

Timo Sprekeler — CV

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Personal Details

Full Name: Timo Frank Sprekeler

Date of Birth: 26 December 1996

Citizenship: German

Academic Positions

2021–24: Peng Tsu Ann Assistant Professor, National University of Singapore (NUS)

2020–21: Stipendiary Lecturer, Keble College, University of Oxford

2016: Undergraduate Research Assistant in Numerical Analysis, TU Dortmund University

Education

University of Oxford, Keble College

Oxford, UK

DPhil in Mathematics (EPSRC Centre for Doctoral Training in PDEs)

10/17–07/21

Thesis: Finite element approximation of elliptic homogenization problems in nondivergence-form.

Advisors: Prof. Endre Süli, Prof. Yves Capdeboscq.

University of Cambridge, Trinity College

Cambridge, UK

MASt in Mathematics (Part III of the Mathematical Tripos)

10/16–07/17

Grade: Distinction. Part III Essay: Deep variational models. Advisor: Prof. Carola-Bibiane Schönlieb.

TU Dortmund University

Dortmund, Germany

B.Sc. in Mathematics

10/13–08/16

Grade: 1.0 (highest). Thesis: Non-trivial solutions of a semilinear equation with critical Sobolev-exponent.

Advisor: Prof. Ben Schweizer.

Visits

11/2022: Research visit at The University of Hong Kong, hosted by Asst.Prof. Guanglian Li

07/2017–09/17: Summer intern in the Cantab Capital Institute for the Mathematics of Information within the University of Cambridge. Research on regularized optimal transport for solving gradient flows, advised by Prof. Carola-Bibiane Schönlieb, Prof. José A. Carrillo, and Dr. Lisa M. Kreusser.

Academic Awards

01/2024: Faculty Teaching Excellence Award 2023, Faculty of Science, NUS.

Number of awards by department: Biological Sciences (4), Chemistry (3), Food Science & Technology (1), Mathematics (6), Pharmacy (1), Physics (3), Statistics & Data Science (1), Biochemistry (1)

01/2023: Faculty Teaching Excellence Award 2022, Faculty of Science, NUS.

Number of awards by department: Biological Sciences (5), Chemistry (2), Food Science & Technology (1), Mathematics (4), Pharmacy (2), Physics (3), Statistics & Data Science (3), Biochemistry (1)

2017–21: Clarendon Fund and Keble College Sloane Robinson Scholarship, University of Oxford
07/2017: Examination Prize and Senior Scholarship, Trinity College, University of Cambridge
11/2016: Award for best overall grade among Math students of year group, TU Dortmund
2015–16: Deutschlandstipendium ('Germany Scholarship')

Publications

Preprints:

- [8] J. Qian, T. Sprekeler, H. V. Tran, and Y. Yu, **Optimal rate of convergence in periodic homogenization of viscous Hamilton-Jacobi equations.**
<https://arxiv.org/abs/2402.03091>
- [7] X. Guo, T. Sprekeler, and H. V. Tran, **Characterizations of diffusion matrices in homogenization of elliptic equations in nondivergence-form.**
<https://arxiv.org/abs/2201.01974>

Journal articles:

- [6] T. Sprekeler, **Homogenization of nondivergence-form elliptic equations with discontinuous coefficients and finite element approximation of the homogenized problem,** *SIAM J. Numer. Anal.*, in press.
- [5] P. Freese, D. Gallistl, D. Peterseim, and T. Sprekeler, **Computational multiscale methods for nondivergence-form elliptic partial differential equations,** *Comput. Methods Appl. Math.*, in press. <https://doi.org/10.1515/cmam-2023-0040>
- [4] E. L. Kawecki and T. Sprekeler, **Discontinuous Galerkin and C^0 -IP finite element approximation of periodic Hamilton–Jacobi–Bellman–Isaacs problems with application to numerical homogenization,** *ESAIM Math. Model. Numer. Anal.*, 56(2):679–704, 2022. <https://doi.org/10.1051/m2an/2022017>
- [3] T. Sprekeler and H. V. Tran, **Optimal Convergence Rates for Elliptic Homogenization Problems in Nondivergence-Form: Analysis and Numerical Illustrations,** *Multiscale Model. Simul.*, 19(3):1453–1473, 2021. <https://doi.org/10.1137/20M137121X>
- [2] D. Gallistl, T. Sprekeler, and E. Süli, **Mixed Finite Element Approximation of Periodic Hamilton–Jacobi–Bellman Problems With Application to Numerical Homogenization,** *Multiscale Model. Simul.*, 19(2):1041–1065, 2021. <https://doi.org/10.1137/20M1371397>
- [1] Y. Capdeboscq, T. Sprekeler, and E. Süli, **Finite element approximation of elliptic homogenization problems in nondivergence-form,** *ESAIM Math. Model. Numer. Anal.*, 54(4):1221–1257, 2020. <https://doi.org/10.1051/m2an/2019093>

Talks

- 12/2023:** Invited speaker at workshop “Recent Advances in Scientific Computing and Deep Learning”, Tsinghua Sanya International Mathematics Forum (TSIMF), Sanya, China
- 12/2023:** Invited talk at Mathematics Colloquium, University of Tennessee, US
- 12/2023:** Invited talk at Mathematics Colloquium, Carnegie Mellon University, US
- 12/2023:** Invited talk at Mathematics Colloquium, Texas A&M University, US
- 12/2023:** Invited speaker at “International Workshop on Multiscale Model Reduction and Scientific Machine Learning”, The Chinese University of Hong Kong, China

