

Erfan Khaniki

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RESEARCH INTERESTS ◇ Proof Complexity and Bounded Arithmetic, including its Model Theory
◇ Intuitionistic Arithmetic and its Model Theory

RESEARCH POSITIONS ◇ **University of Oxford**, Oxford, United Kingdom
Research associate, April 2024 - Present
Host: Ján Pich
◇ **Institute of Mathematics of the Czech Academy of Sciences**, Prague, Czech Republic
Ph.D. student researcher, June 2019 - April 2024

EDUCATION ◇ **Charles University**, Prague, Czech Republic
Ph.D. in Mathematics, December 2019 - November 2023
Ph.D. Thesis: (Im)possibility results in Proof Complexity and Arithmetic
Advisor: Pavel Pudlák
Link in Dspace: <https://dspace.cuni.cz/handle/20.500.11956/187614>
◇ **Sharif University of Technology**, Tehran, Iran
MSc. in Computer Science (Theory of Computation), September 2017 - September 2019
GPA: 17.95/20.00
Master's Thesis: Incompleteness in the Finite Domain
Advisors: Mohammad Ardeshir, Pavel Pudlák
◇ **Sharif University of Technology**, Tehran, Iran
BSc. in Computer Engineering (Hardware), February 2013 - September 2017
BSc. in Computer Science, September 2012 - September 2017
Cumulative GPA: 17.31/20.00
Bachelor's Thesis: Basic Arithmetic
Advisor: Mohammad Ardeshir

HONORS AND AWARDS ◇ Co-winner of the 2024 Sacks Prize for the most outstanding doctoral dissertation in mathematical logic
Link: <https://aslonline.org/prizes-and-awards/sacks-prize-recipient/>
◇ Co-winner of the 2023 Antonín Svoboda Award for the best Ph.D. thesis
Link: <https://www.svobodovacena.cz/prev.html>
◇ Ranked **1st** in the National Entrance Exam for Ph.D. in Computer Science, 2019
◇ Recipient of the grant and membership of Iranian National Elites Foundation, for outstanding academic success, 2014, and 2017-2019
◇ Recipient of admission without exam from the Sharif University of Technology for Master studies in Computer Science, 2017
◇ Ranked **24th** in the National Entrance Exam for Master in Computer Science, 2017
◇ Ranked **53th** in the National Entrance Exam for Master in Computer Engineering, 2017
◇ Ranked **5th** in the National Entrance Exam for Master in Computer Science, 2016

PUBLICATIONS¹ ◇ *How hard is it to prove the Dual Weak Pigeonhole Principle constructively?*
Erfan Khaniki
Submitted manuscript, 2025

- ◇ *Efficient adversaries*
Erfan Khaniki, Ján Pich, Dmitry Sokolov
Submitted manuscript, 2025
- ◇ *The Proof Analysis Problem*
Noel Arteche, Albert Atserias, Susanna F. de Rezende, Erfan Khaniki
To appear in the 66th Annual Symposium on Foundations of Computer Science (FOCS 2025), 2025
Arxiv link: <https://arxiv.org/abs/2506.16956>
- ◇ *Jump operators, Interactive Proofs and Proof Complexity Generators*
Erfan Khaniki
In the 65th Annual Symposium on Foundations of Computer Science (FOCS 2024), pages: 573-593, 2024
DOI: <https://doi.org/10.1109/FOCS61266.2024.00044>
- ◇ *The provably total functions of basic arithmetic and its extensions*
Mohammad Ardehshir, Erfan Khaniki, Mohsen Shahriari
Archive for Mathematical Logic, 64: 205–257, 2025
DOI: <https://doi.org/10.1007/s00153-024-00939-0>
- ◇ *From Proof Complexity to Circuit Complexity via Interactive Protocols*
Noel Arteche, Erfan Khaniki, Ján Pich, Rahul Santhanam
In the 51st International Colloquium on Automata, Languages, and Programming (ICALP 2024), volume 297 of Leibniz International Proceedings in Informatics (LIPIcs), pages 12:1-12:20, 2024
DOI: <https://doi.org/10.4230/LIPIcs.ICALP.2024.12>
- ◇ *TFNP Intersections through the Lens of Feasible Disjunction*
Pavel Hubáček, Erfan Khaniki, Neil Thapen
In the 15th Innovations in Theoretical Computer Science Conference (ITCS 2024), volume 287 of Leibniz International Proceedings in Informatics (LIPIcs), pages 63:1–63:24, 2024
DOI: <https://doi.org/10.4230/LIPIcs.ITCS.2024.63>
- ◇ *New relations and separations of conjectures about incompleteness in the finite domain*
Erfan Khaniki
The Journal of Symbolic Logic, 87(3):912–937, 2022
DOI: <https://doi.org/10.1017/jsl.2021.99>
- ◇ *On Proof complexity of Resolution over Polynomial Calculus*
Erfan Khaniki
ACM Transactions on Computational Logic, 23(3), 2022
DOI: <https://dl.acm.org/doi/abs/10.1145/3506702>
- ◇ *Nisan–Wigderson generators in Proof Complexity: New lower bounds*
Erfan Khaniki
In the 37th Computational Complexity Conference (CCC 2022), volume 234 of Leibniz International Proceedings in Informatics (LIPIcs), pages 17:1–17:15, 2022
DOI: <https://doi.org/10.4230/LIPIcs.CCC.2022.17>
- ◇ *Not all Kripke models of HA are locally PA*
Erfan Khaniki
Advances in Mathematics, 397:22, 2022
DOI: <https://doi.org/10.1016/j.aim.2021.108126>
- ◇ *A counter-example to polynomially bounded realizability of Basic Arithmetic*
Mohammad Ardehshir, Erfan Khaniki, Mohsen Shahriari
Notre Dame Journal of Formal Logic, 60(3):481–489, 2019
DOI: <https://doi.org/10.1215/00294527-2019-0013>

