Robert J. Lemke Oliver

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Last updated: September 2, 2025

Present Position(s):

- Visiting Associate Professor, University of Wisconsin-Madison (2025-)
- (On leave) Associate Professor, Tufts University (2022-)
  - Assistant Professor (2016-2022)

Previous Position:

- NSF Postdoc, Stanford University (2013-2016)

Education:

- Ph.D., Emory University (2013)
- M.A., University of Wisconsin-Madison (2010)
- B.S., Summa Cum Laude, Rose-Hulman Institute of Technology (2008)

Research Interests:

- Arithmetic statistics, analytic number theory, number fields, elliptic curves, the distribution of primes, class groups, and L-functions

Grants:

- Simons Fellowship in Mathematics. $89,429. (January 2023–January 2024)
- NSF DMS-2200760, *Applications of analytic uniformity in arithmetic statistics.* $145,260. (September 2022-July 2025)
- NSF DMS-1802058, *Workshop on Automorphic Forms and Related Topics.* $21,000. (March 2018) (Co-PI's: Michael Chou, Amanda Folsom, Steven J. Miller)
- NSF DMS-1601398, *Concrete arithmetic applications of analytic number theory.* $127,374. (August 2016-July 2020)
- NSF DMS-1303913, Mathematical sciences postdoctoral research fellowship. $150,000. (August 2013-June 2016)

Selected publications:

- (With J. Thorner, A. Zaman) *An approximate form of Artin's holomorphy conjecture and non-vanishing of Artin L-functions.* Inventiones Mathematicae. 235(2024) no. 3, 893–971.
- (With F. Thorne) *Upper bounds on number fields of given degree and bounded discriminant.* Duke Mathematical Journal, 171 (2022), no. 15, 3077-3087.
- (With M. Bhargava, Z. Klagsbrun, A. Shnidman) *Three-isogeny Selmer groups and ranks of abelian varieties in quadratic twist families.* Duke Mathematical Journal, 168 no. 15 (2019), 2951-2989.
- (With K. Soundararajan) *Unexpected biases in the distribution of consecutive primes.* Proceedings of the National Academy of the Sciences, 113 no. 31 (2016), E4446-E4454.

Recent preprints (submitted and accepted works):

1. (With J. Wang, M. Wood) *The average size of* 3*-torsion in class groups of* 2*-extensions.* Forum of Math, Pi. Accepted.
2. *Uniform exponent bounds on the number of primitive extensions of number fields.*
3. (With A. Smith) *Faithful Artin induction and the Chebotarev density theorem.*
4. *Enumerating Galois extensions of number fields.*
5. (With B. Alberts, J. Wang, M. Wood) *Inductive methods for counting number fields.*
6. (With A. Zaman) *Improving the trivial bound for ℓ-torsion in class groups.*

Scheduled invited talks and invited talks given within the last year:

1. *TBA*, Duke University department colloquium. (March 2026)
2. *TBA*, CRM workshop on Arithmetic Statistics. (March 2026)
3. *Enumerating Galois extensions of number fields*, Harvard University number theory seminar. (May 2025)
4. *Symmetries and counting: Finite group theory and arithmetic statistics*, University of Wisconsin-Madison department colloquium. (December 2024)
5. *The distribution of number fields and class groups*, AIM workshop on "Nilpotent counting problems in arithmetic statistics." (November 2024)
6. *Enumerating Galois extensions of number fields*, Stanford University number theory seminar. (November 2024)
7. *Enumerating Galois extensions of number fields*, BC–MIT number theory seminar. (October 2024)

8. *The role of finite group theory in arithmetic statistics*, University of Illinois Urbana-Champaign department colloquium. (October 2024)

9. *The least prime whose Frobenius is in a rational equivalence class*, University of Illinois Urbana-Champaign number theory seminar. (October 2024)

10. *Enumerating Galois extensions of number fields*, invited lecture, Analytic Number Theory and Related Topics, RIMS, Kyoto University. (October 2024)

11. *Enumerating Galois extensions of number fields*, Dartmouth College number theory seminar. (September 2024)

12. *Enumerating Galois extensions of number fields*, Five colleges number theory seminar (Amherst, MA). (September 2024)

Ph.D. Students:

