

# CURRICULUM VITAE

LIANG XIAO

## Contact Information.

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## Academic Interests.

- Slopes of modular forms, and eigenvarieties.
- Geometric representation theory.
- Geometry of Shimura varieties.
- $p$ -adic automorphic forms.
- $p$ -adic Hodge theory and  $(\varphi, \Gamma)$ -modules.
- Iwasawa theory for non-ordinary modular forms.
- Theory of nonarchimedean differential modules and its applications to ramification theory.

## Employment.

- Dickson Instructor at Mathematics Department, University of Chicago, September 2009–February 2013.
- Assistant Professor at Mathematics Department, University of California at Irvine, March 2013–June 2014.
- Assistant Professor at Mathematics Department, University of Connecticut, Storrs, August 2014–August 2019. (tenure approved)
- Professor at Beijing International Center for Mathematical Research, Peking University, August 2019–present.

## Education.

- Ph.D. in Mathematics Science, Massachusetts Institute of Technology, June 2009 (Advisor: Kiran S. Kedlaya).
- B.S. in Mathematics Science, Peking University, China, in June 2005.

## Awards and Grants.

- NSF CAREER grant: “Slopes of  $p$ -adic Modular Forms,” 2018–2019 (DMS–1752703).
- Research Excellence Program, 2018–2019, UConn.
- NSA conference grant: “Connecticut Summer School in Number Theory 2018,” February 2018 (Joint with J. Balakrishnan, K. Conrad, and Á. Lozano-Robledo).
- NSF conference grant: “Connecticut Summer School in Number Theory,” August 2016 (DMS–1608789), (Joint with K. Conrad, A. Folsom, and Á. Lozano-Robledo).
- NSF grant: “Special fibers of modular varieties,” 2015–2018 (DMS–1502147).
- CORCL faculty research grant, UC Irvine, 2014.
- Simons Foundation Collaboration Grant, 2013–2016 (#278433).

- NSF conference grant: “Towards a local proof of local Langlands correspondence”, May 2012 (DMS-1207440), (Joint with M. Morrow, R. Takloo-Bighash, and S. Varma).
- International Mathematics Olympiad: Gold Medal, 2001.

