

# Curriculum Vitae

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

February 16, 2022

## 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. Oscillations in weighted arithmetic sums, *Int. J. Number Theory*, 2021, 17(1):1697–1716 (with M. J. Mossinghoff).
56. Accurate estimation of sums over zeros of the Riemann zeta-function, *Math. Comp.*, 2021, 90(332):2923–2935 (with R. P. Brent and D. J. Platt).
57. Two explicit divisor sums, *Ramanujan J.*, 2021, 56(1):141–149 (with M. Cully-Hugill).

58. Sign changes in the prime number theorem, *Ramanujan J.*, 2022, 57(1):165–173 (with D. J. Platt and T. Morrill).
59. Oscillations in the Goldbach conjecture, *To appear in J. Théor. Nombres Bordeaux* (with M. J. Mossinghoff).
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, *To appear in Trans. Amer. Math. Soc.* (with A. Simonič and C. L. Turnage-Butterbaugh).
64. Four consecutive primitive elements in a finite field, *To appear in Math. Comp.* (with T. Jarso).
65. Explicit lower bounds on  $L(1, \chi)$ , *To appear in J. Number Theory* (with M. J. Mossinghoff and V. Starichkova).
66. Fake Mu’s, *Submitted* (with G. Martin and M. J. Mossinghoff).
67. Primitive elements with prescribed traces, *Submitted* (with A. R. Booker, S. D. Cohen and N. Leong).
68. A limitation on proving the existence of small gaps between zeta-zeros, *Submitted* (with D. Goldston and C. L. Turnage-Butterbaugh).
69. Primitive element pairs with a prescribed trace in the cubic extension of a finite field, *Submitted* (with A. R. Booker, S. D. Cohen and N. Leong).
70. Quadratic non-residues and cyclic norm-Euclidean cubic fields, *In preparation* (with B. Kerr and K. J. McGown).
71. Explicit upper bounds for  $L(1, \chi)$  when  $\chi$  is quadratic, *In preparation* (with F. Francis, O. Ramaré and E. Treviño).
72. Momentary logging of the Riemann zeta-function, *In preparation* (with A. Simonič).
73. On  $r$ -gaps between zeroes of the Riemann zeta-function, *In preparation* (with A. Simonič and C. L. Turnage-Butterbaugh).
74. The constant in the Vinogradov–Korobov zero-free region, *In preparation* (with M. J. Mossinghoff).

## Publications: Other

1. *Applications of perfect numbers*, The Lethbridge Herald, 9/10/10.
2. *Happy birthday  $\pi$* , 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 Award<sup>1</sup> 63rd annual AustMS meeting, Melbourne, 2019  
Visiting Fellow and Oliver Smithies Visiting Lecturer, Balliol College, Oxford, 2019  
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

### Post-docs

Thomas Morrill, 2018–2020  
Bryce Kerr, 2019  
Bryce Kerr (DECRA), 2022–2024

### PhD

Adrian Dudek, 2016  
Matteo Bordignon, 2021  
Aleksander Simonič, 2022 (expected)  
Forrest Francis, 2022 (expected)  
Jeffrey Lay, 2023 (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)  
Andrew Yang, 2025 (expected)

### Honours

Jeffrey Lay, 2013–2014  
Kirsty Chalker, 2016  
Morgan Hunter, 2016  
David Quarel, 2016–2017  
Caitlin Mattner, 2017  
Michaela Cully-Hugill, 2018

### Summer Research Scholars

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

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