

Curriculum Vitae

DANIEL LE

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Education/Employment

- 2020 – Assistant Professor, Purdue University
- 2017 – 2020 NSF Postdoctoral Research Fellow, University of Toronto
- 2016 – 2017 Member, Institute for Advanced Study
- 2015 – 2016 Postdoctoral Fellow, University of Toronto
- 2015 Ph.D. University of Chicago, Mathematics (advisor: Matthew Emerton)
- 2009 B.S. Stanford University, Mathematics (with Honors)

Scientific/Academic honors, grants

- 2023 – 2026 NSF Standard Grant DMS-2302623
- 2017 – 2021 NSF Postdoctoral Research Fellowship
- 2019 Jan. MFO, Oberwolfach “Research in Pairs” program, “Local models and Serre conjectures”, co-PI: Bao V. Le Hung (IAS), Brandon Levin (U of Arizona), Stefano Morra (U de Montpellier)
- 2018 July Centro de Giorgi “Research in Pairs” Program, “Local models and Serre conjectures”, co-PI: Bao V. Le Hung (IAS), Brandon Levin (U of Arizona), Stefano Morra (U de Montpellier)
- 2018 Chercheur invité CNRS, Institut Montpelliérain Alexander Grothendieck
- 2017 June Centre International de Rencontres Mathématiques Research in Pairs Program, “Serre conjectures and p -adic local Langlands”, co-PI: Bao V. Le Hung (U of Chicago), Brandon Levin (U of Chicago), Stefano Morra (U de Montpellier)
- 2016 – 2018 AMS-Simons travel grant
- 2016 July Henri Poincaré Institute Research in Paris Program, “Serre conjectures and the mod p Langlands program for unitary groups”, co-PI: Bao V. Le Hung (U of Chicago), Brandon Levin (U of Chicago), Stefano Morra (U de Montpellier)
- 2009 – 2014 National Science Foundation Graduate Research Fellowship
- 2010 – 2012 McCormick Fellowship, University of Chicago, Department of Mathematics
- 2009 – 2010 Fulbright Scholarship, Russia
- 2009 Firestone Medal (senior thesis prize), Stanford University, Department of Mathematics
- 2009 Member, Phi Beta Kappa Honors Society, Stanford University Chapter

Research interests Algebraic number theory, (p -adic) Langlands program, Galois representations, p -adic representation theory, p -adic Hodge theory

Publications

- 21. (with Bao V. Le Hung, Brandon Levin, and Stefano Morra) *Generic decomposition patterns for Deligne–Lusztig representations*, 17 pp. submitted. [arXiv:math.NT/](https://arxiv.org/abs/math.NT/)
- 20. (with Bao V. Le Hung and Stefano Morra) *K_1 -invariants in the mod p cohomology of $U(3)$ arithmetic manifolds*, 85 pp. submitted. [arXiv:math.NT/2403.09843](https://arxiv.org/abs/math.NT/2403.09843)
- 19. (with Bao V. Le Hung, Stefano Morra, Chol Park, and Zicheng Qian) *Colength one deformation rings*, 34 pp. to appear in Transactions of the AMS. [arXiv:math.NT/2304.03061](https://arxiv.org/abs/math.NT/2304.03061)
- 18. (with Bao V. Le Hung, Brandon Levin, and Stefano Morra) *Extremal weights and a tameness criterion for mod p Galois representations*, 65 pp. to appear in Journal of the EMS. [arXiv:math.NT/2206.06442](https://arxiv.org/abs/math.NT/2206.06442)

