Elena Gribelyuk

Contact Information

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Research Interests

I am broadly interested in theoretical computer science, particularly streaming and sketching algorithms, communication complexity, and graph algorithms. Most recently, I've been thinking about adversarial robustness in the streaming model.

Education

Princeton University, Princeton, NJ. 2022-2027 (expected)

- Ph.D. Candidate in Computer Science (advised by Huacheng Yu)
- M.A. in Computer Science (2024)

Columbia University, New York. 2018–2022

- B.A. in Mathematics and Computer Science, Dean's List
- Senior Thesis in Mathematics, advised by Professor Mikhail Khovanov
- Graduated with Honors in Mathematics

King School, Stamford, CT. 2004–2018

- High School Diploma, STEM and Language distinctions
- Valedictorian, inducted into Cum Laude Society

Research Internships & Visits

Student Researcher, Google Research February 2026 - current

- Working on problems related to differential privacy and adversarial robustness under the guidance of Edith Cohen, Jelani Nelson, and Uri Stemmer.

Publications

Adversarial Robustness for Small Frequency Moments and a Weak Equivalence Theorem for Turnstile Streams
Elena Gribelyuk, Honghao Lin, David P. Woodruff, Huacheng Yu, and Samson Zhou.
In Submission.

Adversarial Robustness on Insertion-Deletion Streams
Elena Gribelyuk, Honghao Lin, David P. Woodruff, Huacheng Yu, and Samson Zhou.
To appear in ACM Symposium on Theory of Computing (STOC 2026)

Adaptively Robust Resettable Streaming
Edith Cohen, Elena Gribelyuk, Jelani Nelson, and Uri Stemmer.
International Conference on Machine Learning (ICML 2026).
Poster at Theory and Practice of Differential Privacy workshop (TPDP 2026).

Lifting Linear Sketches: Optimal Bounds and Adversarial Robustness
Elena Gribelyuk, Honghao Lin, David P. Woodruff, Huacheng Yu, and Samson Zhou.
In ACM Symposium on Theory of Computing (STOC 2025)

Near-Optimal Relative Error Streaming Quantile Estimation via Elastic Compactors
Elena Gribelyuk, Pachara Sawettamalya, Hongxun Wu, and Huacheng Yu.
In ACM-SIAM Symposium on Discrete Algorithms (SODA 2025)

A Strong Separation for Adversarially Robust ℓ_0 Estimation
Elena Gribelyuk, Honghao Lin, David P. Woodruff, Huacheng Yu, and Samson Zhou.
In IEEE Symposium on Foundations of Computer Science (FOCS 2024)

Simple and Optimal GK Sketch: Combining Greenwald-Khanna with Khanna-Greenwald

Elena Gribelyuk, Pachara Sawettamalya, Hongxun Wu, and Huacheng Yu.
In Symposium on Principles of Database Systems (PODS 2024)

Temperley-Lieb categories and dynamics in commutative monoids
Elena Gribelyuk and Mikhail Khovanov. (Senior Thesis)

Honors and Awards

- Professor Van Amringe Mathematical Prize, 2021, Columbia University
  "This prize, established in 1910 by George G. Dewitt, Class of 1867, may be awarded to a first year, a sophomore, and a junior student in the College who are deemed most proficient in the mathematical subjects designated during the year of the award."
- American Invitational Mathematics Examination (AIME) Qualification, 2017, 2018
  Scored in the top 5% of all AMC participants.
- I. I. Rabi Scholar, 2018-2022, Columbia University
  Selected for the I. I. Rabi Scholars program. A small number of incoming first year Columbia College students who demonstrate promise in the sciences are chosen to be Rabi Scholars, and their scientific pursuits are supported with funding to conduct summer research. Requirements for retaining membership in the program include maintaining a 3.5 GPA and conducting scientific research for at least two consecutive summers.

Talks

Adversarial Robustness on Insertion-Deletion Streams

- Google Research Privacy for ML Seminar, June 2026
- UWaterloo Algorithms & Complexity Seminar, May 2026
- MIT Algorithms & Complexity Seminar, April 2026
- DIMACS/Rutgers Theory Seminar, March 2026

Lifting Linear Sketches: Optimal Bounds and Adversarial Robustness

- EnCORE Workshop on New Horizons in Adaptive Robustness, September 2025
- ACM Symposium on Theory of Computing, June 2025
- NYC Graduate Student TCS Day, NYU Tandon, May 2025
- Workshop on Algorithms for Large Data (Online) 2025, April 2025 (poster)
- Princeton Gems of TCS Seminar, March 2025

A Strong Separation for Adversarially Robust ℓ_0 Estimation for Linear Sketches

- Swiss Winter School on Theoretical Computer Science, January 2025
- IEEE Symposium on Foundations of Computer Science, October 2024
- NYC Graduate Student TCS Day, NYU Tandon, October 2024
- Princeton Gems of TCS Seminar, April 2024

Adversarial Robustness of Linear Sketches, Princeton Gems of TCS Seminar, September 2024

Streaming lower bounds for F_p moment estimation via communication complexity, Princeton Communication Complexity Seminar, August 2024

Techniques for proving streaming lower bounds via communication complexity, Princeton Communication Complexity Seminar, July 2024

Connections between Adversarially Robust Streaming, Differential Privacy, and Adaptive Data Analysis, Princeton Gems of TCS Seminar, November 2023

Generalized Framework for Adversarially Robust Streaming, Princeton Gems of TCS Seminar, April 2023

Temperley-Lieb categories and dynamics in commutative monoids, Columbia Undergraduate Mathematics Society Thesis Presentation, April 2022.

