

# Asif Zaman

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University of Toronto

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## A. BIOGRAPHICAL INFORMATION

### Employment

- 2019– University of Toronto, Mathematics  
Assistant Professor, Teaching Stream
- 2017–19 Stanford University, Mathematics  
NSERC Postdoctoral Scholar

### Degrees

- Ph.D. Mathematics, University of Toronto, 2017  
*Analytic estimates for the Chebotarev Density Theorem and their applications*  
supervised by [John Friedlander](#)
- M.Sc. Mathematics, University of British Columbia, 2012
- B.Sc. Mathematics, Simon Fraser University, 2010

## B. AWARDS AND GRANTS

### Teaching Grants and Awards

- 2024 Instructional Technology Innovation Fund (\$10,000)  
awarded \$5,000 by Vice Provost, Innovations in Undergraduate Education and matched \$5,000 by  
department chair for development of interactive models in multivariable calculus
- 2024 Pedagogical Innovation and Experimentation Fund, Faculty of Arts & Science (\$6,200)  
awarded by department chair for textbook development
- 2023 Pedagogical Innovation and Experimentation Fund, Faculty of Arts & Science (\$6,200)  
awarded by department chair for textbook development
- 2022 Pedagogical Innovation and Experimentation Fund, Faculty of Arts & Science (\$4,000)  
awarded by department chair for textbook development
- 2019 Teaching Stream Pedagogical Grant, Faculty of Arts & Science (\$2,000)
- 2017 Ida Bulat Teaching Award  
department award for teaching excellence as a graduate student course instructor
- 2016 Daniel B. Delury Teaching Award  
department award for teaching excellence as a TA
- 2014 TATP TA Teaching Excellence Award  
university award for teaching excellence as a TA

### Research Grants and Awards

- 2022–27 NSERC Discovery Grant – Early Career Researcher (\$115,000)
- 2022 NSERC Discovery Launch Supplement (\$12,500)
- 2017–19 NSERC Postdoctoral Fellowship (\$90,000)
- 2016 Queen Elizabeth II Graduate Scholarship (\$15,000)
- 2015 Ontario Graduate Scholarship (\$15,000)
- 2012–15 NSERC Postgraduate Scholarship D (\$63,000)

## C. SCHOLARLY, CREATIVE, AND PROFESSIONAL WORK

### Research Endeavours

Number theory: analytic, probabilistic, and algebraic.

My research is focused on analytic number theory with applications to algebraic structures and arithmetic statistics. I have investigated problems concerning the distribution of prime numbers, zeros of  $L$ -functions, the Chebotarev density theorem, and binary quadratic forms. These have led to interesting applications involving elliptic curves, modular forms, torsion in class groups, and mass equidistribution on the modular surface. Recently, I have also been studying random multiplicative functions.

Authorship for publications and manuscripts are always listed in alphabetical order by last name.

