Toghrul Karimov

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Academic employment[1]

04/2025 - present	Postdoctoral researcher working with Valérie Berthé (Institut de Recherche en Informatique Fondamental, Paris, France) Funded by the ERC Synergy Grant "DnyAMiCs"
03/2024 - 03/2025	Postdoctoral researcher working with Joël Ouaknine (Max Planck Institute for Software Systems, Saarbrücken, Germany)

Education

2019-2024	PhD student at Saarland University and the Max Planck Institute for Software Systems, Saarbrücken, Germany Supervisor: Joël Ouaknine Thesis: Algorithmic verification of linear dynamical systems doi Co-received the Ackermann Award 2025
2015-2019	MCompSci Computer Science, University of Oxford, UK First Class Honours

Scholarships and awards

7. EACSL **Outstanding Dissertation Award** for Logic in Computer Science (Ackermann Award) 2025.
6. **Fellowship** of the Hausdorff Research Institute for Mathematics (HIM) in Bonn to attend the Trimester Program "Definability, Decidability, and Computability", October 2025
5. ACM-SIGBED **Best Paper Award** at the conference Hybrid Systems: Computation and Control (HSCC) 2024 for the paper "Linear dynamical systems with continuous weight functions" together with R. Aghamov, C. Baier, J. Ouaknine, and J. Piribauer.
4. **Distinguished Paper Award** at the conference ACM/IEEE Symposium on Logic in Computer Science (LICS) 2024 for the paper "On the decidability of monadic second-order logic with arithmetic predicates" together with V. Berthé, J. Nieuvweld, J. Ouaknine, M. Vahanwala, and J. Worrell.
3. CPEC (see `www.perspicuous-computing.science`) **mini-project award** for a two-week research visit to University of Oxford, June 2022.
2. Keble College **Scholarship**, 2016-2019. Awarded for excellent academic performance at the end of each year.

[1] I am currently employed by the Max Planck Institute for Software Systems in Saarbrücken, Germany, and paid by an ERC Synergy grant between Paris and Saarbrücken. I travel regularly to Paris, where I work with V. Berthé and others.

1. The **Scholarship** of the Ministry of Education of Azerbaijan covering the full costs of my study at the University of Oxford, 2015-2019.

Teaching

Winter 2022	"Topics in algorithmic dynamical systems theory", teaching assistant Saarland University
Summer 2020	"Automata and sequences", teaching assistant Saarland University

Invited talks and presentations

16. Decidability of logical theories via rigidity and randomness in dynamical systems. *Algebraic Methods in Dynamics and Particle Physics*, Saarbrücken, Germany, 2025. abstract and slides

15. Some applications of o-minimality to computational problems in dynamical systems theory (seminar talk). *Hausdorff Research Institute for Mathematics*, Bonn, Germany, 2025. video recording

14. Arithmetic predicates and decidability of logical theories (invited talk). *Hausdorff Research Institute for Mathematics*, Bonn, Germany, 2025. video recording

13. Extensions of linear programming with squares and powers of integers (invited talk). *Kyoto University*, Japan, 2025.

12. Rich sequences and decidability of logical theories. *Numeration and Substitution 2025*, Tsukuba, Japan. conference website

11. Ergodicity for linear dynamical systems via o-minimality. *Highlights of Logic, Games, and Automata 2025*, Saarbrücken, Germany. conference website

10. From word combinatorics to automatic structures (invited talk), *Workshop on Recent Developments in Arithmetic Theories and Applications*, Kolkata, India, 2025. conference website

9. On the decidability of Presburger arithmetic expanded with powers (paper presentation). *Symposium on Discrete Algorithm (SODA) 2025*, New Orleans, United States. abstract

8. Ode to o-minimality (invited talk). *Symbolic Dynamics and Arithmetic Expansions*, Roscoff, France, and *Stellenbosch University Logic Seminar*, South Africa, 2024. slides

7. The power of Positivity (paper presentation). *Logic in Computer Science (LICS) 2023*, Boston, United States. conference website

6. The model-checking problem for linear dynamical systems. *Workshop on Algorithmic Aspects of Dynamical Systems*, Barbados, 2023. conference website

5. The pseudo-reachability problem for diagonalisable affine dynamical systems (paper presentation). *Mathematical Foundations of Computer Science (MFCS) 2022*, Vienna, Austria, and *Reachability Problems (RP) 2022*, Saarbrücken, Germany. conference website, conference website

4. The pseudo-Skolem problem is decidable (paper presentation). *Mathematical Foundations of Computer Science (MFCS) 2021*, Tallinn, Estonia. conference website

3. Invariants and impossibility: from geometric constructions to solving polynomial equations. *Monsoon Math 2021*, an online camp for Indian students.

