

# George Kenison

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## Research Experience

**Research Interests:** Linear and Algebraic Dynamical Systems, Theory of Computation, Symbolic and Algebraic Computation, Program Analysis, Automated Verification.

**Research Fellow in Computer Science and Informatics.,** September 2023–August 2025  
*School of Computer Science and Mathematics, Liverpool John Moores University.*

**Postdoctoral Researcher in Automated Reasoning and Program Analysis.,** April 2021–August 2023  
*Institute of Logic and Computation, Technische Universität Wien.*

**Postdoctoral Researcher in Infinite-State Systems and Dynamical Systems.,** June 2018–March 2021  
*Department of Computer Science, University of Oxford.*

## Education

**PhD in Mathematics,** University of Warwick. 2013–2017

*Thesis: Asymptotics in conjugacy classes for free groups.* EPSRC doctoral award studentship.

**MMath (Masters of Mathematics),** University of Warwick, First Class Hons. 2009–2013

*Dissertation: Periodic orbits of hyperbolic and quasi-hyperbolic toral automorphisms*

## Peer-Reviewed Conference Papers

- 2024. **The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters.** In: *51st International Colloquium on Automata, Languages, and Programming (ICALP 2024)*. Vol. 297, 145:1–145:20.
- 2024 (with S. Hitarth, L. Kovács, and A. Varonka). **Linear Loop Synthesis for Quadratic Invariants.** In: *41st International Symposium on Theoretical Aspects of Computer Science, STACS 2024*. Vol. 289, 41:1–41:18.
- 2023 (with L. Kovács and A. Varonka). **From Polynomial Invariants to Linear Loops.** In: *Proceedings of the 2023 International Symposium on Symbolic and Algebraic Computation, ISSAC 2023*, pp. 398–406.
- 2023 (with K. Nosan, M. Shirmohammadi, and J. Worrell). **The Membership Problem for Hypergeometric Sequences with Quadratic Parameters.** In: *Proceedings of the 2023 International Symposium on Symbolic and Algebraic Computation, ISSAC 2023*, pp. 407–416.
- 2023 (with J. Nieuwveld, J. Ouaknine, and J. Worrell). **Positivity Problems for Reversible Linear Recurrence Sequences.** In: *50th International Colloquium on Automata, Languages, and Programming, ICALP 2023*, 130:1–130:17.
- 2022. **On the Skolem Problem for Reversible Sequences.** In: *International Symposium on Mathematical Foundations of Computer Science, MFCS 2022*, 61:1–61:15.
- 2022 (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). **Solving Invariant Generation for Unsolvable Loops.** In: *Static Analysis: 29th International Symposium, SAS 2022*. Radhia Cousot Award winning paper, pp. 19–43.
- 2021 (with O. Klurman, E. Lefaucheux, F. Luca, P. Moree, J. Ouaknine, M. A. Whiteland, and J. Worrell). **On Positivity and Minimality for Second-Order Holonomic Sequences.** In: *International Symposium on Mathematical Foundations of Computer Science, MFCS 2021*, 67:1–67:15.
- 2020 (with R. Lipton, J. Ouaknine, and J. Worrell). **On the Skolem Problem and Prime Powers.** In: *Proceedings of the 45th International Symposium on Symbolic and Algebraic Computation, ISSAC 2020*, pp. 289–296.

## Peer-Reviewed Journal Articles

- 2025 (with R. Ait El Manssour, M. Shirmohammadi, and A. Varonka). **Simple Linear Loops: Algebraic Invariants and Applications.** In: *Proc. ACM Program. Lang.* 9.POPL, pp. 745–771.
- 2024 (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). **(Un)Solvable loop analysis.** In: *Formal Methods in System Design SAS 2022*.
- 2019 (with R. Sharp). **Statistics in conjugacy classes in free groups.** In: *Geometriae Dedicata* 198.1, pp. 57–70.
- 2017 (with R. Sharp). **Orbit counting in conjugacy classes for free groups acting on trees.** In: *Journal of Topology and Analysis* 9.4, pp. 631–647.

