

# Aleksei MILOVANOV

## PERSONAL DATA

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PLACE AND DATE OF BIRTH: Vologda, Russia | 23 March 1991  
PHONE: +351920274987  
EMAIL: [almas239@gmail.com](mailto:almas239@gmail.com)  
Family status: married

## WORK EXPERIENCE

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- 2023-2025 **Postdoctoral Researcher**  
Faculty of Science, University of Lisbon
- 2016-2023 **Research Fellow / Research Assistant**  
Laboratory of Theoretical Computer Science  
Faculty of Computer Science, HSE University (Moscow)
- 2016-2022 **Associate Professor / Lecturer**  
Big Data and Information Retrieval School  
Faculty of Computer Science, HSE University (Moscow)
- 2017-2022 **Associate Professor / Assistant**  
Department of Innovations and High Technology  
Moscow Institute of Physics and Technology (MIPT)
- 2022-2023 **Researcher (Project-based)**  
Steklov Mathematical Institute, Russian Academy of Sciences (MIAN)  
*Project: Multiple Constant Multiplication (MCM) optimization*
  - Theoretical research on arithmetic optimization algorithms.
  - Developed algorithmic approaches for minimizing adder depth/cost.
- 2018 **Postdoctoral Researcher**  
LIRMM (Montpellier, France)

## TECHNICAL SKILLS

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PROGRAMMING: Lean 4, LaTeX, C++ (University level; strong algorithmic background)  
CORE SKILLS: Algorithms & Data Structures, Logic, Mathematical Reasoning

## HONORS & AWARDS

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- 2025 **Best Paper Award**, CiE 2025 (Solution to a problem by E. Allender)  
2017 **Best Student Paper Award**, CSR 2017  
2015 **Best Student Paper Award**, CSR 2015  
2008 **Prize Winner**, All-Russia Olympiad in Mathematics (Final stage)  
2008 **Diploma**, All-Russia Team Olympiad in Programming (VKOSHP)

## EDUCATION

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- 2017 PhD in MATHEMATICS  
Lomonosov Moscow State University  
Scientific Adviser: Nikolay K. Vereshchagin  
Thesis: “On non-stochastic Kolmogorov strings”  
(in Russian: [link](#))
- 2008 - 2013 Specialist in MATHEMATICS  
Lomonosov Moscow State University  
Scientific Adviser: Mikhail A. Cherepniov  
Diploma: “Bounds of some parameters of elliptic curve on finite field”

## RESEARCH INTERESTS

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Logic & Automated Reasoning • Algebraic Complexity • Computational Complexity • Algorithmic Statistics • Kolmogorov Complexity • Cryptography

## PUBLICATIONS

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1. Milovanov Alexey. Some properties of antistochastic strings. CSR 2015, LNCS 9139, pp. 339-349, 2015. **Best Student Paper Award.**
2. Milovanov Alexey. Algorithmic statistics, prediction and machine learning, STACS 2016, LIPICS Vol. 47, pp. 54:1-54:13.
3. Milovanov Alexey. Algorithmic Statistics: Normal Objects and Universal Models, CSR 2016, LNCS 9691, pp. 280-293, 2016. **Solution to the problems posed by Nikolay Vereshchagin.**
4. Milovanov Alexey. Some Properties of Antistochastic Strings, Theory of Computing Systems. 2017. Vol. 61. No. 2. P. 521-535.
5. Milovanov Alexey. On Algorithmic Statistics for Space-Bounded Algorithms, in: CSR 2017 Vol. 10304. Luxemburg : Springer, 2017. p. 232-244. **Best Student Paper Award.**
6. Milovanov Alexey, Vereshchagin Nikolay. Stochasticity in Algorithmic Statistics for Polynomial Time, in: CCC 2017: Schloss Dagstuhl. p. 17:1-17:18.
7. Milovanov Alexey. Algorithmic Statistics and Prediction for Polynomial Time-Bounded Algorithms, CiE 2018. Springer, 2018, p. 287-296.
8. Milovanov Alexey. On Algorithmic Statistics for Space-bounded Algorithms, Theory of Computing Systems, 2019, Vol. 63. No. 4. p. 833-848.
9. Milovanov Alexey. #P-completeness of counting roots of a sparse polynomial, Information Processing Letters. 2019. Vol. 142, p. 77-79.
10. Milovanov Alexey. Predictions and Algorithmic Statistics for Infinite Sequences, in: CSR 2021, Sochi, Russia, Proceedings. Springer, 2021, Ch. 17. p. 283-295.
11. Milovanov, Alexey. Some Games on Turing Machines and Power from Random Strings. In: *Unity of Logic and Computation*. CiE 2023. LNCS, vol 13967. Springer.
12. Milovanov, Alexey. Prediction and MDL for infinite sequences. Theory Computing Systems, 2024.
13. Bruno Loff, Alexey Milovanov. The hardness of decision tree complexity. In STACS 2025. LIPIcs, Vol 327.
14. Milovanov Alexey. On the computational power of C-random strings. CiE 2025, Lisbon. **Best Paper Award and Solution to a problem posed by Eric Allender.**