## Publications.

- (1) (*Joint with Kiran Kedlaya*) Differential modules on  $p$ -adic polyannuli, **Journal de l’Institut de Mathématiques de Jussieu** **9** (2010), 155–201.
- (2) On ramification filtrations and  $p$ -adic differential equations, I: equal characteristic case, **Algebra and Number Theory** **4** (2010), 969–1027.
- (3) On ramification filtrations and  $p$ -adic differential equations, II: mixed characteristic case, **Compositio Mathematica** **148** (2012), 415–463.
- (4) On refined ramification filtrations in the equal characteristic case, **Algebra and Number Theory** **6** (2012), 1579–1667.
- (5) (*Joint with Kiran Kedlaya and Jonathan Pottharst*) Cohomology of arithmetic families of  $(\varphi, \Gamma)$ -modules, **Journal of the American Mathematical Society** **27** (2014), 1043–1115.
- (6) (*Joint with Igor Zhukov*) Ramification of higher local fields, approaches and questions, **Algebra i Analiz** **26** (2014), issue 5, 1–40. reprinted in **Proceedings of the 2nd International Conference on Valuation Theory**.
- (7) (*Joint with Robert Harron*) On  $p$ -adic family of Gauss-Manin connections for nearly overconvergent modular forms, **Annales de l’Institut Fourier** **64** (2014), 2449–2464.
- (8) Cleanliness and log-characteristic cycles of vector bundles with flat connections, **Mathematische Annalen** **362** (2015), 579–627.
- (9) (*Appendix to “On automorphy of certain Galois representations of  $GO_4$ -type” by Tong Liu and Jiu-Kang Yu*) Tensor being crystalline implies each factor being crystalline up to twists, **Journal of Number Theory** (special issue for Prof. Winnie Li) **161** (2016) 70–72.
- (10) (*Joint with Chris Davis and Daqing Wan*) Newton slopes for Artin-Schreier-Witt towers, **Mathematische Annalen** **364** (2016), 1451–1468.
- (11) (*Joint with Yichao Tian*)  $p$ -adic cohomology and classicality of overconvergent Hilbert modular forms, in **Astérisque** **382** (2016), 73–162.
- (12) (*Joint with Yichao Tian*) On Goren-Oort stratification for quaternionic Shimura varieties, **Compositio Mathematica** **152** (2016), 2134–2220.
- (13) (*Joint with Matthew Emerton and Davide Reduzzi*) Galois representations and torsions in the coherent cohomology of Hilbert modular varieties, **Journal für die reine und angewandte Mathematik** **726** (2017), 93–127.
- (14) (*Joint with Davide Reduzzi*) Partial Hasse invariants on splitting models of Hilbert modular varieties, **Annales Scientifiques de l’École Normale Supérieure** **50** (2017), 579–607.
- (15) (*Joint with Daqing Wan and Jun Zhang*) Slopes of eigencurves over boundary disks, **Mathematische Annalen** **369** (2017), 487–537.
- (16) (*Joint with Ruochuan Liu and Daqing Wan*) Eigencurves over the boundary of weight space, **Duke Mathematical Journal** **166** (2017), 1739–1787.
- (17) (*Joint with Rufe Ren, Daqing Wan, and Myungjun Yu*) Slopes for higher rank Artin-Schreier-Witt towers, **Transactions of the American Mathematical Society** **370** (2018), 6411–6432.
- (18) (*Joint with David Helm and Yichao Tian*) Tate cycles on some unitary Shimura varieties mod  $p$ , **Algebra and Number Theory** **11** (2017), 2213–2288.
- (19) (*Joint with Matthew Emerton and Davide Reduzzi*) Unramifiedness of Galois representations arising from some Hilbert modular varieties, **Forum of Mathematics Sigma** **5** (2017), E29.

- (20) (*Joint with Xinwen Zhu*) On vector-valued twisted conjugate invariant functions on a group, in *Representation of Reductive Groups*, **Proceedings of Symposia in Pure Mathematics** **101**, 361–425.
- (21) (*Joint with Yichao Tian*) Tate cycles on some quaternionic Shimura varieties over finite fields, **Duke Mathematical Journal** **168** (2019), 1551–1639.

### Preprints.

- (1) (*Joint with Jonathan Pottharst*) On the parity conjecture in finite-slope families, [arXiv:1410.5050](#).
- (2) (*Joint with Xinwen Zhu*) Cycles on modular varieties via geometric Satake, [arXiv:1707.05700](#).
- (3) (*Joint with Yifeng Liu, Yichao Tian, Wei Zhang, and Xinwen Zhu*) On the Beilinson–Bloch–Kato conjecture for Rankin–Selberg motives, [arXiv:1912.11942](#).