1. Matthew Friedrichsen (2017-2022)

2. Daniel Keliher (2017-2022)

3. Vittoria Cristante (2023-)

4. Johnna Farnham (2023-)

Undergradute students advised/mentored:

1. Elena Axinn. *The distribution of prime and prime-like numbers.* Tufts senior honors thesis. (2023-24)

2. Shayla Lawrence, Adrienne Nolt, Eduardo Pareja Lema. Tufts VERSEIM-REU. (Summer 2022)

3. Fabio Vera-Crespo. *Identifying structure in maximal prime patterns.* Tufts Visiting and Emerging Research Scholars Experience. (Summer 2018)

4. Christopher Keyes. *Point growth on hyperelliptic curves.* Tufts summer scholars, senior honors thesis. (2017-18)

5. Christian Testa. *Elliptic curves.* Tufts senior honors thesis. (2016-17) (co-advised with George McNinch)

Selected additional service activities:

1. AMS Young Scholars Awards committee (2019-2022; chair 2022)

2. Member, department graduate and graduate admissions committees (2016–2023), DEIJ committee (2020-21), outreach committee (2016-17), curriculum committee (2024–)

3. Organizer of the 34th Automorphic Forms Workshop (2018), plus six AMS special sessions (2016–2024)

All Mathematical Publications:
(Note: In mathematics, authors are listed alphabetically.)
Published papers, listed chronologically by time of publication:

1. (With R. Daileda, J. Jou, E. Rossolimo, and E. Trevino) *On the counting function for the generalized Niven numbers.* Journal de Théorie des Nombres de Bordeaux, 21 no. 3 (2009), 503-515.

2. (With C. Alfes and M. Jameson) *Proof of the Alder-Andrews Conjecture.* Proceedings of the American Mathematical Society, 139 no. 1 (2011), 63-78.

3. (With M. Jameson) *On a conjecture of Andrews.* Mathematical Research Letters, 17 no. 6 (2010), 1151-1154.

4. *Almost-primes represented by quadratic polynomials.* Acta Arithmetica, 151 (2012), 241-261.

5. *Gauss sums over finite fields and roots of unity.* Proceedings of the American Mathematical Society, 139 no. 4 (2011), 1273-1276.

6. *Eta-quotients and theta functions.* Advances in Mathematics, 241 (2013), 1-17.

7. (With J. Jung) *Pretentiously detecting power cancellation.* Mathematical Proceedings of the Cambridge Philosophical Society, 154 no. 3 (2013), 481-498.

8. *Multiplicative functions dictated by Artin symbols.* Acta Arithmetica, 161 (2013), 21-31.

9. *Representation by ternary quadratic forms.* Bulletin of the London Mathematical Society, 46 no. 6 (2014), 1237-1247.

10. (With Z. Klagsbrun) *The distribution of 2-Selmer ranks of quadratic twists of elliptic curves with partial two-torsion.* Mathematika, 62 no. 1 (2016), 67-78.

11. (With A. Castillo, C. Hall, P. Pollack, and L. Thompson) *Bounded gaps between primes in number fields and function fields.* Proceedings of the American Mathematical Society, 143 no. 7 (2015), 2841-2856.

12. (With Z. Klagsbrun) *The distribution of the Tamagawa ratio in the family of elliptic curves with a two-torsion point.* Research in the Mathematical Sciences, **1:**15, 2014.

13. (With F. Thorne) *The number of ramified primes in number fields of small degree.* Proceedings of the American Mathematical Society, 145 no. 8 (2017), 3201-3210.

14. (With A. Granville, D. M. Kane, and D. Koukoulopoulos) *Best possible densities of Dickson m-tuples, as a consequence of Zhang-Maynard-Tao.* Analytic Number Theory, in honor of Helmut Maier's 60th Birthday, Springer (eds. C. Pomerance and M. Rassias).

15. (With J. Thorner) *Effective log-free zero density estimates for automorphic L-functions and the Sato-Tate conjecture.* International Mathematics Research Notices, 22 (2019), 6988-7036.

16. (With K. Soundararajan) *Unexpected biases in the distribution of consecutive primes.* Proceedings of the National Academy of the Sciences, 113 no. 31 (2016), E4446-E4454.

17. (With A. Bridy, A. Shallit, J. Shallit) *The Generalized Nagell-Ljunggren Problem: Powers with Repetitive Representations*, Experimental Mathematics, 28 no. 4 (2019), 428-439.

