

Raunak Kumar

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Education

Cornell University

Ithaca, USA

PHD IN COMPUTER SCIENCE

2018 - 2024

- Advisors: Robert D. Kleinberg and Sarah Dean.
- Dissertation: Learning from Interactions via Online Decision-making and Network Science.

University of British Columbia

Vancouver, Canada

B.SC. (WITH DISTINCTION) IN COMPUTER SCIENCE

2013 - 2018

- Advisor: Mark Schmidt.
- A+ graduating average.

Awards

- 2021 **AISTATS Best Paper Award**
- 2020 **NSERC Alexander Graham Bell Canada Graduate Scholarships-Doctoral (CGS D)** CA \$105,000 (declined)
- 2020 **NSERC Postgraduate Scholarships-Doctoral (PGS D)** CA \$63,000
- 2019 **Cornell Computer Science Teaching Assistant Award**
- 2018 **Cornell University Fellowship** US \$30,400
- 2018 **NSERC Canada Graduate Scholarships-Master's** CA \$17,500 (declined)
- 2018 **Rick Sample Memorial Research Scholarship**
- 2018 **CRA Outstanding Undergraduate Researcher Award** Honorable Mention
- 2017 **UBC Computer Science Teaching Assistant Award**
- 2017 **NSERC Undergraduate Student Research Award** CA \$4,000
- 2013-2017 **UBC Science Scholar / Dean's Honors List**
- 2014 **J. Fred Muir Memorial Scholarship in Science** CA \$200
- 2014 **Trek Excellence Scholarship** CA \$1,500
- 2013 **UBC Chancellor's Scholar Award**

Experience

Microsoft

Redmond, USA

APPLIED SCIENTIST

September 2023 - Present

Working in the Microsoft Search, Assistant and Intelligence (MSAI) team on Microsoft 365 Copilot.

Department of Computer Science, Cornell

Ithaca, USA

GRADUATE RESEARCH ASSISTANT

September 2020 - May 2024

Worked with Profs. Robert D. Kleinberg and Sarah Dean on problems in online decision-making, with a focus on extending classic models to incorporate a notion of memory.

Microsoft

Redmond, WA

DATA AND APPLIED SCIENTIST INTERN

May 2023 - August 2023

Worked in the Microsoft Search, Assistant and Intelligence (MSAI) team on grounding large language models with Office 365 data to power new applications such as Microsoft Business Chat. Formulated the problem as converting natural language queries to Cypher, a SQL-like language for graph databases. Used a large language model to perform the conversion, gained numerous insights into the process, and developed multiple approaches to improve it, including iterative construction and refinement of the prompt.

Microsoft

Bellevue, WA

DATA SCIENTIST INTERN

May 2022 - August 2022

Worked in the Microsoft Search, Assistant and Intelligence (MSAI) team that powers Microsoft Office 365 on scaling Graphormer, a graph neural network inspired by the Transformer, for link prediction on large graphs. Developed simple yet effective approaches that lead to significant gains over baselines and gained insight into a general technique that leads to these gains. Also collaborated on other projects related to learning stable node embeddings, and fusing content and interaction signals.

Microsoft

Virtual

DATA SCIENTIST INTERN

May 2021 - August 2021

Worked in the Microsoft Search, Assistant and Intelligence (MSAI) team that powers Microsoft Office 365 on improving related entity prediction using machine learning on graph structured data. Performed data analysis that highlighted challenges and opportunities of our work, developed a reusable experimental pipeline, and contributed to the development and adoption of an internal framework for graph neural networks.

Microsoft

Virtual

DATA SCIENTIST INTERN

May 2020 - August 2020

Worked in the Microsoft Search, Assistant and Intelligence (MSAI) team that powers Microsoft Office 365 on improving topic suggestions for users. Developed multiple unsupervised and supervised learning algorithms that obtained significant improvements in precision and recall. Also developed evaluation metrics and visualizations that provide a more detailed look into the performance of an algorithm on this task.

Department of Computer Science, Cornell

Ithaca, USA

GRADUATE RESEARCH ASSISTANT

February 2019 - December 2019

Worked with Prof. Austin R. Benson on developing neural network models for temporal graphs and hypergraphs. Also developed fast deterministic and randomized sampling algorithms for weighted subgraph retrieval in large graphs.

Department of Computer Science, UBC

Vancouver, Canada

UNDERGRADUATE RESEARCH ASSISTANT

May 2017 - May 2018

Worked with Prof. Mark Schmidt on optimization for machine learning. Proved the first non-asymptotic convergence rate of expectation-maximization (EM) and developed improved variants of the EM algorithm. Also collaborated on projects in computer vision and consulted for a local company on detecting dangerous gases based on sensor measurements as part of a smart air purification system.

Google

Mountain View, USA

SOFTWARE ENGINEERING INTERN

May 2016 - August 2016

Worked on a distributed datastore trigger utility in C++. This utility provides an extensible way to maintain triggers, which are used to schedule and perform asynchronous actions. It was used by an internal team to remove 1 billion triggers from storage.

