Anna MEDVEDOVSKY

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Updated January 3, 2023

EMPLOYMENT

2021–present	Postdoctoral research associate, **Boston University**, Boston, MA
2019–2021	NSF Postdoctoral Research Fellow, **Boston University**, Boston, MA
2018–2019	Maternity leave/Visitor, **Boston University**, Boston, MA
2017–2018	NSF Postdoctoral Research Fellow, **Max Planck Institute (MPIM)**, Bonn, Germany
2016–2017	Postdoctoral fellow, **Max Planck Institute (MPIM)**, Bonn, Germany
2015–2016	Institute Postdoctoral Fellow, **ICERM**, Providence, RI

EDUCATION

2008–2015	**Brandeis University**, Waltham, MA
	Ph.D. in number theory, 2015. Advisor: Joël Bellaïche.
	Thesis: Lower bounds on dimensions of mod-p Hecke algebras: The nilpotence method
1996–2001	**Harvard University**, Cambridge, MA: *AB cum laude* in mathematics, 2001.

PAPERS AND PREPRINTS

☐ **An explicit universal Galois representation on the mod-3 Hecke algebra**.
Preprint. Inspired by work of Bellaïche, unpublished work of Serre on modular forms mod 2.

We analyze the space of mod-3 modular forms of level one and its big Hecke algebra, identifying a compatible $(\mathbb{Z}/3\mathbb{Z})^\times$-grading on both. We construct a universal Galois representation on this Hecke algebra; study its localizations modulo prime ideals, identifying ideals of reducibility and dihedrality; and finally give an explicit matrix realization.

☐ **Mod-2 Hecke algebras of level 3 and 5.** Joint with Shaunak Deo. Submitted.

We use deformation theory to prove that the big Hecke algebra acting on mod-2 modular forms of prime level 3 or 5 is, up to taking maximal reduced quotients, isomorphic to the corresponding universal deformation ring. We determine the explicit structure of this big mod-2 Hecke algebra, and prove an $R = \mathbb{T}$ theorem for the related partially full Hecke algebra.

☐ **Deep congruences + the Brauer-Nesbitt theorem**.
Joint with Samuele Anni and Alexandru Ghitza. In preparation.

When are two finite free $\mathbb{Z}_p[T]$-modules isomorphic as semisimplified $\mathbb{F}_p[T]$-modules? We give a precise criterion, with torsion-free $\mathbb{Z}_{(p)}$-algebras with divided-power ideals generalizing $\mathbb{Z}_p$. The motivating application is establishing up-to-semisimplification Hecke-module isomorphisms between spaces of mod-p modular forms in order to count congruent eigenforms.

☐ **Big images of Galois pseudorepresentations**.
Joint with Andrea Conti and Jaclyn Lang. *Mathematische Annalen* (2022).

We prove a purely algebraic result: under mild conditions, the image of a two-dimensional pseudorepresentation of a p-finite profinite group on a local pro-p domain is "big" — as big as it can be. As a corollary we recover and extend known p-adic big-image theorems for Galois representations arising from classical, Hilbert, and Bianchi modular forms, and from p-adic Hida and Coleman families of classical and Hilbert modular forms.

☐ **Newforms mod p in squarefree level, with applications to Monsky's Hecke-stable filtration**. Joint with Shaunak Deo, and with an appendix by Alexandru Ghitza.
Transactions of the AMS, Series B 6 (2019).

We propose an algebraic definition of the space of ℓ-new mod-p modular forms for $\Gamma_0(N\ell)$ for ℓ, N, p pairwise coprime. Along the way we renormalize the Atkin-Lehner involution to obtain an algebra automorphism of the algebra of modular forms that is well defined in characteristic p.

- [**Mod-2 dihedral Galois representations of prime conductor**](#). Joint with Kiran Kedlaya. *Proceedings of the* 13th *Algorithmic Number Theory Symposium.* Open Book Series 2 (2019).

  For odd primes N up to $500k$, we compute the action of the Hecke operator T_2 on weight-2 cuspforms of level N, and determine whether 0 and 1 appear as mod-2 eigenvalues. We then partially explain our observations in terms of class field theory and modular mod-2 Galois representations. Our methods recover and extend prior results of Setzer, Hadano, and Kida on the nonexistence of elliptic curves and modular forms with certain mod-2 reductions.

- [**Nilpotence index growth of recursion operators in characteristic p**](#). *Algebra and Number Theory* 12 (2018) no. 3.

  We prove that the killing rate of certain degree-lowering "recursion operators" on a polynomial algebra over a finite field grows slower than linearly in the degree of the polynomial attacked. The motivating application is obtaining lower bounds on the Krull dimension of local components of big mod-p Hecke algebras, here explained for $p = 2, 3$ and level one.

Forthcoming work

- **$\bar{\rho}$-Refined dimensions of Atkin-Lehner eigenspaces.** Joint with S. Anni and A. Ghitza.

  We use the trace formula and our earlier work to count cuspidal eigenforms of weight k and level Np with prescribed Atkin-Lehner-at-p eigenvalue and mod-p Hecke eigenvalue system.