17. (with Bao V. Le Hung, Brandon Levin, and Stefano Morra) *Serre weights for three-dimensional wildly ramified Galois representations*, 50 pp. to appear in Algebra & Number Theory. arXiv:math.NT/2202.03303
16. (with Bao V. Le Hung, Stefano Morra, Chol Park, and Zicheng Qian) *Moduli of Fontaine–Laffaille modules and a mod p local-global compatibility result*, 169 pp. to appear in Memoirs of the AMS. arXiv:math.NT/2109.02720
15. (with Bao V. Le Hung) *Serre weights, Galois deformation rings, and local models*, 24 pp. to appear in the Proceedings of the International Colloquium on Arithmetic Geometry
14. (with Eknath Ghate and Mihir Sheth) *Non-admissible irreducible representations of p -adic GL_2 in characteristic p* , Representation Theory **27** (2023), 1088–1101. arXiv:math.NT/2210.07281
13. (with Bao V. Le Hung, Brandon Levin, and Stefano Morra) *Local models for moduli of Galois representations*, Invent. Math. **231** (2023), no. 3, 1277–1488.
12. *Reductive groups I: irreducible representations of reductive groups*, MFO Report no. 18 (2022), 938–940.
11. (with Stefano Morra and Benjamin Schraen) *Multiplicity one at full congruence level*, J. Inst. Math. Jussieu **21**, no. 2, 637–658 (2022).
10. (with Andrea Dotto) *Diagrams in the mod p cohomology of Shimura curves*, Compositio Mathematica **157**, no. 8, 1653–1723 (2021).
9. (with Bao V. Le Hung, Brandon Levin, and Stefano Morra) *Serre weights and Breuil’s lattice conjecture in dimension three*, Forum of Math Pi **8**, e5, 135 pp. (2020).
8. *On some nonadmissible smooth irreducible representations for GL_2* , Math. Research Letters **26**, no. 6, 1747–1758 (2019).
7. *Multiplicity one for wildly ramified representations*, Algebra & Number Theory **13**, no. 8, 1807–1827 (2019).
6. (with Bao V. Le Hung and Brandon Levin) *Weight elimination in Serre-type conjectures*, Duke Math. Journal **168**, no. 13, 2433–2506 (2019).
5. (with Stefano Morra and Chol Park) *On mod p local-global compatibility for $\mathrm{GL}(3)$ in the non-ordinary case*, Proceedings of the LMS **117**, no. 4, 790–848 (2018).
4. (with Bao V. Le Hung, Brandon Levin, and Stefano Morra) *Potentially crystalline deformation rings and Serre weight conjectures*, Invent. Math. **212** (2018), no. 1, 1–107.
3. (with Florian Herzig and Stefano Morra) *On mod p local-global compatibility for $\mathrm{GL}(3)$ in the ordinary case*, Compositio Mathematica **153**, no. 11, 2215–2286 (2017).
2. *Lattices in the cohomology of $U(3)$ arithmetic manifolds*, Math. Annalen **372**, no. 1–2, 55–89 (2018).
1. (with Shelly Manber and Shrenik Shah) *On p -adic properties of twisted traces of singular moduli*, in International Journal of Number Theory **06**, no. 3, 625–653 (2010).

Invited Presentations

- 2024 May Caltech, Number theory seminar: *Some results on the weight part of Serre’s conjecture*
 — Mar. UCLA, Number theory seminar: *Some results on the weight part of Serre’s conjecture*
- 2023 Oct. University of Toronto, Number theory and representation theory seminar: *A mod p multiplicity one result*
 — Sept. Dame Kathleen Ollerenshaw Workshop: Algebra and Number Theory in Conversation, University of Manchester: *A mod p multiplicity one result*
 — Sept. Purdue University, Automorphic forms and representation theory seminar: *A mod p multiplicity one result*

