Arthur Garnier

Mathematics teacher and associate researcher at the LAMFA

+337 72 72 78 97
arthur.garnier@math.cnrs.fr
www.lamfa.u-picardie.fr/agarnier/eng
arthur-garnier
0000-0003-4069-3203

Qualifications

2018–2021 **PhD of Fundamental Mathematics**, *under the supervision of David Chataur and Daniel Juteau*, UPJV, Amiens, Title: Equivariant cellular models in Lie theory.
Defended on December 10th, 2021.

2017–2018 **Master of Mathematics**, *UPJV and Université de Paris*, Amiens, Mention Très bien[1].
Spécialité Algèbre, Théorie des Nombres et Applications.

2015–2017 **Master of Mathematics, "Préparation à l'Agrégation[2]"**, *UPJV*, Amiens, Mention Très bien[1].
Admitted with rank 47 out of 305.

2013–2015 **Licence of Mathematics (BSc)**, *UPJV*, Amiens, Mention Très bien[1].

2012–2013 **Preparatory classes[3] (equivalent to first undergraduate year)**, *Lycée Louis Thuillier, Amiens*, Mention très bien[1].
Spécialité Physique, Chimie et Sciences de l'Ingénieur.

Papers

Published works

- **Fundamental polytope for the isometry group of an alcove.** *(joint work with L. Seco and K.-H. Neeb)*
  Journal of Algebra 683, pp. 633-671, December 2025.
  Available at `https://arXiv.org/abs/2501.01654`.

- **Complex degenerate metrics in general relativity: a covariant extension of the Moore–Penrose algorithm.** *(joint work with E. Battista)*
  European Physical Journal C, 85-284, March 2025.
  Available at `https://arXiv.org/abs/2502.10053`.

- **Particle dynamics in spherically symmetric electro-vacuum instantons.**
  European Physical Journal C, 84-374, April 2024.
  Available at `https://arXiv.org/abs/2401.15809`.

- **Equivariant triangulations of tori of compact Lie groups and hyperbolic extension to non-crystallographic Coxeter groups.**
  Journal of Algebra, 635, pp. 527-576 December 2023.
  Available at `https://arxiv.org/abs/2105.00237`.

[1] For the meaning of such a mention, see `https://en.wikipedia.org/wiki/Academic_grading_in_France`
[2] See `https://en.wikipedia.org/wiki/Agregation` and `https://agreg.org/`
[3] `https://www.enseignementsup-recherche.gouv.fr/fr/classes-preparatoires-aux-grandes-ecoles-cpge-46496`

- **Motion equations in a Kerr-Newman-de Sitter spacetime: some methods of integration and application to black holes shadowing in Scilab.**
  Classical and Quantum Gravity, 40-13, June 2023.
  Available at `https://arxiv.org/abs/2307.04073`.

- **Cellularization for exceptional spherical space forms and the flag manifold of $SL_3(\mathbb{R})$.** *(joint work with R. Chirivì and M. Spreafico)*
  Expositiones Mathematicae 40-3, pp. 572-604, September 2022.
  Available at `https://arxiv.org/abs/2006.14417`.

Preprints

- **Fundamental polytope for the Weyl group acting on a maximal torus of a compact Lie group.**
  Submitted, available at `https://arxiv.org/abs/2409.16483`.

- **Dirichlet–Voronoi domain and injectivity radius of flag manifolds - equivariant cell structures on $O(3)/O(1)^3$.**
  Accepted, available at `https://arxiv.org/abs/2011.06338`.

Teaching

2022– **Main teacher of the first year class**, *Preparatory classes*, Lycée Jean Calvin, Noyon.
Discipline: Applied Mathematics (10h per week).

2021–2022 **Lecture sessions**, *Université de Picardie Jules Verne, Amiens.*
- Scientific calculus (12h in second graduate year “Préparation à l’Agrégation”).

