

Curriculum Vitae

Timothy Scott Trudgian t.trudgian@adfa.edu.au

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Education and Employment

BSc (Hons), The Australian National University, December 2005

DPhil, University of Oxford, June 2010

Lecturer, Merton College, Oxford, September 2009–July 2010

Postdoctoral Research Fellow, University of Lethbridge, July 2010–June 2012

ARC Early Career Research Fellow, The Australian National University, 2012–2016

ARC Future Fellow, University of New South Wales Canberra, 2017–2021

Associate Professor, University of New South Wales Canberra, 2020–present

Research Interests

Analytic number theory: the Riemann zeta-function, distribution of primes, primitive roots.

Publications: Research

1. Introducing complex numbers, *Austral. Senior Math. J.*, 2009, 23(2):59–62.
2. On a conjecture of Shanks, *J. Number Theory*, 2010, 130(12):2635–2638.
3. On the success and failure of Gram’s Law and the Rosser Rule, *Acta Arith.*, 2011, 148(3):225–256.
4. Improvements to Turing’s Method, *Math. Comp.*, 2011, 80(276):2259–2279.
5. An improved upper bound for the argument of the Riemann zeta-function on the critical line, *Math. Comp.*, 2012, 81(278):1053–1061.
6. On Selberg’s method and multiplicities of the zeroes of the Riemann zeta-function, *Comment. Math. Univ. St. Pauli*, 2011–12, 60(1–2):227–229.
7. Between the problems of Pólya and Turán, *J. Austral. Math. Soc.*, 2012, 93(1–2):157–171 (with M. J. Mossinghoff).
8. Twin progress in number theory, *Austral. Math. Soc. Gaz.*, 2013, 40(3):202–208.
9. A new upper bound for $|\zeta(1 + it)|$, *Bull. Aust. Math. Soc.*, 2014, 89(2):259–264.
10. An improved upper bound for the argument of the Riemann zeta-function on the critical line II, *J. Number Theory*, 2014, 134:280–292.
11. There are no socialist primes less than 10^9 , *Integers*, 2014, 14(A63):4pp.
12. An improved upper bound for the error in the zero-counting formulae for Dirichlet L -functions and Dedekind zeta-functions, *Math. Comp.*, 2015, 84(293):1439–1450.

13. Linear relations of the zeroes of the zeta-function, *Math. Comp.*, 2015, 84(294):2047–2058 (with D. G. Best).
14. A still sharper region where $\pi(x) - \text{li}(x)$ is positive, *Math. Comp.*, 2015, 84(295):2433–2446 (with P. Demichel and Y. Saouter).
15. A log-free zero-density estimate and small gaps in coefficients of L -functions, *Int. Math. Res. Not. IMRN*, 2015, 12:4242–4268 (with A. Akbary).
16. Explicit bounds on the logarithmic derivative and the reciprocal of the Riemann zeta-function, *Funct. Approx. Comment. Math.*, 2015, 52(2):253–261.
17. The sum of the unitary divisor function, *Publ. Inst. Math. (Beograd) (N.S.)*, 2015, 97(111):175–180.
18. An improved explicit bound on $|\zeta(\frac{1}{2} + it)|$, *J. Number Theory*, 2015, 147:842–851 (with D. J. Platt).
19. Linnik’s approximation to Goldbach’s conjecture, and other problems, *J. Number Theory*, 2015, 153:54–62 (with D. J. Platt).
20. A short extension of two of Spira’s results, *J. Math. Inequal.*, 2015, 9(3):795–798.
21. Robin’s inequality for 11-free integers, *Integers*, 2015, 15(A12):5pp. (with K. A. Broughan).
22. On consecutive primitive elements in a finite field, *Bull. Lond. Math. Soc.*, 2015, 47(3):418–426 (with S. D. Cohen and T. Oliveira e Silva).
23. Bounds on the number of Diophantine quintuples, *J. Number Theory*, 2015, 157:233–249.
24. Nonnegative trigonometric polynomials and a zero-free region for the Riemann zeta-function, *J. Number Theory*, 2015, 157:329–349 (with M. J. Mossinghoff).
25. A proof of the conjecture of Cohen and Mullen on sums of primitive roots, *Math. Comp.*, 2015, 84(296):2979–2986 (with S. D. Cohen and T. Oliveira e Silva).
26. Updating the error term in the prime number theorem, *Ramanujan J.*, 2016, 39(2):225–234.
27. On the first sign change of $\theta(x) - x$, *Math. Comp.*, 2016, 85(299):1539–1547 (with D. J. Platt).
28. On Grosswald’s conjecture on primitive roots, *Acta Arith.*, 2016, 172(3):263–270 (with S. D. Cohen and T. Oliveira e Silva).
29. Zeroes of partial sums of the Riemann zeta-function, *LMS J. Math. Comput.*, 2016, 19(1):37–41 (with D. J. Platt).
30. Diophantine quintuples containing triples of the first kind, *Period. Math. Hungar.*, 2016, 72(2):235–242 (with D. J. Platt).
31. Improvements to Turing’s Method II, *Rocky Mountain J. Math.*, 2016, 46(1):325–332.
32. Searching for Diophantine quintuples, *Acta Arith.*, 2016, 173(4):365–382 (with M. Cipu).
33. Resolving Grosswald’s conjecture on GRH, *Funct. Approx. Comment. Math.*, 2016, 55(2):215–225 (with K. McGown and E. Treviño).
34. On the least square-free primitive root modulo p , *J. Number Theory*, 2017, 170:10–16 (with S. D. Cohen).
35. The T_4 and G_4 construction of Costas arrays, *J. Combin. Math. Combin. Comput.*, 2017, 100:217–221 (with Q. Wang).

