

Benjamin Bogosel

Birth date: 22 February 1988.

Nationality: Romanian

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Professional Adress: CMAP, École Polytechnique, IP Paris, Palaiseau, France

Marital status: married, two children.

Education and Employment

- 2018- **Assistant Professor of Applied Mathematics**, École Polytechnique, Institut Polytechnique de Paris, Centre de Mathématiques Appliquées
- 2024 **Habilitation à diriger les recherches**, defended at École Polytechnique, Institut Polytechnique de Paris
- 2017-2018 **Postdoctoral Researcher** - CMAP, École Polytechnique, CNRS - **Project SOFIA** coordinated by Grégoire Allaire
- 2016-2017 **Postdoc FSMP** - DMA, École Normale Supérieure - Paris coordinated by Virginie Bonnaille-Noël
- 2015-2016 **Teaching Assistant (ATER)** - Université Grenoble Alpes, Lab. Jean Kuntzmann
- 2012-2015 **PHD student** - Université Joseph Fourier, Grenoble, France, coordinators: Dorin Bucur and Édouard Oudet. Subject: *Shape optimization and spectral problems*
- 2014 **Agrégation externe de mathématiques**
- 2007-2012 **Bachelor and Master degree** - University of Timisoara, Romania
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Research interests

- Calculus of variations, shape optimization, convex geometry
 - Optimal design for industrial constraints - additive manufacturing
 - Numerical shape optimization: the level-set method, Γ -convergence, exact parametrizations
 - Shape optimization for eigenvalue problems
 - Optimal partitioning and multi-phase problems
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Research Projects

- 2024 Mobility Project PN-IV-P2-2.2-MCT-2024-0054 – co-PI – UEFISCDI, Romania – PI: Valeriu BEIU
- 2018-2023 SHAPO Project – member – Agence Nationale de la Recherche, France – PI: Jimmy LAMBOLEY – <https://anr.fr/Projet-ANR-18-CE40-0013>
- 2017-2023 SOLutions pour la Fabrication Industrielle Additive métallique (SOFIA) Project – member (postdoc, thesis co-advisor) – Banque Publique d'Investissement, France
- 2025-2028 STOIQUES Project – member – Agence Nationale de la Recherche, France – PI: Yannick PRIVAT
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Academic supervision activity

- Phd: MARTIN BIHR, 2018-2021, co-director with Grégoire Allaire, CIFRE thesis with Safran Tech
- Postdoc: MATIAS GODOY, 2019-2021, in collaboration with Grégoire Allaire
- Internship: MEHDI MAKNI, summer 2021 – spectral optimal partitioning algorithms, 2nd year Bachelor program, Ecole Polytechnique

Review activity

I wrote reviews for articles submitted to the following journals:

Applied Mathematics and Optimization, Applied Mathematics and Computation, ESAIM: Control Optimization and Calculus of Variations, Acta Applicandae Mathematicae, Structural and Multidisciplinary Optimization, SIAM Journal on Scientific Computing, SIAM Journal of Control and Optimization, SIAM Journal on Mathematical Analysis, Evolution Equations and Control Theory, Nonlinearity, The European Physical Journal E, Applied Mathematics Letters, Results in Mathematics, Materials & Design, Archive of Applied Mechanics, Computational Mathematics, Numerical Algorithms, Nonlinear Analysis, Numerical Methods for Partial Differential Equations, Computers and Mathematics with Applications, Mathematical Reviews