- Apr. Michigan State University: *Automorphic congruences at tame level and a tameness criterion*
- Feb. University of Chicago, Number theory seminar: *Mod p algebraic modular forms on $U(3)$ at first congruence level at p*
- 2022 Oct. Purdue University, Math History seminar: *The concept of a group*
- Sept. Purdue University, Automorphic forms and representation theory seminar: *Automorphic congruences at tame level and a tameness criterion*
- Apr. Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach Arbeitsgemeinschaft 2214, Geometric Representation Theory: *Reductive groups I: irreducible representations of reductive groups*
- 2021 June CMS 75th Anniversary Summer Meeting, Ottawa (Representations of p -adic groups and Langlands correspondences): *A mod p local-global compatibility result for generic Fontaine-Laffaille representations*
- 2020 Dec. p -adic methods and modular forms Conference, International Center for Theoretical Sciences: *A tameness criterion for generic modular mod p Galois representations*
- Nov. Purdue University, Algebraic geometry seminar: *Moduli stacks of Galois representations and local models*
- Nov. Purdue University, Automorphic forms and representation theory seminar: *Serre weights, Breuil-Mézard cycles, and models for Galois deformation spaces*
- Oct. Ulsan National Institute of Science and Technology Colloquium: *Modular forms and congruences*
- Apr. AMS Sectional Meeting, Purdue University (p -adic Galois Representations, Modularity, and Related Topics): *cancelled*
- Jan. TIFR, International Colloquium on Arithmetic Geometry: *Serre weights, the Breuil-Mézard conjecture, and models for deformation rings*
- 2019 Dec. Purdue University Colloquium: *Congruences between modular forms*
- Nov. UC San Diego Colloquium: *Congruences between modular forms*
- Nov. University of Waterloo Colloquium: *Congruences between modular forms*
- Oct. Modularity and Moduli Spaces Workshop, Oaxaca: *Monodromy local models and their geometry*
- June Padova School on Serre conjectures and the p -adic Langlands program: *The mod p cohomology of Shimura curves at first principal congruence level*
- June CMS Summer Meeting, Regina (Session on Representation Theory of Groups Defined over Local Fields): *mod p representations of p -adic GL_2*
- Mar. Morningside Center of Mathematics: *The Breuil-Mézard conjecture for generically tamely potentially crystalline representations*
- Feb. University of Toronto, Number Theory and Representation Theory Seminar: *The Breuil-Mézard conjecture for generically tamely potentially crystalline representations*
- Jan. University of Pittsburgh Colloquium: *Congruences in Langlands reciprocity*
- Jan. McGill University Colloquium: *Congruences in Langlands reciprocity*
- 2018 Dec. University of Illinois-Chicago Colloquium: *Congruences in Langlands reciprocity*
- Dec. Texas A&M Colloquium: *Congruences in Langlands reciprocity*
- Nov. University of California, San Diego, Number Theory Seminar: *Serre weights and affine Grassmannians*
- Nov. University of Illinois at Chicago, Pop-up Number Theory Conference: *Diagrams in the mod p cohomology of Shimura curves*
- July L'Université de Montpellier, Séminaire Algèbre Géométrie Algébrique Topologie Algébrique: *Modular forms: Hodge theory and Arithmetic*
- Mar. University of Utah, Representation Theory and Number Theory Seminar: *The weight part of Serre's conjecture*

- Mar. University of Utah, Department Colloquium: *Conjectures on modularity*
- Mar. Fields University Workshop on Algebraic Varieties, Hodge Theory and Motives: *Weights of mod p Galois representations*
- Mar. Binghamton University Arithmetic Seminar: *The weight part of Serre's conjecture*
- Mar. Cornell University Number Theory Seminar: *The weight part of Serre's conjecture*
- Feb. Queen's University Colloquium: *The geometry of Galois representations*
- 2017 Dec. Rice University Colloquium: *Finite linear groups and duality*
- Dec. Michigan State University Colloquium: *Finite linear groups and duality*
- 2016 Nov. Johns Hopkins Number Theory Seminar: *Weight and level in Serre's conjecture for $U(n)$*
- Oct. Québec-Maine Number Theory Conference: *Weight and level in Serre's conjecture for $U(n)$*
- Sept. Institute for Advanced Study Number Theory working group: *Weight and level in Serre's conjecture for $U(n)$*
- Sept. Institute for Advanced Study Postdoc Series: *Lifting Galois representations*
- July Institut Henri Poincaré working group: *The Breuil–Mézard conjecture and the weight part of Serre's conjecture for $U(3)$*
- June Ottawa Mathematics Conference: *Serre's conjecture on mod p modular forms*
- May Indiana University, The p -adic Langlands Program and Related Topics: *Potentially crystalline deformation rings and applications to local-global compatibility*
- Feb. Québec-Vermont Number Theory Seminar: *Potentially crystalline deformation rings and the cohomology of $U(3)$ arithmetic manifolds*
- 2015 Dec. CMS Winter Meeting (Algebraic Number Theory): *The weight part of Serre's conjecture for $U(3)$*
- Oct. University of Toronto (Number theory seminar): *The weight part of Serre's conjecture*
- Mar. University of Toronto (Number theory seminar): *Lattices in the cohomology of $U(3)$ arithmetic manifolds*
- 2014 May University of Chicago (Number theory seminar): *Lattices in the algebraic vectors of $U(3)$ arithmetic manifolds*

