i>Visiting Assistant Professor</i> Scientific mentor: Prof. Andrea Bonito	College Station, TX, USA 01/2019–06/2020
Texas A&M University <i>Research scholar</i> Scientific mentor: Prof. Andrea Bonito	College Station, TX, USA 10/2017–03/2019
Ecole Polytechnique Fédérale de Lausanne <i>Part-time postdoc</i>	Lausanne, Switzerland 01/2017–09/2017
Manufacture Horlogère Vallée de Joux <i>Internship in a watch company</i> Subjects: i) Metrology ii) Parametrization and optimization of an escapement	Le Sentier, Switzerland 09/2011–02/2012

Research invitation.....

Texas A&M University <i>Visit to Prof. Andrea Bonito (1 week)</i> Goal: analyze an accelerated algorithm for simulating the large deformation of plates	College Station, TX, USA 11/2021–11/2021
Erwin Schrödinger International Institute <i>Participant in the program Computational Uncertainty Quantification: Mathematical Foundations, Methodology & Data (Postponed to 2022)</i>	Vienna, Austria 06/2020–06/2020
University of Maryland <i>Visit to Prof. Ricardo H. Nochetto (1.5 and 2 weeks)</i> Goal: collaborate and initiate a research project on large deformation of prestrain plates	College Park, Maryland, USA 05/2018 and 03/2019
Isaac Newton Institute for Mathematical Sciences <i>Participant in the program Uncertainty quantification for complex systems</i>	Cambridge, UK 04/2018–05/2018
Polytechnique Montréal <i>Visit to Prof. Serge Prudhomme (2 weeks)</i> Goal: collaborate and initiate a research project on goal-oriented error estimation	Montréal, Québec, Canada 02/2017–02/2017
Basque Center for Applied Mathematics <i>Visit to Vincent Darrigrand with Prof. Serge Prudhomme (1 week)</i> Goal: study various types of error representation for goal-oriented error estimation	Bilbao, Spain 08/2017–08/2017

Teaching activities

University of Ottawa <i>Instructor</i>	Ottawa, ON, Canada 07/2020–
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- MAT 3371 - Algèbre linéaire appliquée (Winter 2023): 33 students
- MAT 3341 - Applied Linear Algebra (Winter 2023): 94 students
- MAT 2384 - Ordinary Differential Equations and Numerical Methods (Fall 2022): 83 students
- MAT 3380 - Introduction to Numerical Methods (Winter 2022): 8 students
- MAT 3530 - Introduction aux systèmes dynamiques (Fall 2020, Fall 2021): resp. 9 and 8 students
- MAT 3130 - Introduction to Dynamical Systems (Fall 2020): 15 students

Texas A&M University

College Station, TX, USA

Instructor

01/2019–05/2020

- MATH 417 - Numerical Methods (Spring 2020): 35 students
- MATH 308 - Differential Equations (Fall 2019): 2 sections of 54 students each
- MATH 304 - Linear Algebra (Spring 2019): 45 students

Ecole Polytechnique Fédérale de Lausanne

Lausanne, Switzerland

Substitute Teacher

05/2017–06/2017

Course: Numerical Analysis for mechanical engineering students (152 students)

Ecole Polytechnique Fédérale de Lausanne

Lausanne, Switzerland

Teaching Assistant for bachelor and master level courses:

09/2012–11/2016

- Numerical Approximation of PDE's II (4 semesters): main and only assistant, redaction of the exercices and solutions
- Numerical Analysis for engineers (2 semesters): main assistant, redaction of the exercices and solutions, redaction and organisation of the exams, supervision of the other TAs
- Analysis I for life sciences students (1 semester)
- Analysis I for physicists (1 semester)

Mentoring

University of Ottawa

Ottawa, ON, Canada

07/2020–

- Mohamed Barakat (PhD), since Fall 2023
- Anne Marie Conway (MSc), since Fall 2023
- Hilaire Epstein Nonhou Zogo (Undergraduate Research Project - MAT 4900), Summer 2023
Subject: *Adaptive solvers for ODEs*
- Anne Marie Conway (Undergraduate Research Project - MAT 4900), Winter 2023
Subject: *La méthode des élément finis*
- Patrick Cyr (Work-Study), Fall 2022
Subject: *Implementation of a solver for the unsteady Navier-Stokes equations using Julia*
- Katarina Spasojevic (Semester project), Winter 2022
Subject: *Adaptive finite element method for a partial differential equation with a varying coefficient*

