

Stefano Morra

Curriculum Vitae

Laboratoire d'Analyse, Géométrie Algèbre
Université de Paris 8, France

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Positions

- 2020-2025 **Membre Junior de l'Institut Universitaire de France**
- 2019.01- **Professeur d'Université**
Laboratoire d'Analyse, Géométrie et Applications
Université de Paris 8
- 2011.09- **Maître de Conférences**
2018.12 Université de Montpellier
- 2014.07- **Visiting researcher**
2015.06 University of Toronto
- 2012.01- **Fields-Ontario Post-Doctoral fellow**
2014.06 Fields Institute and University of Toronto
- 2008.09- **Doctorant-Moniteur**
2011.08 Université de Versailles St. Quentin

Career

- Décembre 2017 **Habilitation à Diriger de Recherches**, *Institut Montpelliérain Alexander Grothendieck*
After the reports of C. Breuil, M. Emerton, T. Gee;
Jury: I. Badulescu, C. Bonnafé, P. Boyer, C. Breuil, P. Colmez, F. Herzig, A. Mézard.
- December 2010 **Ph. D. defense**, *Laboratoire de Mathématiques de Versailles*
Supervisor : A. Mézard
- 2008.09 **Master 2 en Mathématiques**, *Université Paris-Sud, Orsay*, mention Très Bien
specialization: Algèbre, Analyse et Géométrie
- 2008.09 **Laurea specialistica in Matematica**, *Università degli Studi di Padova*, cum Laude
- 2006.11 **Laurea triennale in Matematica**, *Università degli Studi di Padova*, cum Laude
- 2004.06 **Diplomprüfung Violine**, *Kunstuniversität Graz*
Supervisor: Professor Y. Kless

Papers

Publications

- 1 *Explicit description of irreducible $GL_2(\mathbf{Q}_p)$ -representations over $\overline{\mathbf{F}}_p$* ,
Journal of Algebra 339, (2011), 252-303
- 2 *Invariant elements for p -modular representations of $GL_2(\mathbf{Q}_p)$* ,
Transaction of the American Mathematical Society 365, (2013), 6625-6667
- 3 *Multiplicity theorems modulo p for $GL_2(\mathbf{Q}_p)$* ,
Mathematische Zeitschrift 276, (2014), 421-456
- 4 *On some representations of the Iwahori subgroup*,
Journal of Number Theory 132, (2012), 1074 - 1150

- 5 *Sur la fidélité de certaines représentations de $GL_2(F)$ sous une algèbre d'Iwasawa*,
Rendiconti del seminario matematico dell' Università di Padova 131, (2014),
49-65,
with B. Schraen, Y. Hu
- 6 *Structure interne des représentations modulo p de $SL_2(\mathbf{Q}_p)$* ,
Manuscripta Mathematica 143, (2014), 191-206,
with R. Abdellatif
- 7 *Iwasawa modules and p -modular representations of GL_2* ,
Israel Journal of Mathematics Volume 219, Issue 1, (2017), 1–70
- 8 *Potentially crystalline deformation rings in the ordinary case*,
Annales de l'Institut Fourier, 66 no. 5, (2016), 1923–1964,
with B. Levin
- 9 *Sur les atomes automorphes de longueur 2 pour $GL_2(\mathbf{Q}_p)$* ,
Documenta Mathematica 22, (2017), 777–823
- 10 *On mod p local/global compatibility for GL_3 in the ordinary case*,
Compositio Mathematica 153, (2017) ,2215–2286,
with F. Herzig and D. Le
- 11 *Serre weights for ordinary 3-dimensional Galois representation*,
Journal of the London Mathematical Society 96 no. 2, (2017), 394–424 ,
with C. Park
- 12 *Potentially crystalline deformation rings and Serre type conjectures (Shapes and Shadows)*,
Inventiones Mathematicae 212 no. 1, (2018), 1–107,
with B. Levin, D. Le, B. Le Hung
- 13 *On mod p local/global compatibility for GL_3 in the non-ordinary case*,
Proceedings of the London Mathematical Society 117, (2018), 790–848,
with D. Le and C. Park
- 14 *Serre weights and Breuil's Lattice conjectue in dimension three*,
Forum of Mathematics, PI 8 (2020), e5,
with B. Levin, D. Le, B. Le Hung
- 15 *Multiplicity one at full congruence level*,
Journal de l' Institut de Mathématiques de Jussieu (2020), 1–22,
with D. Le and B. Schraen
- 16 *Serre weight conjectures for p -adic unitary groups of rank 2*,
Algebra & Number Theory 16 no. 9, (2022), 2005–2097,
with K. Koziol
- 17 *Local models for Galois representations and applications*,
Inventiones Mathematicae 231, 1277–1488 (2023),
with B. Levin, D. Le, B. Le Hung
- 18 *Gelfand–Kirillov dimension and mod p cohomology for GL_2* ,
Inventiones Mathematicae 234, pages 1–128 (2023),
with C. Breuil, F. Herzig, Y. Hu, B. Schraen
- 19 *Moduli of Fontaine–Laffaille modules and mod- p local-global compatibility*,
Memoirs of the American mathematical Society (to appear),
with D. Le, B. Le Hung, C. Park, Z. Qian