- 08/2023:** Contributed talk at “International Congress on Industrial and Applied Mathematics” (ICIAM 2023), Waseda University, Japan
- 05/2023:** Contributed talk at “European Finite Element Fair”, University of Twente, Netherlands
- 04/2023:** Invited online talk at Numerical Analysis Seminar, The University of Hong Kong, China
- 12/2022:** Invited speaker at “Conference on Analysis and Applied Mathematics” (CAAM 3), Saigon University, Vietnam
- 07/2022:** Invited speaker at workshop “Numerical Analysis of Nonlinear and Multiscale Problems”, Friedrich–Schiller–University Jena, Germany
- 06/2022:** Contributed talk at conference “Analysis, PDEs and Applications – Celebrating 60th anniversary of Prof. Nenad Antonić” (NADu22), Dubrovnik, Croatia
- 01/2022:** Invited online talk at YMSC-BIMSA Seminar in Analysis and Applications, Tsinghua University, China
- 12/2021:** Invited online talk at Numerical Analysis Seminar, The University of Hong Kong, China
- 09/2021:** Invited online talk at PDE and Scientific Computing Seminar, National University of Singapore, Singapore
- 02/2021:** Contributed online talk at conference “Multi-scale Analysis: Thematic Lectures and Meeting”, ICTS (MATHLEC-2021), India
- 06/2020:** Invited online speaker at workshop “Multiscale & Multilevel Methods: Numerical Analysis and Applications”, LMS Scottish Numerical Methods Network, ICMS, UK
- 02/2020:** Invited talk at Inria–LJLL Scientific Calculus Seminar, Sorbonne University, France
- 09/2019:** Contributed talk at “Chemnitz Finite Element Symposium”, Mülheim a.d. Ruhr, Germany
- 09/2018:** Invited talk at PDE CDT Summer School, University of Oxford, UK
- 04/2018:** Invited talk at PDE CDT Spring School, University of Oxford, UK
- 09/2017:** Invited talk at Cambridge Image Analysis Seminar, University of Cambridge, UK

Teaching

National University of Singapore

Singapore

Lecturer and tutor for the following courses:

- MA4230: Matrix Computation (Numerical Linear Algebra) 2021/22 & 22/23 & 23/24, Sem 1
- MA4255: Numerical Methods in Differential Equations 2021/22 & 22/23, Sem 2

Lecture notes and problem sheets: <https://blog.nus.edu.sg/sprekeler/lecture-materials/>

University of Oxford

Oxford, UK

Tutor and Teaching Assistant in the Mathematical Institute for the following courses:

- B4.1: Functional Analysis I Michaelmas 2019
- B6.1: Numerical Solution of Differential Equations I Michaelmas 2018 & 2019
- B6.2: Numerical Solution of Differential Equations II Hilary 2019
- CDT: Analysis of Partial Differential Equations Michaelmas 2018
- MMSC: Further Mathematical Methods Hilary 2019
- MMSC: Further Partial Differential Equations Hilary 2020

Stipendiary Lecturer (2020/21) and Tutor in Keble College for the following courses:

- Introduction to University Mathematics Michaelmas 2020

- A1: Differential Equations 1 Michaelmas 2020
- A6: Differential Equations 2 Hilary 2021
- ASO: Calculus of Variations Trinity 2019 & 2020
- ASO: Integral Transforms Hilary 2021
- M3: Introductory Calculus Michaelmas 2020
- M4: Constructive Mathematics Trinity 2020
- M5: Fourier Series and PDE's Hilary 2021
- M5: Multivariable Calculus Hilary 2020

NUS: Sem 1 (Aug–Dec), Sem 2 (Jan–May). Oxford: Michaelmas (Oct–Dec), Hilary (Jan–Mar), Trinity (Apr–Jun).

Supervision

- Ivan Tan Yong Hong: “Pooling matrix designs for group testing”, paper based on his honours year project submitted to *SIAM Undergraduate Research Online*, co-advised with Prof. Delin Chu and Dr. Johannes J. Brust, AY 2022/23
- Jensen Chan Jie Sheng: “Finite element approximation for nondivergence-form elliptic PDEs”, honours year project, AY2022/23
- Yuuka Foo Xiao Ying: “A priori and a posteriori error analysis of finite element methods for elliptic PDEs”, honours year project, AY2022/23
- Wenqian Yu: “Finite difference approximation of conservation laws”, MSc dissertation, AY2022/23

Other Responsibilities

Reviewing: I have reviewed manuscripts for the following journals: Discrete and Continuous Dynamical Systems - Series B, Foundations of Computational Mathematics, Journal of Computational and Applied Mathematics, Multiscale Modeling and Simulation.

Examination: Examination of honours year projects and MSc dissertations at NUS: Yu Liang Lim (AY2021/22), Ivan Tan Yong Hong (AY2022/23), Ding Wang (AY2022/23)

Organization: Involved in organization of the 2023 Department retreat of NUS Math Department

Admissions: Involved in undergraduate admissions interviews (Keble College) and marking of admissions exams at the University of Oxford (2018–21)

Languages

German (native), English (fluent), French (passed DELF B2), Mandarin (beginner, passed HSK 3)

Computer Skills

L^AT_EX, MATLAB, C++, FreeFem++, FEniCS, Netgen/NGSolve, MS Office

Additional Qualifications

2009–20: Participation in several Memory Championships and member of the European Society for Memory Enhancement “MemoryXL”. Notable results: 6th in individual (in age group) and 1st in team (team Germany) at World Championships 2012, German Vice-Champion (in age group) 2008

2016–21: Member of the Cambridge (16/17)/Oxford (2017–21) University Badminton Club
Representing the University in British Universities & Colleges Sport matches