Texas A&M University

College Station, TX, USA

05/2018–08/2018

- Shelly Thompson (Undergraduate Summer Project), Summer 2018, co-supervised with A. Bonito
Subject: *Numerical approximations of parametric PDEs (Taylor polynomials)*
- Luis Trevino (Undergraduate Summer Project), Summer 2018, co-supervised with A. Bonito
Subject: *Numerical approximations of parametric PDEs (reduced basis)*
- Ashley Zhang (Graduate Summer Directed Study), Summer 2018, co-supervised with A. Bonito
Subject: *Comparison of polynomial and reduced basis approximations for parametric PDEs*

Service

Workshops, conferences, and seminars.....

- Organizer of the Applied Math Seminars (Fall 2021, Winter 2022, Fall 2022, Winter 2023, Fall 2023), University of Ottawa, Ottawa, Ontario, Canada
- Co-organizer (with S. Bartels and C. Melcher) of the mini-symposium *Interplay of Numerical and Analytical Methods in Nonlinear PDEs*, 10th International Congress on Industrial and Applied Mathematics (ICIAM 2023), Tokyo, Japan, August 20-26, 2023
- Co-organizer (with K. Kergrene and S. Prudhomme) of the mini-symposium *Applications of Goal-Oriented Error Estimation and Adaptivity*, 11th International Conference on Adaptive Modeling and Simulation (ADMOS 2023), Gothenburg, Sweden, June 19-21, 2023
- Co-organizer (with Y. Bourgault) of the mini-symposium *Numerical Methods for Partial Differential Equations*, CMS Summer meeting, Ottawa, Ontario, Canada, June 2-5, 2023
- Co-organizer (with K. Kergrene and S. Prudhomme) of the mini-symposium *Error Estimation and Adaptive Methods in CFD*, 22nd IACM Computational Fluids Conference (CFC2023), Cannes, France, April 25-28, 2023
- Co-organizer (with I.-G. Farcas and M. Tezzele) of the mini-symposium *Accelerating Computational Science and Engineering via Data-Driven Learning and Nonlinear Model Reduction*, SIAM Conference of Computational Science and Engineering (CSE23), RAI Congress Center, Amsterdam, The Netherlands, February 26-March 3, 2023
- Co-organizer (with B. Kaltenbacher and W. Rundell) of the workshop *Inverse Problems for Anomalous Diffusion Processes (22w5043)*, Banff International Research Station (BIRS), Banff, Alberta, Canada, May 8-13, 2022
- Co-organizer (with A. Bonito) of the mini-symposium *Recent advances in the numerical approximation of geometric partial differential equations*, SIAM Texas-Louisiana Section, Texas A&M University, College Station, Texas, USA, October 16-18, 2020
- Co-organizer (with P. Jantsch) of the mini-symposium *Recent advances in high-dimensional approximation*, SIAM Texas-Louisiana Section, Southern Methodist University, Dallas, USA, November 1-3, 2019

University of Ottawa.....

- Member of the hiring committee for a position in Applied Dynamical Systems, Fall 2023
- Open house: Discussion panel in French (Winter 2022, Winter 2023), Meet and Greet (Fall 2022), Information session in French (Fall 2023)
- Judge for the Three-Minute Thesis competition of the Ottawa Mathematics and Statistics Conference (OMSC), May 24, 2023
- Presentation at the Math Horizons Day (for grade 11 students), May 5, 2023. *Les mathématiques dans la vie de tous les jours: traitement d'images*
- Presentation at the Math Club (for undergraduate students), March 17, 2022. *Introduction to the adaptive finite element method*

Thesis committees.....

- University of Ottawa: 3 PhD students and 1 MSc student
- Carleton University: 2 MSc

Journal refereeing.....

Advances in Computational Mathematics, Calcolo, Journal of Numerical Mathematics, Mathematics of Computation, Methods and Algorithms for Scientific Computing, Numerische Mathematik

Institutional responsibilities.....

