

# MATAN SHTEPEL

(925) · 922 · 9254 ◊ [matan.shtepel@gmail.com](mailto:matan.shtepel@gmail.com) ◊ [matanshtepel.com](http://matanshtepel.com)

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## OVERVIEW

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I'm a first year Ph.D. student at Carnegie Mellon University, working primarily in cryptography  $\cup$  coding theory and broadly interested in theory. Outside of broad interests in theoretical computer science and math, I also like Bob Dylan, blockchains, Australian rock music, rationality, and surfing.

## EDUCATION

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**Carnegie Mellon University** August 2024 - Ongoing  
Computer Science PhD student.

Advisors: [Prof. Wenting Zhang](#) and [Prof. Rashmi Vinayak](#).

**University of Pennsylvania** October 2023 - June 2024  
Cryptography Research Assistant.

Advisors: [Prof. Brett Falk](#) and [Prof. Pratyush Mishra](#) (UPenn).

Research in cryptography  $\cap$  coding theory.

**University of California, Los Angeles** September 2021 - March 2023

B.S.E Computer Science (concentration in Pure Math) with honors.

GPA: 3.86

Research in cryptography

Primary advisor: [Prof. Rafail Ostrovsky](#) (UCLA)

Secondary advisor: [Prof. Brett Falk](#) (Upenn)

Organized [Theory@UCLA](#).

**Las Positas Community College** June 2020 - May 2021

A.S Computer Science with honors.

A.S Math with honors.

GPA: 3.95

Honors project advised by [Dr. William Pezzaglia](#): [Quaternion-based Graphics](#)

Math Club Mu Alpha Theta (honor society) officer

## PAPERS

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Authors in alphabetical order unless stated otherwise.

- **Maliciously secure PIR (almost) for free**

We show how transform any PIR scheme to a maliciously-secure PIR scheme with very low overhead. Shows the complexity-theoretic equivalence of the primitives.

[B. Falk](#), [Pratyush Mishra](#), [Matan Shtepel](#). *Preprint*

- **DORAM revisited: Maliciously secure RAM-MPC with logarithmic overhead**

We give the first malicious construction of Distributed ORAM while matching the asymptotics of the best-known semi-honest constructions. As a corollary, we give the *first* maliciously-secure MPC with logarithmic random access overhead.

[B. Falk](#), [D. Noble](#), [R. Ostrovsky](#), [M. Shtepel](#), [J. Zhang](#)

*Accepted to TCC'23*

- **GigaDORAM: Breaking the Billion Address Barrier**

We construct and implement the most practically efficient Distributed Oblivious RAM (DORAM) protocol to date, outperforming all existing DORAM constructions by [over 400x](#). We hope our construction will enable RAM-MPC to be deployed in practice.

- **On Totalization of Computable Functions in a Distributive Environment**

Mark Burgin, Matan Shtepel.

*International Journal of Parallel, Emergent and Distributed Systems, Volume 37, Number 3, October 2021.*

## FUNDING & AWARDS

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- **Sui Academic Research Award.** Co-I on proposal “Scalable Post-Quantum Transparent SNARKs” which partially funded me as an RA at UPenn. PIs: [Prof. Brett Falk](#) and [Prof. Pratyush Mishra](#). Award: \$25,000.
- **GEM Fellowship: Final Round.** Selected for the final round of the GEM fellowship.
- **NSF REU Funding for Summer 2023.** Granted for work on secure multiparty computation advised [Prof. Rafail Ostrovsky](#) at UCLA.
- **USENIX'23 Student Travel Grant.** All attendance and (partial) travel costs covered by USENIX'23.
- **The 10'th Heidelberg Laureate Forum + Full Travel Grant.** Selected one of 200 young researchers (undergraduates, graduates, and postdoctoral fellows) worldwide invited to the 10'th Heidelberg Laureate Forum. All travel and attendance costs covered.
- **NSF REU Funding for Summer 2022.** Granted for work on secure multiparty computation advised [Prof. Rafail Ostrovsky](#) at UCLA.
- **Outliers 23'.** Participate in competitively selected applied cryptography/web3 focused, VC-backed, summer program.
- **Hack Lodge (sponsored by ETH university) 2023.** Participate in competitively selected applied cryptography/Ethereum ecosystem-focused hacker house.
- **Stanford Blockchain Club Hacker House) Summer 2022.** Participate in SBC hacker house ran by [Daniel Marin](#) in SF.

