



E-Mail: f.bertrand@utwente.nl
 Date of birth: June 6th, 1987
 Place of birth: Caen, France
 Nationality: French, German (since 2015)

WORK EXPERIENCE AND EDUCATION

Since 12/2020

University of Twente

Assistant Professor of theory of finite element methods

- ▷ Organisation of the Study Group Mathematics with Industry 24-28.01.2022
- ▷ Teaching award for the implementation of challenge-based learning (5000€)
- ▷ Organisation of Oberwolfach collaboration on Numerical Analysis of Electromagnetic Problems, together with Matthias Schlottbom and Gerhard Starke

10/2018-11/2020

Humboldt Universität zu Berlin

Assistant Professor (W1) of Computational Mathematics

- ▷ Organisation of the fourth workshop on Minimum Residual and Least-Squares Finite Element Methods, 15-18.09.2019

07/2014-10/2018

Universität Duisburg-Essen

Post-Doc in the group Numerical Analysis of Prof. Dr. Gerhard Starke

- ▷ August 2017: Member of the Global Young Faculty
- ▷ February 2017: Post-Doc Award of the mathematic faculty (5000 €)
- ▷ January 2016: elected member of the Bachelor-/Master-exam committee
- ▷ December 2015: Nomination to GAMM Junior
- ▷ April 2015: Nomination to academic council

Since 2012

CEO of Leibniz Betreuungstandem e.V.

Plattform for shared childcare between the members of Universität Hannover

11/2010-07/2014

Gottfried Wilhelm Leibniz Universität Hannover

Student assistant and PhD-student

- ▷ DFG-Project: Simulation of Darcy-Flows: mathematical modelling and numerical simulation
- ▷ Title of the thesis: *Approximated Flux Boundary Conditions for Raviart-Thomas Finite Elements on Domains with Curved Boundaries and Applications to First-Order System Least-Squares*, grade: summa cum laude

10/2004-09/2010

Gottfried Wilhelm Leibniz Universität Hannover

Diploma degree in Mathematics with focus on *Computational Mathematics* and additional courses in Meteorology. Grade: *sehr gut*

10/2004-04/2007

Institut National des Sciences Appliquées (Rouen, France)

- ▷ Dual study program in mathematical engineering
- ▷ Focus: numerical analysis, modelling and simulation.

09/2001-06/2004

Lycée Blanche de Castille in Nantes (F): Baccalaureat

PUBLICATIONS (INTERNATIONAL, PEER-REVIEWED)

- [1] L. Alzaben, FB, and D. Boffi. “On the Spectrum of an Operator Associated with Least-Squares Finite Elements for Linear Elasticity”. *Computational Methods in Applied Mathematics* (2022).
- [2] FB and D. Boffi. “Least-squares formulations for eigenvalue problems associated with linear elasticity”. *Computers and Mathematics with Applications* (2021).
- [3] FB and D. Boffi. “First order least-squares formulations for eigenvalue problems”. *IMA Journal of Numerical Analysis* (2021).
- [4] FB, D. Boffi, and G. G. de Diego. “Convergence analysis of the scaled boundary finite element method for the Laplace equation”. *Advances in computational mathematics* 47 (2021), pp. 17–34.
- [5] FB, L. Demkowicz, and J. Gopalakrishnan. “Recent Advances in Least-Squares and Discontinuous Petrov Galerkin Finite Element Methods”. *Computers and Mathematics with Applications* 95 (2021).
- [6] FB, A. Ern, and F. Radu. “Robust and reliable finite element methods in poromechanics”. *Computers and Mathematics with Applications* 91 (2021).
- [7] FB, B. Kober, M. Moldenhauer, and G. Starke. “Weakly symmetric stress equilibration and a posteriori error estimation for linear elasticity”. *Numerical Methods for Partial Differential Equations* 37.4 (2021), pp. 2783–2802.
- [8] FB and E. Pirch. “Least-squares finite element method for a meso-scale model of the spread of covid-19”. *Computation* 9.2 (2021), pp. 1–22.
- [9] FB and G. Starke. “A posteriori error estimates by weakly symmetric stress reconstruction for the Biot problem”. *Computers and Mathematics with Applications* 91 (2021), pp. 3–16.
- [10] FB, D. Boffi, and R. Ma. “An adaptive finite element scheme for the Hellinger-Reissner elasticity mixed eigenvalue problem”. *Computational Methods in Applied Mathematics* 21 (2020), pp. 501–512.
- [11] FB, D. Boffi, and R. Stenberg. “Asymptotically Exact A Posteriori Error Analysis for the Mixed Laplace Eigenvalue Problem”. *Computational Methods in Applied Mathematics* 20.2 (2020), pp. 215–225.
- [12] FB, M. Moldenhauer, and G. Starke. “Weakly symmetric stress equilibration for hyperelastic material models”. *GAMM Mitteilungen* 43.2 (2020).
- [13] FB, Z. Cai, and E. Park. “Least-Squares Methods for Elasticity and Stokes Equations with Weakly Imposed Symmetry”. *Computational Methods in Applied Mathematics* 19.3 (2019), pp. 415–430.
- [14] FB, L. Demkowicz, J. Gopalakrishnan, and N. Heuer. “Recent Advances in Least-Squares and Discontinuous Petrov-Galerkin Finite Element Methods”. *Computational Methods in Applied Mathematics* 19.3 (2019).
- [15] FB, M. Moldenhauer, and G. Starke. “A Posteriori Error Estimation for Planar Linear Elasticity by Stress Reconstruction”. *Computational Methods in Applied Mathematics* 19.3 (2019), pp. 663–679.
- [16] FB. “First-order system least-squares for interface problems”. *SIAM Journal on Numerical Analysis* 56.3 (2018), pp. 1711–1730.
- [17] FB and G. Starke. “Parametric Raviart-Thomas elements for mixed methods on domains with curved surfaces”. *SIAM Journal on Numerical Analysis* 54.6 (2016), pp. 3648–3667.
- [18] FB, S. Müntenmaier, and G. Starke. “First-order system least squares on curved boundaries: Higher-order Raviart-Thomas elements”. *SIAM Journal on Numerical Analysis* 52.6 (2014), pp. 3165–3180.
- [19] FB, S. Müntenmaier, and G. Starke. “First-order system least squares on curved boundaries: Lowest-order Raviart-Thomas elements”. *SIAM Journal on Numerical Analysis* 52.2 (2014), pp. 880–894.