Teaching

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| 2024 | Algebraic geometry (reading course), Purdue University |
| 2024 | Class field theory II (reading course), Purdue University |
| 2024 | Modular forms II (reading course), Purdue University |
| 2024 | Class field theory I (reading course), Purdue University |
| 2024 | Modular forms I (reading course), Purdue University |
| 2023 | Algebraic number theory (graduate course), Purdue University |
| 2023 | Algebraic geometry (reading course), Purdue University |
| 2023 | Lie groups (reading course), Purdue University |
| 2023 | Abstract algebra II: Representation theory (graduate course), Purdue University |
| 2023 | Algebraic number theory (reading course), Purdue University |
| 2022 | Introduction to abstract algebra (graduate course), Purdue University |
| 2022 | Linear algebra and its applications (undergraduate course), Purdue University |
| 2022 | Arithmetic curves and surfaces (reading course), Purdue University |
| 2022 | Algebraic number theory (reading course), Purdue University |
| 2022 | Commutative algebra (reading course), Purdue University |
| 2022 | Elliptic curves (graduate topics course), Purdue University |
| 2022 | Fourier analysis on number fields (reading course), Purdue University |
| 2021 | Abstract Algebra I (graduate course), Purdue University |
| 2021 | Algebraic number theory (reading course), Purdue University |

2021	Representations of the Weil group and p -adic GL_n (reading course), Purdue University
2021	Finite flat group schemes (reading course), Purdue University
2021	Linear algebra and its applications (5/15 weeks), Purdue University
2021	Elliptic curves and modular forms (reading course), Purdue University
2020	Elliptic curves and modular forms (reading course), Purdue University
2019	Linear algebra, University of Toronto
2019	Calculus II, University of Toronto
2018	Linear algebra, University of Toronto
2015 – 2016	Multivariable Calculus (two semester course), University of Toronto
2014 – 2015	Calculus (three quarter course), University of Chicago
2011 – 2012	Teaching assistant: Introduction to Representation Theory of Finite Groups, Introduction to Commutative Algebra, Topics in Geometry, University of Chicago

Mentoring

2024 –	Ruipeng Zou (Ph.D. student)
2024 –	Esteban Saldarriaga Marin (Undergraduate student)
2023 –	Mansimar Singh (Ph.D. student)
2023 –	Heejong Lee (Postdoc)
2021 – 2023	Shiang Tang (Postdoc)
2020 – 2021	Justin Fong (Ph.D. student)
2020 – 2021	Mason Kennedy (Masters student)
2021 –	Emerging Leaders Science Scholars mentor, Katherine Yi
2014 Sum.	Mentor for six students in the University of Chicago REU
2013 Fall	Mentor for the University of Chicago Directed Reading Program
2012 Sum.	Mentor for six students in the University of Chicago REU
2011 Sum.	Mentor for six students in the University of Chicago REU
2010 Sum.	PROMYS Counselor, Boston University

Committees

Thesis committees

2024	Christian Hokaj
2023	Yifu Wang
2022	Pavel Coupek
2022	Kegang Liu
2021	Heng Du

Advanced topics exams

2024	Benjamin Doyle
2024	Kyungtak Hong
2023	George Nico Diaz-Wahl
2022	Daniel Flores
2021	Christian Hokaj