Curriculum vitæ

Sebastian Bechtel

Contents

1 General information and contact details

Business address	Université Paris-Saclay, CNRS
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	France
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Website	www.sebastian-bechtel.info
Date of birth	18th of December, 1992
Nationality	German

Language skills

- German: mother tongue
- English: fluent
- French: fluent[1]
- Dutch: basic knowledge

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[1]certified by a DALF diploma on the CERF C1 level

2 Education and work

Professional background

since 09/24   **Cofund MathInGreaterParis postdoctoral researcher** at Université Paris-Saclay, Orsay, France.

09/22-08/24   **Feodor Lynen postdoctoral researcher** in the "Feodor Lynen–Forschungsstipendium" program of the "Humboldt Stiftung" at TU Delft, Delft, The Netherlands.

09/21 – 08/22 **ANR Rage postdoctoral researcher** in the "ANR RAGE" project at l'Institute de Mathématiques de Bordeaux, Talence, France.

10/17 – 08/21 **PhD candidate** at TU Darmstadt under the co-supervision of Robert Haller (Darmstadt) and Moritz Egert (Orsay), Darmstadt, Germany.

04/16 – 09/17 **Master of Science** at TU Darmstadt.

10/13 – 03/16 **Bachelor of Science** at TU Darmstadt.

10/12 – 09/13 Studies in computer science[2] at TU Darmstadt.

2012   **Abitur** (High school diploma in Germany), Hanau, Germany.

PhD thesis

"On mixed boundary conditions, function spaces, and Kato's square root property", under the co-supervision of Robert Haller (Darmstadt) and Moritz Egert (Orsay), PhD defense **with distinction** on the 24th of June, 2021 at TU Darmstadt.

The findings of my PhD research I turned into a **peer-reviewed monograph**[3] entitled "Square Roots of Elliptic Systems in Locally Uniform Domains" published in Birkhäuser's series Linear Operators and Linear Systems (volume 303).

Research topic

I am interested in harmonic analysis, in particular Kato's square root property and its applications in partial differential equations, for instance in non-autonomous (stochastic) evolution problems. More recently, I started working on non-linear (stochastic) partial differential equations with a focus on the variational setting. Many of these questions I studied with a special focus on rough geometry and mixed boundary conditions. Also, I studied the theory of function spaces including the construction of extension operators and the development of an interpolation theory in this context.

Scholarships

since 09/24   **Postdoctoral fellowship** of the "Cofund MathInGreaterParis"[4] program, awarded by the European Union 🇪🇺.

09/22-08/24   **Postdoctoral fellowship** of the "Feodor Lynen–Forschungsstipendium"[5] program, awarded by the "Humboldt Stiftung".

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[2]After one year I changed my major subject to mathematics.
[3]https://link.springer.com/book/10.1007/978-3-031-63768-1
[4]https://www.mathingp.fr

08/21 – 09/22   **Postdoctoral scholarship** in the project "ANR RAGE"[6].

08/18 – 08/21   **PhD fellowship**, awarded by the "Studienstiftung des deutschen Volkes"[7].

Memberships

since 01/24   Member of the "DFG Research Network" on "Maximal Regularity Methods in Mathematical Fluid Mechanics".

since 09/22   Member of the "Humboldt Stiftung".

since 08/21   Member of the project "ANR Rage".

since 08/18   Member of the "Studienstiftung des deutschen Volkes".

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[5] https://www.humboldt-foundation.de/en/apply/sponsorship-programmes/feodor-lynen-research-fellowship
[6] https://anr.fr/Project-ANR-18-CE40-0012
[7] https://www.studienstiftung.de/en/

3 Talks and collaborations

Conference talks

07/24	*SPDEs below sea level*, Delft, The Netherlands.
10/22	*Harmonic Analysis for Semigroups on Commutative and Non-commutative L^p spaces*, Marne-la-Vallée, France.
10/22	*Function spaces and applications*, Apolda, Germany.
10/19	*Evolution Equations: Applied and Abstract Perspectives*, CIRM 2071, Luminy, France.
05/19	*Parabolic Equations, Harmonic Analysis and Spectral Theory*, Bad Herrenalb, Germany.
07/18	*21st International Internet Seminar*[8], Wuppertal, Germany.
07/17	*20th International Internet Seminar*[8], Salerno, Italy.

