ELFAROUK HARB

EDUCATION

University of Illinois Urbana-Champaign (UIUC) *August 2021 - May 2026*
PhD Candidate in Computer Science. Co-advised by Chandra Chekuri and Sariel Har-Peled. GPA: **4.0/4.0**

Hong Kong University of Science and Technology (HKUST) *September 2015 - May 2019*
Double major in Mathematics and Computer Science (First Class Honors) CGA: **3.932/4.300**

EXPERIENCE

Two Sigma June 2025 - August 2025
New York, Quantitative Researcher Intern

- Developed mid-frequency order-book alpha signals for E-Mini S&P (ES), NASDAQ-100 (NQ), and Gold futures across 1-minute and 5-minute horizons, improving intraday predictive coverage.
- Quantified signal quality and behavior by measuring information coefficient (IC), autocorrelation functions (ACF), pseudo-pnl and pseudo-sharpe, perma-bet/tilt metrics, and volatility-normalized feature adjustments.
- Engineered and cleaned multi-dimensional feature sets, then trained and validated an XGBoost model to extract robust predictive patterns. Processed datasets containing billions of rows.

Google May 2022 - August 2022
New York, PhD Software Engineer Intern

- Collaborated with cross-functional teams to optimize C++ performance for Colossus, Google's distributed file system.
- Implemented new features and functionalities in the encryption library using hardware acceleration.
- Designed performance tests, achieving a 3x speedup in cryptographic operations.

Citadel Securities July 2019 - May 2021
Hong Kong, Quantitative Trader (Served 18-months Non-Compete Following May 2021)

- Responsible for post-trade analytics and index-arbitrage research.
- Rewrote the trading simulation system and pipeline using Python and C++ that resulted in a 15x speedup on simulation run times.
- Implemented a customized resource allocation algorithm for simulation workload on a large-scale cluster, cutting simulation cost by $\approx 15\%$.
- Designed and developed clustering methods for correlated alpha signal groups to improve regression fits.

Credit Suisse June 2018 - August 2018
Hong Kong, Technology Analyst Intern

- Collaborated with the development team to implement a recommender system for financial instruments, improving user recommendations by 92%.
- Developed and executed test plans to ensure the functionality and reliability of the recommender system.
- Participated in daily stand-up meetings and sprint planning sessions.

PROJECTS AND OPEN SOURCE CONTRIBUTIONS

Algorithm Implementation in NetworkX. Open source contributor to NetworkX. Contributed two algorithms to the library NetworkX, a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex graphs, which has over 50 million downloads.

Reddit Suicide Posts Detector: Programmed a decision tree based on information gain to detect whether a Reddit post was about self-harm (suicide) or not.

Atari Playing Bot: Developed a Deep Neural Network (DNN) using policy gradients to learn Pong, and a Deep Q-Network (DQN) to play Space Invaders.

Graph Neural Network for Dynamic Programming: Used PyTorch to program a Graph Neural Network to speed up dynamic programming problems.

PROGRAMMING LANGUAGES AND FRAMEWORKS

Python, C++, TensorFlow, PyTorch, Scikit-learn

SELECT PEER REVIEWED PUBLICATIONS

For a more complete list, see my Google Scholar page.

1. **E. Harb** and Y. Yassin, C. Chekuri. Corporate Needs You to Find the Difference: Revisiting Submodular and Supermodular Ratio Optimization Problems **(NeurIPS 2025 Spotlight)**
2. **E. Harb** New Prophet Inequalities via Poissonization and Sharding. Published in ACM-SIAM Symposium on Discrete Algorithms (**SODA 2025**).
3. **E. Harb**, Vasilis Livanos, Sariel Har-Peled. Oracle-Augmented Prophet Inequalities. Published in 2024 International Colloquium on Automata, Languages and Programming (**ICALP 2024**)
4. **E. Harb**, S. Har-Peled. Revisiting Random Points: Combinatorial Complexity and Algorithms. Published in 2024 Symposium on Simplicity in Algorithms (**SOSA 2024**)
5. **E. Harb**, M. Golin. Polynomial Time Algorithms for Constructing Optimal AIFV Codes. Published in **IEEE Transactions on Information Theory in 2023.**
6. **E. Harb**, K. Quanrud, C. Chekuri. Faster and Scalable Algorithms for Densest Subgraph and Decomposition. Published in 2022 Conference on Neural Information Processing Systems (**NeurIPS 2022**)
7. **E. Harb** and H. S. Lam. KFC: A Scalable Approximation Algorithm for k-center Fair Clustering. Published in 2020 Conference on Neural Information Processing Systems (**NeurIPS 2020**)

HONORS AND AWARDS

1. Awarded the Outstanding Teaching Assistant Award at UIUC CS, recognizes outstanding teaching assistants.
2. Accepted to the Swiss Winter School on Theoretical CS. The goal of the school is to educate top international theory PhD students about exciting **recent** developments in the field. Only 60/500 candidates accepted.
3. On list of teachers ranked as excelled by their students at UIUC in Fall 2023.
4. NeurIPS 2022 Scholar Award (travel award).
5. Saburo Muroga Endowed Fellowship, 2021. It is awarded to outstanding graduate students in computer science.
6. Academic Achievement Medal, 2019, for ranking in the top 1% of undergraduates at HKUST.
7. Dean's List at HKUST for all semesters (2015-2019).
8. Chern Class Scholarship, 2016. (Top 5% in math department at HKUST).
9. HKUST University Scholarship Scheme for Continuing Undergraduates Students, 2016-2019. To recognize and honor continuing undergraduate students at HKUST with outstanding academic performance.
10. The Joseph Lau Luen Hung Charitable Trust Scholarship. Full ride scholarship for 2015 at HKUST.

PROFESSIONAL SERVICE

I have acted as a reviewer or subreviewer for the following conferences, refereeing at least 30 papers.

SODA 2026, NeurIPS 2025, ICML2025, WADS 2025, ICML 2025, ITCS 2025, AAAI 2025, SODA2025, FOCS2024, ICML 2024, ISIT2024, SOCG 2024, ICLR 2024, SODA 2024, NeurIPS 2023

And the following journals:

IEEE Transactions on Information Theory, IEEE Transactions on Communications, Transactions on Machine Learning Research (TMLR)

I have acted on the **program committee** of AAAI 2025, AAAI 2026.