## PREPRINTS

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1. Milovanov Alexey. Limit on the computational power of C-random strings, 2026. ECCC Report TR26-034. ([link](#)) **Solution to a problem posed by Eric Allender.**
2. Milovanov Alexey. PIT for depth-4 circuits and Sylvester-Gallai theorem for polynomials, 2019. ECCC Report.
3. Milovanov Alexey. Bounds of some parameters of elliptic curve on finite field, 2013. arXiv.

## SOFTWARE & PROJECTS

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- **Kernel-Computable Keccak-256 Engine in Lean 4**  
[github.com/AlexeyMilovanov/lean-keccak-unrolled](https://github.com/AlexeyMilovanov/lean-keccak-unrolled)  
Developed an unrolled circuit architecture to bypass Lean 4 kernel evaluation limits for heavy cryptography. Enabled a zero-axiom formal verification base for an EVM compiler.
- **Formalization of Logic and Kolmogorov Complexity in Lean 4**  
[github.com/AlexeyMilovanov/LogicKolmogorov](https://github.com/AlexeyMilovanov/LogicKolmogorov)  
Formalized the theoretical connection between Kolmogorov complexity and formal logic, integrating with the Foundation formalized logic library.
- **Formalization of Algorithmic Information Theory in Lean 4**  
[github.com/AlexeyMilovanov/kolmogorov-complexity-lean](https://github.com/AlexeyMilovanov/kolmogorov-complexity-lean)
- **Contributor to Mathlib** (Lean 4 mathematics library)

## INTERNATIONAL COLLABORATION

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2015, 2017 - visits to LIRMM, Montpellier. Invited by A. Shen.

## TEACHING EXPERIENCE

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- 2017-2022 **Mathematical Logic and Theory of Algorithms** (Lectures & Seminars)  
MIPT (Dept. of Aeromechanics / Dept. of Innovations)
- 2016-2019 Discrete Mathematics (Seminars), HSE
- 2019-2022 A Theorist's Toolkit (Fourier analysis, Approx. algos), HSE
- 2020-2022 Combinatorial Constructions in TCS, HSE
- 2021-2022 One-Way Functions and Their Applications, HSE
- 2017-2019 Computational Complexity, Yandex School of Data Analysis

## GRADUATED STUDENTS

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- LUKIANENKO NIKITA: Master, 2020, thesis: "On Some Generalizations of the Knapsack Problem"  
BYCHKOV ANDREY: Master, 2022, thesis: "Quadratization PDEs"

## LANGUAGES

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- RUSSIAN: Native  
ENGLISH: Advanced  
PORTUGUESE: Basic

## OTHER ACTIVITIES

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ALPINISM: Climbing the eastern peak of Elbrus (5642 m), 2016  
MARATHON: Overcoming the marathon distance (42.2 km), 2017