Omer Wasim

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EDUCATION

PhD. Candidate in Computer Science, Northeastern University, Boston MA, USA · 2020-
- Conducting research with the overarching goal of resolving hard algorithmic and mathematical challenges arising in big data applications, decision making under uncertainty, and machine learning.
- *Cumulative GPA:* 3.95/4.0, *Advisor:* Rajmohan Rajaraman.

MSc. in Computer Science, University of Victoria, Victoria BC, Canada · 2020
- Fully funded by NSERC grant. *Thesis:* Preserving large cuts in fully dynamic graphs.
- *GPA:* 4.0/4/0, *Advisor:* Valerie King.

BEng. in Computer Science, University of Hong Kong, Hong Kong · 2018
- Fully supported by: HKU Foundation Scholarship for Outstanding International Students and HKSAR Government Scholarship Fund.
- Study abroad at the University of Chicago, Chicago IL, supported by CV Starr Scholarship (2016-2017).

Graduate-level coursework completed: Machine Learning, Distributed Systems, Sublinear Algorithms, Algorithmic Game Theory, Advanced Algorithms, Analysis of Algorithms, Modern Toolkit for Algorithms and Analysis, Programming Languages, Machine Learning Theory, Randomized Algorithms, Stochastic Financial Modelling.

RESEARCH AND WORK EXPERIENCE

Graduate Research Assistant, Khoury College of Computer Sciences, Northeastern University, Boston MA · 2020-
Algorithms for Big Data–Online, Dynamic and Distributed Algorithms.
- Developed the first fully dynamic sublinear update time algorithm for $(\Delta + 1)$ coloring, breaking the long-standing barrier and settling a major open problem in dynamic algorithms [1]. Joint work with S. Behnezhad and R. Rajaraman.
- Developed the first *optimal* competitive algorithms for *capacitated online recoloring*–a problem concerned with resource allocation under real time anti-affinity requests [3]. Joint work with R. Rajaraman.
- Developed *optimal* competitive algorithms for online balanced allocation of dynamic components, modelling dynamic resource allocation under affinity requests and VM re-allocation [2]. Joint work with R. Rajaraman.
- Developed a near-optimal competitive deterministic algorithm for *online balanced graph partitioning*–a problem concerned with demand-aware resource allocation under affinity requests in a distributed cloud [5]. Joint work with R. Rajaraman.

Machine Learning and Network Science.
- Developed an optimization framework to analyze the sample complexity of opinion convergence in networks motivated by applications in algorithmic fairness, resource allocation and federated learning [4]. Joint work with multiple co-authors.

Graduate Research Assistant, University of Victoria, Victoria BC, Canada · 2018-2020
- Developed the first *fully dynamic* algorithms for the MAX-CUT problem-a problem with wide-ranging applications in network design, statistical physics, circuit layout design, and data clustering [6].

Algorithm Developer, LogFlows, Hong Kong · Apr-Aug 2018
- Developed efficient algorithms for shipment allocation and network routing in Python and C++ to automate the manual process of matching drivers to shipment routes.

Software Engineering Intern, KPMG, Hong Kong · Jul-Aug 2016
- Researched and implemented string-similarity algorithms on dynamic data sets. Successfully scaled and parallelized algorithms achieving an overall speedup of 60%.

Software Engineering Intern, Alike Audience · Jun-Aug 2016
- Implemented efficient algorithms for location-data obfuscation techniques for efficient ad targeting.

Software Engineering Intern, KPMG, Hong Kong · Dec 2015-Feb 2016
- Developed predictive risk algorithms by employing a variety of supervised and non-supervised learning techniques; optimized running time of algorithms by 50%.

Publications

[1] **Fully Dynamic $(\Delta + 1)$ Coloring Against Adaptive Adversaries,** with S. Behnezhad and R. Rajaraman. In Symposium of Discrete Algorithms (SODA), 2025.

[2] **Online Balanced Allocation of Dynamic Components,** with R. Rajaraman. In submission to Innovations in Theoretical Computer Science (ITCS), 2025.

[3] **Competitive Algorithms for Capacitated Online Recoloring,** with R. Rajaraman. In European Symposium on Algorithms (ESA), 2024.

[4] **Sample Complexity of Opinion Formation in Networks,** with H. Liu, R. Sundaram, R. Rajaraman, A. Vullikanti and H. Xu. https://arxiv.org/abs/2311.02349. In submission to AAAI 2025.

[5] **Improved bounds for online balanced graph re-partitioning,** with R. Rajaraman. In European Symposium on Algorithms (ESA), 2022.

[6] **Fully dynamic sequential and distributed algorithms for MAX-CUT,** with V. King. In Foundations of Software Technology and Theoretical Computer Science (FSTTCS), 2020.

Other Projects

- **Predicting diabetes using common health indicators,** Northeastern University: built a machine learning model by implementing several classification methods including logistic regression, decision trees, Naïve Bayes classifer, SVM and Deep Neural Networks on the BRFSS data set. 2022
- **Empirical analysis of distributed online graph partitioning,** Northeastern University: implemented and analyzed novel graph partitioning algorithms over high performance computing clusters and boosted run times by 70%. 2021
- **Pricing an American call option with increasing strike price,** University of Victoria: developed a binomial tree method to price an exotic option in MATLAB. 2020

Teaching Experience

- **Teaching Assistant** for CSC 3000: Algorithms and Data, Northeastern University. Fall 2020.
- **Course Instructor** for CSC 320: Foundations of Computer Science, University of Victoria. May-Aug 2020
- **Teaching Assistant** for CSC 320: Foundations of Computer Science, CSC 425: Advanced Algorithms, and CSC 423: Randomized Algorithms, University of Victoria. 2018-2020

Academic Service

Reviewer/sub-reviewer for the following conferences in algorithms and theoretical computer science: SODA 2025, ESA 2024, SOSA 2024, ESA 2023, SPAA 2022, SPAA 2021.

Talks

- 32nd European Symposium on Algorithms (ESA), London, UK. 2022
- Theory Seminar, University of Houston, Houston TX, USA. 2023
- 30th European Symposium on Algorithms (ESA), Potsdam, Germany. 2022
- 40th IARCS Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS), remote. 2020
- 7th Biennial Canadian Discrete and Algorithmic Mathematics Conference (CANADAM), Vancouver, Canada. 2019

Skills

- **Programming:** Python, C++, C, SQL, MATLAB, R, Haskell, Java.
- **Specializations:** Machine Learning, Algorithm design, Data Analysis, Distributed Systems, Optimization, Probability and Applied Mathematics.
- **AI/ML Stack:** TensorFlow, PyTorch, SciPy, NumPy, Pandas.