### Refereed Publications

18. J. Thorner and A. Zaman. “An explicit version of Bombieri’s log-free density estimate and Sárközy’s theorem for shifted primes.” *Forum Math.*. (2024), published online. doi:10.1515/forum-2023-0091
17. J. Thorner and A. Zaman. “Refinements to the prime number theorem for arithmetic progressions.” *Math. Z.* 306 (2024), no. 54. doi:10.1007/s00209-023-03414-3
16. R. J. Lemke Oliver, J. Thorner, and A. Zaman. “An approximate form of Artin’s holomorphy conjecture and non-vanishing of Artin  $L$ -functions.” *Invent. Math.*. 235 (2024), 893–971. doi:10.1007/s00222-023-01232-2
15. J. Thorner and A. Zaman. “A zero density estimate for Dedekind zeta functions.” *Int. Math. Res. Not.*, 2023 (2023), no. 8, 6739–6761. doi:10.1093/imrn/rnac015
14. D. Aggarwal, U. Subedi, W. Verreault, A. Zaman, and C. Zheng. “A conjectural asymptotic formula for multiplicative chaos in number theory.” *Res. Number Theory*. 8 (2022), no. 35. doi:10.1007/s40993-022-00332-x
13. D. Aggarwal, U. Subedi, W. Verreault, A. Zaman, and C. Zheng. “Sums of random multiplicative functions over function fields with few irreducible factors.” *Math. Proc. Camb. Phil. Soc.*, 173 (2022), no. 3, 715–726. doi:10.1017/S030500412200010X
12. K. Soundararajan and A. Zaman. “A model problem for multiplicative chaos in number theory.” *Enseign. Math.*, 68 (2022), no. 3, 307–340. doi:10.4171/lem/1031
11. F. Brumley, J. Thorner, and A. Zaman. With an appendix by C. J. Bushnell and G. Henniart. “Zeros of Rankin-Selberg  $L$ -functions at the edge of the critical strip.” *J. Eur. Math. Soc.*, 24 (2022), no. 5, 1471–1541. doi:10.4171/jems/1134.
10. J. Thorner and A. Zaman. “An unconditional  $GL(n)$  large sieve.” *Adv. Math.* 378 (2021), paper no. 107529, 24 pp. doi:10.1016/j.aim.2020.107529
9. J. Thorner and A. Zaman. “A unified and improved Chebotarev density theorem.” *Alg. Num. Theory*. 13 (2019), no. 5, 1039–1068. doi:10.2140/ant.2019.13.1039
8. A. Zaman. “Primes represented by positive definite binary quadratic forms.” *Q.J. Math.* 56 (2018), no. 4, 1353–1386. doi:10.1093/qmath/hay028
7. B. Hanson and A. Zaman. “The density of numbers represented by diagonal forms of large degree.” *Mathematika*. 64 (2018), no. 2, 542–550. doi:10.1112/S0025579318000190
6. J. Thorner and A. Zaman. “A Chebotarev variant of the Brun–Titchmarsh theorem and bounds for the Lang–Trotter conjectures.” *Int. Math. Res. Not.* 2018 (2018), no. 16, 4991–5027. doi:10.1093/imrn/rnx031
5. A. Zaman. “The least unramified prime which does not split completely.” *Forum. Math.* 30 (2017), no. 3, 651–661. doi:10.1515/forum-2017-0081
4. J. Thorner and A. Zaman. “An explicit bound for the least prime ideal in the Chebotarev density theorem.” *Alg. Num. Theory* 11 (2017), no. 5, 1135–1197. doi:10.2140/ant.2017.11.1135
3. A. Zaman. “Bounding the least prime ideal in the Chebotarev Density Theorem.” *Funct. Approx. Comment. Math.* 57 (2017), no. 1, 115–142. doi:10.7169/facm/1651
2. A. Zaman. “On the least prime ideal and Siegel zeros.” *Int. J. Number Theory*. 12 (2017), no. 8, 2201–2229. doi:10.1142/S1793042116501335
1. A. Zaman. “Explicit estimates for the zeros of Hecke  $L$ -functions.” *J. Number Theory*. 162

(2016), 312–375. doi:10.1016/j.jnt.2015.10.003

#### Submitted Manuscripts and Articles In Preparation

20. M. Hofmann, A. Hoganson, S. Menon, W. Verreault and A. Zaman. “Moments of random multiplicative functions over function fields.” (2024), preprint available upon request.
19. K. Benli, S. Goel, H. Twiss and A. Zaman. “Explicit zero repulsion of Dirichlet  $L$ -functions.” (2024), preprint available upon request.

