

Akshar Varma

Assistant Teaching Professor, Khoury College of Computer Sciences, Northeastern University

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Work Experience

- Assistant Teaching Professor (February 2025–)
Khoury College of Computer Sciences, Northeastern University
Courses Taught: *CS 3000: Algorithms & Data*
- Software Engineer Intern at Oracle (Summer 2020)
Project Title: *Automated Time Series Forecasting and Anomaly Detection*
- Applied Scientist Intern at Amazon (May–December 2018)
Project Title: *Latent Space Embeddings for Query Reformulation*

Education

- **PhD. in Computer Science** GPA: 3.98/4
Northeastern University, Boston, USA. (2017–2024)
Thesis: Estimating and Leveraging Graph Parameters via Approximation Algorithms and Machine Learning
Advisor: Dr. Ravi Sundaram
- **B.Tech. (Hons.) in Information and Communication Technology**
Minor: Computational Science GPA: 8.9/10
DA-IICT, Gandhinagar, India. (2013–2017)
Bachelor's Thesis: Reachability Problems and Space Bounds
Advisor: Dr. Nutan Limaye, IIT Bombay

Teaching Experience

- Assistant Teaching Professor:
 - *CS 3000: Algorithms & Data*
- Instructor of Record, *CS 3000: Algorithms & Data* in:
 - 2024 Fall (September–December).
 - 2023 Summer 2 (June–July).
- Head Teaching Assistant for:
 - *CS5800: Algorithms* offered to Master's students (Fall 2019, 2020, 2021, 2022).
 - *CS5002: Discrete Structure* offered to Master's students (Fall 2023).
 - *CS3800: Theory of Computation* offered to undergraduates (Spring (January–April) 2024).
 - *CS3000: Algorithms & Data* offered to undergraduates (Summer 1 (May–June) 2024, Spring 2021).
- Teaching Assistant:
 - *CS4800: Algorithms and Data* offered to undergraduates (Fall 2017).
 - *CS301: High Performance Computing* course offered to junior year students (Fall 2016).

Research interests

- **Theoretical Computer Science**
Theoretical aspects of Machine Learning and deep learning in particular;
Graph algorithms and hardness: specifically sublinear and FPT algorithms.
- **Other**
Computational Science: High Performance Computing; Complex Networks

Papers and posters

- **Toward remote and secure authentication: Disambiguation of magnetic microwire signatures using neural networks**
Akshar Varma, Xiaoyu Zhang, Brian Lejeune, Laura Cebada Almagro, Rafael P del Real, Pilar Marin, Ogheneyunume Fitchorova, Laura H Lewis, Ravi Sundaram.
MRS Communications, <https://doi.org/10.1557/s43579-022-00302-5>
Preliminary work was presented as a poster at MRS 2022 Spring Meeting.
- **Realization Problems on Reachability Sequences**
Matthew Dippel, Ravi Sundaram, Akshar Varma.

Theoretical Computer Science 866: 1-13 (2021). Preliminary version appeared in *COCOON* (2020), <https://aksharvarma.org/TCS-Realization-problems-on-reachability-sequences.pdf>

- **Let's HPC: A web-based platform to aid parallel, distributed and high performance computing education**

Bhaskar Chaudhury, Akshar Varma, Yashwant Keswani, Yashodhan Bhatnagar, Samarth Parikh.

Journal of Parallel and Distributed Computing (2018), <https://doi.org/10.1016/j.jpdc.2018.03.001>.

- **Parallelizing Union-Find for shared-memory architectures**

Joint work with Yashwant Keswani, under the guidance of Prof. Bhaskar Chaudhury.

Poster presented @ *IEEE International Conference on High Performance Computing, Data, & Analytics, 2016*

Workshops

- Short talk at the Theoretical Basis of Machine Learning discussion meeting at ICTS Bangalore, December 2018.
- *Attended:* Statistical Physics and Machine Learning at ICTS, Bangalore, January 2020; Theory of Deep Learning: Where next? at IAS, Princeton, October 2019; Non-convex optimization and deep learning at MIT, Boston, 2019; The NMI workshop on Complexity Theory at IIT Gandhinagar, November 2016; Forum for Information Retrieval Evaluation at DA-IICT, Gandhinagar, December 2015.

Selected course projects

- **Estimating the Last Vertex of Random Walks on Graphs in the Streaming Model**
Mentor: Prof. Huy L. Nguyen. Spring 2019
Looked at the problem of outputting the last vertex in a t -step random walk on graphs in the one-pass streaming model. Showed a lower bound of $\Omega(n \log n)$ for this problem in the case of both directed and undirected graphs where n is the number of vertices in the graph.
- **Who let the tweets out: Author identification of very short texts**
Mentor: Prof. Rose Yu. Team Size - 2. Fall 2018
Studied the problem of author attribution for very short texts, focusing on the feature extraction aspect. Implemented latent space embeddings methods and evaluated their performance against bag of words based approaches on Twitter data. Github: <https://github.com/aksharvarma/who-let-the-tweets-out>.
- **GPUs for HPC: Future directions and challenges**
Mentor: Prof. Gene Cooperman. Fall 2017
Surveyed the use of GPUs for HPC applications, focusing on the challenges in using GPUs for HPC in the cloud, in embedded systems and incorporating them using heterogeneous computing techniques.

Graduate Coursework

Theoretical Topics in Machine Learning, Advanced Algorithms, Topics in Streaming Algorithms, Theory of Computation, Cryptography, Probabilistic Methods, Machine Learning, HPC and GPU programming, Compilers.

Programming skills

- Python (PyTorch; Scientific computing: Numpy, Scipy, Matplotlib, Pandas, etc.)
- Basic experience: Haskell, Elisp, Standard ML.
- C (Linux/GCC development environment; OpenMP, MPI parallelization libraries; CUDA)

Positions of responsibility

- Founding member and head of the student Research Club at DA-IICT (January 2017 – April 2017).
- Chief Editor of the College e-magazine in DA-IICT (January 2017 – April 2017) and Member of Editorial Board (April 2015 – April 2017).