PROCEEDINGS

- [1] L. Alzaben, FB, and D. Boffi. “Computation of Eigenvalues in Linear Elasticity with Least-Squares Finite Elements: Dealing with the Mixed System”. *14th WCCM-ECCOMAS Congress*. CIMNE, 2021.
- [2] FB. “A Decomposition of the Raviart-Thomas Finite Element into a Scalar and an Orientation-Preserving Part”. *14th WCCM-ECCOMAS Congress*. CIMNE, 2021.
- [3] FB. “Phase field method for quasi-static brittle fracture: an adaptive algorithm based on the dual variable”. *PAMM* 21.1 (2021).
- [4] FB, D. Boffi, J. Gedicke, and A. Khan. “Some Remarks on the a Posteriori Error Analysis of the Mixed Laplace Eigenvalue Problem”. *14th WCCM-ECCOMAS Congress*. CIMNE, 2021.
- [5] FB, L. Lambers, and T. Ricken. “Least Squares Finite Element Method for Hepatic Sinusoidal Blood Flow”. *PAMM* 20.1 (2021).
- [6] FB and H. Schneider. “Least-Squares Methods for Linear Elasticity: Refined Error Estimates”. *14th WCCM-ECCOMAS Congress*. CIMNE, 2021.
- [7] FB and D. Boffi. “A counterexample for the inf-sup stability of the $RT0 - P1 \subset L^2(\Omega) \times H_0^1(\Omega)$ finite element combination for the mixed Poisson equation”. *PAMM* 19.1 (2019).
- [8] FB. “Stress-based Finite Element Methods for Sea Ice Dynamics”. *PAMM* 18.1 (2018), e201800450.

OTHER PUBLICATIONS

- [1] FB, B. Kober, M. Moldenhauer, and G. Starke. “Equilibrated Stress Reconstruction and a Posteriori Error Estimation for Linear Elasticity”. *CISM International Centre for Mechanical Sciences, Courses and Lectures* 597 (2020), pp. 69–106.
- [2] FB and D. Boffi. “The Prager-Synge theorem in reconstruction based a posteriori error estimation”. *75th Mathematics of Computation, Contemporary Mathematics* volume 754 (2019).
- [3] S. FB Münzemaier. “Eiskalte Spannungen, eine Herausforderung an Mathematik und Mechanik”. *Unikate* (53) (2018).

EDITED SPECIAL ISSUES

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| 2019 | Recent advances in least-squares and discontinuous Petrov-Galerkin finite element methods, in <i>Comput. Methods Appl. Math.</i> with L. Demkowicz, J. Gopalakrishnan, and N. Heuer, |
| 2020 | Robust and Reliable Finite Element Methods in Poromechanics, in <i>Comput. Mathematics with Appl.</i> with A. Ern and F. Radu, |
| 2020 | Recent advances in least-squares and discontinuous Petrov-Galerkin finite element methods, in <i>Comput. Mathematics with Appl.</i> with L. Demkowicz and J. Gopalakrishnan, |

