

## Curriculum vitae (January 2022)

MIKHAIL ERSHOV

University of Virginia  
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- M.A. in Mathematics, Brandeis University, February 2000
- Ph.D. in Mathematics, Yale University, May 2005
- Ph.D. Advisors: Efim Zelmanov, University of California San Diego and Gregory Margulis, Yale University
- Ph.D. Title: On finite presentability of some pro- $p$  groups and related questions
- Research interests: pro- $p$  groups, Lie methods in group theory, combinatorial and geometric group theory, Kazhdan's property ( $T$ ), amenability, Kac-Moody groups, automorphism groups of free groups.

### Appointments

- Professor, Department of Mathematics, University of Virginia, August 2017 - present
- Associate Professor, Department of Mathematics, University of Virginia, August 2011 - August 2017
- Assistant Professor, Department of Mathematics, University of Virginia, August 2007 - August 2011
- L.E. Dickson Instructor, Department of Mathematics, University of Chicago, August 2006 - August 2007
- Member of the School of Mathematics, Institute for Advanced Study, September 2005 - June 2006

### Synergistic activities

- Referee for
  - Annals of K-theory
  - Bulletin of Mathematical Sciences
  - Canadian Journal of Mathematics
  - Combinatorica
  - Communications in Algebra
  - Communications in Mathematics
  - Compositio Mathematica
  - Comptes rendus mathématiques de l'Académie des sciences, Canada
  - Crelle's Journal
  - Duke Mathematical Journal
  - European Journal of Combinatorics
  - l'Enseignement Mathématique
  - Geometria Dedicata
  - Groups, Geometry and Dynamics
  - International Journal of Algebra and Computation
  - Inventiones Mathematicae

Israel Journal of Mathematics  
 Journal of Algebra  
 Journal of Algebra and its Applications  
 Journal of Combinatorial Algebra  
 Journal of the European Mathematical Society  
 Journal of Group Theory  
 Journal of the London Mathematical Society  
 Journal of Pure and Applied Algebra  
 Journal of the Ramanujan Mathematical Society  
 Journal of Topology and Analysis  
 Mathematica Slovaca  
 Notices of AMS  
 Pacific Journal of Mathematics  
 Proceedings of AMS  
 Proceedings of the London Mathematical Society  
 Quarterly Journal of Mathematics  
 Transactions of AMS

- Organizer of the Algebra Seminar at the University of Virginia, Fall 2008-Fall 2010, Fall 2011-Fall 2016, Fall 2017-Fall 2021
- Co-organizer of the Colloquium at the University of Virginia, Fall 2011-Spring 2017.
- Co-organizer (with A.Lubotzky, G.Prasad and D.Witte-Morris) of the workshop “Arithmetic aspects of algebraic groups” at BIRS, Banff, September 2020 (online) and June 2022
- Co-organizer (with N. Nikolov) of the workshop on “Golod-Shafarevich groups and algebras and rank gradient” at the Edwin Schrödinger Institute, Vienna, August 2012
- Co-organizer (with A. Rapinchuk) of the workshop on “Arithmetic groups and their applications in combinatorics, geometry and topology” at the University of Virginia, April 2010
- Co-organizer (with M. Kassabov and A. Salehi-Golsefidy) of the special session on “Arithmetic and profinite groups” at the AMS sectional meeting at the Pennsylvania State University, October 2009
- Associate Chair, Department of Mathematics, University of Virginia, 2013-2014, 2017-2018
- Chair of the Hiring Committee, Department of Mathematics, University of Virginia, 2013-2014
- Co-organizer of the Math Club at the University of Virginia, 2009-2010, 2013-2014

### Honors and Awards

- Alfred Sloan Fellowship, 2011-2015
- NSF Grant DMS-1201452, 2012-2015
- NSF Grant DMS-0901703, 2009-2012
- Prize Teaching Fellowship, Yale University 2003/2004 and 2004/2005 (award for excellence in teaching)
- Russian Math Olympiad. Third degree prize, 1993 and 1994

### Publications

1. On distortion of subsemigroups, *Moscow University Bulletin* 1999, no. 4, 36-38
2. New just-infinite pro- $p$  groups of finite width and subgroups of the Nottingham group, *Journal of Algebra* 2004, no. 275(1), 419-449
3. The Nottingham group is finitely presented, *Journal of the London Mathematical Society* 2005, no. 71(2), 362-378

