

Bao V. Le Hung

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CONTACT INFORMATION	Department of Mathematics Northwestern University 2033 Sheridan Road Evanston, IL 60208, USA	E-mail: lhvietbao@gmail.com
RESEARCH INTERESTS	Galois representations, Automorphic forms, Arithmetic geometry and their interactions. Moduli spaces of Galois representations and related aspects in modular and geometric representation theory.	
EDUCATION	Ph.D in Mathematics, Harvard University, May 2014 (Advisor: Richard Taylor). MMath (with Distinction), University of Cambridge, May 2009. B.A. in Mathematics (Senior Wrangler), University of Cambridge, May 2008.	
PRE-DOCTORAL AWARDS, HONORS AND FELLOWSHIPS	Jean E. de Valpine Fellowship in Mathematics, Harvard University (2013-2014). Joseph John Fay III and Phuong-Mai Fay Fellowship, Harvard University (2013-2014). Pierce Fellowship, Harvard University (2009-2012). Senior Scholar, Trinity College, University of Cambridge (2006-2008).	
POSTDOCTORAL AWARDS, HONORS AND FELLOWSHIPS	Fondation Sciences Mathematiques de Paris Research Chair (2021) Sloan Research Fellowship, Alfred Sloan Foundation (2019-2021) Berlekamp Scholar, MSRI (Fall Term 2014).	
EMPLOYMENT	Associate Professor, Northwestern University (September 2023 - present) Assistant Professor, Northwestern University (July 2018 - August 2023). Member, Institute for Advanced Study (September 2017 - July 2018). L.E. Dickson Instructor, University Chicago (September 2014- June 2017). Postdoctoral Fellow, Mathematical Sciences Research Institute (August 2014- December 2014).	
GRANTS	NSF grant “Moduli spaces of Galois representations” (2023-2026) NSF FRG grant “Geometric structures in the p -adic Langlands program” (2021-2023) NSF grant “Moduli of Galois Representations and Applications” (2018-2021). France and Chicago collaboration in the Sciences grant, University of Chicago (2016-2017).	

Research in Paris grant, Institut Henri Poincaré (June 2016- July 2016)

PUBLICATIONS AND
PREPRINTS

17. B. Le Hung, A. Mezard, and S. Morra, *Local model theory for non-generic tame potentially Barsotti-Tate deformation rings*, arXiv:2311.16617 (2023), *submitted*, 59 pages.
16. T. Feng and B. Le Hung, *Mirror symmetry and the Breuil-Mezard conjecture*, arXiv:2310.07006 (2023), *submitted*, 77 pages.
D. Le, B. Le Hung, S. Morra, C. Park and Z. Qian, *Colength one deformation rings*, arXiv:2304.03061 (2022), *submitted*, 45 pages.
15. D. Le, B. Le Hung and S. Morra, *$K(1)$ invariants in mod p cohomology of $U(3)$ arithmetic manifolds*, preprint (2023).
14. D. Le, B. Le Hung, B. Levin and S. Morra, *Local models for Galois deformation rings and applications*, *Inventiones Mathematicae* **231** (2023), 1277-1488..
13. P. Allen, F. Calegari, A. Caraiani, T. Gee, D. Helm, J. Newton, B. Le Hung, P. Scholze, R. Taylor and J. Thorne *Potential automorphy over CM fields*, *Annals of Mathematics* **197** no. 3 (2023), 897-1113.
12. D. Le, B. Le Hung, B. Levin and S. Morra, *Extremal weights and a tameness criterion for mod p Galois representations*, arXiv:2206.06442 (2022), *submitted*, 65 pages.
11. D. Le, B. Le Hung, B. Levin and S. Morra, *Serre weights for wildly ramified three dimensional representations*, *Algebra and Number Theory*, *to appear* 50 pages.
10. D. Le and B. Le Hung, *Serre weights, Galois deformation rings, and Local models*, *Proceedings of the International Colloquium on Arithmetic Geometry*, *to appear*, 25 pages .
9. D. Le, B. Le Hung, S. Morra, C. Park and Z. Qian, *Moduli of Fontaine-Laffaille representations and a mod p local-global compatibility result*, *Memoirs of the AMS*, *to appear*, 169 pages.
8. D. Le, B. Le Hung, B. Levin, and S. Morra, *Serre weights and Breuil's lattice conjecture in dimension three*, *Forum of Mathematics, Pi*, **8** (2020), 135 pages.
7. D. Le, B. Le Hung, and B. Levin, *Weight elimination in Serre type conjectures*, *Duke Mathematical Journal* **168**, number 13 (2019), 2433-2506.
6. D. Le, B. Le Hung, B. Levin, and S. Morra, *Potentially crystalline deformation rings and Serre weight conjectures: Shapes and Shadows*, *Inventiones Mathematicae* **212** (2018), 1-107.
5. B. Le Hung and C. Li, *Level raising mod 2 and arbitrary 2-Selmer ranks*, *Compositio Mathematica* **152** (2016) issue 08, 1576-1608.
4. A. Caraiani and B. Le Hung, *On the image of Complex conjugation in Automorphic Galois representations*, *Compositio Mathematica* **152** (2016) issue 07, 1476-1488.
3. N. Freitas, B. Le Hung, and S. Siksek, *Elliptic curves over real quadratic fields are modular*, *Inventiones Mathematicae* **201** (2015), 159-206.
2. Q. Ho, B. Le Hung, and B. C. Ngo, *Average size of 2-Selmer groups of elliptic curves over function fields*, *Mathematical Research Letters* **21** (2014) no. 6, 1305-1339.
1. B. Le Hung, *Modularity of some elliptic curves over totally real fields*, Harvard PhD Thesis (2014).