Ecole Polytechnique Fédérale de Lausanne

Lausanne, Switzerland

Committee member

12/2015–12/2015

User committee for the project to extend the virtualization of the classrooms

Goal: identify virtual desktops needs for the EPFL courses

Conferences

Presentations.....

- Oct 2023** (Seminar talk) Numerical Analysis and Scientific Computing Seminar, Waterloo University, Waterloo, Ontario, Canada, October 17, 2023
- Aug 2023** (Talk in minisymposium) 10th International Congress on Industrial and Applied Mathematics (ICIAM 2023), Tokyo, Japan, August 21, 2023
- May 2023** (Invited talk) Frontiers of Numerical PDEs - conference in honor of Professor Ricardo H. Nochetto's 70th birthday, University of Maryland, College Park, Maryland, USA, May 18, 2023
- Feb 2023** (Seminar talk) PDE and Applied Math Seminar, Drexel University, Philadelphia, Pennsylvania, USA, February 24, 2023
- Dec 2022** (Talk in minisymposium) CMS Winter meeting, Toronto, Ontario, Canada, December 3, 2022
- Sep 2022** (Plenary talk) Swiss Numerics Day, Zürich, Switzerland, September 12, 2022
- Aug 2022** (Talk in minisymposium) 15th World Congress in Computational Mechanics (WCCM), Virtual (originally scheduled at Yokohama, Japan), August 4, 2022
- May 2022** (Invited talk in minisymposium) 2022 SIAM Annual Meeting, Pittsburgh, Pennsylvania, USA, July 12, 2022
- Jun 2022** (Invited talk in minisymposium) Reliable Methods of Mathematical Modeling (RMMM), Lausanne, Switzerland, June 23, 2022
- May 2022** (New Prof Lecture) Faculty of Science, University of Ottawa, Ottawa, Ontario, Canada, May 3, 2022
- Mar 2022** (Invited talk) Math Club, University of Ottawa, Ottawa, Ontario, Canada, March 17, 2022
- Dec 2021** (Invited talk) Workshop on Controlling Error and Efficiency of Numerical Models: Methods, benchmarks, and case studies, University of Ottawa (online), Ottawa, Ontario, Canada, December 3, 2021
- Nov 2021** (Invited talk in minisymposium) SIAM Texas-Louisiana Section, University of Texas Rio Grande Valley, South Padre Island, Texas, USA, November 7, 2021
- Sept 2021** (Seminar talk) CRM Applied Math Seminar, McGill University, Montréal, Québec, Canada, September 20, 2021
- Sept 2021** (Seminar talk) Modeling and Computation Seminar, University of Arizona, Tucson, Arizona, USA, September 16, 2021
- Mar 2021** (Invited talk in minisymposium) SIAM Conference on Computational Science and Engineering (CSE), Virtual Conference, Originally scheduled in Forth Worth, Texas, USA, March 1, 2021
- Dec 2020** (Seminar talk) Oberseminar: Angewandte Mathematik, Albert-Ludwigs-University Freiburg, Freiburg im Breisgau, Germany, December 15, 2020
- Nov 2020** (Seminar talk) Applied Mathematics Seminar, Baylor University, Waco, Texas, USA, November 16, 2020
- Nov 2020** (Colloquium talk) CAAM Virtual Colloquium Series at Rice University, Houston, Texas, USA, November 9, 2020

