

Jing Guo

Curriculum Vitæ

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Research Interests

Interpretability and alignment: Mechanistic interpretability and theoretical foundations of emergent behaviours

Research software engineering for foundational models: Bridging the gap between AI research and real-world applications

AI engineering and MLOps: Efficient algorithms and optimizations for AI workloads

AI for (formal) mathematics

Education

Winter 2022 – **M.Sc. Mathematics**, *Universität Regensburg*, Regensburg, Bavaria, Germany.

Summer **Thesis:** *A Tale of Two Arcs: The Circle Method and Waring's Problem*

2025 **Supervisor:** Prof. Dr. Guido Kings

Grade: 1.7 / 5.0 (gut/good)

Fall 2020 – **Budapest Semesters in Mathematics (Online)**, Budapest, Hungary.

Summer

2021

Fall 2016 – **B.S. Mathematics**, *University of Utah*, Salt Lake City, UT, USA.

Spring 2020 Minor in Computer Science

Spring 2019 **Budapest Semesters in Mathematics**, Budapest, Hungary.

Fall 2018 **Math in Moscow**, *Independent University of Moscow*, Moscow, Russia.

Professional Experience

Oct. 2023 – **Student Research Assistant (Studentische Hilfskräfte)**, *Fakultät für Informatik und Data Science*, Universität Regensburg.

May 2024 Supervisor: Dr. Radu Curticapean

Description: Implement and optimize fixed-parameter tractable (FPT) algorithms for counting graph homomorphisms in SageMath

Summer **Research Assistant**, *Budapest Semesters in Mathematics (Online)*, Budapest, Hungary.

2021

Supervisor: Dr. András Gyárfás

Description: Linear Turán number of the Crown C_{13} in linear 3-graphs

Sep. 2019 – **Undergraduate Researcher**, *School of Computing*, University of Utah.

Sep. 2020 Supervisor: Dr. Blair D. Sullivan

Description: Improve heuristics and approximation algorithms for Vertex Cover and Odd-Cycle Transversal with fixed-parameter tractable algorithms

Honors and Awards

- Fall 2022 – **ALGANT Excellence Scholarship**, *ALGANT*.
Spring 2024
April 2020 **Undergraduate Research Scholar**, *University of Utah*.

Publications and Preprints

- [1] Alvaro Carbonero, Willem Fletcher, Jing Guo, András Gyárfás, Rona Wang, and Shiyu Yan. Crowns in linear 3-graphs of minimum degree 4. *The Electronic Journal of Combinatorics*, 29(4):P4.17, 2022.

Software

- May 2024 **count-graph-homs**, with Radu Curticapean (supervisor)
SageMath implementation of exact graph homomorphism counting algorithm.
<https://github.com/guojing0/count-graph-homs>

Funding and grants

- October 2025 **Cohere Labs Catalyst Grant**, \$500 USD API credits.

Research Visits

- August 2023 **Department of Computer Science, IT University of Copenhagen**, Copenhagen, Denmark.
Hosted by Dr. Radu Curticapean, for one week
February 2023 **Department of Mathematics, Czech Technical University**, Prague, Czech.
Hosted by Dr. Jan Volec, for one week

Talks

- April 2024 **Seminar on Mathematical Communication**, *Universität Regensburg*.
History and recent developments of Roth's theorem, with its Fourier analytic proof
November 2023 **Seminar on Fourier analysis and representation theory**, *Universität Regensburg*.
Measure theory, Radon and Haar measures, L^p spaces, and modular functions.
July 2023 **Seminar on Modular Forms and Representations**, *Universität Regensburg*.
The gamma function, Dirichlet series, and local zeta and L-functions.
June 2023 **Seminar on CAT(0) Cube Complexes**, *Universität Regensburg*.
Median graphs, hyperplanes, and its equivalence with CAT(0) cube complexes.
June 2023 **Seminar on Turing machines, lambda calculus, and proofs as programs**, *Universität Regensburg*.
Register machines, Turing computability, and recursive functions.
February 2023 **Seminar on Open Covers and Complexity**, *Universität Regensburg*.
Topological complexity of the root-finding problem and its relation to sectional category.
December 2022 **Seminar on Lattice-Based Cryptography**, *Universität Regensburg*.
Worst-case to average-case reductions based on Gaussian measures.

Professional Activities

- September 2024 **Trieste Algebraic Geometry Summer School (TAGSS) 2024 - Tropical Geometry and Related Topics**, *The Abdus Salam International Centre for Theoretical Physics (ICTP)*, Trieste, Italy.
- July 2024 **Conference on Tropical and Non-Archimedean Geometry**, *Universität Regensburg*, Regensburg, Germany.
- June 2024 **Additive Combinatorics Summer School**, *Erdős Center, Rényi Institute*, Budapest, Hungary.
- February 2024 **Thematic Month on Discrete Mathematics & Computer Science: Groups, Dynamics, Complexity, Words**, *CIRM*, Marseille, France.
Workshop on Randomness, Information, and Complexity
- August 2023 **Copenhagen Summer of Counting & Algebraic Complexity**, *Department of Computer Science, IT University of Copenhagen*, Copenhagen, Denmark.
- July 2023 **Summer School in Mathematics**, *Institute of Mathematics, Eötvös Loránd University*, Budapest, Hungary.
Paradoxical decompositions, fractals, and dynamics
- June 2023 **Foundations of Computational Mathematics 2023**, Paris, France.
- July 2018 **The Racket Summer School**, Salt Lake City, UT, USA.

Work Experience

- June 2023 – **Research Programmer (Remote)**, *SageMath*, Google Summer of Code.
Sep. 2023 Supervisor: Dr. Benjmain Hutz
Description: Fix bugs and generalize height algorithms in number fields
- June 2022 – **Research Programmer (Remote)**, *SageMath*, Google Summer of Code.
Sep. 2022 Supervisor: Dr. Benjmain Hutz and Alexander Galarraaga
Description: Fix bugs, improve implementations of height functionalities, and implement the Arakelov–Zhang pairing of rational maps in algebraic geometry
- Nov. 2021 – **Common Lisp Software Intern (Remote)**, *Atlas Engineer*, USA and
Feb. 2022 Germany.
Authored and merged 9 pull requests, implementing several useful features for navigating document structures, optimizing components across multiple files for performance and maintainability, and collaborating with the community to address user issues, improve project documentation, and contribute to testing.
- Sep. 2020 – **Contract Research Programmer (Remote)**, *University of Bergen*, Bergen,
Oct. 2020 Norway.
Supervisor: Dr. Mateus de Oliveira Oliveira
Description: Implement functionalities related to treewidth and tree decomposition

Open Source Contributions

- June 2023 – **SageMath**, *Free open-source mathematics software system*.
May 2024 June 2022 – Oct. 2022
<https://www.sagemath.org/>
- Nov. 2021 – **Nyxt Browser**, *Keyboard-driven web browser written in Common Lisp*.
Feb. 2022 <https://nyxt.atlas.engineer/>

Personal Projects

August 2025 **Smol MoE Language Model**, *Implemented a small MoE language model (switch transformer), upcycled a dense LLM into a MoE model (sparse upcycling), and continued pre-training this MoE model.*

Other Information

Programming Python, Common Lisp, Racket, Ruby, Java, C/C++, Rust (learning), and $\text{\LaTeX}$
Technical Linux, Git, PyTorch, and transformers (learning)
skills
Languages Chinese, English, German (Basic), and Russian (Basic)