### Research Talks.

- Slopes of modular forms and ghost conjecture of Bergdall and Pollack, Harvard University, December 11, 2019.
- Bloch–Kato conjecture for some Rankin–Selberg motives, University of Laval, November 22, 2019.
- A refined halo theorem, Quebec–Vermont Number theory seminar, November 21, 2019.
- Two talks on cycles on special fiber of Shimura varieties, workshop on *Geometric realizations of Jacquet–Langlands correspondences*, American Institute of Mathematics, November 12 and 13, 2019.
- On the slopes of modular forms, Paris–Peking–Tokyo Seminar, October 16, 2019.
- Cycles on Shimura varieties via geometric Satake, Tsinghua University, October 14, 2019.
- Tate cycles on special fibers of Shimura varieties, Tsinghua University, October 11, 2019.
- On the ghost conjecture of Bergdall and Pollack, *The p-adic Langlands programme and related topics*, at King’s College London, May 2019.
- AIM SQuaRE: geometry of Shimura varieties and arithmetic applications to L-functions, American Institute of Mathematics, San Jose, CA, April 2019.
- Bloch–Kato conjecture for some Rankin–Selberg motives, UC Berkeley, April 2019.
- Bloch–Kato conjecture for some Rankin–Selberg motives, Binghamton University, February 2019.
- Bloch–Kato conjecture for some Rankin–Selberg motives, Ohio State University, February 2019.
- Basic locus of Shimura varieties and application to Tate conjecture, Johns Hopkins University, November, 2018.
- On the Beilinson–Bloch–Kato conjecture in the unitary Gan–Gross–Prasad paradigm, University of Maryland, November 2018.
- An analogue of Ihara’s lemma for some even unitary groups and application, *The joint International Meeting of the Chinese Mathematical Society and the American Mathematical Society*, June 2018.
- Vector-valued conjugate-invariant functions on a semisimple group, University of Connecticut, April 2018.
- Slopes of modular forms and ghost conjecture of Bergdall and Pollack, Arkansas Spring Lecture Series, April 2018.
- AIM SQuaRE: geometry of Shimura varieties and arithmetic applications to L-functions, American Institute of Mathematics, San Jose, CA, April 2018.
- Slopes of modular forms and ghost conjecture of Bergdall and Pollack, *32nd Automorphic Forms Workshop*, Tufts University, April 2018.

- Cycles on the special fiber of some Shimura varieties and Tate conjecture, John Hopkins University, March 2018.
- Cycles on the special fiber of some Shimura varieties and Tate conjecture, University of Chicago, January 2018.
- Cycles on the special fiber of some Shimura varieties and Tate conjecture, Northwestern University, January 2018.
- Cycles on the special fiber of some Shimura varieties and Tate conjecture, University of Toronto, January 2018.
- Supersingular locus of Shimura variety for  $G(U(1, n) \times U(n, 1))$  and Tate conjecture, *Workshop on unitary Shimura varieties*, Centre de Recherches Mathématiques, Montreal, Canada, January 2018.
- Some remarks on the ghost conjecture of Bergdall and Pollack, *2017 Maine-Québec Number Theory Conference*, University of Maine, October 2017.
- Cycles on Shimura varieties via geometric Satake, Beijing International Center of Mathematical Research, Beijing, August 2017.
- Slopes of modular forms and ghost conjecture, UC Irvine, April 2017.
- AIM SQuaRE: geometry of Shimura varieties and arithmetic applications to L-functions, American Institute of Mathematics, San Jose, CA, March 2017.
- Cycles on Shimura varieties mod  $p$  and Tate conjecture, Joint COLUMBIA-CUNY-NYU Number Theory Seminar, December 2016.
- Eigencurves for Artin–Schreier–Witt tower and Igusa tower., *AMS Sectional meeting*, Minneapolis, MN, October 2016.
- On the ghost conjecture of Bergdall and Pollack, Morningside Center, China, August 2016.
- On the ghost conjecture of Bergdall and Pollack, l’ENS de Lyon, France, June 2016.
- Basic locus of some Shimura varieties mod  $p$  and Tate Conjecture, *Rencontres Arithmétiques de Caen 2016*, Caen, France, June 2016.
- On the ghost conjecture of Bergdall and Pollack, Université de Paris 13, May 2016.
- On the ghost conjecture of Bergdall and Pollack,  *$p$ -adic Langlands 2016*, University of Indiana, May 2016.
- Slopes of cohomology of Artin–Schreier–Witt towers, Wesleyan University, September 2015.
- Eigencurve over the boundary of the weight space, University of Buffalo, September 2015.
- Eigencurve over the boundary of the weight space, University of Chicago, May 2015.
- Eigencurve over the boundary of the weight space, Boston University, April 2015.
- Cycles on the special fiber of Shimura varieties, *UMD–JHU Algebra and Number Theory Day*, March 2015.
- Eigencurve over the boundary of the weight space, Princeton University, February 2015.
- Supersingular locus of Hilbert modular variety and Tate conjecture, University of Maryland, February 2015.
- A generalization of gram determinant for periodic meanders, University of Connecticut, Storrs, January 2015
- Eigencurve over the boundary of the weight space, Caltech, January 2015.
- Eigencurve over the boundary of the weight space, University of California at Irvine, January 2015.
- Slopes of modular forms, BC–MIT number theory seminar, September 2014.
- Slopes of modular forms, University of California at Irvine, May 2014.
- Galois representations and torsion in the cohomology of Hilbert modular varieties, University of California at San Diego, April 2014
- Slopes of the eigencurve over boundary disks, University of Chicago, February 2014.
- Slopes of the eigencurve over boundary disks, Northwestern University, February 2014.