- Jul 2020** (Invited talk in minisymposium) WCCM-ECCOMAS Congress, Paris, France, July 19-24, 2020 (Postponed to 2021)
- Jun 2020** (Invited talk) Workshop on Approximation of high-dimensional parametric PDEs in forward UQ, ESI, Vienna, Austria, June 2-5, 2020 (Postponed to 2022)
- Feb 2020** (Invited talk) Workshop Mathematics of Reduced Order Models, ICERM, Providence, Rhode Island, USA, February 17, 2020
- Nov 2019** (Talk in minisymposium) SIAM Texas-Louisiana Section, Southern Methodist University, Dallas, Texas, USA, November 3, 2019
- Jul 2019** (Seminar talk) Numerical Analysis Seminar at EPFL, Lausanne, Switzerland, July 23, 2019
- Jul 2019** (Invited talk in minisymposium) 9th International Congress on Industrial and Applied Mathematics (ICIAM), Valencia, Spain, July 18, 2019
- Mar 2019** (Seminar talk) Numerical Analysis Seminar at UMD, College Park, Maryland, USA, March 25, 2019
- Mar 2019** (Talk) Finite Element Rodeo, The University of Texas at Austin, Austin, Texas, USA, March 1, 2019
- Oct 2018** (Invited talk) 2018 TTU Red Raider Minisymposium, Texas Tech University, Lubbock, Texas, USA, October 27, 2018
- Oct 2018** (Seminar talk) CLASS Seminar (Department of Nuclear Engineering) at Texas A&M University, Texas, College Station, USA, October 19, 2018
- Jul 2018** (Talk) 13th World Congress in Computational Mechanics (WCCM), New York City, New York, USA, July 23, 2018
- Feb 2018** (Talk) Finite Element Rodeo, Louisiana State University, Baton Rouge, Louisiana, USA, February 24, 2018
- Nov 2017** (Seminar talk) Numerical Analysis Seminar at Texas A&M University, College Station, Texas, USA, November 8, 2017
- Sep 2017** (Plenary talk) ECCOMAS Young Investigators Conference, Milan, Italy, September 15, 2017
- Jun 2017** (Talk in minisymposium) International Conference on Adaptive Modeling and Simulation (ADMOS), Verbania, Italy, June 26, 2017
- Feb 2017** (Seminar talk) Internal Seminar at Polytechnique Montréal, Montréal, Canada, February 13, 2017
- Oct 2016** (Contributed talk) Workshop on Sparse Grids and Applications, Miami, Florida, USA, October 4, 2016
- Jun 2016** (Contributed talk) MATHICSE Retreat, Leysin, Switzerland, June 28, 2016
- Jun 2106** (Talk in minisymposium) European Community on Computational Methods in Applied Sciences (ECCOMAS), Crète, Greece, June 10, 2016
- Apr 2016** (Talk) Colloque Numérique Suisse, Fribourg, Switzerland, April 22, 2016
- Apr 2016** (Contributed talk) SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, April 8, 2016
- Jun 2015** (Talk in minisymposium) Reliable Methods of Mathematical Modeling (RMMM), Zürich, Switzerland, June 30, 2015
- Jun 2105** (Contributed talk) International Conference on Adaptive Modeling and Simulation (ADMOS), Nantes, France, June 9, 2015
- Jun 2014** (Contributed talk) MATHICSE Retreat, Leysin, Switzerland, June 12, 2014

Poster

- Apr 2015** Swiss Numerical Day 2015, Geneva, Switzerland, April 17, 2015

Attendance.....

- May 2022** Workshop on Nonlinear Bending, Albert-Ludwigs-Universität Freiburg, Freiburg im Brisgau, Germany, May 23-25, 2022
- May 2022** Workshop on Inverse Problems for Anomalous Diffusion Processes (22w5043), Banff International Research Station (BIRS), Banff, Alberta, Canada, May 8-13, 2022
- May 2022** Workshop on Approximation of high-dimensional parametric PDEs in forward UQ, Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria, May 9-13, 2022 (virtual attendance)
- Jul 2021** SIAM Annual Meeting (AN21), Virtual Conference, July 19-23, 2021
- Jul 2020** Joint SIAM/CAIMS Annual Meeting (AN20), Virtual Conference, Originally scheduled in Toronto, Ontario, Canada, July 6-17, 2020
- Apr 2017** Swiss Numerical Analysis Day, Basel Switzerland, April 28, 2017
- Dec 2013** International Workshop on Uncertainty Quantification in Fluids Simulation (BOQUSE), Talence, France, December 16-18, 2013
- Aug 2013** The European Conference on Numerical Mathematics and Advanced Applications (ENUMATH), Lausanne, Switzerland, August 26-30, 2013

Professional memberships

- Society for Industrial and Applied Mathematics (SIAM), since 2017.
- Canadian Association for Computational Science and Engineering (CACSE), since 2021
- Centre de Recherches Mathématiques (CRM) – Applied Mathematics Laboratory, since 2022
- Canadian Association for Applied and Industrial Mathematics (CAIMS), since 2022