18. (With K. Soundararajan) *The distribution of consecutive prime biases and sums of sawtooth random variables*, Mathematical Proceedings of the Cambridge Philosophical Society, 168 no. 1 (2020), 149-169.

19. (With M. Bhargava, Z. Klagsbrun, A. Shnidman) *Three-isogeny Selmer groups and ranks of abelian varieties in quadratic twist families.* Duke Mathematical Journal, 168 no. 15 (2019), 2951-2989.

20. (With F. Thorne) *Upper bounds on polynomials with small Galois group.* Mathematika, 66 no. 4 (2020), 1054-1059.

21. (With M. Bhargava, Z. Klagsbrun, A. Shnidman) *Elements of given order in Tate–Shafarevich groups of abelian varieties in quadratic twist families.* Algebra & Number Theory, 15 no. 3 (2021), 627-655.

22. (With A. Landesman and F. Thorne) *Improved lower bounds for the number of fields with alternating Galois group.* Bulletin of the London Mathematical Society, 53 no. 4 (2021), 1159-1173.

23. (With F. Thorne) *Rank growth of elliptic curves in nonabelian extensions.* International Mathematics Research Notices, 24 (2021), 18411-18441.

24. (With F. Thorne) *Upper bounds on number fields of given degree and bounded discriminant.* Duke Mathematical Journal, 171 (2022), no. 15, 3077-3087.

25. (With T. Anderson, A. Gafni, D. Lowry-Duda, G. Shakan, R. Zhang) *Quantitative Hilbert irreducibility and almost prime values of polynomial discriminants.* International Mathematics Research Notices, 2023 no. 3, 2188-2214.

26. (With S. Shrestha, F. Thorne) *Asymptotic identities for additive convolutions of sums of divisors functions.* Mathematical Proceedings of the Cambridge Philosophical Society, 174 (2023) no. 1, 59-78.

27. (With J. Thorner, A. Zaman) *An approximate form of Artin's holomorphy conjecture and non-vanishing of Artin L-functions.* Inventiones Mathematicae. 235(2024) no. 3, 893–971.

28. (With J. Thorner) *Zeros of twisted L-functions near* $\Re(s) = 1$. Appendix to *Shimura curves and the abc conjecture*, by H. Pasten. Journal of Number Theory, Prime, 254 (2024), 214–335.

29. (With T. Anderson, A. Gafni, K. Hughes, D. Lowry-Duda, F. Thorne, J. Wang, R. Zhang) *Improved bounds on number fields of small degree.* Discrete Analysis, 2024, Paper No. 19, 24 pp.

30. (With D. Loughran, A. Shnidman) *Normal distribution of bad reduction.* Ramanujan Journal, 67 (2025), no. 3, Paper No. 52, 15 pp.

Undergraduate Astronomy Publications:

1. J. Sauppe, S. Torno, R. Lemke Oliver, and R. Ditteon, *Asteroid Lightcurve Analysis at the Oakley Observatory: March/April 2007.* Minor Planet Bulletin, 34 no. 4 (2007), p. 119.

2. S. Torno, R. Lemke Oliver, and R. Ditteon, *Asteroid Lightcurve Analysis at the Oakley Southern Sky Observatory: October 2007.* Minor Planet Bulletin, 35 no. 2 (2008), p. 54.

3. R. Lemke Oliver, H. Shipley, and R. Ditteon, *Asteroid Lightcurve Analysis at the Oakley Southern Sky Observatory: 2008 March.* Minor Planet Bulletin, 35 no. 4 (2008), p. 149.

Selected Student Awards:

- Emory University, Department of Mathematics and Computer Science, Marshall Hall, Jr. Award for outstanding teaching as a graduate student (Spring 2013)

- Heminway Medal for highest GPA for a graduating senior (Rose-Hulman, Spring 2008)

