

# George Kenison

School of Computer Science and Mathematics – Liverpool John Moores University

0000-0002-7661-7061 • [georgekenison.github.io](https://github.com/georgekenison)

## Research Experience

**Research Interests:** Decision Problems, Program Analysis, Automated Verification, Dynamical Systems.

**Research Fellow in Computer Science and Informatics.,**

September 2023–

*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.**

2017

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

**MMath (Master of Mathematics), University of Warwick, First Class Hons.**

2013

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

## Publications

- **2024** (with S. Hitarth, L. Kovács, and A. Varonka). “Linear Loop Synthesis for Quadratic Invariants”. In: *International Symposium on Theoretical Aspects of Computer Science, STACS 2024*. Accepted. arXiv: [2310.05120](https://arxiv.org/abs/2310.05120).
- **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. doi: [10.1145/3597066.3597109](https://doi.org/10.1145/3597066.3597109).
- **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*. Vol. 261, 130:1–130:17. doi: [10.4230/LIPIcs.ICALP.2023.130](https://doi.org/10.4230/LIPIcs.ICALP.2023.130).
- **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. doi: [10.1145/3597066.3597121](https://doi.org/10.1145/3597066.3597121).
- **2022**. “On the Skolem Problem for Reversible Sequences”. In: *International Symposium on Mathematical Foundations of Computer Science, MFCS 2022*, 61:1–61:15. doi: [10.4230/LIPIcs.MFCS.2022.61](https://doi.org/10.4230/LIPIcs.MFCS.2022.61).
- **2022** (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). “Solving Invariant Generation for Unsolvability Loops”. In: *Static Analysis Symposium 2022*. **Radhia Cousot Award winning paper**, pp. 19–43. doi: [10.1007/978-3-031-22308-2\\_3](https://doi.org/10.1007/978-3-031-22308-2_3).
- **2021** (with O. Klurman, E. Lefauchaux, 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. doi: [10.4230/LIPIcs.MFCS.2021.67](https://doi.org/10.4230/LIPIcs.MFCS.2021.67).
- **2020** (with R. Lipton, J. Ouaknine, and J. Worrell). “On the Skolem Problem and Prime Powers”. In: *International Symposium on Symbolic and Algebraic Computation, ISSAC 2021*. doi: [10.1145/3373207.3404036](https://doi.org/10.1145/3373207.3404036).
- **2019** (with R. Sharp). “Statistics in conjugacy classes in free groups”. In: *Geom. Dedicata* 198.1, pp. 57–70. doi: [10.1007/s10711-018-0329-2](https://doi.org/10.1007/s10711-018-0329-2).
- **2017** (with R. Sharp). “Orbit counting in conjugacy classes for free groups acting on trees”. In: *J. Topol. Anal.* 9.4, pp. 631–647. doi: [10.1142/S1793525317500261](https://doi.org/10.1142/S1793525317500261).

## Preprints

- (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). *(Un)Solvable Loop Analysis*. arXiv: [2306.01597](https://arxiv.org/abs/2306.01597).
- (with O. Klurman, E. Lefauchaux, F. Luca, P. Moree, J. Ouaknine, M. A. Whiteland, and J. Worrell). *On Inequality Decision Problems for Low-Order Holonomic Sequences*. arXiv: [2007.12282](https://arxiv.org/abs/2007.12282).
- *The Membership and Threshold Problems for Hypergeometric Sequences with Quadratic Parameters*. arXiv: [2211.02447](https://arxiv.org/abs/2211.02447).

## Teaching Experience

**Co-lecturer for MSc seminar course on *Formal Methods*,** Summer 2022, Summer 2023  
*Institute of Logic and Computation, Technische Universität Wien.*

**Co-lecturer for MSc course *Probabilistic Model Checking*,** Winter 2019/20  
*Department of Computer Science, University of Oxford.*

**Stipendiary Lecturer in Pure Mathematics, *St Peter's College, Oxford.*** October 2018–September 2020

- **Academic tutor** for second year undergraduates. Tutorials in *Linear Algebra*, *Lebesgue 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*, and *Dynamical Systems*.

