

CURRICULUM VITAE

Contact information

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Education

- Université Paris-Sud, PhD in mathematics, 2005.
- École Normale Supérieure, 1999-2003.

Diplomas

- 2001 : DEA "Méthodes algébriques" from Université Paris 6.
Title of the DEA thesis : Termes locaux dans la formule des points fixes de Lefschetz, d'après un article de M. Goresky et R. MacPherson.
Director : Gérard Laumon.
- 2003 : Agrégation externe de mathématiques (rank : 4th).
- December 2005 : PhD in mathematics, Université Paris-Sud.
Title : Complexes d'intersection des compactifications de Baily-Borel.
Le cas des groupes unitaires sur \mathbb{Q} .
Director : Gérard Laumon.

Academic positions

- Directeur de recherche, CNRS and ENS Lyon, since February 2020.
- Invited professor, Université Lyon 1, February-May 2018.
- Invited professor, ENS de Lyon, October 2017-January 2018.
- Professor, Princeton University, September 2012-January 2019.
- Member, Institute for Advanced Study, 2012-2013.
- Professor, Harvard University, December 2009- August 2012.
- Member, Institute for Advanced Study, 2010-2011.
- Visitor, Harvard University, September 2009 - December 2009.
- Member, Institute for Advanced Study, 2006-2009.

- Teaching assistant, Université Paris-Sud (September 2002-August 2005).

Publications

(available on the arXiv)

- *Complexes d'intersection des compactifications de Baily-Borel. Le cas des groupes unitaires sur \mathbb{Q}* , thèse, Université Paris-Sud (2005)
- *Complexes pondérés sur les compactifications de Baily-Borel. Le cas des variétés de Siegel*, J. Amer. Math. Soc. 21 (2008), p 23-61
- *Note sur les polynômes de Kazhdan-Lusztig*, Math. Z. 268 (2011), no. 1-2, p 593-600
- *On the cohomology of certain non-compact Shimura varieties*, Annals of Mathematics Studies 173, Princeton University Press (2010)
- *Cohomologie d'intersection des variétés modulaires de Siegel, suite*, Compos. Math. 147 (2011), no. 6, p 1671-1740
- *The intersection complex as a weight truncation and an application to Shimura varieties*, Proceedings of the International Congress of Mathematicians, Hyderabad, India (2010)
- *The sign conjecture for Shimura varieties*, with Junecue Suh, Journal für die reine und angewandte Mathematik (2014)
- *Construction de représentations galoisiennes de torsion, d'après Peter Scholze*, séminaire Bourbaki, juin 2015
- *Some combinatorial identities appearing in the calculation of the cohomology of Siegel modular varieties*, with Richard Ehrenborg and Margaret Readdy, (*Algebraic Combinatorics*, October 2019)
- *A generalization of combinatorial identities for stable discrete series constants*, with Richard Ehrenborg and Margaret Readdy (*Journal of combinatorial algebra*, 2022)
- *Sharing pizza in n dimensions*, with Richard Ehrenborg and Margaret Readdy (*Transactions of the American Mathematical Society*), 2022
- *Pizza and 2-structures*, with Richard Ehrenborg and Margaret Readdy (to appear in *Discrete & Computational geometry*)
- *The six operations on perverse motives*, with Florian Ivorra (to appear in *Journal of the European Mathematical Society*)

Prepublications

(available on the arXiv)

- *Mixed l -adic complexes for schemes over number fields* (submitted, 2019)

- *Comparison of different definitions of pseudocharacters*, with Kathleen Emerson (2023)