36. On sums of two squares and at most two powers of 2, *Amer. Math. Monthly*, 2017, 124(8):737–740 (with D. J. Platt).
37. The Liouville function and the Riemann hypothesis, *Exploring the Riemann Zeta Function*, pp. 201–221, Springer, Cham, 2017 (with M. J. Mossinghoff).
38. Linear combinations of primitive elements of a finite field, *Finite Fields Appl.*, 2018, 51:388–406 (with S. D. Cohen, T. Oliveira e Silva and N. Sutherland).
39. Square-full primitive roots, *Int. J. Number Theory*, 2018, 14(4):1013–1021 (with M. Munsch).
40. Existence results for primitive elements in cubic and quartic extensions of a finite field, *Math. Comp.*, 2019, 88(316):931–947 (with G. Bailey, S. D. Cohen and N. Sutherland).
41. Quadratic non-residues that are not primitive roots, *Math. Comp.*, 2019, 88(317):1251–1260 (with T. Jarso).
42. Fujii’s development on Chebyshev’s conjecture, *Int. J. Number Theory*, 2019, 15(3):639–644 (with D. J. Platt).
43. Primitive values of quadratic polynomials in a finite field, *Math. Comp.*, 2019, 88(318):1903–1912 (with A. R. Booker, S. D. Cohen and N. Sutherland).
44. Lehmer numbers and primitive roots modulo a prime, *J. Number Theory*, 2019, 203:68–79 (with S. D. Cohen).
45. Explicit upper bounds on the least primitive root, *Proc. Amer. Math. Soc.*, 2020, 148(3):1049–1061 (with K. J. McGown).
46. Improved bounds on Brun’s constant, *From Analysis to Visualization. JBCC 2017*, pp. 395–406, Springer Proc. in Math. and Stat., vol. 313. Springer, Cham, 2020 (with D. J. Platt).
47. An elementary bound on Siegel zeroes, *J. Number Theory*, 2020, 212:448–457 (with T. Morrill).
48. On integers n for which $\sigma(2n+1) \geq \sigma(2n)$, *J. Number Theory*, 2020, 215:138–148 (with M. Kobayashi).
49. The least primitive root modulo p^2 , *J. Number Theory*, 2020, 215:20–27 (with B. Kerr and K. J. McGown).
50. A tale of two omegas, *75 Years of Mathematics of Computation*, pp. 343–364, Contemp. Math., 754, Amer. Math. Soc., Providence, RI, 2020 (with M. J. Mossinghoff).
51. The error term in the prime number theorem, *Math. Comp.*, 2021, 90(328):871–881 (with D. J. Platt).
52. The distribution of k -free numbers, *Math. Comp.*, 2021, 90(328):907–929 (with M. J. Mossinghoff and T. Oliveira e Silva).
53. The Riemann hypothesis is true up to $3 \cdot 10^{12}$, *Bull. Lond. Math. Soc.*, 2021, 53(3):792–797 (with D. J. Platt).
54. A harmonic sum over nontrivial zeros of the Riemann zeta-function, *Bull. Aust. Math. Soc.*, 2021, 104(1):59–65 (with R. P. Brent and D. J. Platt).
55. Two explicit divisor sums, *To appear in Ramanujan J.* (with M. Cully-Hugill).
56. Oscillations in weighted arithmetic sums, *To appear in Int. J. Number Theory* (with M. J. Mossinghoff).
57. Sign changes in the prime number theorem, *To appear in Ramanujan J.* (with D. J. Platt and T. Morrill).

