

A. Anas Chentouf

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Education

- 06/2025 **Massachusetts Institute of Technology**, *Candidate for M.Eng. in EECS, GPA: 5.0/5.0.*
- 06/2024 **Massachusetts Institute of Technology**, *B.S. in Mathematics and B.S. in EECS, GPA: 5.0/5.0.*
Relevant Coursework: Number Theory (G), Analytic Number Theory (G), Commutative Algebra (G), Symmetry for Machine Learning (G), Algorithmic Lower Bounds (G), Theory of Computation, Applied Crypto and Security (G), Elliptic Curves, Design & Analysis of Algorithms, Complex Analysis.
A more comprehensive list of classes and projects can be found at web.mit.edu/~chentouf/www/classes.
(G) denotes a graduate-level course.

Research-relevant Experience

- 06/2023–
07/2023 **Virginia REU in Number Theory**, *Supervised by Jesse Thorner, UIUC and Ken Ono, UVA.*
Proved a bounded gaps result for primes arising from a joint Sato–Tate distribution of newforms.
Generalized the bounded gaps theorem with the Green–Tao theorem to prove a hybrid result.
- 02/2023–
08/2023 **Algorithmic Number Theory Research**, *Supervised by Andrew Sutherland, MIT.*
Developed an algorithm to efficiently compute imaginary quadratic discriminants of bounded class number.
Optimized computations from 19.5 hours to 19 seconds using hashing and pre-processing.
Trained and evaluated machine learning models to predict the Sato-Tate group of elliptic curves.
- 10/2022–
1/2023 **Statistics and Probability Research**, *Supervised by Praneeth Vepakomma, Media Lab, MIT.*
Conducted research on (de-)correlating maps using probability theory.
Applied elements of information theory to the problem of correlating random variables.
- 12/2020–
present **Computational Research on Tetrahedra**, *Supervised by Bjorn Poonen, MIT.*
Proved results on the [non-]tiling and embeddings of certain rectifiable tetrahedra.
Compiled and updated a [list](#) of currently known tetrahedra with Dehn invariant zero.
Designed and implemented [efficient algorithms](#) to search for and classify Dehn invariant zero tetrahedra.
- 01/2022 **Directed Reading Program (DRP) in Number Theory**, *Supervised by Murilo Zanarella, MIT.*
Read *Intro to Analytic Number Theory* (Tom Apostol) and *Algebraic Theory of Numbers* (Pierre Samuel).
Learned the proof of Dirichlet’s theorem on arithmetic progressions using the non-vanishing of characters.
Presented results on the density of certain families of primes to the DRP Symposium.
- 06/2021–
09/2021 **Polymath Jr. Summer Research Project**, *Supervised by Seoyoung Kim, Queen’s University.*
Explored generalizations of Diophantine m -tuples to rings.
Conducted numerical searches to inform conjectures for said generalizations over finite fields.

Works and Contributions

- "Patterns of Primes in the Joint Sato–Tate Distribution" (with C. Cossaboom, S. Goldberg, and J. Miller), *Journal of Number Theory* (2024), arXiv: [2308.06632](https://arxiv.org/abs/2308.06632).
- "Dehn Invariant Zero Tetrahedra" (with Kimi Sun and supervised by Bjorn Poonen), arXiv: [2312.01282](https://arxiv.org/abs/2312.01282)
- "Tetrahedra Tiling Problem" (with Kimi Sun and supervised by Bjorn Poonen), arXiv: [2312.01654](https://arxiv.org/abs/2312.01654)
- "Linear Recurrences of Order at Most Two in Small Divisors" *J. Integer Sequences* **25** (2022), arXiv: [2108.13173](https://arxiv.org/abs/2108.13173).
- "Linear Recurrences of Order at Most Two in Large Divisors" (with Youssef Marrakchi).
- "Algorithms and Complexity for the Divisor Multiset and Bounded Subset Products" (joint with Yazan Almajnoui, Fares Pasuni; produced for 6.5440 - *Algorithmic Lower Bounds*).
- "Security of Bloom Filters" (joint with Zi Song Yeoh, Ningshan Karen Ma, and Yanyi Zhang; produced for 6.5610 - *Applied Cryptography and Security*).
- "Discrete Logarithm Problem" (an expository paper on the discrete logarithm problem and the Diffie-Hellman exchange protocol, produced for 18.704 - *Seminar in Algebra*)

“On Sylvester’s Sequence and Some of its Properties” *Parabola* Volume 56 Issue 2, Sep. 2020.
Online Encyclopedia of Integer Sequences (OEIS) Contributions, Sequence Entry [A346447](#):
Positive integers whose small divisors form a linear recurrence of order at most two.