**Fellow of the Higher Education Academy, *Professional Qualification.***

**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.”

## Seminar Talks

**From Polynomial Invariants to Linear Loops, *IRIF, Paris.*** Dec 2023

**(Un)Solvable Loop 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, *Oxford.*** Feb 2019

**Skolem's Problem and prime powers, *Bristol.*** Dec 2018

**Statistics in conjugacy classes in free groups, *Warwick.*** Jan 2018

**Statistics in conjugacy classes in free groups, *Bristol.*** Nov 2017

**Comparing length functions on free groups, *Warwick.*** May 2017

**Asymptotics in conjugacy classes for free groups, *Manchester.*** Nov 2017

**Orbit counting in conjugacy classes for free groups acting on trees, *Warwick.*** Nov 2015

## Conference and Workshop Talks

**The Membership Problem for Hypergeometric Sequences with Quadratic Parameters, *Tromsø,*** July 2023  
*International Symposium on Symbolic and Algebraic Computation.*

**On the Skolem Problem for Reversible Sequences, *Kaiserslautern,*** Oct 2022  
*International Conference on Reachability Problems.*

**On the Skolem Problem for Reversible Sequences, *Vienna,*** Aug 2022  
*International Symposium on the Mathematical Foundations of Computer Science.*

**On the Skolem Problem for Reversible Sequences, *Paris,*** June 2022  
*Highlights of Logic, Games, and Automata.*

**On Positivity and Minimality for Second-Order Holonomic Sequences, *Tallinn,*** Aug 2021  
*International Symposium on the Mathematical Foundations of Computer Science.*

**On the Skolem Problem and Prime Powers, *Kalamata,*** July 2020  
*International Symposium on Symbolic and Algebraic Computation.*

<b>Skolem meets Euclid</b> , <i>Moorea</i> , Workshop on Dynamical Systems and Computation.	<b>June 2019</b>
<b>Asymptotics in conjugacy classes for group actions</b> , <i>St Andrews</i> , Young Researchers In Mathematics.	<b>Aug 2016</b>
<b>Asymptotics for free group actions</b> , <i>Manchester</i> , Workshop on Dynamical Systems, Ergodic Theory and Applications.	<b>June 2016</b>
<b>Orbit counting in conjugacy classes for free groups acting on trees</b> , <i>Goettingen</i> , Summer School on Dynamical Approaches in Spectral Geometry.	<b>Sept 2015</b>

## Widening Participation and Outreach

<b>Mathematics in Education and Industry</b> , <i>Problem Solving Matters: tutor and mentor</i> .	<b>Summer 2017</b>
<b>Further Maths Support Programme</b> , <i>STEP/AEA workshops, enrichment days, Royal Institution masterclasses, and problem solving classes</i> .	<b>2012–2019</b>

## Academic Service

### Program Committee Member.

- (RP) International Conference on Reachability Problems 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 2023, 2020
- (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 2023
- (STOC) Symposium on Theory of Computing 2024
- (TACAS) Conference on Tools and Algorithms for the Construction and Analysis of Systems 2023

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

- (JMCS) J. Math. Comput. Sci.,
- (TOPLAS) ACM Trans. Program. Lang. Syst.,
- Fundamenta Informaticae

<b>Organiser</b> , <i>Workshop on Reachability, Recurrences, and Loops</i> , ICALP 2023 Satellite Workshop.	<b>10 July 2023</b>
---	---------------------

### **Autobóz**, *Annual Research Workshop on Automata, Logic, and Games*.

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

## Departmental & University Service

<b>Pay and remuneration committee for sessional teachers</b> , <i>Warwick</i> .	<b>2015–2017</b>
<b>Staff &amp; Graduate Student Liaison Committee (Mathematics)</b> , <i>Warwick</i> .	<b>2014–2017</b>