- Supersingular loci and Tate conjecture for some Shimura varieties mod  $p$ , M.I.T., February 2014.
- Galois representations and torsion in the cohomology of Hilbert modular varieties, Boston University, September 2013.
- Cycles on the special fiber of Hilbert modular varieties, University of Connecticut at Storrs, September 2013.
- Goren–Oort stratification of Hilbert modular varieties and Tate conjecture, University of California at Los Angeles, May 2013.
- Goren–Oort stratification of Hilbert modular varieties and Tate conjecture, University of California at San Diego, May 2013.
- Goren–Oort stratification of Hilbert modular varieties and Tate conjecture, Caltech, April 2013.
- Goren–Oort stratification of Hilbert modular varieties and Tate conjecture, University of California at Berkeley, April 2013.
- Goren–Oort stratification of Hilbert modular varieties, University of California at Irvine, April 2013.
- Goren–Oort stratification of Hilbert modular varieties, University of Illinois at Chicago, March 2013.
- Goren–Oort stratification of Hilbert modular varieties and Tate conjecture, Princeton University, March 2013
- Goren–Oort stratification of Hilbert modular varieties, Michigan State University, February 2013.
- Goren–Oort stratification of Hilbert modular varieties, University of Chicago, December 2012.
- Ekedahl–Oort stratification and classicality of overconvergent automorphic forms, *Arithmetic Geometry and Automorphic Form*, Morningside Center, China, August 2012.
- Global triangulation over eigenvarieties, *Arithmetic Geometry week in Tokyo*, June 2012.
- Global triangulation over eigenvarieties, *Second Annual Upstate Number Theory Conference*, Rochester University, April 2012.
- On the parity conjecture for Selmer groups of modular forms, Purdue University, February 2012.
- On the parity conjecture for Selmer groups of modular forms, Northwestern University, February 2012.
- On the parity conjecture for Selmer groups of modular forms, University of Texas at Austin, February 2012.
- On the parity conjecture for Selmer groups of modular forms, University of Indiana at Bloomington, January 2012.
- On the parity conjecture for Selmer groups of modular forms, University of California at Irvine, January 2012.
- On family versions of some arithmetic conjectures, *Arithmetic geometry and representation theory*, Institute for Advanced Study, Hong Kong University of Science and Technology, December 2011.
- Computing log-characteristic cycles using ramification theory, Boston College, December 2011.
- On the parity conjecture for Selmer groups of modular forms, University of Minnesota, December 2011.
- On the parity conjecture for Selmer groups of modular forms, Iowa State University, December 2011.
- On the parity conjecture for Selmer groups of modular forms, MIT, November 2011.