#### Invited Conferences on Research

- 2024 (upcoming) Canadian Number Theory Association 16th Meeting. Toronto, ON.  
invited lecture; held at Fields Institute
- 2023 PIMS CRG Summer School: Inclusive Paths in Explicit Number Theory. Kelwona, BC.  
invited lectures and project leader; held at UBC Okanagan
- 2023 Canadian Undergraduate Mathematics Conference. Toronto, ON.  
invited keynote lecture
- 2022 Ulsan National Institute of Science and Technology. Ulsan, Korea.  
First International Workshop in Analytic Number Theory
- 2020 Canadian Mathematical Society Winter Meeting. Montréal, QC.  
Arithmetic Statistics session, Probability in Number Theory session
- 2019 Joint Math Meetings. Baltimore, MD.  
AMS Special Session. Analytic Number Theory
- 2019 Joint Math Meetings. Baltimore, MD.  
AMS Invited Paper Session. Counting Methods in Number Theory
- 2018 Canadian Mathematical Society Winter Meeting. Vancouver, BC.  
Analytic Number Theory session
- 2018 Oregon Number Theory Days. Corvallis, OR.  
Hosted by Portland State University, University of Oregon, and Oregon State University
- 2017 Joint Math Meetings. Atlanta, GA.  
AMS Special Sessions. Analytic Number Theory and Arithmetic
- 2016 Canadian Mathematical Society Winter Meeting. Niagara Falls, ON.  
Analytic Number Theory session
- 2016 Canadian Number Theory Association 14th Meeting. University of Calgary. Calgary, AB.  
invited lecture
- 2015 Canadian Mathematical Society Winter Meeting. Montréal, QC.  
Analytic Number Theory session

#### Invited Seminars on Research

- 2024 University of Virginia. Charlottesville, VA.  
Number Theory seminar
- 2024 Kyushu University. Fukuoka, Japan.  
Algebra seminar
- 2023 University of Toronto. Toronto, ON.  
Probability seminar
- 2023 Pacific Institute for the Mathematical Sciences. Vancouver, BC.  
CRG  $L$ -functions in Analytic Number Theory seminar
- 2022 American Institute of Mathematics. San Jose, CA.  
FRG  $L$ -functions graduate seminar
- 2022 Rutgers University. Newark, NJ.  
Number Theory seminar
- 2021 Kansas State University. Manhattan, KS.  
Number Theory seminar

- 2021 University of Mississippi. Oxford, MS.  
Number Theory seminar
- 2021 Heilbronn Institute. Bristol, UK.  
Number Theory seminar
- 2021 Montreal number theory group. Montréal, QC.  
MOBIUS ANT mini-course (4 talks)
- 2021 Institut Elie Cartan de Lorraine. France.  
Nancy Metz Number Theory seminar
- 2021 Boise State University. Boise, ID.  
Department colloquium
- 2021 Fields Institute. Toronto, ON.  
Number Theory seminar
- 2020 University of Lethbridge. Lethbridge, AB.  
Number Theory and Combinatorics seminar
- 2019 University of Wisconsin-Madison. Madison, WI.  
Number Theory seminar
- 2019 University of New South Wales Canberra. Canberra, Australia.  
Number Theory seminar
- 2019 University of New South Wales Sydney. Sydney, Australia.  
Number Theory seminar
- 2019 Duke University. Durham, NC.  
Number Theory seminar
- 2018 Tufts University. Medford, MA.  
Algebra and Number Theory seminar
- 2018 Stanford University. Stanford, CA.  
Number Theory seminar
- 2018 University of Oregon. Eugene, OR.  
Number Theory seminar
- 2018 University of Wisconsin-Madison. Madison, WI.  
Number Theory seminar
- 2018 Boise State University. Boise, ID.  
Complexity Across Disciplines REU seminar
- 2017 University of Waterloo. Waterloo, ON.  
Number Theory seminar
- 2016 Stanford University. Stanford, CA.  
Number Theory seminar
- 2016 University of Lethbridge. Lethbridge, AB.  
Number Theory and Combinatorics seminar
- 2016 York University. Toronto, ON.  
Number Theory seminar

#### D. LIST OF COURSES

##### University of Toronto

- 2023–24 MAT237 Multivariable Calculus with Proofs (coordinator, 4 sections, 550 enrolled)
- 2023 Winter MAT198 Cryptology (Innis FYF)
- 2022–23 MAT237 Multivariable Calculus with Proofs (coordinator, 4 sections, 500 enrolled)
- 2021–22 MAT237 Multivariable Calculus with Proofs (coordinator, 4 sections, 500 enrolled)
- 2021 Fall MAT198 Cryptology (Innis FYF)

2020–21	MAT237 Multivariable Calculus with Proofs (coordinator, 4 sections, 500 enrolled)
2020 Fall	MAT198 Cryptology
2020 Winter	MAT198 Cryptology
2019–20	MAT137 Calculus with Proofs (coordinator, 8 sections, 1500 enrolled)