4. On subgroups of the Nottingham group of positive Hausdorff dimension, *Communications in Algebra* 2007, no. 35(1), 193-206
5. Finite presentability of  $SL_1(D)$ , *Israel Journal of Mathematics* 2007, no. 158, 297-347
6. Abstract simplicity of complete Kac-Moody groups over finite fields, with Lisa Carbone and Gordon Ritter, *Journal of Pure and Applied Algebra* 2008, no. 212(10), 2147-2162
7. Golod-Shafarevich groups with property  $(T)$  and Kac-Moody groups, *Duke Mathematical Journal* 2008, no. 145(2), 309-339
8. Property  $(T)$  for noncommutative universal lattices, with Andrei Jaikin-Zapirain, *Inventiones Mathematicae* 2010, no. 179(2), 303-347
9. On the commensurator of the Nottingham group, *Transactions of the American Mathematical Society* 2010, no. 362(12), 6663-6678
10. Kazhdan quotients of Golod-Shafarevich groups, with appendices by Andrei Jaikin-Zapirain, *Proceedings of the London Mathematical Society* 2011, no. 102(4), 599-636
11. The congruence subgroup property for  $\text{Aut } F_2$ : A group-theoretic proof of Asada's theorem, with Kai-Uwe Bux and Andrei Rapinchuk, *Groups, Geometry and Dynamics* 2011, no. 5(2), 327-353
12. Abstract commensurators of profinite groups, with Yiftach Barnea and Thomas Weigel, *Transactions of the American Mathematical Society* 2011, no. 363(9), 5381-5417
13. Golod-Shafarevich groups: a survey, *International Journal of Algebra and Computation*, 2012, no. 22(5), 68 pages
14. Groups of positive weighted deficiency and their applications, with Andrei Jaikin-Zapirain, *Journal für die reine und angewandte mathematik*, 2013, no. 677, 71-134
15. The first  $L^2$ -Betti number and approximation in arbitrary characteristic, with Wolfgang Lück, *Documenta Mathematica*, 2014, no. 19, 313-331.
16. Groups graded by root systems and property  $(T)$ , with Andrei Jaikin-Zapirain, Martin Kassabov and Zezhou Zhang, *Proceedings of the National Academy of Sciences*, 2014, no. 111(50), 17759-17764.
17. The Tarski numbers of groups, with Mark Sapir and Gili Golan, *Advances in Mathematics* (2015), no. 284, 21-53.
18. Kazhdan groups whose  $FC$ -radical is not virtually abelian, *Journal of Combinatorial Algebra* (2017), no. 1(1), 59-62.
19. Property  $(T)$  for groups graded by root systems, with Andrei Jaikin-Zapirain and Martin Kassabov, *Memoirs of the American Mathematical Society* (2017), no. 1186, vii+141 pp.
20. Property  $(T)$  for Kac-Moody groups over rings, with Ashley Rall, *Journal of Algebra* (2018), no. 500, 221-241; an extended version with an appendix by Zezhou Zhang available at arXiv:1708.01968.
21. On finiteness properties of the Johnson filtrations, with Sue He, *Duke Mathematical Journal* (2018), no. 167(9), 1713-1759.
22. On finite generation of the Johnson filtrations, with Thomas Church and Andrew Putman, to appear in *Journal of the European Mathematical Society*, 37 pages, available at arXiv:1711.04779.
23. On the second cohomology of the norm one group of a  $p$ -adic division algebra, with appendix by Mikhail Ershov and Thomas Weigel, to appear in *Michigan Mathematical Journal*, 67 pages, available at <https://uva.theopenscholar.com/mikhail-ershov/research>

24. Effective finite generation of  $[IA_n, IA_n]$  and the Johnson kernel, with Daniel Franz, *preprint* (2021), submitted for publication, 35 pages, available at arXiv:2010.09673.

### Courses taught

#### At University of Virginia:

Fall 2021: Bilinear Forms and Group Representations  
 Spring 2021: Algebra-II (graduate)  
 Fall 2020: Algebra-I (graduate)  
 Spring 2020: Algebraic Coding Theory  
 Fall 2019: Algebra-I (graduate)  
 Spring 2019: Algebra-II (graduate)  
 Fall 2018: Algebra-I (graduate)  
 Fall 2018: Introduction to Real Analysis  
 Spring 2018: Transition to Higher Mathematics  
 Fall 2017: Bilinear Forms and Group Representations  
 Fall 2016: Number Theory  
 Fall 2016: Survey of Algebra  
 Spring 2016: Introduction to Probability  
 Spring 2016: Survey of Algebra  
 Fall 2015: Introduction to Real Analysis  
 Spring 2015: Basic Real Analysis  
 Spring 2015: Survey of Algebra  
 Fall 2014: Introduction to Real Analysis  
 Spring 2014: Number Theory  
 Fall 2013: Lie Groups (graduate)  
 Spring 2013: Representation Theory (graduate)  
 Spring 2013: Number Theory  
 Fall 2012: Group Theory (graduate)  
 Spring 2012: Algebra-II (graduate)  
 Fall 2011: Algebra-I (graduate)  
 Fall 2011: Advanced Linear Algebra  
 Fall 2010: Group Theory (graduate)  
 Fall 2010: Survey of Algebra  
 Spring 2010: Algebra-II (graduate)  
 Fall 2009: Algebra-I (graduate)  
 Spring 2009: Algebra-II (graduate)  
 Fall 2008: Algebra-I (graduate)  
 Spring 2008: Survey of Algebra  
 Fall 2007: Survey of Algebra