GRANTS

- 2020 *Synthetic data-driven model reduction methods for modal analysis*
 ▷ with Daniele Boffi (KAUST, Saudi Arabia)
 ▷ Own share: 72 050\$, Total 183 000\$.
- 2018 *Approximation and reconstruction of the stress tensor in the deformed configuration for hyperelastic materials*, in the DFG priority programm SPP 1748
 ▷ with Prof. Jörg Schröder (Institut für Mechanik, Duisburg-Essen)
 and Prof. Gerhard Starke (Fakultät für Mathematik, Duisburg-Essen).
 ▷ Own share: 144 600€.
- 2018 *Numerical simulation of thermally induced crack propagation*, Mercator Research Center Ruhr (MERCUR)
 ▷ with Prof. Caroline Birk (Universität Duisburg-Essen)
 and Prof. Christian Meyer (TU Dortmund).
 ▷ Own share: 49 500€.
- 2016 *Symmetry of finite element formulations in solid mechanics* Universität Duisburg-Essen, programm for excellent young researcher: half of a PhD-position

ORGANISED MINISYMPOSIA

- 08/2022 *Eigenvalue problems in applied mathematics*, with Daniele Boffi (KAUST), CMAM Vienna.
- 06/2022 *Robust and reliable numerical methods in poromechanics*, with Jakub Both (Bergen, Norway), ENUMATH Oslo, Norway.
- 06/2020 *Numerical methods for eigenvalue problems arising from partial differential equations*, with Daniele Boffi (KAUST), WCCM Paris, France.
- 07/2019 *Recent Advances in A Posteriori Error Estimation and Adaptive Methods*, with Markus Weimar (Ruhr-Universität Bochum), ICIAM Valencia, Spain.
- 06/2019 *Adaptive and property preserving finite element methods*, with Pavel Bochev (Sandia National Laboratories), Mafelap.
- 03/2018 *Young Researcher Minisymposium on Non-Standard Mixed Finite Element Schemes for Solid Mechanics*, with Friederike Hellwig (HU Berlin), Gamm Jahrestagung München.
- 09/2017 *Minisymposium on Mixed and Non-smooth Methods for Numerical Solid Mechanics*, with Prof. Oliver Sander (TU Dresden), ENUMATH Voss, Norway.

INVITED TALKS

- 08/2021 *DPG methods for eigenvalue problems*, Keynote talk at 16th U.S. National Congress on Computational Mechanics
- 02/2021 *Numerical methods for eigenvalue problems arising from partial differential equations*, invited talk at Babuška Forum
- 09/2019 *Least-Squares methods for eigenvalue problems*, Invited plenary talk to FEM symposium 2019, Mühlheim.
- 09/2019 Oberwolfach Workshop Innovative Approaches to the Numerical Approximation.
- 03/2019 *Adaptive strategy for the reconstruction based error estimator*, Università degli studi di Pavia
- 01/2019 *Accuracy enhancement for non-isoparametric simulations with Raviart-Thomas element*, Sorbonne Université, Paris.
- 10/2018 *Stress Reconstruction for Elasticity Problems*, Oberwolfach Workshop Computational Engineering.
- 09/2017 *Extending Stress Reconstruction techniques to hyperelastic material models*, Universität Stuttgart.
- 01/2017 *Flächen- und kantenbasierte Finite-Element-Approximationen in der Festkörpermechanik*, TU Dresden.
- 09/2016 *Weakly Imposed Symmetry in Least-Squares Methods for Elasticity*, Oberwolfach Workshop on Self-Adaptive Numerical Methods for Computationally Challenging Problems.
- 08/2016 *Interplay of Energy Minimizing Mixed Formulations*, invited talk to Tufts University, Medford, USA.
- 07/2016 *Rotationsansätze in der Least-Squares Formulierung für Elastizitätsprobleme*, Humboldt Universität zu Berlin.
- 03/2016 *Supercloseness of the Least-Squares Method for Elasticity*, invited talk to Purdue University, West Lafayette, USA.

TEACHING (ONLY MAIN COURSES)

- SS 2022 *Finite element methods*, M.Sc Applied Mathematics, ECTS 6
- SS 2022 *Scientific computing*, M.Sc. Applied Mathematics, ECTS 6
- SS 2021 *Scientific computing*, M.Sc. Applied Mathematics, ECTS 6
- SS 2019 *Mixed finite element methods*, M.Sc Mathematics, ECTS 10
- WS 2018/19 *Numerical methods for ODEs*, B.Sc. Mathematics, ECTS 10
- SS 2018 *Advanced Numerical Methods*, M.Sc. Computational Mechanics, ECTS 6
- SS 2017 *Advanced Numerical Methods*, M.Sc. Computational Mechanics, ECTS 6
- SS 2016 *Adaptive finite element methods*, M.Sc Mathematics, ECTS 9
- WS 2015/16 *Introduction to Numerical Methods*, M.Sc. Computational Mechanics, ECTS 6
- SS 2015 *Advanced Numerical Methods*, M.Sc. Computational Mechanics, ECTS 6
- SS 2015 *Programming course*, ECTS 2