**Stanford University**

2019 Spring	MATH 122 Modules and Group Representations
2019 Spring	MATH 106 Functions of a Complex Variable
2018 Spring	MATH 52 Integral Calculus of Several Variables
2018 Winter	MATH 106 Functions of a Complex Variable

**University of Toronto**

2017 Winter	MAT135 Calculus I(A) for Life Sciences (co-coordinator)
2016 Fall	MAT186 Calculus I for Engineers
2016 Summer	MAT136 Calculus I(B) for Life Sciences (co-coordinator)
2015 Fall	MAT186 Calculus I for Engineers
2014 Fall	MAT186 Calculus I for Engineers
2014 Summer	MAT136 Calculus I(B) for Life Sciences (co-coordinator)

**E. LEADERSHIP, PROFESSIONAL DEVELOPMENT, AND SERVICE****Pedagogical Leadership**

2024	(upcoming) Arts & Science Showcase, University of Toronto invited speaker on DTL studio project
2023–	Arts & Science Digital Teaching & Learning Studio, University of Toronto (ongoing) created 6 pilot MAT237 concept videos with Alexandra Logue, Phil Rudz, and DTL studio team
2023	Student Writing Workshop by CMS student committee. CMS Winter Meeting, Montreal QC invited workshop leader on "How to get the most out of a math talk"
2023	Mathematics Education seminar. Department of Mathematics, University of Toronto invited talk on "Lifecycle of assessments in a large course"
2023	Arts & Science Showcase: Writing-Integrated Teaching, University of Toronto invited roundtable panelist on "Employing WIT for TA Development and Student"
2022	Arts & Science Teaching & Learning Community of Practice, University of Toronto invited talk on "Lifecycle of assessments in a large course"
2019–22	First-time instructor training, Mathematics Department, University of Toronto supported 3 to 4 new instructors with microteaching sessions, class observations, and reflections
2019–21	First-time TA training, Mathematics Department, University of Toronto supported training and led interactive sessions on grading, feedback, and consistency for 90+ TAs
2019–21	Director of Math Learning Centre, Mathematics designed and implemented new drop-in TA resource for large first year courses with total enrollment 7000 per semester; both in-person and online; relocated to better space in collaboration with FAS
2018	Postdoc instructor training, Mathematics Department, Stanford University led two sessions on experiences with active learning at this 3-day workshop
2017	Graduate student instructor training, Mathematics Department, University of Toronto provided feedback to graduate students in microteaching session
2014	Teaching Assistants' Day. University of Toronto. Toronto, ON. invited speaker and roundtable panelist

**Undergraduate Supervision**

2024	Fields Institute Undergraduate Summer Research Program (3 students, upcoming) Declan Hoban (Berkeley); Nadya-Catherine Ismail (Smith College); Jibrán Shah (U. Toronto)
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- 2024 Mathematics Undergraduate Summer Research Program, U. Toronto (3 students, upcoming)  
Sabek Germame; Hanfu Gong; Lucas Olmstead
- 2024 Work Study Program, Textbook Design Assistants (2 to 4 students, upcoming)  
to be decided
- 2023 Fields Institute Undergraduate Summer Research Program (3 students)  
Max Hoffman (U. Goethe Frankfurt); Annemily Hoganson (Carleton College); Siddarth Menon  
(Berkeley)
- 2023 Work Study Program, Textbook Design Assistants (4 students)  
Victoria Allder; Chengyuan (Ryan) Shi; Amy Wang; Sarah Xie
- 2022 Work Study Program, Textbook Design Assistants (4 students)  
Sirui (Ariel) Chen (next MSc Computer Science at Stanford); Kevin Didi (next MSc Economics at U.  
Toronto); Sarah Verreault (next MSc Computer Science at ETH); Amy Wang
- 2021 Work Study Program, Textbook Design Assistants (3 students)  
Sam De Abreu (next PhD Earth and Planetary Sciences at Yale U.); Raymond Liu; Lucas Prates
- 2020 Fields Institute Undergraduate Summer Research Program (4 students)  
Daksh Aggarwal (Grinnell, next PhD Math at Brown U.); Unique Subedi (U. Mississippi, next PhD  
Stats at U. Michigan); William Verreault (U. Laval, next MSc Math at U. Laval, now PhD Math at U.  
Toronto); Chenghui Zheng (U. Toronto, next MSc Stats at U. Toronto, now PhD Stats at UW Madison)