- 20 *Serre weights for three dimensional wildly ramified Galois representations*,
Algebra & Number Theory (to appear)
avec B. Levin, D. Le, B. Le Hung
- 21 *Extremal weights and a tameness criterion for mod- p Galois representations*,
Journal of the European Mathematical Society (to appear)
with B. Levin, D. Le, B. Le Hung
- 22 *Conjectures and results on modular representations of $GL_n(K)$ for a p -adic field K* ,
Memoirs of the American Mathematical Society (to appear)
with C. Breuil, F. Herzig, Y. Hu, B. Schraen
- 23 *Colength one deformation rings: results and applications*,
Transactions of the American Mathematical Society (to appear)
with D. Le, B. Le Hung, C. Park, Z. Qian

Preprints

- 24 *Multivariable $(\varphi, \mathcal{O}_K^\times)$ -modules and local-global compatibility*, (2022, 95 pages)
with C. Breuil, F. Herzig, Y. Hu, B. Schraen
- 25 *Gelfand–Kirillov dimension and mod p -cohomology for p -adic unitary groups of rank 2*, (2023, 67 pages),
with K. Koziol
- 26 *Local model theory for non-generic tame potentially Barsotti–Tate deformation rings*, (2023, 59 pages),
with A. Mézard, B. Le Hung
- 27 *K_1 -invariants in the mod p cohomology of $U(3)$ arithmetic manifolds*, (2024, 74 pages),
with D. Le, B. Le Hung

Other writings

- 1 *Sur les représentations modulaires en caractéristique p de $GL_2(K)$* ,
Actualités Mathématiques du CNRS (<https://www.insmi.cnrs.fr/fr/cnrsinfo/sur-les-representations-modulaires-en-caracteristique-p-de-gl2k>)
with C. Breuil, B. Schraen
- 2 *Le modèle local des représentations galoisiennes*,
Actualités Mathématiques du CNRS (to appear)

Advanced courses

- September 2023 **The Langlands Programme (for Algebraists)** , *University of Manchester*, (4 hours course)
for the international conference “Algebra and Number Theory in Conversation”
- April 2021 **Towards a mod p Langlands correspondence**, *Universitaet Duisburg–Essen*, (3 hours course)
for the international spring school “towards a mod p Langlands correspondence”
- March–Mai 2021 **Local models for potentially crystalline Galois representations**, *Ulsan National Institute of Science and Technology*, (16 hours course)
- December 2020 **Completed cohomology of Shimura curves**, *Tata Institute*, (Mumbai), (4 hours course)
for the international conference “Recent developments around p -adic modular forms”
- July 2020 **Patching and the p -adic local Langlands correspondence**, *Ulsan National Institute of Science and Technology*, (10 hours course)

- June 2019 **Patching and the p -adic local Langlands correspondence**, *Università degli studi di Padova*, (7.5 hours course)
for the international summer school “Padova school on Serre conjectures and the p -adic Langlands program ”
- Feb. 2015 **Recent developments in the p -adic Langlands correspondence**, *Università degli studi di Padova*, (4.5 hours course)
- Jan. 2015 **Global patching and the Breuil-Mézard conjecture for $GL_2(\mathbf{Q}_p)$** , *KIAS*, (Seoul), (5 hours course)
- Dec. 2013 **On the p -modular Langlands program for GL_2** , *Tata Institute*, (Mumbai), (6 hours course)
for the international conference “Conference on the Local Langlands Conjectures and Galois Representations”

Prizes, grants, outreach

Junior Member of the Institut Universitaire de France (Appointed 2020–2025)

Member of the ANR-DFG “Galois moduli und modulare Heckealgebren” (2023–2025), **Appel Aide à la Recherche** (2019 research fund from the Université Paris 8-LAGA), **Member of the ANR “CLap CLap”** (2018–2023), **Prime de recherche et d’encadrement doctoral** (2018–2022 et 2014–2018), **Délégation CNRS** (6 months, 2017), **Prix de Thèse** de la Fondation de Mathématiques Jaques Hadamard, 2012