Publications

- [1] Giannis Fikioris, Robert Kleinberg, Yoav Kolumbus, **Raunak Kumar**, Yishay Mansour, and Éva Tardos. “Learning in Budgeted Auctions with Spacing Objectives”. In: *arXiv*, 2411.04843 (2024).
- [2] **Raunak Kumar**, Sarah Dean, and Robert Kleinberg. “Online Convex Optimization with Unbounded Memory”. In: *Proceedings of the 37th Conference on Neural Information Processing Systems (NeurIPS)*. 2023.
- [3] **Raunak Kumar** and Robert Kleinberg. “Non-monotonic Resource Utilization in the Bandits with Knapsacks Problem”. In: *Proceedings of the 36th Conference on Neural Information Processing Systems (NeurIPS)*. 2022.
- [4] Frederik Kunstner, **Raunak Kumar**, and Mark Schmidt. “Homeomorphic-Invariance of EM: Non-Asymptotic Convergence in KL Divergence for Exponential Families via Mirror Descent”. In: *Proceedings of the 24th International Conference on Artificial Intelligence and Statistics (AISTATS)*. (**Best Paper Award**). 2021.
- [5] **Raunak Kumar***, Paul Liu*, Moses Charikar, and Austin R. Benson. “Retrieving Top Weighted Triangles in Graphs”. In: *Proceedings of the 13th ACM International Conference on Web Search and Data Mining (WSDM)*. 2020.
- [6] **Raunak Kumar** and Mark Schmidt. “Convergence Rate of Expectation-Maximization”. In: *The 10th Neural Information Processing Systems (NeurIPS) Workshop on Optimization for Machine Learning (OPT)* (2017).

Teaching

Department of Computer Science

Cornell University

TEACHING ASSISTANT

January 2019 - May 2024

Worked as a TA for Machine Learning in Feedback Systems, Mathematical Foundations for The Information Age, and Introduction to Analysis of Algorithms. My responsibilities included handling course administration, leading and coordinating the team of TAs, holding office hours and grading. I was awarded a Cornell Computer Science Teaching Assistant Award in recognition of my accomplishments and contributions in this role.

Computer Science 490: Problem Solving Seminar

University of British Columbia

INSTRUCTOR

Jan 2017 - April 2017

As an undergrad, co-taught a full 3 credit student seminar focusing on practical applications of advanced algorithms and data structures. My responsibilities included lecturing, writing lecture notes and creating assignments. Website:

<https://www.students.cs.ubc.ca/~cs-490/2016W2/>

Worked as a TA for many courses, including Machine Learning (graduate and undergraduate), Advanced Algorithm Design and Analysis, Intermediate Algorithm Design and Analysis, Advanced Operating Systems, Introduction to Computer Systems, and Models of Computation. My responsibilities included lecturing, grading, and holding office hours and tutorials. I was awarded a UBC Computer Science Teaching Assistant Award in recognition of my accomplishments and contributions in this role.

Service

- 2024 **Reviewer** International Conference on Learning Representations (ICLR)
- 2024 **Reviewer** Learning for Dynamics and Control Conference (L4DC)
- 2023 **Reviewer** Neural Information Processing Systems (NeurIPS)
- 2023 **Reviewer** Learning for Dynamics and Control Conference (L4DC)
- 2023 **Program Committee** AAAI Conference on Artificial Intelligence (AAAI)
- 2021 **Reviewer** Innovations in Theoretical Computer Science (ITCS)
- 2020 **Reviewer** Conference on Learning Theory (COLT)

Outreach

Cornell High School Programming Contest

Ithaca, NY

VOLUNTEER

2023

Mentored students in a programming contest designed to encourage students from underrepresented groups to explore computer science.

Cornell High School Programming Contest

Virtual

VOLUNTEER

2021

Mentored students in a programming contest designed to encourage students from underrepresented groups to explore computer science.

Girls' Adventures in Math

Ithaca, USA

VOLUNTEER

2019

Mentored students and graded exams in a contest designed to encourage upper elementary and middle school girls to explore mathematics.

Expand Your Horizons

Ithaca, USA

VOLUNTEER

2019

Taught Scratch to girls in 7th - 9th grades to get them interested in STEM fields.

Extracurricular Activity

Computer Science Graduate Organization

Cornell University

PRESIDENT

October 2020 - September 2021

Led the representative body for computer science graduate students. Worked on mechanisms to help integrate new students into the department in light of the pandemic, supporting underrepresented minority applicants applying for graduate school, and improving the TA experience for graduate students.

Computer Science Graduate Organization

Cornell University

SPECIAL REPRESENTATIVE FOR WASTE MANAGEMENT

May 2019 - September 2020

Worked to develop a culture of reuse and composting in the department, and reduce the amount of landfill waste generated, especially single-use plastic from food events. Engaged with the Cornell Sustainability Office to initiate campus wide compost dropoff spots and organize an educational sustainability themed seminar for graduate students in the department.

Honors

PROGRAMMING CONTESTS

- 2017 **Coach** ACM-ICPC PacNW Regionals (Div. 2) - placed 1st and 3rd (2017)
- 2015-2017 **Contestant** ACM-ICPC PacNW Regionals - placed 13th (2016) and 15th (2017) in Div. 1, and 6th in Div. 2 (2015)
- 2016-2017 **Contestant** Microsoft College Code Competition - placed 6th (2016) and 2nd (2017)
- 2016-2017 **Contestant** NAIPC (Open Division USA/Canada) - placed 27th (2016) and 15th (2017)
- 2017 **Contestant** SFU Winter Programming Contest - placed 8th
- 2015 **Contestant** Calgary Collegiate Programming Competition (Div. 2) - placed 3rd