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), Commutative Algebra (G), Statistical Learning Theory, Symmetry for Machine Learning (G), Algorithmic Lower Bounds (G), Probability (G), Deep Learning (G), Theory of Computation, Applied Crypto and Security (G), Elliptic Curves, 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

06/2024–06/2025 **Graduate Research Assistant in LIDS**, *Supervised by Marzyeh Ghassemi, MIT.*
Investigating robust optimization techniques for deep neural nets under label changes, through the lens of perturbation theory.

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.

12/2020–12/2023 **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 noncommutative rings.
Conducted numerical searches to inform conjectures for said generalizations over matrices of 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).

"Dehn Invariant Zero Tetrahedra" (with Kimi Sun and supervised by Bjorn Poonen), arXiv: 2312.01282

"Tetrahedra Tiling Problem" (with Kimi Sun and supervised by Bjorn Poonen), arXiv: 2312.01654

"Linear Recurrences of Order at Most Two in Small Divisors" *J. Integer Sequences* **25** (2022), arXiv: 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 Almajnouni, 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

06/2024-09/2024 **ML Research Assistant**, *(Mass General Hospital)*, supervised by Oleg Pianykh.
Proved results on the stability of internal machine learning models used for medical diagnosis.
Implementing stability-inducing protocols to ensure the consistency of internal models.

01/2024-05/2024 **Teaching Assistant**, *Signal Processing (6.003)*, taught by Sixian You.
Held weekly office hours to reinforce material and answer students' questions.
Prepared course materials and graded assignments.

12/2023-02/2024 **Lead Instructor**, *6.S096 (Number Theory for Computer Science Winter Course)*.
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-present **Teaching Assistant**, *18.01 (Single Variable Calculus)*, taught by Larry Guth.
Held weekly recitations and office hours to reinforce material and answer students' questions.
Prepared homework solutions and exam review materials.

08/2022-present **Research Staff**, *MIT Undergraduate Research Journal*.
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**.

02/2022-06/2023 **Academic Staff**, *Undergraduate Mathematics Association*.
Organized academic events and resources for the undergraduate mathematics community at MIT.

08/2022-present **Resident Peer Mentor**, *MIT Division of Student Life*.
Served as resident mentor to freshmen, helping them navigate various resources at MIT.

01/2022-05/2022 **Undergraduate Assistant**, *18.781 (Theory of Numbers)*, taught by Ju-Lee Kim.
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-present **Coach**, *Algerian Mathematical Olympiads*.
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.

09/2020-09/2022 **Harvard-MIT Mathematics Tournament**, *Problem Staff*.
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.

2019 **International Mathematical Olympiad**, *Honourable Mention*.

Conferences and Workshops Attended

08/2024 **Young Mathematicians Conference**, *Ohio State University*, Columbus, Ohio, delivered a talk on *Patterns of Primes in joint Sato–Tate distributions*.

08/2024 **Exchange of Mathematical Ideas**, *Embry-Riddle Aeronautical University*, Prescott, Arizona, delivered a talk on *Equivariant Learning - an application of representation theory to machine learning*.

08/2024 **Algorithmic Number Theory Symposium (ANTS XVI)**, *Cambridge, MA*, delivered a lightning talk on *Algorithmic Aspects of Dehn Invariant Zero Tetrahedra*.

09/2023 **Québec-Maine Number Theory Conference**, *University of Maine*, Bangor, Maine, 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*, Columbus, Ohio, delivered a talk on *Dehn Invariant Zero Tetrahedra*.

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

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

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

11/2022 **Undergraduate Mathematics Symposium (UMS)**, *UI Chicago*, Chicago, Illinois, 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*, Providence, Rhode Island, 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)**