- **Lower bounds on dimensions of mod-p Hecke algebras in the genus-zero case.**

  We use earlier work to obtain lower bounds on Krull dimensions of local components of mod-p Hecke algebras of level N if the genus of $X_0(Np)$ is zero, generalizing Ph.D. thesis to $N > 1$.

- **Density of modular forms of level one modulo 3.**

  We apply Bellaïche's density results to prove that "half" of the generic forms of level one mod 3 have equidistributed prime Fourier coefficients. We also give explicit combinatorial formulas for the density of abelian and dihedral forms, generalizing unpublished work of Bellaïche on $p = 2$.

Awards and honors

2022	(Canceled, Ukraine invasion) AMS-NSF-Simons-ICM Travel Grant recipient for ICM 2022
2017–2021	DMS-1703834 NSF Mathematical Sciences Postdoctoral Research Fellowship (24 months research support; sponsoring scientists: Don Zagier, Jared Weinstein)
2016-2017	AMS-Simons Travel Grant (funds for two years of research-related travel; stopped 2017 for NSF fellowship)
2015	Jerome Levine Thesis Prize (department award for best dissertation)
2008–2010	GAANN Fellowship
2006–2007	Math in Moscow Scholarship (NSF/AMS)
2000, 1998	Certificate of Distinction and Excellence in Teaching, Derek Bok Center, Harvard ∗ Math 122 (abstract algebra), Fall 2000 ∗ Math 25a (real analysis), Fall 1998

Short-term stays (longer than a conference, shorter than a year)

2021 July	**Max Planck Institute (MPIM)**, Bonn, Germany
2020 July	(Covid-canceled) Visit to **Max Planck Institute (MPIM)**, Bonn, Germany
2015 Fall	Computational Aspects of the Langlands Program participant, **ICERM**, Providence, RI

Teaching

Spring 2023	(Scheduled) Boston University MA 542: Modern Algebra II (rings, fields, and Galois theory)
Fall 2022	Boston University MA 123: Calculus I (150-student lecture in coordinated course)
Spring 2022	Boston University MA 294: Applied abstract algebra (requirement for joint math/CS majors)
Fall 2021	Boston University MA 541: Modern Algebra I (group theory)

Fall 2020	Boston University MA 741: Algebra I (graduate algebra)
Fall 2019	Boston University MA 541: Modern Algebra I (group theory)
Fall 2011	Brandeis University Math 10B: Calculus II
Spring 2011	Brandeis University Math 10A: Calculus I
Fall 2010	Brandeis University Math 10A: Calculus I
Fall 2009	Brandeis University Math 10A: Calculus I

ORGANIZER/LECTURER ROLE

2023 Jan/Feb	(Scheduled) Research school "Introduction to SAGA" CIRM, Luminy, France Scientific committee: week-long course on modular forms and Galois representations
2016 May	AIM workshop for the LMFDB release, San Jose, CA Organizer for the mod-p modular forms working group

CONFERENCE AND WORKSHOP TALKS

2023 Feb	(Scheduled) Plenary talk, Symposium on Arithmetic Geometry and its Applications, CIRM, Luminy, France
2023 Jan	(Scheduled) JMM talk in AMS special session on arithmetic geometry informed by computation
2023 Jan	(Scheduled) JMM talk in AMS special session on women in automorphic forms
2022 July	(Covid-derailed talk) Thematic Program in p-adic L-functions and Eigenvarieties, University of Notre Dame, South Bend, IN
2017 May 03	Bridges between automatic sequences, algebra, number theory, CRM, Montréal, Canada
2016 Sept 09	Automorphic Forms: theory and computation (workshop), King's College, London, UK
2016 July	Building Bridges 3, Sarajevo, Bosnia (contributed talk; speed talk)
2016 March	30th Automorphic Forms Workshop, Wake Forest University (contributed talk)
2015 Sept	BU-Keio Workshop in number theory, Boston University (contributed talk; poster)
2015 April	Upstate Number Theory Conference, Cornell University (contributed talk)

WORKSHOP INVITATIONS

2023 June	(Scheduled) Research in pairs, CIRM, Luminy, France (with Jean-Morlet Chair in Arithmetic Statistics holders Peter Stevenhagen and Samuele Anni)
2023 Jan	(Scheduled) Arithmetic aspects of deformation theory, online/BIRS
2022 June	Galois representations, automorphic forms and L-functions, CIRM, Luminy, France

SEMINAR TALKS

2022 Dec 5	Special colloquium, University of Arizona, Tucson, AZ
2022 Apr 13	Johns Hopkins Number Theory Seminar, Baltimore, MD
2021 Oct 13	Dublin Algebra and Number Theory Seminar, online
2021 May 26	London Number Theory Seminar, online
2020 Dec 7	Boston University Number Theory Seminar, online
2020 Nov 18	Michigan State University algebra seminar, online
2018 Jan 30	Oberseminar Zahlentheorie, Universität zu Köln, Cologne, Germany
2017 March 8	Heilbronn Number Theory Seminar, University of Bristol, Bristol, UK
2017 Jan 27	University of Heidelberg number theory seminar, Heidelberg, Germany
2016 Nov 30	Bielefeld Arithmetic Geometry Seminar [BAGS], Bielefeld, Germany
2016 Nov 23	Max Planck Institute number theory lunch seminar, Bonn, Germany