58. Oscillations in the Goldbach conjecture, *To appear in J. Théor. Nombres Bordeaux* (with M. J. Mossinghoff).
59. Accurate estimation of sums over zeros of the Riemann zeta-function, *To appear in Math. Comp.* (with R. P. Brent and D. J. Platt).
60. Wolstenholme and Vandiver primes, *To appear in Ramanujan J.* (with A. R. Booker, S. Hathi, and M. J. Mossinghoff).
61. Uniform effective estimates for $|L(1, \chi)|$, *To appear in J. Number Theory* (with A. Languasco).
62. The mean-square of the error term in the prime number theorem, *To appear in J. Number Theory* (with R. P. Brent and D. J. Platt).
63. Some explicit and unconditional results on gaps between zeroes of the Riemann zeta-function, *Submitted* (with A. Simonič and C. L. Turnage-Butterbaugh).
64. Explicit lower bounds on $L(1, \chi)$, *Submitted* (with M. J. Mossinghoff and V. Starichkova).
65. Quadratic non-residues and cyclic norm-Euclidean cubic fields, *In preparation* (with B. Kerr and K. J. McGown).
66. Four and five consecutive primitive elements in a finite field, *In preparation* (with T. Jarso).
67. Explicit upper bounds for $L(1, \chi)$ when χ is quadratic, *In preparation* (with F. Francis, O. Ramaré and E. Treviño).
68. Momentary logging of the Riemann zeta-function, *In preparation* (with A. Simonič).
69. On primitive elements of a finite field with given trace, *In preparation* (with S. D. Cohen and N. Leong).
70. On the discrete fourth-moment of the Riemann zeta-function, *In preparation* (with R. R. Hall)
71. On r -gaps between zeroes of the Riemann zeta-function, *In preparation* (with A. Simonič and C. L. Turnage-Butterbaugh).

Publications: Other

1. *Applications of perfect numbers*, The Lethbridge Herald, 9/10/10.
2. *Happy birthday π* , The Drum, 4/3/11.
3. *The Leonora Overture: making the best of mandatory detention*, The Drum, 6/12/10.
4. *Why Australia can win the Ashes 5-0* (nine articles), ESPNcricinfo, 14/11/11.
5. *Possible Outcome of 2012 Alberta General Election with Preferential Voting*, Foundation for Democratic Advancement, 25/4/12.
6. Eight articles for *The Conversation*, 2014–present, on cricket, economics, and politics: <https://theconversation.com/profiles/tim-trudgian-128111>

Awards, Grants, and Scholarships

Blue Hat Award¹ 63rd annual AustMS meeting, Melbourne, 2019

Visiting Fellow and Oliver Smithies Visiting Lecturer, Balliol College, Oxford, 2019

¹Awarded by the students at the AustMS to the best non-student talk. Roughly on par with a Fields Medal, the Governor-Generalcy, and skippering 5-0 Ashes series victories.

Special Research Grant, UNSW Canberra, 2018
 National Computational Infrastructure, NCMAS, 2017, 2019, 2020
 Future Fellowship, ARC, 2016–2019
 Discovery Project (Chief Investigator), ARC, 2016–2018
 President, Number Theory Special Interest Group, AustMS, 2015–2019
 Outstanding Contribution to Student Learning by an Early Career Academic, ANU, 2014
 Research Travel Grant, Edinburgh Mathematical Society, 2014
 Visiting Lecturers to Scotland Grant, Royal Society of Edinburgh, 2014
 Travel Grant, Ian Potter Foundation, 2014
 Discovery Early Career Researcher Award, ARC, 2012–2015
 General Sir John Monash Award, 2006–2009

Supervision

I am very passionate about increasing the number of women in mathematics and about providing mentoring to current female students.

Post-docs

Thomas Morrill, 2018–2020
 Bryce Kerr, 2019

Caitlin Mattner, 2017
 Michaela Cully-Hugill, 2018

PhD

Adrian Dudek, 2016
 Matteo Bordignon, 2021 (expected)
 Jeffrey Lay, 2022 (expected)
 Aleksander Simonič, 2022 (expected)
 Forrest Francis, 2022 (expected)
 Ethan Lee, 2023 (expected)
 Michaela Cully-Hugill, 2023 (expected)
 Shehzad Hathi, 2023 (expected)
 Valeriia Starichkova, 2024 (expected)
 Daniel Johnston, 2025 (expected)
 Nicol Leong, 2025 (expected)

Summer Research Scholars

Shuhui He, 2012–2013
 Benedict Morrissey, 2012–2013
 Eloise Hamilton, 2013–2014
 Nam Ho, 2013–2014
 Kirsty Chalker, 2014–2015
 Owen Header, 2014–2015
 Kam-hung Yau, 2014–2015
 Mitchell Chiew, 2015–2016
 Madeleine Kyng, 2015–2016
 Jacob Vtv, 2015–2016
 Jana Pretorius, 2018

Honours

Jeffrey Lay, 2013–2014
 Kirsty Chalker, 2016
 Morgan Hunter, 2016
 David Quarel, 2016–2017

Advanced Studies Students

Jeffrey Lay, 2013
 Benjamin Thompson, 2014
 Daniel Hills, 2015
 Angus Gruen, 2015
 Morgan Hunter & Kyle Steemson, 2015
 Kirsty Chalker & Morgan Hunter, 2016
 Michaela Cully-Hugill, 2018