## TALKS

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- *From CC to PhD: Why You Should Do it and How You Can Achieve it* October 8th, 10th  
Las Positas Community College [MESA Scholars Program](#), Math Club.
- *Maliciously-Secure PIR is (almost) Free,* July 15th, 2024  
[Workshop in Private Information Retrieval](#) at [Privacy Enhancing Technologies Symposium 2024](#).
- *Maliciously-Secure PIR is (almost) Free,* May 22nd, 2024  
New York University (NYU) Crypto Seminar.
- *Maliciously-Secure PIR is (almost) Free,* Apr. 30th, 2024  
Carnegie Mellon University (CMU) Cylab Crypto Seminar. [Video recording](#),
- *Theory and Practice of RAM-MPC from Distributed ORAM.,* Feb. 16th, 2024  
University of Maryland (UMD) College Park, Crypto Reading Group.
- *Theory and Practice of RAM-MPC from Distributed ORAM.,* Dec. 6th, 2023  
Stanford Security Seminar.
- *Theory and Practice of RAM-MPC from Distributed ORAM.,* Nov. 30th, 2023  
University of Pennsylvania (UPenn) Security and Privacy Lab
- *Theory and Practice of RAM-MPC from Distributed ORAM.* Nov. 29th, 2023  
Boston University (BU) Security Lunch.
- *GigaDORAM: Breaking the Billion Address Barrier* Aug. 10, 2023  
USENIX Security 2023

## NON-RESEARCH ACADEMIC ACTIVITIES

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### Undergraduate Research Mentor

Oct 2022 - present

Cryptography research at UCLA

- Mentor [Felix Adena](#) on cryptography research: implementing privacy-preserving, money laundering detection protocols in C++.
- Mentor [Nakul Khambhati](#) on cryptography research: proving lower bounds on sublinear message complexity information-theoretic MPC in the many-server model.
- Mentor [Stephen Kelman](#) on cryptography research: implementing high-performance, novel MPC protocols in C++ (3 party maliciously secure DORAM).

### Founder & Organizer

Sep 2022 - May 2023

Theory@UCLA

- Found and organize the [Theory@UCLA](#), UCLA's (first?) theoretical computer science community. Meet on a weekly basis, to discuss various readings in theoretical computer science.
- [The Guild continues](#) in Fall'23 under [Nakul Khambhati](#)'s leadership.

### How-to-Research Advising and Programming

May 2023 - Sep 2023

UCLA Undergraduate Research Center

- Created [how-to-research programming](#) for UCLA students and participated in office hours.

### Advocate for Community College Researchers

Sep 2022 - present

UCLA Engineering Transfer Center

- Invited to speak on the Engineering Research Presentations & Panel (only transfer student) at [UCLA Engineering Day](#).
- Invited to speak at the Engineering Transfer Day Research Panel (only current undergraduate) at [UCLA Engineering Transfer Day](#).
- Research-oriented talk Las Positas / Chabot Community College (expected, December 2023)

## WORK EXPERIENCE

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### Teaching Assistant

Jan 2024 - June 2024

University of Pennsylvania

- TA [Prof. Pratyush Mishra](#) Cryptography (CIS 5560) course.

### Research Assistant

September 2023 - present

University of Pennsylvania, University of California, Los Angeles

- Work with [Prof. Brett Falk](#) and [Prof. Pratyush Mishra](#) (UPenn) in the interface of cryptography and coding theory.
- Member of [Penn's Security and Privacy Lab](#)
- Starting Jan. 2024, also sponsored by [Prof. Rafail Ostrovsky](#) at UCLA.

### REU Researcher

September 2023 - present

University of California, Los Angeles, sponsored by the National Science Foundation

- Cryptography research Summer 2022, Summer 2023 with Prof. Rafail Ostrovsky at UCLA.

### STEM Tutor

July 2019 - March 2021

Matan's Tutoring Business & Pleasanton Unified School District

*Pleasanton, CA*

- Independently tutor middle and high school students primarily in math, but also in biology, programming, and history.
  - Over the entire period, had about 7 students, on average meeting with 3 students a week, each for an hour.

- Tutored for the Pleasanton Unified School District
  - Tutor at Fairlands Elementary School after-school program, twice a week during the 2019 schoolyear until COCIV (march 2019).
  - Tutor at summer school 2019 for English and math.

**Founder, Designer, Advertiser, ...**

June 2019 - June 2020

RAWGNARLY! (fashion brand)

*Pleasanton, CA*

- Founded and operated [RAWGNARLY!](#) a fashion brand all about having not-too-serious fun with your friends.
- Sold about 120 garments, both locally in Pleasanton (about 100) and all across the US (about 20).
- Designed garments, photographed lookbooks, created advertisements, built website, negotiated with vendors (US & abroad).

**Sales Associate, Pizzaboy**

August 2018 - May 2019

Skechers & Pizza Guys

*Livermore, Pleasanton, CA*

- Retail associate at Skechers Footwear at the Livermore outlets and cook at Pizza Guys' Pleasanton branch.

**RELEVANT COURSEWORK**

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*At Penn:* Theory and Practice of SNARKs, Foundations of Deep Learning.

*At UCLA:* Graduate cryptography sequence + special topics (winter 23'), graduate communication complexity theory, graduate quantum computing, graduate computational complexity theory (winter 23'), graduate theory hits of 21'st century (winter 23'), real analysis sequence, probability theory sequence, linear algebra sequence, group theory, enumerative combinatorics, required CS curriculum.