IN PROGRESS

B. Le Hung, *Local model theory for non-generic potentially crystalline Emerton-Gee stacks*

D. Le, B. Le Hung, *Some multiplicity one results for GL_n* .

D. Le, B. Le Hung, *Serre weights over CM fields*.

INVITED TALKS

Workshop on Deformation Theory and Arithmetic, BIRS (January 2023).

East Asia Algebraic Geometry Seminar (October 2022).

Joint Berkeley-Caltech-Stanford Number Theory Seminar (February 2022).

Yale Geometry, Symmetry and Physics Seminar (September 2021).

Special session on Galois representations and automorphic forms, Mathematical Congress of the Americas (July 2021).

John Hopkins University and University of Maryland Algebra and Number Theory Day (April 2021).

UCSD Number theory seminar (December 2020).

UCLA Number theory seminar (September 2020).

Workshop on Serre weight conjectures and geometry of Shimura varieties, Universite de Montreal (September 2020).

Asian Mathematical Conference, Quang Ninh, Vietnam (July 2021) (cancelled due to COVID-19).

International Colloquium on Arithmetic Geometry, Tata Institute for Fundamental Research (January 2020).

Boston College-MIT Number Theory seminar (December 2019).

Modular Representation Theory, Clay Math Institute, Oxford (October 2019).

Joint IAS/ Princeton University Number Theory Seminar (March 2018).

Yale Algebra and Number Theory Seminar (November 2017).

University of Arizona Algebra and Number Theory Seminar (November 2017).

Automorphic forms and Arithmetic Seminar, Columbia University (October 2017).

Seminaire de Geometrie Algebrique, University of Montpellier (September 2017).

Ecole Polytechnique Special Seminar (September 2017).

Ohio State University Number Theory Seminar (April 2017).

UIUC Number Theory Seminar (April 2017).

Special Session on Automorphic Forms and Algebraic Number Theory, AMS Sectional Meeting, University of Indiana (April 2017).

University of Minnesota Automorphic Forms and Number Theory Seminar (March 2017).

Duke University Number Theory Seminar (January 2017)

Boston College Number Theory Seminar (December 2016)

Northwestern University Number Theory Seminar (December 2016)

Rice University Algebraic Geometry and Number Theory Seminar (November 2016)

Joint IAS/Princeton University Number Theory Seminar (September 2016).

Working group on Serre weight conjecture and Breuil's lattice conjecture, Institut Henri Poincaré (July 2016).

Number Theory and Algebraic Geometry Seminar, Rice University (March 2016).

Automorphic Forms and Representation Theory Seminar, Purdue University (March 2016).

Number Theory Seminar, University of Chicago (February 2016).

Number Theory Seminar, Boston University (December 2015).

Number Theory Seminar, John Hopkins University (October 2015).

Number Theory Seminar, Hanoi Mathematics Institute (September 2015).

Number Theory Seminar, Northwestern University (February 2015).

Number Theory Seminar, UC Berkeley (November 2014).

Postdoc Seminar, MSRI (October 2014).

Princeton junior Number Theory Seminar, Princeton University (November 2013)

Number Theory Seminar, Vietnamese Institute for Advanced Studies in Mathematics-VIASM (August 2013).

Pan Asia Number Theory Conference, VIASM (July 2013).

RESEARCH VISITS Université Paris 13, April 2021 - September 2021.

University of Arizona, December 16- December 20, 2019.

Workshop on Modularity and Moduli Spaces, Oaxaca, October 20 - October 25, 2019.

University of Padova, February - March 2019.

Research in pairs program, MFO Oberwolfach, January 2019.

University of Arizona, November 13 - November 17, 2017.

CNRS Visiting Position, University of Montpellier, July 12 - October 12 2017.

CIRM, Luminy, June 12 - June 30 2017.

Research in Paris, Institut Henri Poincaré, June 25 - July 24 2016.