- Global triangulation on the eigencurve, Boston University, November 2011.
- On the parity conjecture for Selmer groups of modular forms, University of Illinois at Chicago, November 2011.
- On family versions of some arithmetic conjectures, University of Chicago, November 2011.
- Lecture series: *Euler Systems*, Morningside Center, China, Summer 2011.
- Computing log-characteristic cycles using ramification theory, *Memorial Lecture and Conference*, Chicago, April 2011.
- Computing log-characteristic cycles using ramification theory, University of Wisconsin at Madison, April 2011.
- Computing log-characteristic cycles using ramification theory, *AMS Special Session*, March 2011.
- Computing log-characteristic cycles using ramification theory, *Midwest Number Theory Conference for Graduate Students and Recent PhD's*, November 2010.
- Computing log-characteristic cycles using ramification theory, *Berkovich Spaces and  $p$ -adic Differential Equations*, IRMA Strasbourg, France, November 2010.
- Cohomology of  $(\varphi, \Gamma)$ -modules and application, Beijing Normal University, China, September 2010.
- Lecture series: *Introduction to  $p$ -adic Hodge Theory*, Morningside Center, China, Summer 2010.
- Ramification theory and  $p$ -adic differential modules, Northwestern University, May 2010.
- Slope filtration d'après Kedlaya, University of Chicago, May 2010.
- Non-archimedean differential modules and ramification theory (poster), *Journées de Géométrie Arithmétique de Rennes*, Rennes, France, July 2009.
- Ramification theory and  $p$ -adic differential modules, Nottingham University, May 2009.
- Ramification theory and  $p$ -adic differential modules, Columbia University, February 2009.
- Ramification theory and its application to algebraic geometry, MIT STAGE, October 2008.
- Ramification theory for local fields with imperfect residue field, MIT STAGE, November 2007.
- Semistable reduction in  $p$ -adic cohomology, MIT STAGE, March 2007.
- Conductors of Galois representations à la Colmez, MIT STAGE, November 2006.
- $p$ -adic modular forms (after Katz), MIT STAGE, September 2006.
- An introduction to algebraic fundamental groups, MIT BAGS, April 2006.
- $p$ -divisible groups, MIT STAGE, March 2006.

### Lecture Series.

- $p$ -adic functions on  $\mathbb{Z}_p$ , Connecticut Summer School in Number Theory 2020.
- *Basic Algebraic Number Theory*, Connecticut Summer School in Number Theory 2018.
- *A modern introduction to Taylor–Wiles–Kisin modularity lifting theorem*, at Peking University, summer 2016.
- *Introduction to the local-global principle*, Connecticut Summer School in Number Theory 2016.
- *From Dirichlet Theorem to Class Number Formula*, REU program at University of Chicago, summer 2012.
- *Euler systems*, Morningside Center of Mathematics, Beijing, summer 2011.
- *Introduction to  $p$ -adic Hodge theory*, Morningside Center of Mathematics, Beijing, summer 2010.

### Synergistic Activities.

- Co-organize a workshop “Euler systems” at AMS Sectional Meeting at the University of Connecticut, Hartford, CT; on April 13, 2019.
- Co-organized the summer school on Gan–Gross–Prasad cycles and Beilinson–Bloch–Kato conjecture for Rankin–Selberg motives, at Morningside Center of Mathematics, China, July 9–20, 2018.
- Co-organized the summer school on Gan–Gross–Prasad conjecture, at Beijing International Center of Mathematical Research, China, June 25–29, 2018.
- Co-organized the *Connecticut Summer School in Number Theory 2018*, at University of Connecticut, Storrs, on May 28–June 3, 2018.
- Organize University of Connecticut Algebra Seminar, Fall 2017–Spring 2018.
- Co-organizing a workshop “ $p$ -adic aspect of arithmetic geometry” at AMS Sectional Meeting at the University of Buffalo, NY; on September 16–17, 2017.
- Co-organized a conference “ $p$ -adic Hodge Theory and Automorphic Forms” at Beijing International Center of Mathematical Research, China, June 5–9, 2017.
- Co-organized the *Number Theory Days at UConn*, held at the University of Connecticut, Storrs, CT, on March 30, 2017; April 11, 2018.
- Co-organize the *Connecticut Summer School in Number Theory 2016* and *Conference on elliptic curves, modular forms, and related topics*, held at University of Connecticut, Storrs, CT, on August 8-14, 2016.
- Co-organize University of California Irvine Number Theory Seminar, Spring 2013–Spring 2014.
- Co-organize a workshop on *local proof of local Langlands correspondence*, held at University of Illinois at Chicago, IL, on May 12-13, 2012.
- Co-organize University of Chicago Number Theory Seminar.
- Refereed articles for the following journals:
  - *Algebra and Number Theory*
  - *Bulletin of the London Mathematical Society*
  - *Canadian Journal of Mathematics*
  - *Compositio Mathematica*
  - *Duke Mathematical Journal*
  - *International Mathematics Research Notices*
  - *Journal de l’Institut de Math. de Jussieu*
  - *Journal de Théorie des Nombres de Bordeaux*
  - *Journal für die reine und angewandte Mathematik*
  - *Journal of Algebraic Geometry*
  - *Journal of American Mathematical Society*
  - *Mathematische Annalen*
  - *Milan Journal of Mathematics*
  - *Proceeding of the London Mathematical Society*
  - *Research in Number Theory*
  - *Transactions of the American Mathematical Society*
- Reviewer for *Mathematics Reviews*.
- Reviewer for *Zentralblatt MATH*.

