

# Toghrul Karimov

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Theoretical computer scientist working on decision problems that lie at the intersection of dynamical systems, number theory, logic, and automata theory

## Employment

<b>Apr 2025 - present</b>	Postdoctoral researcher working with Valérie Berthé
	IRIF, CNRS, Paris and Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken, Germany
	Funded by the ERC Synergy Grant “DnyAMiCs”
<b>Mar 2024 - Mar 2025</b>	Postdoctoral researcher working with Joël Ouaknine MPI-SWS, Saarbrücken, Germany

## Education

<b>Sep 2019 - Feb 2024</b>	PhD student at Saarland University and the MPI-SWS, Germany
	Supervisor: Joël Ouaknine
	Thesis: <a href="#">Algorithmic verification of linear dynamical systems</a> Received the grade <i>summa cum laude</i>
<b>Oct 2015 - May 2019</b>	MCompSci Computer Science, University of Oxford, UK First Class Honours

## Scholarships and awards

1. CPEC (see [www.perspicuous-computing.science](http://www.perspicuous-computing.science)) mini-project award for a two-week research visit to Oxford University; Deutsche Forschungsgemeinschaft grant 389792660
2. Keble College Scholarship, 2016-2019. Awarded for excellent performance in exams at the end of each year
3. The Scholarship of the Ministry of Education of Azerbaijan covering the full costs of my study at the University of Oxford, 2015-2019

## Teaching

### Summer 2020

Graduate-level course “Automata and sequences”, teaching assistant  
Saarland University

### Winter 2022

Graduate-level course “Topics in algorithmic dynamical systems theory”, teaching assistant  
Saarland University

## Invited talks and conference presentations

1. Applications of o-minimality to linear loops. *Workshop On Loop Invariants and Algebraic Reasoning*, Aarhus, Denmark, 2025
2. From word combinatorics to automatic structures. *Workshop on Recent Developments in Arithmetic Theories and Applications*, Kolkata, India, 2025
3. On the decidability of Presburger arithmetic expanded with powers. *SODA 2025*, New Orleans, United States
4. Ode to o-minimality. *Symbolic Dynamics and Arithmetic Expansions* workshop in Roscoff, France, 2024 and *Stellenbosch University Logic Seminar*, online
5. The power of Positivity. *LICS 2023*, Boston, United States
6. The model-checking problem for linear dynamical systems. *Bellairs 2023* workshop in Barbados
7. The pseudo-reachability problem for diagonalisable affine dynamical systems. *MFCS 2022*, Vienna, Austria and *RP 2022*, Saarbrücken, Germany
8. The pseudo-Skolem problem is decidable. *MFCS 2021*, Tallinn, Estonia
9. Deciding  $\omega$ -regular properties on linear recurrence sequences. *POPL 2021*, online
10. On LTL model-checking for low-dimensional discrete linear dynamical systems. *MFCS 2020*, online

## Publications

1. [Multiple reachability in linear dynamical systems](#)  
T. Karimov, E. Kelmendi, J. Ouaknine, J. Worrell  
*LICS 2025*
2. [Verification of linear dynamical systems via o-minimality of the real numbers](#)  
T. Karimov  
*ICALP 2025*

3. [On the decidability of Presburger arithmetic expanded with powers](#)  
T. Karimov, F. Luca, J. Nieuwveld, J. Ouaknine, and J. Worrell  
*SODA 2025*
4. [The monadic theory of toric words](#)  
V. Berthé, T. Karimov, J. Nieuwveld, J. Ouaknine, M. Vahanwala, and J. Worrell  
*Theoretical Computer Science, Vol. 1025*
5. [On the decidability of monadic second-order logic with arithmetic predicates](#)  
V. Berthé, T. Karimov, J. Nieuwveld, J. Ouaknine, M. Vahanwala, and J. Worrell  
*LICS 2024, Distinguished Paper Award*
6. [Linear dynamical systems with continuous weight functions](#)  
R. Aghamov, C. Baier, T. Karimov, J. Piribauer, and J. Ouaknine  
*HSCC 2024, ACM SIGBED Best Paper Award*
7. [Model checking Markov chains as distribution transformers](#)  
R. Aghamov, C. Baier, T. Karimov, J. Nieuwveld, J. Ouaknine and M. Vahanwala  
*Principles of Verification: Cycling the Probabilistic Landscape, LNCS 15261, 2024*
8. [The power of Positivity](#)  
T. Karimov, E. Kelmendi, J. Nieuwveld, J. Ouaknine and J. Worrell  
*LICS 2023*
9. [What’s decidable about discrete linear dynamical systems?](#)  
T. Karimov, E. Kelmendi, J. Ouaknine and J. Worrell  
*Principles of System Design—Thomas A. Henzinger Festschrift, LNCS 13660, 2022*
10. [Parameter synthesis for parametric probabilistic dynamical systems and prefix-independent specifications](#)  
C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefauchaux, J. Ouaknine, D. Purser, M. Whiteland, and J. Worrell  
*CONCUR 2022*
11. [The pseudo-reachability problem for diagonalisable linear dynamical systems](#)  
J. D’Costa, T. Karimov, R. Majumdar, J. Ouaknine, M. Salamati, and J. Worrell  
*MFCS 2022*

12. [What’s decidable about linear loops?](#)  
T. Karimov, E. Lefauchaux, J. Ouaknine, D. Purser, J. Worrell, and M. Whiteland  
*POPL 2022, Proc. of the ACM on Programming Languages, Vol. 6*
13. [The orbit problem for parametric linear dynamical systems](#)  
C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefauchaux, F. Luca, J. Ouaknine, D. Purser, M. Whiteland, and J. Worrell  
*CONCUR 2021*
14. [The pseudo-Skolem problem is decidable](#)  
J. D’Costa, T. Karimov, R. Majumdar, J. Ouaknine, M. Salamati, S. Soudjani, and J. Worrell  
*MFCS 2021*
15. [Deciding  \$\omega\$ -regular properties on linear recurrence sequences](#)  
S. Almagor, T. Karimov, E. Kelmendi, J. Ouaknine, and J. Worrell  
*POPL 2021, Proc. of the ACM on Programming Languages, Vol. 5*
16. [Reachability in dynamical systems with rounding](#)  
C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefauchaux, J. Ouaknine, A. Pouly, D. Purser, and M. Whiteland  
*FSTTCS 2020*
17. [On LTL model-checking for low-dimensional discrete linear dynamical systems](#)  
T. Karimov, J. Ouaknine, and J. Worrell  
*MFCS 2020*