## Preprints

- (with J. Konieczny, F. Luca, A. Scoones, M. Shirmohammadi, and J. Worrell). **On the growth of hypergeometric sequences.** arXiv: [2507.22437 \[math.NT\]](https://arxiv.org/abs/2507.22437).
- (with R. Ait El Manssour, M. Shirmohammadi, and J. Worrell). **Determination Problems for Orbit Closures and Matrix Groups.** arXiv: [2407.04626 \[cs.CC\]](https://arxiv.org/abs/2407.04626).
- (with O. Klurman, E. Lefaucheux, F. Luca, P. Moree, J. Ouaknine, M. A. Whiteland, and J. Worrell). **On Inequality Decision Problems for Low-Order Holonomic Sequences.** arXiv: [2007.12282 \[math.NT\]](https://arxiv.org/abs/2007.12282).

## Technical Skills

**Languages:** Python, PARI/GP.

**Tools:** Matlab, Mathematica

**Other:** L<sup>A</sup>T<sub>E</sub>X, Git, SVN.

## Teaching Experience

**Co-lecturer for MSc course on *Formal Methods*,**  
*Institute of Logic and Computation, Technische Universität Wien.*

**Summer 2022, Summer 2023**

**Co-lecturer for MSc course *Probabilistic Model Checking*,**  
*Department of Computer Science, University of Oxford.*

**Winter 2019/20**

**Stipendiary Lecturer in Pure Mathematics, St Peter's College, Oxford.**

**October 2018–September 2020**

- Academic tutor for second year undergraduates. Tutorials in *Linear Algebra, Integration, Group Theory, and Graph Theory*. Duties included feedback, assessment, and writing progression reports.
- Admissions interviewer for mathematics and joint schools.

**Teaching Associate, School of Mathematics, University of Bristol.**

**August 2017–May 2018**

- Academic tutor for *Linear Algebra, Calculus, Metric Spaces, and Geometry*.

**Teaching Assistant, Mathematics Institute, University of Warwick.**

**October 2013–June 2017**

- Undergraduate supervisor. Small group teaching across the first year mathematics curriculum.

- Support classes in *Analysis, Metric Spaces, Experimental Maths, Mathematical Computing, and Dynamical Systems*.

**Departmental Award for Outstanding Teaching, Mathematics Institute, University of Warwick.**

### Student Feedback.

- “Always prepared, always cheerful and always willing to go that extra mile in helping students to understand—a true inspiration!”
- “He was engaging, whilst provoking the students to find their own way to the answers.”
- “I was involved in an incident in term one and if it wasn’t for his support, both [academic and pastoral], I wouldn’t have made it through the term and hence the year.”
- “George made me feel comfortable asking questions and. . . his analysis classes were a highlight of my week.”

## Selected Seminar Talks

**Decision Problems for P-finite Sequences, Warsaw.**

**July 2025**

**The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters, Liverpool.**

**June 2024**

**From Polynomial Invariants to Linear Loops, IRIF, Paris.**

**Dec 2023**

**(Un)Solvability Analysis, Liverpool.**

**Oct 2023**

**Decision Problems for Hypergeometric Sequences, TU Wien and ISTA.**

**Feb 2023**

**On the Skolem Problem and Reversible Sequences, Chalmers and Gothenburg.**

**July 2022**

**On the Skolem Problem and Reversible Sequences, TU Wien and ISTA.**

**May 2022**

**On Positivity and Minimality for Second-Order Holonomic Sequences, Open University.**

**Sept 2021**

**On Positivity and Minimality for Second-Order Holonomic Sequences, TU Wien and ISTA.**

**Sept 2021**

**Skolem’s Problem and prime powers, Bristol.**

**Dec 2018**

## Selected Conference and Workshop Talks

**The Membership Problem for Hypergeometric Sequences, Warsaw,**

**Jun 2025**

Workshop on Series, Automata, Matrices, Symbolic dynamics, and their Applications.