Other Activities

- 06/2024–**ML Research Assistant**, (*Mass General Hospital*), supervised by Oleg Pinykh.
09/2024 Proven results on the stability of internal machine learning models used for medical diagnosis. Implementing stability-inducing protocols to ensure the consistency of internal models.
- 01/2024–**Teaching Assistant**, *Signal Processing (6.003)*, taught by Sixian You.
05/2024 Held weekly office hours to reinforce material and answer students’ questions.
Prepared course materials and graded assignments.
- 12/2023–**Lead Instructor**, *6.S096 (Number Theory for Computer Science Winter Course)*.
02/2024 Prepared lecture materials and assignments for a 6-unit class (half the standard courseload).
Led a team of three instructors in teaching topics from number theory relevant to cryptography and theoretical computer science to 50+ students.
- 01/2024 **MISTI-Ivory Coast Olympiad Training**, *Teacher*.
Taught a two-week camp for the Ivorian Mathematical Olympiad program in preparation for international competitions.
- 08/2023–**Teaching Assistant**, *18.01 (Single Variable Calculus)*, taught by Larry Guth.
present Held weekly recitations and office hours to reinforce material and answer students’ questions.
Prepared homework solutions and exam review materials.
- 08/2022–**Research Staff**, *MIT Undergraduate Research Journal*.
present Served as a referee/reviewer for scientific papers submitted to the journal.
- 01/2023 **Quantitative Analyst Intern**, *Halliday International*.
Designed and tested fraud-detection frameworks using **Pandas** to prevent malicious users from exploiting financial services in the web3 setting.
Used statistics and machine learning (**scikit**) to analyze market and reduce lending risk.
Developed a local data mining/analysis pipeline using **Python**.
- 02/2022–**Academic Staff**, *Undergraduate Mathematics Association*.
06/2023 Organized academic events and resources for the undergraduate mathematics community at MIT.
- 08/2022–**Resident Peer Mentor**, *MIT Division of Student Life*.
present Served as resident mentor to freshmen, helping them navigate various resources at MIT.
- 01/2022–**Undergraduate Assistant**, *18.781 (Theory of Numbers)*, taught by Ju-Lee Kim.
05/2022 Graded weekly problem sets and held office hours/review sessions.
Received evaluations of 7.0/7.0 (stimulated interest, displayed knowledge, supported learning).
- 12/2020–**Coach**, *Algerian Mathematical Olympiads*.
present Trained Algerian high school students on Olympiad problem solving.
Graded solutions and provided feedback on proof-writing to students.
Defended students’ solutions through coordination in 6+ contests.
Served as Observer A at IMO 2021 and IMO 2022, and Deputy Leader in various competitions.
Prepared a Django-based database to store junior Olympiad problems for training purposes.
- 09/2020–**Harvard-MIT Mathematics Tournament**, *Problem Staff*.
09/2022 Proposed, reviewed, and tested problems for three editions of the tournament.
- 01/2021 **MISTI-Africa Olympiad Training**, *Teacher*.
Taught a two-week Olympiad camp on Algebra and Number Theory for students in Ghana and Nigeria.

Awards

- 2023 **Harold J. Pettegrove Award**, *For outstanding service to intramural athletics at MIT*.
2022 **Putnam Competition**, *Top 250 Contestants*.
2022 **MIT Integration Bee**, *Finalist (Top 16)*.

2022 **U.S. Colleges Arabic Debate Championship**, *Semifinalist*.

2020 **GCC Hackathon: Digitally Excluded Challenge**, *1st Place*.

Developed a simple, mobile-based solution targeted towards senior citizens in the GCC to serve as a center for relevant and reliable information about COVID-19.

Conferences and Workshops Attended

09/2023 **Québec-Maine Number Theory Conference**, *University of Maine, Bangor*, delivered a talk on *Patterns of Primes in the Joint Sato–Tate Distribution*, joint with Jack B. Miller.

08/2023 **Young Mathematicians Conference**, *Ohio State University*, delivered a talk on *Dehn Invariant Zero Tetrahedra*.

08/2023 **Exchange of Mathematical Ideas**, *University of Northern Iowa*, delivered a talk on *Tetrahedra: Tilings and Scissors–Congruence*.

08/2023 **Number Theory and Combinatorics in Duluth**, *University of Minnesota Duluth*, presented a lightning talk on *Dehn Invariant Zero Tetrahedra*.

05/2023 **IACR Public Key Cryptography (PKC)**, *GeorgiaTech*.

11/2022 **Undergraduate Mathematics Symposium (UMS)**, *UI Chicago*, presented a poster on *Dehn Invariant Zero Tetrahedra*.

08/2022 **Algorithmic Number Theory Symposium (ANTS) XV**, *University of Bristol (Remote)*.

03/2022 **Symposium for Undergraduates in the Mathematical Sciences**, *Brown University*, delivered a talk on *Connect Four*, joint with Y. Marrakchi and D. Atia.

02/2022 **Directed Reading Program Symposium**, *MIT*, delivered a talk titled "Density, Primes in Your Favorite Number Field, and Beyond", joint with C. Tang, supervised by Murilo Zanarella.

11/2021 **Geometry and Analysis Seminar for Boston Area Graduate Students**, *MIT*.

08/2021 **Young Mathematicians Conference**, *Oregon State University (Remote)*, delivered a talk on the paper "Linear Recurrences of Order at Most Two in Small Divisors".

08/2021 **Young Researchers in Algebraic Number Theory**, *University of Bristol (Remote)*.

04/2021 **Rose-Hulman Undergraduate Mathematics Conference**, *Rose-Hulman Institute of Technology (Remote)*.

Computer Skills

Skilled HTML, CAD, Django, Julia, C, C++

Proficient Python, Sage, Pytorch, NumPy, Pandas, \LaTeX , Microsoft Office

Languages

Arabic **Native**

English **Fluent**

French **Advanced**

Turkish **Intermediate**

Spanish **Elementary**

Russian **Elementary (Learning)**