2018–2022 **Exercise sessions**, *Université de Picardie Jules Verne, Amiens.*
- Elementary calculus (20h in first undergraduate year, 2018-2022).
- General algebra: groups, rings, fields (35h in third undergraduate year, 2018-2021).
- Complex numbers and geometry (20h in third undergraduate year, 2018-2021).
- Numerical optimization (20h in first graduate year, 2021-2022).
- Numerical analysis (18h in second undergraduate year, 2021-2022).
- Scientific calculus (12h in second graduate year “Préparation à l’Agrégation”, 2021-2022).
- Affine and Euclidean geometry (8h in second undergraduate year, 2020-2021).
- Probability and statistics (8h in first undergraduate year, 2018-2019).

Talks

In conferences

2022 **Soergel bimodules.**
Arbeitsgemeinschaft: Geometric Representation Theory (Oberwolfach, Germany), 04/05.

Hyperbolic tori for finite non-crystallographic Coxeter groups.
Colloque tournant du GDR TLAG (Dijon, France), 03/17.

In seminars

2025 **Equivariant triangulations of tori of Lie groups and hyperbolic tori for non-crystallographic Coxeter groups**
Dynamics seminar of the LMPA Joseph Liouville (Calais, France), 13/02.

2022 **Numerical general relativity: how to shadow a black hole?**
PhD students seminar of the LAMFA (Amiens, France), 05/18.

Some W-equivariant cellular models in Lie theory.
Topology seminar of the Laboratoire Paul Painlevé (Lille, France), 02/04.

2021 **Equivariant cellular structures on the flag manifold of $\mathbb{R}^3$ and Dirichlet–Voronoi domains.**
Algebra seminar of the LAMFA (Amiens, France), 11/04.

Introduction to arithmetic groups
Workgroup "Topology of moduli spaces of principally polarized abelian varieties" (Amiens, France), 06/08.

Hyperbolic tori for finite non-crystallographic Coxeter groups.
Algebra seminar of the LAMFA (Amiens, France), 04/15.

Homotopy, invariants and Serre fibrations.
Second lecture of the workgroup "Simplicial random variables" (Amiens, France), 03/17.

Equivariant cellular structures on spheres and flag manifolds.
Algebra/Topology seminar (Copenhagen, Denmark), 02/15.

2019 **Representation theory: from finite groups to reductive algebraic groups and Borel–Weil theory.**
PhD students seminar of the LAMFA (Amiens, France), 10/02.

2018 **Enumerative geometry & Schubert calculus – From the four lines to cohomology and characteristic classes.**
PhD students seminar of the LAMFA (Amiens, France), 10/17.

Conferences

2022 **Journées tresses 2022 : Groupes de tresses généralisés**, *Amiens, France.*
From 08/29 to 09/02.

Arbeitsgemeinschaft: Geometric Representation Theory, *Oberwolfach, Germany.*
From 04/03 to 04/08.

Colloque tournant du GDR "Théorie de Lie algébrique et géométrique", *Dijon, France.*
From 03/16 to 03/18.

2019 **Colloque 2019 du GDR "Topologie algébrique et applications"**, *Arras, France.*
From 10/28 to 10/31.

2018 **Lens Topology and Geometry**, *Lens, France.*
From 11/12 to 11/13.

Representations in Lie Theory and Interactions, *CIRM, Marseille, France.*
From 11/05 to 11/09.

Colloque 2018 du GDR "Topologie algébrique et applications", *Montpellier, France.*
From 10/23 to 10/26.

Other activities

2020–2021 **Co-organizer of the workgroup “Simplicial random variables”**, Amiens.
With Yohan Hosten, Clément Lefevre and Ismaïl Razack.

2019–2020 **Co-organizer of the PhD students seminar of the LAMFA**, Amiens.
With Clément Lefevre and Ismaïl Razack.

Miscellaneous

Computer science skills

Programming **GAP, Python, Scilab, Sage, Maple.**

Other languages **Linux, SQL, LaTeX.**

Spoken languages

French, *Native.*

English, *C1 level.*

German, *A2 level.*

Hobbies

Classical Piano, *self-taught practice since 15 years.*