

# Corentin Le Coz

POST-DOC · PURE MATHEMATICS

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## Areas of research

I am interested in geometry and analysis in metric spaces, including Cayley and vertex-transitive graphs. More precisely, my research is focused on coarse-geometric monotone invariants: asymptotic dimension, Poincaré and separation profiles. Recently, I've also been interested in applications of geometric group theory in cryptography.

## Work Experience

### Technion – Israel Institute of Technology

Post-Doc

Supervisor: N. Lazarovich (Technion)

*Geometric group theory, Hyperbolic geometry, Buildings*

Haifa, Israel

Nov. 2020 - PRESENT

## Education

### Université Paris-Saclay

PHD IN PURE MATHEMATICS

Supervisors: R. Tessera (IMJ-PRG), J. Briousselle (IMAG)

PhD report available [here](#)

*Coarse geometry, Isoperimetry, Expansion of graphs*

Orsay, France

2017 - 2020

### ENS Paris-Saclay

MASTER'S DEGREE IN MATHEMATICAL TEACHING

Preparation for French higher education competitive exam

Diploma "agrégation" obtained in 2017, ranked 26<sup>th</sup> over 305 admitted.

*Linear algebra, Calculus, Probability, Computer algebra*

Cachan, France

2016 - 2017

### Université Paris-Diderot

MASTERS DEGREE IN MATHEMATICAL RESEARCH

Master thesis: Integrable orbit equivalence and free groups, after Lewis Bowen

Supervisor: R. Tessera (IMJ-PRG)

*Measured group theory, Operator algebra, Differential Geometry*

Paris, France

2015 - 2016

## Publications

### Higher dimensional platforms for Tillich-Zémor hash functions

MAIN AUTHOR, CO-AUTHOR WITH C. BATTARBEE, R. FLORES, T. KOBERDA AND D. KAHROBAEI

*Using recent work of Arzhantseva-Biswas, we define new Tillich-Zémor hash functions, using as platforms higher dimensional special linear groups over finite fields. The Cayley graphs involved combine quick mixing properties and high girth, which give rise to good preimage and collision resistance of the hash functions.*

Preprint available [here](#)

Preprint

### Hyperbolic groups with logarithmic separation profile

CO-AUTHOR WITH N. LAZAROVICH

*We prove that hyperbolic groups with logarithmic separation profiles split over cyclic groups. This shows that such groups can be inductively built from Fuchsian groups and free groups by amalgamations and HNN extensions over finite or virtually cyclic groups. However, we show that not all groups admitting such a hierarchy have logarithmic separation profile by providing an example of a surface amalgam over a cyclic group with superlogarithmic separation profile.*

Preprint available on [arXiv.org](#)

Submitted

### Poincaré profiles of lamplighter diagonal products

AUTHOR

*We exhibit finitely generated groups with prescribed Poincaré profiles. It can be prescribed for functions between  $n / \log n$  and linear, and is sharp for functions at least  $n / \log \log n$ . As applications, we show that there exists bounded degrees graphs of asymptotic dimension one that do not coarsely embed in any finite product of bounded degrees trees, exhibit hyperfinite sequences of graphs of arbitrary large distortion in  $L^p$ -spaces, and prove the existence of a continuous family of pairwise uncomparable amenable groups.*

Preprint available on [arXiv.org](#)

Submitted

## Separation profiles, isoperimetry, growth and compression

accepted at *Ann. Inst. Fourier*

CO-AUTHOR WITH A. GOURNAY

We give lower and upper bounds for the separation profile (introduced by Benjamini, Schramm & Timár) for various graphs using isoperimetric profile, volume growth and Hilbertian compression. We show that solvable groups of exponential growth cannot have a separation profile bounded above by a sublinear power function. We also introduce a notion of local separation, with applications for percolation clusters of  $\mathbb{Z}^d$  and graphs which have polynomial isoperimetry and growth.

