George Kenison

School of Computer Science and Mathematics – Liverpool John Moores University

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Research Experience

Research Interests: Decision Problems, Formal Methods, Automated Verification, Linear 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

2023b (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.

2023c (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.

2023d (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.

2022b. "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.

2022c (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). "Solving Invariant Generation for Unsolvable Loops". In: *Static Analysis Symposium 2022*. Radhia Cousot Award winning paper, pp. 19–43. DOI: 10.1007/978-3-031-22308-2_3.

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. DOI: 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.

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.

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.

Preprints

2023a (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). *(Un)Solvable Loop Analysis*. Submitted. arXiv: 2306.01597.

2022a (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*. Submitted.

2022d. *The Membership and Threshold Problems for Hypergeometric Sequences with Quadratic Parameters*. Submitted. arXiv: 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

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.

Skolem meets Euclid, *Moorea*,   **June 2019**
Workshop on Dynamical Systems and Computation.

Asymptotics in conjugacy classes for group actions, *St Andrews*,   **Aug 2016**
Young Researchers In Mathematics.

Asymptotics for free group actions, *Manchester*,   **June 2016**
Workshop on Dynamical Systems, Ergodic Theory and Applications.

Orbit counting in conjugacy classes for free groups acting on trees, *Goettingen*,   **Sept 2015**
Summer School on Dynamical Approaches in Spectral Geometry.

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*   **2012–2019**
masterclasses, and problem solving classes.

Academic Service

External Reviewer/Sub-Reviewer, *SODA* 2024, *CONCUR* 2023, *MFCS* 2023, *ICALP* 2023, *LICS* 2023, *TACAS* 2023, *POPL* 2023, *STACS* 2023, *CASC* 2022, *MFCS* 2021, *ICALP* 2020, *J. Math. Comput. Sci. (JMCS)*, *ACM Trans. Program. Lang. Syst. (TOPLAS)*.

Organiser, *Workshop on Reachability, Recurrences, and Loops*, ICALP 2023 Satellite Workshop.   **10 July 2023**

Autobóz, *Research Workshop on Automata, Logic, and Games*.
- **Steering Committee,** 2023–
- **Organiser,** Autobóz 2023 (16–22 July) in partnership with the *Highlights Collaborative Research Week*.
- **Tutor** Autobóz 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**