2016 Nov 16	University of Luxembourg number theory seminar, Luxembourg
2016 Apr 7	Joint Columbia-CUNY-NYU Number Theory Seminar, NYC
2016 Feb 15	Brown University Algebra Seminar, Providence, RI
2015 April 21	Five College Number Theory Seminar, Amherst College, Amherst, MA
2015 Mar 17	Brandeis University Everytopic Seminar, Waltham, MA
2015 Feb 21	AMS Graduate Student Math Conference, Brown University, Providence, RI
2015 Feb 8	University of Connecticut Algebra Seminar, Storrs, CT
2014 Dec 8	Boston University Number Theory Seminar, Boston, MA

SERVICE AND OUTREACH

2016–present	Referee (Acta Arithmetica, Research in Number Theory, the Ramanujan Journal)
2022–present	Math circle, grades 3–5, Baldwin School, Cambridge, MA
2022 June 7	Guest lecture, Connecticut Summer School in Number Theory, UConn, CT
2021 May	Outdoor math circle activity, Morse School, Cambridge, MA
2020 Spring	(Covid-canceled after one meeting) Math circle leader (grade 2), Morse School, Cambridge, MA
2015–2018	**LMFDB** contributor. Worked on a user-friendly database of mod-p modular forms.
2015–2016	Math circle leader (grades K-3), Tobin Montessori School, Cambridge, MA
2015 Oct 28	UConn Math Club talk (undergraduates), UConn, CT
2010 Apr 10	Kaplan Math Circle talk (middle-schoolers), Boston, MA
2007 Summer	Teacher counselor, **PROMYS**, Boston University, Boston, MA
2001 Summer	Seminar instructor, **Ross Young Scholars Program**, Ohio State University, Columbus, OH

POSTER SESSIONS AND JUNIOR SEMINAR TALKS

2015 Nov 30	ICERM peer-to-peer seminar (postdoc seminar talk)
2015 Nov	Computational aspects of L-functions, ICERM (poster)
2015 Oct	Explicit methods for modularity of K3 surfaces, higher weight motives, ICERM (poster)
2015 Sept	Modular forms and curves of low genus, ICERM (poster)
2014 Oct 30	Graduate Student Seminar, Brandeis Mathematics Department (talk)
2014 Apr 3	Graduate Student Seminar, Brandeis Mathematics Department (talk)

ADDITIONAL WORKSHOP AND CONFERENCE PARTICIPATION

2020 Feb	A Room of One's Own initiative (supported focused research time)
2018 July	Galois representations (workshop), Heidelberg, Germany
2018 July	Explicit and computational approaches in Galois representations (summer school), Luxembourg
2018 March	Conf. on Arithmetic and Automorphic Forms (Günter Harder's 80th birthday), Bonn, Germany
2017 May	Modular forms are everywhere (conference in honor of Don Zagier), Bonn, Germany
2016 May	The p-adic Langlands Program and related topics, Indiana University, Bloomington, IN
2015 May	p-Adic methods in number theory (conference inspired by Robert Coleman) UC Berkeley, CA
2015 Mar	p-Adic methods in the theory of classical automorphic forms, CRM Montréal
2015 Jan	Joint Mathematics Meeting, San Antonio, TX
2014 Feb	Hot Topics: Perfectoid Spaces and their Applications, MSRI
2013 March	Arizona Winter School: Modular forms and modular curves Project group: Congruences between modular forms (Frank Calegari)

2012 Jan	Joint Mathematics Meeting, Boston, MA
2011 May	Workshop on L-functions, Galois representations, and Iwasawa theory, Ann Arbor, MI
2011 March	Arizona Winter School: Stark-Heegner points. Project group: Stark-Heegner points (Henri Darmon, Victor Rotger)
2010 May	Women and Mathematics: p-Adic Langlands, IAS, Princeton, NJ
2009 Summer	PCMI Summer Session: Arithmetic of L-functions, Park City, UT

ADDITIONAL EXPERIENCE

2008–2014	**Brandeis University**, Waltham, MA Grader, section leader. Differential equations, algebra, multivariable calculus etc.
2000 Summer	**PROMYS**, Boston University, Boston, MA, Boston University, Boston, MA Counselor for flagship high-school student program
1997–2000	**Harvard University Mathematics Department**, Cambridge, MA Course assistant: Led weekly review sections, graded problem sets
1999–2000	**Collège J. Vallès**, **Ecoles J. Macé**, **V. Hugo**, Choisy-le-Roi, France Foreign assistant. Taught English as a foreign language in a suburb of Paris.
2002–2006	**SparkNotes LLC**, New York, NY Editor, writer at educational publishing company. Published works include *For Whom the Bell Tolls* SparkNote, 2003 (writer).
1996 Summer	**Ross Young Scholars Program**, Ohio State University, Columbus, OH Junior counselor

PERSONAL

- ☐ US citizen. Emigrated from Russia to the US as a child. Fully bilingual.
- ☐ Proficient in French and German.