Research in Pairs (Mathematisches Institut Oberwolfach, with B. Levin, D. Le, B. Le Hung), **AIM SQuaRE** (with B. Schraen, C. Breuil, S-W. Shin), **Research in Pairs** (Banff, with K. Koziol), **Research in Pairs** (Centro de Giorgi, Pisa, with B. Levin, D. Le, B. Le Hung), **Binôme de Recherche** (Luminy, with B. Levin, D. Le, B. Le Hung), **Research in Paris** (Institut Henri Poincaré, with B. Levin, D. Le, B. Le Hung)

INdAM periodo intensivo (25.000 EUR), **Compositio Foundation** (4995 EUR), **Berkeley-France Fund** (12.000 \$, Principal Investigator in France, avec S-W Shin, C. Breuil, B. Schraen), **FACCTS funding** (12.000 \$ avec B. Levin, B. Le Hung Chicago, B. Schraen, L. Fargues)

Ph. D. students

- 2018–2022 **Kegang Liu** (currently Post-Doc at Westlake University, Hangzhou, China),
Compatibilité locale-globale dans le programme de Langlands mod p ,
Co-supervisor: P. Boyer ,
Defended on February 11th, 2022 with jury: P. Boyer, C. Johansson, D. Le, A. Mézard,
S. Morra, B. Stroh, reports from C. Johansson et B. Stroh.
- 2021–2024 **Mohamed Moakher**, *Groupes de Selmer, Pseudodéformations locales et fonctionnalités de Langlands p -adiques*,
Funding: bourse de l'ENS Lyon
- 2021–2024 **Dat Pham**, *Geometry of the Emerton–Gee stack of p -adic Langlands parameters*,
co-supervisor: B. Le Hung
Funding: programme CoFund de la FSMP
- 2024–2027 **Youshua Kesting**, *A Drinfeld Lemma for Banach–Colmez spaces*, co-supervisor:
Johannes Anschuez, Arthur–César Le Bras
Funding: Université de Paris 8

Jury member for the Ph. D. thesis of

- Nov. 2022 **Seignus Mowlavi**, (Supervisor : C. Breuil, Orsay)
- Sept. 2021 **Hanneke Wiersema**, (Supervisor: F. Diamond, King's College London)
- June 2021 **Yichian Cai**, (Supervisor J. Tilouine, LAGA)
- October 2020 **Yu Min**, (Supervisor M. Morrow, Jussieu)
- July 2020 **Vincent de Daruvar**, (Supervisor : B. Schraen, Polytechnique)
- July 2019 **Zicheng Qian**, (Supervisor : C. Breuil, Orsay)

Organization of scientific events

- Summer 2022 **Iwahori-Hecke algebras and the mod- p Langlands program;
Regular de Rham Galois representations in the completed cohomology of modular curves;
Cohomologie étale des grassmanniennes affines et géométrie des modèles locaux**,
courses given by Karol Koziol (Michigan), Lue Pan (Princeton) and João Lourenço (Bonn), respectively
(co-organisé avec Arthur–César Le Bras)
- Fall 2021 **École Parisienne d'Arithmétique et Géométrie**
coordinator for the network of Ph. D. students in algebraic geometry and number theory in the Paris region
- Summer 2021 **Algebraic local models and Galois representations**, (organizer of a 2 month
cours given by B. Le Hung, invited on the excellence chair of the Fondation de Sciences Mathématiques de Paris)
(about 15 participants)
- January 2021 **The geometry of the stack of Fontaine-Laffaille modules**, (mini-cours given by
Z. Qian at the LAGA)
(about 10 participants)
- 2019–2024 **The Paris–London Number theory Seminar**, (co-organiser with : A. Caraiani,
F. Diamond, V. Dokchitser, D. Fiorilli, M. Hindry, M. Morrow, Y. Petridis, S. Zerbes)
(about 35 participants each event)

- September **Journées Arithmétiques du LAGA**, (*twice a year at the LAGA*)
 2019– (about 20 participants each event)
- Fall 2019 **Groupe de travail sur Caraiani–Scholze**, (*with the IMJ, Institut de Mathématiques d’Orsay*)
 (about 20 participants)
- Summer **Padova School on Serre weight conjectures and the p -adic Langlands program**, (*budget: 81550 EUR, >60 participants fully accommodated for 3 weeks*)
 2019
- 2012–2017 **organizer of the weekly seminars**, (*“Number and Representation theory” at UoToronto, “Séminaire de théorie des Nombres” at Université de Montpellier*)

Further Academic Responsibilities

Ecole Polytechnique, Lozère, Jury Committee for “Monge” Assistant Professor positions, 2019, 2020, 2021

Université de Paris 8, Université de Montpellier, Jury committee for MCF positions, 2018, 2020

Referee for, *IMRN, MRN, Annales de l’ENS, Israel J. of Math., Bulletin et Mémoires de la SMF, Rendiconti del Seminario dell’Università di Padova, Mathematische Zeitschrift, Documenta Mathematica, Proceedings of the LMS, Annals of Mathematical studies*