Advanced courses

- Spring 2014 : graduate course at Princeton University on the geometric Satake correspondence.
- Fall 2014 : graduate course at Princeton University on Vincent Lafforgue's work on the global Langlands correspondence.
- February-March 2015 : mini-course (10h) called *On the Kontsevich-Zagier conjecture on periods* at the CRM in Montréal as Aisenstadt chair.
- May 2015 : mini-course (10h) called *Deformation rings in equal characteristic* at the CRM in Montréal as Aisenstadt chair.
- February 2016 : mini-course (10h) at the IPM in Teheran on the global Langlands correspondence.
- May 2016 : mini-course (8h) at the ENS de Lyon on the geometric Langlands correspondence.
- June 2016 : mini-course (4h) at the summer school *Fundamental groups in arithmetic geometry* on Vincent Lafforgue's work.
- January 2017 : mini-course (10h) on derived deformation rings at TIFR in Mumbai.
- January-April 2018 : graduate course at the Université Lyon 1 on derived algebraic geometry.
- May 2018 : mini-course (10h) with Benoît Stroh on the work of Genestier-Lafforgue about the local Langlands correspondence.
- Spring 2019 : graduate course at Princeton University on rigid analytic geometry (adic spaces).
- Fall 2019 : graduate course at Princeton University on homological algebra.
- Fall 2020 : graduate algebraic geometry course at the ENS Lyon.
- Fall 2021 : graduate course on Lie groups and Lie algebras at the ENS Lyon.
- June 2022 : *Weighted cohomology of Shimura varieties*, course at the IRMA summer school *Motives and arithmetic groups* in Strasbourg.
- July 2022 : *Introduction to Shimura varieties*, course at the IHES summer school on the Langlands program.
- Fall 2022 : a graduate course on complex algebraic geometry and a graduate course on rigid geometry at the ENS Lyon.
- Fall 2023 : Graduate course on representation theory at the ENS de Lyon.

Other teaching

- At Harvard University :
 - Fall 2009 : Math 21b (linear algebra and differential equations).
 - Spring 2010 : Math 129 (number fields).
 - Fall 2011 : Math 21b (linear algebra and differential equations), and a graduate student seminar on Morihiko Saito's theory of pure Hodge modules (with Sam Raskin).
 - Spring 2012 : Math 21a (multivariable calculus).
- At Princeton University :
 - Fall 2012 : Co-organizer (with Chris Skinner and Richard Taylor) of the working seminar on number theory.
 - Spring 2013 : Co-organizer (with Chris Skinner and Richard Taylor) of the working seminar on number theory.
 - Fall 2013 : Math 449 (Representation theory of compact Lie groups) and Co-organizer (with Chris Skinner, Richard Taylor and SHouwu Zhang) of the working seminar on number theory.
 - Spring 2014 : Co-organizer (with Chris Skinner, Richard Taylor and SHouwu Zhang) of the working seminar on number theory.
 - Fall 2014 : Math 449 (Representation theory of Lie algebras), and Co-organizer (with Chris Skinner, Richard Taylor and Shouwu Zhang) of the working seminar on number theory.
 - Fall 2016 : Math 449 (Representation theory : finite groups, compact groups and introduction to Lie groups and Lie algebras) and Co-organizer (with Chris Skinner, Richard Taylor and SHouwu Zhang) of the working seminar on number theory.
 - Spring 2017 : Math 217 (Honors linear algebra) and Co-organizer (with Chris Skinner, Richard Taylor and Shouwu Zhang) of the working seminar on number theory.
 - I participated (and gave lectures) in the working seminars on reductive group schemes at the Université Lyon 1 and on Fargues's geometric proof of local class field theory at the ENS de Lyon.
 - Undergraduate seminar at the ENS de Lyon in January-April 2018 (about representations of finite groups and applications to random walks).
 - Fall 2018 : Math 449 (Representation theory : representations of locally compact groups, Peter-Weyl theorem, Gelfand pairs, applications).
- At the ENS Lyon :
 - Spring 2020 : Classical algebraic geometry.