Preprint available on [arXiv.org](https://arxiv.org)

## Talks

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|---------|--|---------------------|
| Mar. 22 | <b>CUNY Algebra and Cryptography Seminar</b> , Hyperbolic groups with logarithmic separation profile                 | New York City, USA  |
| Jul. 21 | <b>Young Geometric Group Theory X</b> , Embeddings into products of trees (lightning talk)                           | online              |
| Jun. 21 | <b>GAGTA 21</b> , Poincaré profiles of diagonal products of lamplighters (contributed talk)                          | online              |
| Dec. 20 | <b>Technion Geometry and Topology Seminar</b> , Expanders, Property (T) and Poincaré profiles                        | Haifa, Israel       |
| Jun. 20 | <b>University of Bristol Analysis and Geometry Seminar</b> , Separation profiles of solvable groups                  | Bristol, UK         |
| May 20  | <b>ENS Group Theory Seminar</b> , Separation and isoperimetric profiles, slides available <a href="#">here</a>       | Paris, France       |
| Feb. 20 | <b>Alfréd Rényi Institute Geometry and Probability Seminar</b> , Separation and isoperimetric profiles               | Budapest, Hungary   |
| Jan. 20 | <b>Séminaire Darboux de l'Université de Montpellier</b> , Profil de séparation des groupes résolubles                | Montpellier, France |
| May 19  | <b>Séminaire GTD de l'Université Paris-Saclay</b> , Une étude des liens entre séparation et isopérimétrie            | Orsay, France       |
| Mar. 19 | <b>ANR Gamme conference</b> , Une étude des liens entre séparation et isopérimétrie                                  | St Etienne, France  |
| Dec. 18 | <b>Graduate students popularization seminar</b> , Growth function of groups, abstract available <a href="#">here</a> | Orsay, France       |

## Conferences and workshops

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|---------|---|--------------------|
| Jul. 21 | <b>Young Geometric Group Theory X</b> , Actions on Trees and Cantor Sets, Helly graphs and groups   | online             |
| 2021    | <b>Technion, Geometry workshops</b> , Buildings following Ronan, L-space conjecture following Gordon, JSJ decompositions following Guirardel and Levitt | Haifa, Israel      |
| 2019    | <b>Université Paris-Saclay, Geometry workshops</b> , Margulis Superrigidity following Zimmer, Expander graphs following Lubotzky                        | Orsay, France      |
| Mar. 19 | <b>ANR Gamme conference</b> , Groups, Actions, Metrics, Measures and Ergodic theory   | St Etienne, France |
| May 18  | <b>ANR Agira conference</b> , IRS à Sète  | St Etienne, France |
| Feb. 18 | <b>Borel combinatorics and ergodic theory</b> , CIB conference  | Lausanne, Switz.   |
| Oct. 17 | <b>ANR Gamme conference</b> , Groups, Actions, Metrics, Measures and Ergodic theory   | St Jean, France    |

## Schools

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|--------|---|-------------------|
| Jan 19 | <b>Groups and Geometries Master Class</b> , $CAT(0)$ geometry, Lattices in Lie groups | Marseille, France |
| May 18 | <b>MathExp school</b> , Linear programming, Computer Algebra, Markov chains           | St Flour, France  |

## Teaching experience

### Teaching assistant in Mathematics

UNIVERSITÉ PARIS-SACLAY

Various bachelor and undergraduate courses: Algebra, Analysis, Computer algebra, ODE, Basics

Orsay, France

2017 - 2020

### Oral examinations

LYCÉE PIERRE DE COUBERTIN (MEAUX); INSTITUT BOSSUET, UNIVERSITÉ PARIS 7, LYCÉE SAINT-NICOLAS

Bachelor competitive exam training

Paris, France

2013 - 2018

## Skills

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|--------------------|--|
| <b>Programming</b> | Python, Sagemath (advanced, with teaching experience), Scilab, C++ (ability to illustrate mathematical subjects) |
| <b>Tools</b>       | $\text{\LaTeX}$ , Git, Bash scripting  |
| <b>Languages</b>   | French (native), English (fluent)  |

## Personal information

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**Date of birth** July 1, 1992

**Marital status** Married, two children

**Nationality** French

## Miscellaneous

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**Popularization** Active participation in math events for children: Math en Jean (2018), Journée de la Science (2018, 2019)

**Music** Guitar and violin player (jazz, classical)