Vietnamese Institute for Advanced Studies in Mathematics (VIASM), August - September 2015, July 2014, July - August 2013, July - August 2012

TEACHING

Instructor

- Math 518, Topics in Galois representations, Northwestern University (Spring 2023).
- Math 336-1, Elementary number theory, Northwestern University (Winter 2023).
- Math 220-2, Single-Variable Integral Calculus, Northwestern University (Spring 2022).
- Math 240, Linear algebra, Northwestern University (Fall 2021, Fall 2022).
- Math 518, Elliptic curves, Northwestern University (Winter 2021).
- Math 470-1, 2, Algebra, Northwestern University (Fall 2020, Winter 2021).
- Math 518, Modular forms, Northwestern University (Winter 2020).
- Math 482, Algebraic Number Theory, Northwestern University (Fall 2018, Fall 2019, Winter 2022).
- Math 250, Elementary Differential Equations, Northwestern University (Fall 2018, Spring 2019).
- Math 20300 Analysis in $\mathbb{R}^n - 1$, University of Chicago (Fall 2015, Winter 2017).
- Math 20400 Analysis in $\mathbb{R}^n - 2$, University of Chicago (Winter 2016, Spring 2017).
- Math 20500 Analysis in $\mathbb{R}^n - 3$, University of Chicago (Winter 2015, Fall 2016, Winter 2017).
- Math 25600 Basic Algebra-3, University of Chicago (Spring 2016).
- Math 26700 Representations of Finite Groups, University of Chicago (Fall 2015).
- Math 19620 Linear Algebra, University of Chicago (Spring 2015).
- Math 21a Multivariable Calculus, Harvard University (Spring 2014).

Advanced Mini-Courses

- Introduction to local models of Galois deformation rings, Université Paris 13 (Spring 2021).
- Mini course in Hausdorff School on the Emerton-Gee stack and related topics, Hausdorff Center for Mathematics, Bonn (Sep 2019).
- Modular forms and elliptic curves, University of Padova (Spring 2019).
- Number Theory: From classical to modern (summer school, joint with Prof. B. C. Ngo), VIASM (Sep 2015).
- The Modularity Theorem, SEAMS Summer School ‘Algebraic Curves’, VIASM (July 2013).
- Introduction to Elliptic curves, VIASM Summer School, VIASM (July-Aug 2012).

MENTORSHIP

Undergraduate students

- Sun Woo Park, University of Chicago (Fall 2015, joint with Prof. F. Calegari)

Graduate students

- Junho Won, Northwsetern University (2022-).
- Dat Pham, Universite Paris 13 (2021-), joint with Prof S. Morra.
- Stephan Snegirov, Northwestern University (2021-).
- Eivind Hjelle, Northwestern University (2020-).
- Pham Ngoc Hoang Minh, University of Chicago (PhD 2019), joint with Prof. B. C. Ngo.
- Jora Belusov, Northwestern University (MA 2019).

DEPARMENTAL SERVICE

- Graduate admissions Committee (2018-2019).
- Tenure-line hiring Committee (2019-2020,2020-2021,2021-2022).
- Postdoctoral hiring Committee (2020-2021).
- Colloquium Committee (2021-2022).
- Organizer of Northwestern University Number Theory Seminar (2018-).

PROFESSIONAL SERVICE

- Editor, Bulletin and Journal of the LMS (2024-present).
- Referee: Publicationes I.H.E.S, Forum of Mathematics Pi, Duke Math. Journal, Algebra and Number Theory, Math.Annalen, Selecta Mathematica, Math. Res. Letters, Math.Zeit, Pacific Jour. Math., Canadian Jour. of Math., Acta.Vietnam.Math, Revista Math. Iberoamericana, Manuscripta Mathematica.
- Reviewer for Math Review.
- Co-organizer of Northwestern University Number Theory Seminar (2018 - present)
- Co-organizer of University of Chicago Number Theory Seminar (2015-2017).
- Co-organizer (with Tuan D. Ngo and Hai P. Ho), Special Session on Arithmetic Geometry, 2019 Vietnam - USA joint Mathematical Meeting, Quy Nhon University.

WORKSHOP AND CONFERENCES ATTENDED

- Spring School “Towards a mod p local Langlands correspondence” (April 2021).
- Representation Theory and Analysis on Locally Symmetric Spaces, IAS (March 2018).
- Motives, Galois representations and cohomology around the Langlands program, IAS (November 2017).
- Deformation Theory, Completed Cohomology, Leopoldt Conjecture and K-theory, CIRM Luminy (December 2016).
- Automorphic forms, Shimura varieties, Galois representations and L-functions, MSRI (December 2014).
- Categorical structures in Harmonic Analysis, MSRI (November 2014).
- Pan Asia Number Theory Conference, VIASM (July 2013).
- Arizona Winter School, University of Arizona (March 2013).
- Fields Medal Symposium, Fields Institute (October 2012).
- Workshop on Cohomology of Shimura varieties: arithmetic aspects and the construction of Galois representations, Fields Insitute (March 2012).

- Workshop on the arithmetic geometry of Shimura varieties and Rapoport-Zink spaces, Kyoto University (July 2011).
- FRG/RTG workshop on L-functions, Galois representations and Iwasawa theory, University of Michigan (May 2011).
- Workshop on Galois representations and Automorphic forms, IAS (March 2011).
- Summer school and conference on automorphic forms and Shimura varieties, ICTP (July 2007).

CITIZENSHIP

- Vietnamese
- USA permanent resident