Seminar talks

12/24	Langenbach Seminar, WIAS Berlin, Germany.
11/24	Minisymposium on SPDEs, TU Delft, The Netherlands.
10/24	Séminaire d'analyse harmonique, Université Paris-Saclay, France.
06/24	Analysis Seminar, TU Delft, The Netherlands.
05/24	Analysis Seminar, KIT (Karlsruhe), Germany, invited by Patrick Tolksdorf.
01/24	Analysis Seminar, Konstanz, Germany, invited by Franz Gmeineder.
12/23	Analysis Seminar, Darmstadt, Germany, invited by Moritz Egert.
12/23	Analysis Seminar, Kaiserslautern, Germany, invited by Amru Hussein.
01/23	RAGE project meeting, Bordeaux, France.
12/22	Analysis Seminar, Darmstadt, Germany, invited by Moritz Egert.
11/22	MFO 2247b, Oberwolfach, Germany.
11/22	Function spaces seminar, Jena, Germany, invited by Jonas Sauer.
09/22	Analysis Seminar, Delft, The Netherlands.
07/22	Analysis Seminar, Mainz, Germany, invited by Patrick Tolksdorf.
02/22	Analysis Seminar UW-Madison (via Zoom), Madison, United States, invited by Andreas Seeger.
01/22	RAGE project meeting, Nantes, France.
11/21	Séminaire d'EDP, Bordeaux, France.
07/20	Analysis seminar (via Zoom), Delft, The Netherlands, invited by Mark Veraar.

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[8]conference on evolution equations for masters and PhD students

01/20	Function spaces seminar, Jena, Germany, invited by Winfried Sickel.
08/18	Analysis seminar, Hamburg, Germany, invited by Jan Meichsner.
06/18	"What is...?"-Seminar, Darmstadt, Germany.
02/18	Langenbach Seminar, Weierstrass-Institute, Berlin, Germany, invited by Joachim Rehberg.

Research stays

11/24	**TU Delft**, during one week, invited by Mark Veraar, Delft, The Netherlands.
11/23	**Université de Bordeaux**, during one week, invited by El-Maati Ouhabaz, Bordeaux, France.
03/19	**Université Paris-Sud**, during one week, invited by Moritz Egert, Orsay, France.
02/18	**Université Paris-Sud**, during two weeks, invited by Moritz Egert, Orsay, France.

4 Publication list

Articles published in a peer-reviewed journal

1. S. Bechtel and M. Egert: *Interpolation theory for Sobolev functions with partially vanishing trace on irregular open sets.*
   J. Fourier Anal. Appl. 25 (2019), 2733–2781. doi:10.1007/s00041-019-09681-1.

2. S. Bechtel, M. Egert, and R. Haller-Dintelmann: *The Kato square root problem on locally uniform domains.*
   Adv. Math. 375 (2020). doi:10.1016/j.aim.2020.107410.

3. S. Bechtel: *The extension problem for fractional Sobolev spaces with a partial vanishing trace condition.*
   Arch. Math. 117 (2021), 79–85. doi:10.1007/s00013-021-01594-0.

4. S. Bechtel and E-M. Ouhabaz: *Off-diagonal bounds for the Dirichlet-to-Neumann operator.*
   J. Math. Anal. Appl. 530 (2024). doi:10.1016/j.jmaa.2023.127696.

5. S. Bechtel L^p-*estimates for the square root of elliptic systems with mixed boundary conditions II.*
   J. Differential Equations 379 (2024), 104–124. doi:10.1016/j.jde.2023.09.036.

6. S. Bechtel, R. Brown, R. Haller, and P. Tolksdorf: *Sobolev extension operators for functions with partially vanishing trace.*
   To appear in **Ann. Inst. Fourier**. ArXiv: https://arxiv.org/abs/1910.06009.

7. S. Bechtel, C.Mooney, and M. Veraar: *Counterexamples to maximal regularity for operators in divergence form.*
   Arch. Math. 123 (2024), 199–209. doi:10.1007/s00013-024-02014-9.

8. S. Bechtel: *Weighted non-autonomous $L^q(L^p)$ maximal regularity for complex systems under mixed regularity in space and time.*
   J. Differential Equations 409 (2024), 49–82. doi:10.1016/j.jde.2024.07.002

Proceedings

9. S. Bechtel, C. Bui, and P. Kunstmann: *Around maximal regularity for Navier–Stokes Equations.*
   Appeared in **Panorama et Synthèses** (2024).

Preprints

10. S. Bechtel and M. Veraar: *An extrapolation result in the variational setting: improved regularity, compactness, and applications to quasilinear systems.*
    33 pages, submitted. ArXiv: https://arxiv.org/abs/2311.01271.