**The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters, Vienna,**  
International Conference on Reachability Problems.

**Sept 2024**

**The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters, Tallinn,**  
International Colloquium on Automata, Languages, and Programming.

**July 2024**

**The Membership Problem for Hypergeometric Sequences with Quadratic Parameters, Tromsø,**  
International Symposium on Symbolic and Algebraic Computation.

**July 2023**

**On the Skolem Problem for Reversible Sequences, Kaiserslautern,**  
International Conference on Reachability Problems.

**Oct 2022**

**On the Skolem Problem for Reversible Sequences, Vienna,**  
International Symposium on the Mathematical Foundations of Computer Science.

**Aug 2022**

**On Positivity and Minimality for Second-Order Holonomic Sequences, Tallinn,**  
International Symposium on the Mathematical Foundations of Computer Science.

**Aug 2021**

**On the Skolem Problem and Prime Powers, Kalamata,**  
International Symposium on Symbolic and Algebraic Computation.

**July 2020**

## **Widening Participation and Outreach**

**Mathematics in Education and Industry, Problem Solving Matters: tutor and mentor.**

**Summer 2017**

**Further Maths Support Programme, STEP/AEA workshops, enrichment days, Royal Institution master-classes, and problem solving classes.** 2012–2019

## **Academic Service**

**Program Committee Member.**

- RP. *International Conference on Reachability Problems* 2025, 2024

**External Reviewer/Sub-Reviewer (Conferences).**

- CASC. *Computer Algebra in Scientific Computing* 2022
- CONCUR. *International Conference on Concurrency Theory* 2023
- ICALP. *International Colloquium on Automata, Languages, and Programming* 2025, 2023, 2020
- ISSAC. *International Symposium on Symbolic and Algebraic Computation* 2024
- LICS. *Symposium on Logic in Computer Science* 2025
- MFCS. *International Symposium on Mathematical Foundations of Computer Science* 2023, 2021
- POPL. *Principles of Programming Languages* 2023
- SODA. *Symposium on Discrete Algorithms* 2024
- STACS. *Symposium on Theoretical Aspects of Computer Science* 2025, 2023
- STOC. *Symposium on Theory of Computing* 2025, 2024
- TACAS. *Conference on Tools and Algorithms for the Construction and Analysis of Systems* 2023

**External Reviewer/Sub-Reviewer (Journals).**

- Ex. Countex. *Examples and Counterexamples*
- FI. *Fundamenta Informaticae*
- Int. J. Math. Comput. Sci. *International Journal of Mathematics and Computer Science*
- J. Symbolic Comput. *The Journal of Symbolic Computation*
- TOPLAS. *ACM Transactions on Programming Languages and Systems*

**Workshop Organiser.**

- *Workshop on Loop Invariants and Algebraic Reasoning*, ICALP 2025 Satellite Workshop.
- *Workshop on Reachability, Recurrences, and Loops*, ICALP 2023 Satellite Workshop.

**Autobáz, Annual Research Camp on Automata, Logic, and Games.**

- **Steering Committee**, 2023–
- **Organiser**, Autobáz 2023 (16–22 July) in partnership with the *Highlights Collaborative Research Week*.
- **Speaker** at Autobáz 2023 (Tutorials on Decision Problems for Linear Recurrence Sequences).

## **Departmental & University Service**

**Pay and remuneration committee for sessional teachers, Warwick.**

**2015–2017**

**Staff & Graduate Student Liaison Committee (Mathematics), Warwick.**

**2014–2017**

## **Professional Development**

**Academic Leadership Development Course, Informatics Europe.**

**Effective Research Project Proposal Writing for Public Funding, TU Wien.**

**Cultivating Research-rich Education and Training Excellence (FHEA certified), University of Bristol.**

**Postgraduate Award in Teaching and Learning in Higher Education (AFHEA certified), University of Warwick.**