Course notes and exposition

(available on my website)

- *Representation theory (fall 2018)*
- *Introduction à la géométrie algébrique dérivée* (notes of my graduate class at the Université Lyon 1 in January-April 2018).
- Notes of my two graduate classes about geometric Satake and Vincent Lafforgue's work (taken by Dan Collins, not proofread by me).
- *Notes from MAT 449 (Introduction to representation theory, Fall 2016)* (notes of all the lectures, homework problems, take-home final and full solutions)
- *I know that you know : enigmas based on the concept of common knowledge* (expository, in Persian, joint with Mohammad Shahryari; appeared in the Newsletter of the Iranian Mathematical Society, 149-150, Fall-Winter 2017)
- *Beilinson's construction of nearby cycles and gluing*
- *A quick introduction to perverse sheaves*

Service

- Participation in Hiring committees at Harvard and Princeton Universities, and in various French universities (at the graduate school, postdoc, junior faculty and senior faculty level).
- Member of the editorial committee of the *Journal de l'École polytechnique* and of *Essential Number Theory*.
- Organizer (with Arthur-César Le Bras, Vincent Pilloni and Timo Richarz) of the research school *Condensed mathematics* at CIRM in March 2023.
- Member of the outside scientific committee of the special trimester "Groupes algébriques et géométrisation du programme de Langlands" (ENS de Lyon and Université Lyon 1, April-June 2018).
- Organizer (with Dennis Gaitsgory and Xinwen Zhu) of the workshop "Global Langlands correspondence" at AIM in December 2016.
- Organizer (with Peter Scholze, Richard Taylor and Jared Weinstein) of the workshop *Perfectoid Spaces and their Applications* at MSRI in February 2014.
- Organizer (with Pascal Boyer, Alain Genestier, Laurent Lafforgue, Sergey Lysenko and Bao Chau Ngo) of the conference *De la géométrie algébrique aux formes automorphes : une conférence en l'honneur de Gérard Laumon* (Orsay, June 2012) and editor of the proceedings of that conference.

- Referee for the ERC.
- Since 2007 : Referee for *Annales de l'Institut Fourier*, *Annales Scientifiques de l'École Normale Supérieure*, *Annals of Mathematics*, *Astérisque*, *Compositio Mathematica*, *Duke Mathematical Journal*, *Inventiones Mathematicae*, *Journal de l'Institut Mathématique de Jussieu*, *Journal für die reine und angewandte Mathematik (Crelle)*, *Journal of the American Mathematical Society*.

Graduate advising

- Kathleen Emerson (phd, 2013-2018), topic : *Comparison of different definitions of pseudo-characters*.
- Josselin Poiret, Spring 2021, master's thesis.
- Swann Tubach, Spring 2021, master's thesis.
- Swaa Tubach, Fall 2022-, phd.

Undergraduate advising

- Spring 2012 : Lucia Mocz, reading course on the étale fundamental group.
- Spring 2013 : Minh-Tam Trinh, junior project titled *From representation theory to L-functions*.
- Spring 2015 : Daniel Li, sophomore independent project titled *Deligne-Lusztig theory for $GL_n(\mathbb{F}_q)$* .
- Fall 2016-Spring 2017 : Daniel Li, senior thesis titled *A Scholzian approach to the local Langlands correspondence for GL_n over function fields*.
- Spring 2017 : Joshua Wang, reading course on modern algebraic geometry.
- Spring 2017 : Roger van Peski, junior project titled *Macdonald polynomials and root systems*.
- Spring 2017 : Timothy Ratigan, junior project titled *Local class field theory is easier*.
- Spring 2017 : Xiaoyu Xu, junior project titled *A homological approach to Hilbert's third problem*.
- Spring 2019 : Two reading courses (introduction to Lie groups and modern algebraic geometry).
- Spring 2019 : Eitan Levin, junior project on invariant theory.
- Spring 2020 : Riku Kurama, junior project on de Jong's conjecture.
- Spring 2021 : Antoine Galet, senior thesis.
- Spring 2022 : Matteo Verni, senior thesis.

Fellowships and honors

- Clay Research Fellowship, 2006-2011.
- Speaker in the number theory section of the ICM in Hyderabad (India), August 2010.
- Prize of the European Mathematical Society (July 2012).
- Inaugural AWM-Microsoft prize in algebraic and number theory (August 2014).
- Aisenstadt chair at the CRM in Montréal (Spring 2015).