Teaching Experience: *Tufts University:*

- Math 32, Calculus I: Fall 2020

- Math 34, Calculus II: Fall 2016, Spring 2018

- Math 51, Differential Equations: Spring 2020

- Math 63, Number Theory: Spring 2017, Fall 2022

- Math 70, Linear Algebra: Fall 2019 (two sections), Fall 2021

- Math 135, Real Analysis I: Spring 2021

- Math 136, Real Analysis II: Fall 2021, Fall 2022, Spring 2024

- Math 145, Abstract Algebra I: Fall 2016, Fall 2020, Fall 2024

- Math 146, Abstract Algebra II: Spring 2024

- Math 150, Elliptic Curves: Spring 2018
- Math 235, Graduate Analysis I: Fall 2024
- Math 240, Arithmetic Statistics: Spring 2022
- Math 246, Graduate Algebra II: Spring 2025
- Math 250, The Distribution of Primes: Fall 2017

Experience prior to Tufts:

- Instructor for Math 19 (Calculus 1) at Stanford University (Winter 2015)
- Instructor for Math 108 (Introduction to Combinatorics) at Stanford University (Winter 2015)
- Project leader at 2013 Emory REU in Number Theory (Summer 2013). Resulted in two publications. One mentee was an honorable mention for the Alice T. Schafer prize.
- Project leader at 2012 Emory REU in Number Theory (Summer 2012). Resulted in a publication. One mentee won the Alice T. Schafer prize.
- Instructor for Math 111 (Calculus 1) at Emory University (Fall 2010, 2011, 2012)
- Instructor for Math 112 (Calculus 2) at Emory University (Spring 2011, 2013)
- Teaching Assistant for Math 221 (Calculus 1) at UW-Madison (Fall 2008)

Selected Older Seminars and Invited Talks :

- *Uniform exponent bounds on primitive extensions of number fields*, University of Toronto number theory seminar. (April 2024)
- *Faithful induction theorems and the Chebotarev density thoerem*, invited lecture, Pittsburgh Links between Analysis and Number Theory conference. (March 2024)
- *Faithful induction theorems and the Chebotarev density theorem*, Harvard University number theory seminar. (November 2023)
- *Uniform exponent bounds on the number of primitive extensions of number fields*, invited lecture, Around Frobenius Distributions and Related Topics IV. (Online) (October 2023)
- *Simple ways of encoding roots of polynomials and bounds on number fields*, Mathematics Colloquium, Tulane University. (April 2023)
- *Simple ways of encoding roots of polynomials and bounds on number fields*, Mathematics Colloquium, University of South Carolina. (March 2023)

- *Uniform exponent bounds on the number of primitive extensions of number fields*, inivted talk, Southern Regional Number Theory Conference, Baton Rouge, Louisiana. (March 2023)
- *Uniform exponent bounds on the number of primitive extensions of number fields*, Simons Collaboration meeting on arithmetic geoemetry. (January 2023)
- *Uniform exponent bounds on the number of primitive extensions of number fields*, Number Theory Web Seminar. (December 2022)
- *Upper bounds on number fields*, VaNTAGe online number theory seminar. (July 2022)
- *The average size of* 3*-torsion in class groups of* 2*-extensions*, Princeton University/IAS number theory seminar. (April 2022)
- *Algebraic points on elliptic curves*, plenary lecture at *Modular forms, arithmetic, and women in mathematics* conference at Emory University. (November 2019)
- *Number fields and class groups*, Stanford University number theory seminar. (February 2019)
- *Prime numbers, randomness, and the gambler's fallacy*, Duquesne University colloquium. (November 2018)
- *Inductive methods for counting number fields*, Yale University number theory seminar. (November 2018)
- *Counting finite towers of number fields*, invited talk, CNTA 2018. (July 2018)
- *Prime numbers, randomness, and the gambler's fallacy*, Williams College colloquium. (April 2018)
- *Tate-Shafarevich groups of abelian varieties in quadratic twist families*, Harvard University number theory seminar. (December 2017)
- *Selmer groups and Tate-Shafarevich groups in quadratic twist families*, MIT number theory seminar. (October 2017)
- *Prime numbers, randomness, and the gambler's fallacy*, University of Vermont colloquium. (September 2017)
- *Prime numbers, randomness, and the gambler's fallacy*, University of Connecticut colloquium. (April 2017)
- *Prime numbers, randomness, and the gambler's fallacy*, Bryn Mawr-Haverford bicollege colloquium. (February 2017)
- *Quadratic twists of elliptic curves with* 3*-torsion*, Mathematical Sciences Research Institute. (February 2017)
- *The distribution of consecutive prime biases*, Mathematical Sciences Research Institute. (February 2017)