Brice Loustau

Research Scientist, PhD

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Research areas

- **Pure Mathematics:** Differential Geometry • Linear Algebra • Mathematical Physics
- **Math Visualization:** Computational Geometry • Math Programming
- **Data Science & Machine Learning:** Graph Representation Learning • Geometric Deep Learning

Academic positions

2020 – 2022	Research Scientist at the Heidelberg Institute of Theoretical Studies (HITS) and Heidelberg University. Heidelberg, Germany.
2018 – 2020	Postdoctoral Associate at TU Darmstadt. Darmstadt, Germany.
2015 – 2018	Postdoctoral Associate at Rutgers University. Newark, New Jersey, USA.
2014 – 2015	Research Scientist at Instituto de Matemática Pura e Aplicada (IMPA). Rio de Janeiro, Brazil.
2011 – 2014	Postdoctoral Associate at Université Paris-Sud XI Orsay. Paris, France.

Education (France)

2008 – 2011	PhD in Pure Math., Univ. of Toulouse 3. Mention Très Honorable (highest honors). *Title:* The symplectic geometry of projective structures. *Advisor:* Prof. Jean-Marc Schlenker.
2004 – 2007	ENS Cachan. Master in Pure Math. Agrégation of Math. (national ranking 28/2801).
2002 – 2004	Classes Prépa. (M. Montaigne, Bordeaux). Bachelor degree in Math & Computer Science.
2002	Baccaulauréat à Option Internationale. Mention Très Bien (highest honors).

Leadership

Teaching → brice.loustau.eu/teaching.html

- Designed and taught 30+ courses in Mathematics, Physics, and Computer Science at all levels (Bachelor, Master, PhD) in universities in Europe and the US (Heidelberg, Darmstadt, Rutgers, Paris-Sud, Toulouse 3).
- Creation of teaching material and resources: lectures notes, video lectures, exercise sheets, tests and quizzes, web sites. Authored a textbook (*Hyperbolic geometry*, to be published by Springer in 2022).
- Mentoring of students: 2 Master theses, 8 undergraduate research projects.

Academic service

- (Co-)organizer and leader of 11 conferences and workshops.
- Refereed research papers for 9 academic journals.
- Outreach: Creation of digital content, outreach in high schools, interview for *Science & Vie* (science magazine).

Heidelberg Experimental Geometry Lab (HEGL)

- I was put in charge of creating HEGL by Prof. Anna Wienhard, director of the Research Station. I designed the space, picked all the equipment (computers, 3D printers, etc), created the website, etc.
- I oversee HEGL activities: seminars, student research, 3D printing, etc.

Code

→ brice.loustau.eu/code.html → github.com/seub

HITS (Heidelberg Institute of Theoretical Studies)

- I collaborate with mathematicians and data scientists at HITS to develop geometric methods in Machine Learning, e.g. hyperbolic neural networks. HITS offers a *High Performance Cluster* for ML computations.

Development of math software with a GUI (C++/Qt)

Circle Packings (with B. Beeker)
Computes and shows circle packings and Riemann conformal mappings.

Harmony (with J. Gaster)
Computes and shows equivariant harmonic maps.

Heidelberg Experimental Geometry Lab (HEGL)

- I mentor student projects at HEGL since 2021. These involve math, coding, and visualization.
- I have acquired experience with 3D printing and VR.

Programming Languages

- Proficient: C++, Python.
- Experience with: Bash, C, HTML, Javascript, Julia, Latex, Mathematica, Matlab, Pascal, Qt, Sage, SQL.

Select publications (out of 10)

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- **Book:** Hyperbolic geometry (*Springer Undergraduate Texts in Mathematics*, 2022)
- **Article:** Computing harmonic maps between Riemannian manifolds (*Canadian Journal of Math*, 2021)
- **Article:** The sum of Lagrange numbers (*Proceedings of the AMS*, 2021)
- **Report:** Hyperbolic geometry and applications (*HITS Annual Report*, 2020)
- **Article:** The symplectic geometry of projective structures (*Geometry & Topology*, 2015)

Select invited talks (out of 50+)

- *Hyperbolic geometry and Data Science* (HITS, Sept 2021)
- *Discrete Riemannian geometry via the Laplace operator* (Heidelberg University, June 2021)
- *Computing discrete minimal surfaces* (University of Singapore, Nov 2019)
- *Computing equivariant harmonic maps* (Stanford University, June 2019)

Other skills

Languages	French (native); English (bilingual); Spanish, Portuguese, German (conversational).
Music	I play the piano (classical and jazz). My husband Benjamin Velez is a composer/lyricist.
Hobbies	Reading, playing chess, cooking.
US status	Permanent resident.