Teaching activity

- 2020-2023 *École Polytechnique: Ingénieur Polytechnicien program*
- MAP472: Responsible for the Modal, supervision of 2-3 groups each year
- MAP435: Optimization and Optimal control: 2nd year
- MAP562: Shape Optimization: 3rd year
École Polytechnique: Bachelor program
- MAA209: Introduction to Optimization
- 2019-2020 *École Polytechnique: Ingénieur Polytechnicien program*
- MAP412: Introduction to numerical analysis: 2nd year, conceived subject and corrected the final exam (contrôle classant, approx 120 students)
- MAP562: Shape Optimization: 3rd year
École Polytechnique: Bachelor program
- MAA209: Introduction to Optimization
- 2018-2019 *École Polytechnique: Ingénieur Polytechnicien program*
- MAP411: Numerical approximation and optimization: 2nd year
- MAP562: Shape Optimization: 3rd year
École Polytechnique: Bachelor program
- MAA209: Introduction to Optimization
ENSTA Paris: Introduction to Shape Optimization
- 2015-2016 Université de Grenoble: Mathematics for finance
- 2012-2015 Université de Savoie: Calculus, Linear algebra, Probabilities
- 2019-2023 *Fabrication Additive Paris-Saclay: Shape optimization doctoral course for PhD students, with G. Allaire*
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Organization and Responsibilities

- 2019 *Journées Optimisation de Formes et Applications (JOFA 4)*, 28-29 oct. 2019
Palaiseau (France), website: <https://jofa.sciencesconf.org/>
- 2022–present Organization of the Seminar of the Analysis Pole at CMAP
- 2023–present Elected member of the CMAP council
- May 2023 Member of the selection committee for a "Maître de Conférences" position at University Grenoble-Alpes
- 2024 Member in thesis defense jury: Fernando Hubner, Ecole Polytechnique (2024), Luca GORINI, Ecole Polytechnique

Talks

- *Optimal Partitions and Anisotropic Perimeter*, Seminar, Université de Savoie, 2013
- *Eigenvalue optimization under perimeter constraint*, ANR Optiform, Rennes and Seminar Avignon, 2015
- *Numerical methods in shape optimization*, Colloque InterActions Grenoble, April 2015
- *Numerical method for solving boundary eigenvalue problems*, ANR Optiform, Paris, 2015
- *Some numerical aspects in spectral partitioning problems*, Workshop on Calculus of Variations, Chambéry, 2015
- *Spectral optimization and fundamental solutions*, Journées EDP Rhône-Alpes-Auvergne, 2015
- *Optimal partitions on surfaces - Numerical aspects*, ANR Optiform-Geometrya, 2016
- *Optimization of spectral quantities under perimeter constraint*, Journées Jeunes EDPistes Français, March 2016
- *Partitions of minimal length on surfaces*, PICOE, June 2016
- *Spectral optimization on variable domains*, Operator Theory Conference, Timisoara, Romania 2016
- *Optimal partitions for spectral functionals*, Calculus of Variations Seminar, Paris, 2017
- *Regularity of minimizers for an optimization problem under perimeter constraint*, Spectral Theory Group Seminar, Orsay, 2017
- *Numerical shape optimization on fixed grids*, Seminar University of Lille, 2017
- *Optimal partitions for spectral functionals*, Seminar University of Poitiers, 2017
- *Parametric representation in shape optimization*, Seminar University of Nancy, 2017
- *Numerical computation of optimal partitions*, Seminar University of Tours, 2017
- *Large Optimal Spectral Partitions*, Conference - SMAI 2017
- *Discrete version of an optimal partitioning problem*, International conference on difference equations and applications, Timisoara, Romania, 2017
- *Automatic conception and optimization of supports in additive manufacturing*, Presentation, Project SOFIA, Paris, June 2017
- *Parametric representation in shape optimization*, Seminar, Isaac Newton Institute, Cambridge, November 2017
- *Optimization of Supports in Additive Manufacturing*, Seminar, University of Pau, January 2018
- *Optimization of Supports in Additive Manufacturing*, Congres CANUM 2018
- *Optimization of Supports in Additive Manufacturing*, Journées Optimisation de Formes et Applications, Pau, June 2018
- *Optimization of Supports in Additive Manufacturing*, European Conference on Computational Mechanics, Glasgow, June 2018
- *Shape optimization using the phase-field method*, Seminar CMAP École Polytechnique, June 2018
- *Efficient algorithms for finding optimal partitions for spectral functionals*, Computational and Data Science seminar, University of Luxembourg, July 2018
- *Parametric shape optimization using the support function*, Rencontres normandes EDP, November 2018
- *Optimizing supports in additive manufacturing*, New trends and challenges in the mathematics of optimal design, Isaac Newton Institute, June 2019
- *Optimizing the eigenvalues of the Dirichlet-Laplace operator under perimeter and diameter constraints*, Aspect 19, September 2019
- *Optimization of supports in additive manufacturing*, Séminaire Fabrication Additive Paris-Saclay, February 2020
- *Parametric shape optimization using the support function*, Séminaire Parisien d'Optimisation: Institut Henri Poincaré, Paris, February 2020
- *Optimizing supports in additive manufacturing*, Workshop Additive Manufacturing - Arkema Chair at Ecole Polytechnique, November 2020

