



# Tim van Beeck

Ph.D. Student · Numerical mathematics

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## Scientific biography

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I am a Ph.D. student in Applied Mathematics at the University of Göttingen, supervised by Christoph Lehrenfeld. My research focuses on the numerical analysis of partial differential equations. I am currently working on the discretization of time-harmonic wave propagation problems arising in nematoacoustics and helioseismology.

## Education

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since 01/2024	<b>Ph.D. in Mathematics</b> , University of Göttingen. <i>Supervisor: Christoph Lehrenfeld.</i>
12/2021 - 12/2023	<b>M.Sc. in Mathematics</b> , University of Göttingen, Grade: 1.0 (with distinction). <i>Thesis: On stable discontinuous Galerkin discretizations for Galbrun's equation.</i> <i>Supervisor: Christoph Lehrenfeld.</i>
10/2017 - 12/2021	<b>B.Sc. in Mathematics</b> , University of Göttingen, Grade: 2.3. <i>Thesis: On a Discontinuous Galerkin discretization for a degenerate diffusion equation.</i> <i>Supervisor: Christoph Lehrenfeld.</i>
2009 - 2017	<b>Secondary school</b> (Abitur), Gymnasium Corvinianum Northeim.

## Experience

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### Positions:

since 01/2024	<b>Research assistant</b> , University of Göttingen, Germany.
11/2021 - 12/2023	<b>Student assistant</b> , University of Göttingen, Germany.

### Teaching:

10/2025 - 03/2026	Mathematical oriented programming (University of Göttingen, tutorial class, 2SWS).
10/2023 - 03/2024	Partial differential equations (University of Göttingen, tutorial class, 2SWS).

## Publications

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### In preparation:

- [1] J. Preuss, P. Stocker, **T. van Beeck**, *Learned infinite elements for the vector-valued Galbrun's equation.*
- [2] **T. van Beeck**, *A  $C^0$ -hybrid interior penalty method for the nematic Helmholtz-Korteweg equation.*
- [3] T. Brüers, C. Lehrenfeld, **T. van Beeck**, M. Wardetzky, *High-order surface flow discretizations via discrete Helmholtz-Hodge decompositions.*

### Preprints:

- [1] P. L. Lederer, C. Lehrenfeld, C. Merdon, **T. van Beeck**, *Pressure-robustness for the axisymmetric Stokes problem by velocity reconstruction*. arXiv:2603.01030.
- [2] M. Halla, C. Lehrenfeld, **T. van Beeck**, *Hybrid discontinuous Galerkin discretizations for the damped time-harmonic Galbrun's equation*. arXiv:2504.09547.
- [3] P. E. Farrell, **T. van Beeck**, U. Zerbinati, *Analysis and numerical analysis of the Helmholtz–Korteweg equation*. arXiv:2503.10771.
- [4] **T. van Beeck**, U. Zerbinati, *An adaptive mesh refinement strategy to ensure quasi-optimality of finite element methods for self-adjoint Helmholtz problems*. arXiv:2403.06266.

#### Journal articles:

- [1] C. Lehrenfeld, **T. van Beeck**, I. Voulis, *Analysis of divergence-preserving unfitted finite element methods for the mixed Poisson problem*. Math. Comp. 94 (2025), 1667-1699, DOI: 10.1090/mcom/4027.
- [2] E. Burman, J. Preuss, **T. van Beeck**, *Variational data assimilation for the wave equation in heterogeneous media*. Accepted in Commun. Appl. Math. Comput., arXiv:2509.13108.

## Scientific exchange

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#### Research visits:

- 03/2026 University of Oxford, United Kingdom, working with U. Zerbinati & P. E. Farrell.
- 10/2025 University of Oxford, United Kingdom, working with U. Zerbinati & P. E. Farrell.
- 12/2024 Pavia, Italy, working with U. Zerbinati.
- 01/2024 - 03/2024 UCL London, United Kingdom, working with E. Burman & J. Preuss  
*Topic: Variational data assimilation for the wave equation in heterogeneous media.*

#### Conference talks:

- 09/2025 ENUMATH 2025, Heidelberg, Germany, *Divergence-preserving unfitted FEM for the mixed Poisson problem*.
- 05/2025 EFEF 2025, Trieste, Italy, *Pressure-robustness in an axisymmetric setting*.
- 02/2025 Wave Phenomena 2025, Karlsruhe, Germany, *Learned infinite elements for the vector-valued Galbrun's equation*.
- 11/2024 GAMM Numerical Analysis, Augsburg, Germany, *Hybrid discontinuous Galerkin discretizations of Galbrun's equation*.
- 09/2024 FEM Symposium 2024, Chemnitz, Germany, *Divergence-preserving unfitted FEM for the mixed Poisson problem*.
- 07/2024 WCCM 2024, Vancouver, Canada, *Divergence-preserving unfitted FEM for the mixed Poisson problem*.
- 06/2024 WAVES 2024, Berlin, Germany, *Stable hybrid discontinuous Galerkin discretization for Galbrun's equation*.
- 06/2024 EFEF 2024, London, United Kingdom, *Ensuring quasi-optimality for the Helmholtz problem*.
- 05/2023 EFEF 2023, Enschede, Netherlands, *Unfitted Mixed Finite Element Methods*.
- 06/2022 41th NoKo, Hannover, Germany, *Unfitted Mixed Finite Element Methods*.

## Administrative work

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- 04/2024 - 03/2027 Managing board of the institute for numerical and applied mathematics (representing scientific employees).
- 04/2025 - 03/2026 Deputy PhD students representative (Faculty of Computer Science & Mathematics).