ACADEMIC
VISITS

- ◇ **University of Bath**, Bath, UK
October 2025
Host: Raheleh Jalali

¹In mathematics and theoretical computer science, author order is typically alphabetical.

- ◇ **Lagrange Mathematics and Computing Research Center**, Paris, France
September 2025
Host: Farzad Jafarrahmani
- ◇ **Institute of Mathematics of the Czech Academy of Sciences**, Prague, Czech Republic
September 2025
Host: Pavel Pudlák
- ◇ **University of Warwick**, Coventry, UK
December 2024
Host: Igor Carboni Oliveira
- ◇ **McGill University**, Montreal, Canada
December 2023
Host: Robert Robere
- ◇ **Lund University**, Lund, Sweden
November - December 2023
Host: Susanna F. de Rezende
- ◇ **Simons Institute for the Theory of Computing**, Berkeley CA, USA
Visiting Graduate Student, March - April 2023
Program: Meta-Complexity
- ◇ **University of Oxford**, Oxford, UK
Visiting Graduate Student, August 2022
Host: Ján Pich
- ◇ **Simons Institute for the Theory of Computing**, Berkeley CA, USA
Visiting Graduate Student, January - May 2021
Program: Satisfiability: Theory, Practice, and Beyond (virtual)
- ◇ **Institute of Mathematics of the Czech Academy of Sciences**, Prague, Czech Republic
Visiting Graduate Student, July 2018
Host: Pavel Pudlák
- ◇ **Institute of Mathematics of the Czech Academy of Sciences**, Prague, Czech Republic
Visiting Graduate Student, October - November 2017
Host: Pavel Pudlák
- ◇ **Institute of Mathematics of the Czech Academy of Sciences**, Prague, Czech Republic
Visiting Undergraduate Student, July - August 2017
Host: Pavel Pudlák

SELECTED
TALKS

- ◇ Jump operators, Interactive Proofs and Proof Complexity Generators
 - Oxford Proof Complexity Workshop (**invited talk**), University of Oxford, August 2025
 - Logic Seminar (**invited online talk**), Institute of Mathematics of the Czech Academy of Sciences, February 2025
 - Complexity Network: In-person meeting (**invited talk**), Imperial College London, November 2024
- ◇ From Proof Complexity to Circuit Complexity via Interactive Protocols
 - Oxford Proof Complexity Workshop (**invited talk**), University of Oxford, September 2024
 - Logic Seminar, Institute of Mathematics of the Czech Academy of Sciences, March 2024
- ◇ Nisan-Wigderson generators in Proof Complexity: New lower bounds
 - Mathematical Logic Weekly Seminar (**invited online talk**), Institute for Research in Fundamental Sciences (IPM), December 2024
 - Logic Colloquium, University of Milan, June 2023
 - Proof Complexity and Meta-Mathematics workshop (**invited talk**), Simons Institute for the Theory of Computing, March 2023
 - Computational Complexity Conference 2022 (online talk), July 2022

- Mathematical Approaches to Lower Bounds (**invited online talk**), International Centre for Mathematical Sciences (ICMS), July 2022
- Complexity Network (**invited online talk**), March 2022
- Logic Seminar, Institute of Mathematics of the Czech Academy of Sciences, March 2022
- ◇ Not all Kripke models of HA are locally PA
 - Mathematical Foundations of Computation Seminar (**invited talk**), University of Bath, October 2025
 - Logic Seminar (online talk), Institute of Mathematics of the Czech Academy of Sciences, October 2020
- ◇ On Proof Complexity of Resolution over Polynomial Calculus
 - Satisfiability: Theory, Practice, and Beyond Reunion (online talk), Simons Institute for the Theory of Computing, June 2022
 - Logic Seminar (online talk), Institute of Mathematics of the Czech Academy of Sciences, March 2020
- ◇ New relations and separations of conjectures about incompleteness in the finite domain
 - Complexity Network: In-person meeting (**invited talk**), University of Warwick, June 2025
 - Complexity Seminar, Institute of Mathematics of the Czech Academy of Sciences, December 2019

SERVICES

- ◇ Reviewing: Logic Journal of the IGPL, Bulletin of Symbolic Logic, MFCS 2019, CCC 2021, STOC 2024, Mathematical Reviews/MathSciNet (July 2025 - Present)

TEACHING
EXPERIENCE

- ◇ Teaching Assistant at Sharif University of Technology
 - Mathematical logic
 - Theory of Computation
 - Theory of Languages and Automata
- ◇ Mehregan Mathematics Workshop for Junior High School students, August 2013 and 2014
- ◇ Computer Programming for Elementary School students (Rouzbeh Educational Complex), November 2013 - April 2019