- *Optimizing the Steklov eigenvalues under various constraints*, Geometric and Computational Spectral Theory, Canadian Mathematical Society Winter Meeting, December 2020
- *Parametric shape optimization in FreeFEM*, FreeFEM Days, December 2020
- *Longest minimal length partitions*, ANR SHAPO Seminar, June 2021
- *On the polygonal Faber-Krahn inequality*, Online workshop on Numerical Methods in Bifurcation Theory - Madrid University, December 2021
- *On the polygonal Faber-Krahn inequality*, ANR SHAPO meeting Autrans, April 2022
- *On the polygonal Faber-Krahn inequality*, IP Paris Optimization meeting, April 2022
- *On the polygonal Faber-Krahn inequality*, Spectral Geometry in the Clouds, May 2022
- *SFB Seminar*, University of Bonn, May 2022
- *Numerical optimization among convex sets*, Shape optimization, related topics and applications, Roscoff, June 2022
- *On the polygonal Faber-Krahn inequality*, Minisymposium "Geometric Variational Problems and Their Applications", SIAM Annual Meeting, July 2022
- *Discrete optimal partitioning problems*, International conference on difference equations and applications, July 2022
- *Towards a hybrid (theoretical-numerical) proof in shape optimization*, CMAP opening day, September 2022
- *On the polygonal Faber-Krahn inequality*, QuamProcs ANR meeting, Bordeaux, October 2022
- *Shape optimization among convex sets*, seminar Groupe de travail CalVa, Paris, October 2022
- *Shape Optimization: Theory and Numerics*, Maths en herbe seminar for 3rd year students, IHES, Bures-sur-Yvette, 2023
- *Accessibility constraints in shape optimization*, ANR SHAPO conference, Paris, 2023

Scientific computing skills

Coding: Matlab, FreeFEM, Python, Jupyter Notebook, Pari-GP, Julia
 Toolboxes: Maximizing perimeter of minimal length partitions in 2D/3D (Python, FreeFEM):
<https://github.com/bbogo/LongestShortestPartitions>
 Optimal Cheeger Clusters (Matlab):
https://github.com/bbogo/Cheeger_patch
 Shape Optimization for convex shapes (FreeFEM):
<https://github.com/bbogo/ConvexSets>
 Blaschke Santalo diagrams: studying optimal inequalities (Matlab):
<https://github.com/bbogo/BlaschkeSantalo>
 Numerical proof of local minimality for a problem in shape optimization: the polygonal Polya-Szego conjecture (Matlab, Intlab):
<https://github.com/bbogo/PolyaSzego>

Distinctions

- *International Mathematical Competition for University Students*: First Prize 2010; Second Prize 2008, 2009, 2011 (reference www.imc-math.org).

Languages

English: Reading, Writing, Speaking fluent.
 French: Reading, Writing, Speaking good.
 Romanian: Reading, Writing, Speaking native.

Hobbies

Mathematical problem solving blog: mathproblems123.wordpress.com

Project Euler <http://projecteuler.net> - Level 13 (solved over 325 problems)

Chess, Piano