Research visits

- 2023 **Northwestern University, City University of New York, Hausdorff Center for Mathematics**, *invited by B-V Le Hung, K. Koziol, for special trimester “The Arithmetics of the Langlands program”*
- 2022 **Northwestern University**, *invited by B-V Le Hung*
- 2019 **UNIST (Ulsan), Northwestern University, University of California, Berkeley, Università degli Studi di Padova, University of Arizona**, *invited by C. Park, B-V Le Hung, S-W Shin, B. Chiarellotto, B. Levin respectively*
- 2018 **Korean Institute for Advanced Studies, Ecole Normale Supérieure (Lyon)**, *invited by C. Park, special trimester on the géométrisation of the Langlands program of Fargues–Scholze*
- 2017 **University of Arizona, École Polytechnique, CIRM, University of Bar-Ilan, University of Chicago**, *invited by B. Levin, B. Schraen, recherche en biôme, M. Schein, B-V Le Hung respectively*
- 2016 **Morningside center for Mathematics, University of Chicago, IHP, École Polytechnique**, *invited by Y. Hu, B. Levin, research in Paris, B. Schraen respectively*
- 2015 **École Polytechnique, University of Chicago, IHES, Max Planck Institute, Università di Padova**, *invited by B. Schraen, B-V. Le Hung, B. Schraen, Max Planck, B. Chiarellotto respectively*
- 2014 **University of Chicago, IHES, TATA Institute**, *invited by B. Levin, B. Schraen, E. Gathe respectively*

Selected talks

In international conferences

- July 2024 “On the mod- p cohomology of Shimura curves and representations of $GL_2(\mathbf{Q}_p^f)$ ”, **Université du Luxembourg**, for the closing conference of the ANR *Galois Representations, Automorphic Forms and their L-functions*.
- June 2021 “Fontaine–Laffaille modules and mod p local–global compatibility”, **Université de Montpellier**, for the *Journées du GDR Théorie de Lie Algébrique et Géométrie*
- April 2021 “Towards a mod p Langlands correspondence”, **Universitaet Duisburg–Essen**, for the international spring school “towards a mod p Langlands correspondence”
- December 2020 “Completed cohomology of Shimura curves”, **Tata Institute (Mumbai)**, *Minicourse* for the international conference “Recent developments around p -adic modular forms”
- July 2019 “Local models for potentially crystalline deformation rings and the Breuil–Mézard conjecture”, **Università degli studi di Genova**, Recent advances in the arithmetic of Galois representations
- July 2018 “An algebraic local model for mod p Galois representations”, **CIRM-Luminy**, for the Conference *p -adic Langlands, Shimura varieties and Perfectoids*
- May 2018 “An algebraic local model for mod p Galois representations”, **University College London** for the 24th *London-Paris Number theory seminar*
- June 2017 “Generalized Serre conjectures, local-global compatibility, and the p -adic local Langlands program”, **Bar-Ilan University**, 5-th Israeli *Algebra and Number Theory Day*
- February 2017 “Propriétés de multiplicité un à niveau de congruence principal pour les courbes de Shimura”, **Université d’Amiens**, *Colloque tournant* en théorie de Lie algébrique et géométrie
- August 2016 “On the mod p local Langlands program for Hilbert modular forms”, **Banach Center-Będlewo**, for the conference *Galois representations and automorphic forms*
- June 2016 “Serre weights and Breuil’s Lattice conjectue in dimension three”, **Université de Caen**, *Journées Arithmétiques de Caen*
- January 2014 “On the ordinary representations in the p -modular Langlands program”, **Tata Institute, Mumbai**, *International Conference on the p -adic Langlads correspondence*

In weekly seminars

- 2024 **Bordeaux, Heidelberg, Sydney**
- 2023 **Cambridge**
- 2022 **Melbourne**
- 2021 **Muenster, RAMpAGe (online), Paris 13, Brazilia (online), Tokyo (online)**
- 2020 **Jussieu, Marseille, Grenoble, Versailles**
- 2019 **Paris 13, University of Illinois at Urbana Champaign, Orsay**
- 2018 **Jussieu, Strasbourg, Versailles, Lyon, Seoul**
- 2017 **ENS Lyon, Bordeaux, Amsterdam**
- 2016 **Grenoble, Paris 13, Montpellier, Rennes**
- 2015 **Duisburg-Essen, Max Plank Institut, Strasbourg**
- 2014 **Jussieu, Versailles Saint-Quentin, Northwestern, Chicago, Rochester, Buffalo**
- 2013 **Ottawa, King’s College London, Padova**
- 2012 **Columbia, Toronto, Muenster**

2011 ENS Lyon, Rennes, Bordeaux, Jussieu, Besançon, Strasbourg