2. Deciding ω-regular properties on linear recurrence sequences (paper presentation). *Principles of Programming Languages (POPL) 2021*, online. abstract

1. On LTL model-checking for low-dimensional discrete linear dynamical systems. *Mathematical Foundations of Computer Science (MFCS) 2020*, online. conference website

Publications in reverse chronological order[2]

20. *Linear dynamical systems with weight functions pdf

    R. Aghamov, C. Baier, T. Karimov, J. Piribauer, and J. Ouaknine

    Nonlinear Analysis: Hybrid Systems, Vol. 60

19. Model checking linear temporal logic with standpoint modalities doi

    R. Aghamov, C. Baier, T. Karimov, R. Majumdar, J. Ouaknine, J. Piribauer, and T. Spork

    Principles of Knowledge Representation and Reasoning (KR) 2025

18. Multiple reachability in linear dynamical systems doi

    T. Karimov, E. Kelmendi, J. Ouaknine, and J. Worrell

    Logic in Computer Science (LICS) 2025

17. Algorithmic applications of Schanuel's conjecture doi

    T. Karimov, J. Nieuwveld, J. Ouaknine, M. Vahanwala and J. Worrell

    Principles of Formal Quantitative Analysis: Essays Dedicated to Christel Baier on the Occasion of Her 60th Birthday

16. *Verification of linear dynamical systems via o-minimality of the real numbers doi

    T. Karimov

    International Colloquium on Automata, Languages, and Programming (ICALP) 2025

15. On the decidability of Presburger arithmetic expanded with powers doi

    T. Karimov, F. Luca, J. Nieuwveld, J. Ouaknine, and J. Worrell

    Symposium on Discrete Algorithms (SODA) 2025

14. *The monadic theory of toric words doi

    V. Berthé, T. Karimov, J. Nieuwveld, J. Ouaknine, M. Vahanwala, and J. Worrell

    Theoretical Computer Science, Vol. 1025

13. On the decidability of monadic second-order logic with arithmetic predicates doi

    V. Berthé, T. Karimov, J. Nieuwveld, J. Ouaknine, M. Vahanwala, and J. Worrell

    Logic in Computer Science (LICS) 2024
    Distinguished Paper Award

[2] In theoretical computer science, the authors of a paper are usually listed in the alphabetical order. The papers in which Toghrul Karimov was the clear lead author are marked with an asterisk.

12. *Linear dynamical systems with continuous weight functions doi

    R. Aghamov, C. Baier, T. Karimov, J. Piribauer, and J. Ouaknine

    Hybrid Systems: Computation and Control (HSCC) 2024

    ACM SIGBED Best Paper Award

11. Model checking Markov chains as distribution transformers doi

    R. Aghamov, C. Baier, T. Karimov, J. Nieuwveld, J. Ouaknine and M. Vahanwala

    Principles of Verification: Cycling the Probabilistic Landscape. Essays Dedicated to Joost-Pieter Katoen on the Occasion of His 60th Birthday, Part II

10. *The power of Positivity doi

    T. Karimov, E. Kelmendi, J. Nieuwveld, J. Ouaknine and J. Worrell

    ACM/IEEE Symposium on Logic in Computer Science (LICS) 2023

9. *What's decidable about discrete linear dynamical systems? doi

    T. Karimov, E. Kelmendi, J. Ouaknine and J. Worrell

    Principles of Systems Design: Essays Dedicated to Thomas A. Henzinger on the Occasion of His 60th Birthday

8. Parameter synthesis for parametric probabilistic dynamical systems and prefix-independent specifications doi

    C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefaucheux, J. Ouaknine, D. Purser, M. Whiteland, and J. Worrell

    International Conference on Concurrency Theory (CONCUR) 2022

7. *The pseudo-reachability problem for diagonalisable linear dynamical systems doi

    J. D'Costa, T. Karimov, R. Majumdar, J. Ouaknine, M. Salamati, and J. Worrell

    Mathematical Foundations of Computer Science (MFCS) 2022

6. *What's decidable about linear loops? doi

    T. Karimov, E. Lefaucheux, J. Ouaknine, D. Purser, J. Worrell, and M. Whiteland

    POPL 2022, Proceedings of the ACM on Programming Languages, Vol. 6

5. The orbit problem for parametric linear dynamical systems doi

    C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefaucheux, F. Luca, J. Ouaknine, D. Purser, M. Whiteland, and J. Worrell

    International Conference on Concurrency Theory (CONCUR) 2021

4. *The pseudo-Skolem problem is decidable doi

    J. D'Costa, T. Karimov, R. Majumdar, J. Ouaknine, M. Salamati, S. Soudjani, and J. Worrell

    Mathematical Foundations of Computer Science (MFCS) 2021

3. *Deciding ω-regular properties on linear recurrence sequences doi

   S. Almagor, T. Karimov, E. Kelmendi, J. Ouaknine, and J. Worrell

   POPL 2021, Proceedings of the ACM on Programming Languages, Vol. 5

2. Reachability in dynamical systems with rounding doi

   C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefaucheux, J. Ouaknine, A. Pouly, D. Purser, and M. Whiteland

   Foundations of Software Technology and Theoretical Computer Science (FSTTCS) 2020

1. *On LTL model-checking for low-dimensional discrete linear dynamical systems doi

   T. Karimov, J. Ouaknine, and J. Worrell

   Mathematical Foundations of Computer Science (MFCS) 2020

Papers under peer review

- Automata on S-adic words arXiv

  V. Berthé, T. Karimov, and M. Vahanwala

- Preservation theorems for transducers outputs pdf

  V. Berthé, H. Goulet-Oullet, T. Karimov, D.Perrin, and M. Vahanwala

- *Rich sequences and decidability of logical theories pdf

  T. Karimov, J, Nieuwveld, and J. Ouaknine

- On the decidability of monadic theories of arithmetic predicates arXiv

  V. Berthé, T. Karimov, J. Nieuwveld, J. Ouaknine, M. Vahanwala, and J. Worrell