11. S. Bechtel and T. Böhnlein: *Hardy spaces adapted to elliptic systems on open sets.*
    40 pages, submitted. ArXiv: https://arxiv.org/abs/2311.13316.

12. S. Bechtel, C. Hutcheson, T. Schmatzler, T. Tasci, and M. Wittig: *A second order approach to the Kato square root problem on open sets.*

25 pages. ArXiv: https://arxiv.org/abs/2406.12812.

13. S. Bechtel, F. Germ, and M. Veraar: *An extended variational setting for critical SPDEs with Lévy noise.*
62 pages, submitted. ArXiv: https://arxiv.org/abs/2412.17420.

Peer-reviewed books

14. S. Bechtel: *Square Roots of Elliptic Systems in Locally Uniform Domains*, Linear Operators and Linear Systems vol. 303.
Birkhäuser, Cham, 2024.

5 Teaching experience

I have experience in teaching, tutoring, supervision and other (outreach) activities as described in detail below.

Teaching

I have teaching experience in German and English for students from various study programs. My responsibilities included giving exercise classes, creating and grading exercise sheets and exams as well as the coordination of undergraduate teaching assistants. These activities are summarized in the following table.

year	level	subject	volume
2018	Master	Banach algebras & numerical analysis	440h
2019/20	Bachelor	analysis III	190h
2019/20	Master	parabolic PDE	30h
2020/21	Master	harmonic analysis	220h
2023/24	Master	harmonic analysis techniques for elliptic operators	40h

Supervision

I have **supervised the theses** of several students.

- Master's thesis of Michelle Luckas entitled "Regularity Properties of Divergence Form Operators in the H^{-1} Setting" at TU Darmstadt in 2020.

- Master's thesis of Luca Calo entitled "Compatibility of inverse operators between interpolation spaces" at TU Darmstadt in 2021.

- Master's thesis of Toby Leeuwis entitled "The critical setting of non-autonomous unbounded operators" at the Technical University of Delft in 2024.

Moreover, as part of the "International Internet Seminar"[9] I **coordinated and supervised** the work of **international groups of students** in 2019, 2020 and 2024.

Tutoring

As an undergraduate teaching assistant I was **tutoring** in the following classes:

- integration and measure theory,

- functional analysis,

- mathematical logic,

- theoretical computer science[10],

- mathematics for computer scientists[10].

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[9] https://www.math.kit.edu/iana3/seite/isem/
[10] for computer science students

As a PhD student, I offered a **reading course on tent spaces** on a weekly basis over one semester for an interested student that followed my exercise class on harmonic analysis the previous semester and was eager to deepen his knowledge. Meanwhile, this student is pursuing a PhD in harmonic analysis.

With the intention to help students in their passage from high school to university, I was involved in the **VEMINT project**[11]. The goal of this project was to create study material like work books, exercise sheets etc. for students coming from high school to university and having gaps in their high school knowledge. I also **participated at a course** to improve the **design of exercise sheets**.

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[11]https://www.mathematik.tu-darmstadt.de/didaktik/ag_forschung/did_forschung/did_projekte/
pj_diagnose_feedback_foerderung/projekt_vema_vemint/index.de.jsp

6 Outreach and other pedagogical activities

I contacted my former high school and offered them to give a **talk** for their **high school students** about a subject in PDE adapted to their knowledge. This was a successful and inspiring experience for both the students and me.

In the scope of my fellowship with the Studienstiftung des deutschen Volkes I gave a **layman's talk** about mathematical research to fellows from other study programs. Also, I **organized a podium discussion** to exchange about "cultural differences" among different disciplines in science and research.

Since 2021, I am a **voluntary member** of an association that **supports refugees in learning the German language**. I regularly meet with the participants (individual or in a group) and discuss with them various topics so that they can practice speaking German in a safe and friendly environment. These encounters also taught me new aspects in teaching as well as the value of patience and empathy.

7 Other scientific activities

Below I describe other scientific activities in which I was engaged.

Referee work

I refereed for various international journals including Journal of Differential Equations, Journal of Fourier Analysis and Applications, Nagoya Mathematical journal or Bulletin de la Société Mathématique de France.

Committee member

I worked as a committee member for the TU Darmstadt as well as for the "Studienstiftung des deutschen Volkes". In the latter case, this was on a voluntary basis on my week-ends and concerned the selection of new fellows of this foundation.

Organization

I was involved in the organization of seminars for the TU Darmstadt and for the "Studienstiftung des deutschen Volkes".