Thick points in a random square subdivision model generated by Bernoulli trials

- Columbia Undergraduate Research Symposium, October 2021.
- Columbia Mathematics REU presentations, August 2021.

Limits & Continuity, Intro to Proofs Workshop, Columbia Undergraduate Mathematics Society, October 2021.

Association of airway tree morphology with quantitative emphysema subtypes, Columbia Undergraduate Research Symposium, October 2020.

Spatial association of small airway count with quantitative emphysema subtypes, Columbia Undergraduate Research Symposium, October 2019.

Teaching Experience

Since Spring 2023, I have been a part-time instructor at Art of Problem Solving (Princeton location), where I previously taught the High School Contest Math summer class (2023, 2025), Algebra 2 (AY 2023-2024), Pre-Calculus (AY 2024-2025), and High School Contest Math (AY 2025-2026). I will teach the High School Contest Math class again during the summer of 2026 and AY 2026-2027.

Also, I have been a teaching assistant for the following courses at Princeton University and Columbia University. My responsibilities included grading homework and exams, holding office hours and recitations, writing practice problems, and editing lecture notes.

- COS 423 Theory of Algorithms, taught by Professor Robert Tarjan in Spring 2024
- COS 521 Advanced Algorithm Design, taught by Professor Huacheng Yu in Fall 2023
- COMS 4995 Advanced Algorithms, taught by Professor Alexandr Andoni in Spring 2022
- CSOR W4231 Analysis of Algorithms, taught by Professor Alexandr Andoni in Fall 2021
- MATH UN2030 Ordinary Differential Equations, taught by Professor Evgeni Dimitrov in Fall 2021
- CSOR W4231 Analysis of Algorithms, taught by Professor Xi Chen in Summer 2021
- COMS W3261 Computer Science Theory, taught by Timothy Randolph in Summer 2021
- MATH GU4042 Modern Algebra II, taught by Professor Inbar Klang in Spring 2021
- COMS W3203 Discrete Math: Combinatorics and Graph Theory, taught by Professor Ansaf Salleb-Aouissi in Fall 2020 and Spring 2021

Lastly, during the summers of 2020-2022, I was a mathematics instructor at the King Summer Institute, where I taught the six-week accelerated Pre-Calculus course to 10-15 students. My responsibilities included teaching for 3 hours/weekday, writing all course materials, holding office hours, and meeting with students individually to check in and offer additional help when needed.

Organizations & Service

Princeton Theory Lunch - Co-organizer
July 2023 - May 2024, July 2025 - May 2026.

- Every Friday, theoretical computer science students, faculty, and postdocs all come together for lunch to listen to talks by visiting researchers.
- Working together with faculty, we are responsible for inviting and coordinating with speakers, organizing casual student sessions to meet with speakers, and recording the talks to share on the Princeton TCS YouTube channel.

Princeton Computer Science G1 mentorship program
September 2023 -

- The CS G1 mentorship program is designed to match returning CS PhD students with incoming students to offer support and help navigate graduate student life. I am happy to have served as a mentor in this program during the past few years, and am continuing this year as well.

Raising a Mathematician Foundation - Lecturer
December 2024- current

- During the 2024 All Girls Math Nurture camp (December 2024), I gave a 90-minute lecture at the All Girls Math Nurture Camp, which is a program designed to expose middle and high school girls in India to exciting new topics in discrete math.
- For the 2025 AG program (December 2025), I was a full-time lecturer and gave three 90-minute lectures on probability.
- I gave a 75 minute lecture on streaming algorithms at the 2026 RAM Training Program (May 2026).

Princeton CS Pre-Application Mentorship program - volunteer
September 2022 -

- I participate in a yearly CS graduate application mentorship program, which aims to make the graduate school application process more equitable by pairing prospective students with PhD student mentors. We meet one-on-one with prospective students to provide support with editing research and personal statements.

Columbia Music Performance Program - solo pianist, chamber musician
2018 - 2022

- During my undergraduate studies at Columbia, I was a solo pianist and chamber musician in the Columbia Music Performance Program. Through this program, I have regularly trained with professors at Columbia University, learned new solo and chamber ensemble repertoire, and performed both on campus and at various halls in NYC.

Columbia Classical Performers - Executive Board member/ Treasurer (2021-2022), performer (2019-2020)

- CCP is a student-run classical music organization. We aim to provide all Columbia musicians with audition-free opportunities to perform for the community, promoting an inclusive atmosphere and a love for classical music.
- I was responsible for keeping track of club finances, as well as organizing bi-monthly concerts, recruiting new performers, and creating concert programs.

Reviewer for FOCS (2024, 2025), SODA (2025, 2026), SOSA 2026, ITCS 2026, ICML 2026, ICALP 2026, ESA 2026, RANDOM 2026

Technical Skills

- *Programming Languages*: C/C++, Python, Java, Scala, LaTeX
- *Technical Softwares*: MATLAB, Simulink
- *Languages*: Russian (native, fluent), English (fluent), Spanish (full professional proficiency)