#### Postdoctoral and Graduate Supervision

- 2023– Research Project, Inclusive Pathways in Explicit Number Theory summer school (2 students)  
Shivani Goel (IIIT-Delhi PhD); Henry Twiss (Brown PhD); co-led with Kubra Benli (ULeth postdoc)
- 2023 Reading Course, University of Toronto (1 student)  
Matias Bruna Penalzoza; studied sieve theory and binary quadratic forms

#### Professional Development

- 2023–24 Peer-to-Peer Mentorship program, CTSI, University of Toronto  
participant in intensive program with biweekly meetings and 4 workshops
- 2023 CMS Winter meeting. Montreal, QC  
participant at talks on teaching and learning
- 2023 MAA Seaway Sectional Spring meeting. Waterloo, ON  
participant at talks and workshops on teaching and learning
- 2023 Teaching & Learning Showcase 2023, CTSI, University of Toronto  
participant at 3-day conference organized by university's teaching centre
- 2022–23 Arts & Science Teaching & Learning Community of Practice, University of Toronto  
participant at monthly seminar organized by faculty
- 2019–20 MAA Project NExT Silver Dot  
participated at invited MAA program for teaching development of junior faculty members
- 2020 MAA MathFest. online.  
Project NExT program and other activities on teaching
- 2020 Joint Math Meetings. Denver, CO.  
Project NExT program and other workshops on teaching
- 2019 MAA MathFest. Cincinnati, OH.  
Project NExT program and other activities on teaching
- 2017 Mentors in Teaching Program, Stanford University  
participated in 3 full-day workshops and gave feedback to TAs in the Math Department
- 2013–14 Advanced University Teaching Preparation Certificate, University of Toronto  
offered by Teaching Assistants' Training Program for completing 10 workshops, in-class observation,  
microteaching, and teaching dossier
- 2014 Teaching Large Classes, Mathematics Department, University of Toronto  
Course offered by Prof. Joe Repka with practice preparing course materials and teaching a class

2013–14 Teaching Assistants' Training Program workshops, University of Toronto  
 offered by Centre for Teaching Support & Innovation including: Active Learning Methods in Science  
 and Engineering; Pedagogy 101; Accessibility and AODA in the University Environment; Fostering  
 Academic Integrity; Dealing with Students in Difficulty

#### **Service within the University**

2023–24 Undergraduate Committee, Mathematics  
 2023 Online Grading RFSQ Committee, University  
 2022–23 Teaching Stream Appointments Committee, Mathematics  
 2021–22 Teaching Stream Appointments Committee, Mathematics  
 2020–21 Workload Committee, Mathematics  
 2020–21 Undergraduate Committee, Mathematics  
 2019–20 Undergraduate Committee, Mathematics

#### **Service outside the University**

2023 Co-organizer for online conference "Around Frobenius Distributions and Related Topics IV"  
 co-organized with Lucile Devin and Jesse Thorner.  
 2019 Co-organizer for a session of Canadian Mathematical Society Winter Meeting  
 Analytic Number Theory session co-organized with Yu-Ru Liu and Stanley Xiao.  
 2018– Reviewer for publications on MathSciNet  
 2017– Peer reviewer for academic journals  
*Algebra and Number Theory*  
*Bulletin of the London Mathematical Society*  
*Duke Mathematical Journal*  
*Forum Mathematics, Pi*  
*International Mathematics Research Notices*  
*Journal of Mathematical Analysis and Applications*  
*Journal of Number Theory*  
*Mathematical Research Letters*  
*Mathematics of Computation*  
*Mathematika*  
*Proceedings of the American Mathematical Society*  
*Quarterly Journal of Mathematics*  
*Research in the Mathematical Sciences*  
*Research in Number Theory*  
*Transactions of the American Mathematical Society*  
 2017–19 Organizer of Stanford Analytic Number Theory learning seminar