#### At University of Chicago:

Spring 2007: Analysis in  $\mathbb{R}^n$ -III  
 Spring 2007: Honors Calculus-III  
 Winter 2007: Honors Calculus-II  
 Fall 2006: Honors Calculus-I

#### At Yale University:

Fall 2004: Multivariable Calculus  
 Fall 2003: Differential Calculus of One Variable

Fall 2002: Integral Calculus of One Variable

Fall 2001: Differential Calculus of One Variable

### Invited talks

- Novosibirsk, Russia, *International Conference on Ring Theory* (virtual talk). August, 2021
- Texas A&M University, *Groups and Dynamics Seminar* (virtual talk). June, 2021
- ICMAT, Madrid, *Workshop on  $L^2$ -invariants and their analogues in positive characteristic*. June, 2018
- University of Georgia, *Georgia international topology conference*. June, 2017
- UIUC, *Conference on geometric and combinatorial methods in group theory*. May, 2017
- Oxford University, *Algebra Seminar*. May, 2017
- ENS, Paris, *Conference on “Growth, Symbolic Dynamics and Combinatorics of Words in Groups”*. June, 2015
- Rutgers University, *Lie Groups and Quantum Mathematics Seminar*. May, 2015
- Oxford University, *Workshop on “Asymptotic Invariants of Groups”*. April, 2015
- Vanderbilt University, *Colloquium*. November, 2014
- MFO Oberwolfach, *Meeting on “Group Theory, Measure, and Asymptotic Invariants”*. August, 2013
- City College of New York, *Conference “Geometric and asymptotic group theory with applications 7”*. May, 2013.
- Spa, Belgium, Conference *“Locally compact groups beyond Lie theory”*. April, 2013.
- ESI, Vienna, Workshop *“Golod-Shafarevich groups and algebras and rank gradient”*. August, 2012.
- AIM, Palo Alto, Workshop *“ $L^2$ -invariants and their relatives for finitely generated groups”*. September, 2011.
- CIEM, Castro Urdiales, Spain, *Conference on “New trends in group theory”*. May, 2011
- Group Theory International Webinar. March, 2011
- University of Michigan, *Groups Theory, Lie Theory and Number Theory Seminar*. March, 2011
- Yale University, *Dynamics of Group Actions Seminar*. February 2011
- MFO Oberwolfach, *Meeting on “Actions and Invariants of Residually Finite Groups: Asymptotic Methods”*. September 2010
- CRM Montreal, *Workshop “Geometric, Asymptotic, Combinatorial Group Theory with Applications 4”*. August 2010
- Yale University, *Colloquium*. February 2010
- Vanderbilt University, *Topology and Group Theory Seminar*. September 2009
- Oxford University, *Algebra Seminar*. June 2009
- Imperial College, London, *Algebra Colloquium*. June 2009
- Rutgers University, *Colloquium*. April, 2009
- Stevens Institute of Technology, *Conference “Geometric and asymptotic group theory with applications 3”* March, 2009
- Yale University, *Algebra and Lie Groups Seminar*. March, 2009
- Cornell University, *Topology and Geometric Group Theory Seminar*. December, 2008
- Institute for Pure and Applied Mathematics, *Conference on Expanders in Pure and Applied Mathematics*, February, 2008
- University of Illinois, *Geometry and Topology Seminar*. April, 2007
- University of Wisconsin, *Conference on pro-p groups and pro-p algebras*. April, 2007
- Penn State University, *Algebra and Number Theory Seminar*. January, 2007

- University of Virginia, *Colloquium*. January, 2007
- University of Michigan, *Groups and Lie Theory Seminar*. October, 2006
- Vanderbilt University, *Conference on Combinatorial and Geometric Group Theory*. May, 2006
- University of Virginia, *Algebra Seminar*. March, 2006
- University of Virginia, *Colloquium*. March, 2006
- Institute for Advanced Study, *Lie Groups and Representation Theory Seminar*. March, 2006
- Rutgers University, *Group Theory Seminar*. December, 2005
- Institute for Advanced Study, *Members Seminar*. November, 2005
- Cornell University, *Geometric Group Theory Seminar*. October, 2005
- AMS Conference in Newark, DE. Special session *Arithmetic groups and related topics*. April, 2005
- AMS Conference in Binghamton, NY. Special session *Infinite groups and group rings*. October, 2003