### Teaching Experience.

- Fall 2020, TBA, Peking University.
- Fall 2018, Math 2210, Applied Linear Algebra, University of Connecticut, Storrs.
- Fall 2017, Math 2410, Elementary Differential Equations, University of Connecticut, Storrs.

- Spring 2017, Math 2410, Elementary Differential Equations, University of Connecticut, Storrs.
- Fall 2016, Math 2410, Elementary Differential Equations, University of Connecticut, Storrs.
- Spring 2016, Math 5320, Algebraic Geometry, University of Connecticut, Storrs.
- Fall 2015, Math 2410, Elementary Differential Equations, University of Connecticut, Storrs.
- Spring 2015, Math 5020, Topics in Algebra: Introduction to  $p$ -adic Numbers, University of Connecticut, Storrs.
- Fall 2014, Math 5230 Algebraic Number Theory, University of Connecticut, Storrs.
- Spring 2014, Math 232C Algebraic Number Theory, University of California at Irvine.
- Winter 2014, Math 232B Algebraic Number Theory, University of California at Irvine.
- Fall 2013, Math 232A Algebraic Number Theory, University of California at Irvine.
- Spring 2013, Math 121B Linear Algebra, University of California at Irvine.
- Winter 2013, Math 25400 Basic Algebra I, and Math 25500 Basic Algebra II, University of Chicago.
- Spring 2012, Math 25500 Basic Algebra II, and Math 25600 Basic Algebra III, University of Chicago.
- Fall 2011, Math 19620 Linear Algebra, University of Chicago.
- Spring 2011, Math 25500 Basic Algebra II, and Math 25600 Basic Algebra II, University of Chicago.
- Winter 2010, Math 19900 Introduction to Analysis and Linear Algebra, and Math 25400 Basic Algebra I, University of Chicago.
- Spring 2010, Math 16300 Honors Calculus III, University of Chicago.
- Winter 2009, Math 16200 Honors Calculus II, and Math 26200 Point Set Topology, University of Chicago.
- Fall 2008, Recitation for 18.01 Calculus, MIT.
- Spring 2007, Recitation for 18.03 Differential Equations, MIT.

**Postdoc mentored.**

- Bin Zhao (2015–2018 at UConn; now at Morningside Center of Mathematics)
- Chan-Ho Kim (co-mentored at UC Irvine; now at KIAS)

**Ph.D. students.**

- Rufe Ren (2017 co-advised, postdoc at U Rochester);
- Nha Truong (current, at UConn);
- Han Zhou (current co-advising, at UConn);
- Linli Shi (current co-advising, at UConn);
- Ruiqi Bai (current, at Peking University)

**Master's students.**

- Hongze Tan (current, at Peking University)

**Undergraduates supervised.**

- Undergraduate thesis at PKU:
- PKU
- UC Irvine Undergraduate research project: Craig Skeinke.
- UConn senior thesis: William Pettinico.
- MIT Undergraduate Research Opportunity Program, Fall 2008: Hansheng Diao.
- MIT Research Science Institute, Summer 2008: Edwards Miles, Sung-hun Song.



**Personal Information.** Born: September 1982  
Citizenship: China

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