RAUNAK KUMAR

Department of Computer Science

Gates Hall

Cornell University

Ithaca, NY, 14853

Email: rk749@cornell.edu

Homepage: `https://raunakkmr.github.io`

SUMMARY

I take keen interest in machine learning, algorithms and competitive programming. My goal is to contribute to the advancement in machine learning research in order to develop novel solutions to real-life problems.

EDUCATION

Ph.D. in Computer Science, Cornell University   2018 - 2023 (Expected)

B.Sc. in Computer Science, University of British Columbia   2013 - 2018
Research Supervisor: Mark Schmidt.
GPA in Computer Science and Mathematics courses: 90.4%

AWARDS

- Cornell University Fellowship (2018).
- NSERC Canada Graduate Scholarships-Master's (2018) (Declined).
- CRA Outstanding Undergraduate Researcher Award - Honorable Mention (2018).
- UBC Computer Science Teaching Assistant Award (2017).
- NSERC Undergraduate Student Research Award (2017).
- UBC Science Scholar / Dean's Honors List (2013 - 2017).
- J. Fred Muir Memorial Scholarship in Science (2014).
- UBC Chancellor's Scholar Award (2013).

WORK EXPERIENCE

Undergraduate Researcher, UBC   May 2017 - August 2018
Department of Computer Science.
Supervisor: Mark Schmidt.

- Proved the first non-asymptotic global convergence rate of expectation- maximization (EM) and developed improved variants of the EM algorithm.
- Collaborated on projects in computer vision, such as image segmentation and consulted for a company on detecting dangerous gases based on sensor measurements as part of a smart air purification system.

Software Engineering Intern, Google   May 2016 - August 2016
Mountain View, USA.

- Wrote a distributed datastore trigger utility in C++.
- The utility proves an extensible way to maintain triggers, which are used to schedule and perform asynchronous actions. It was used to remove 1 billion triggers from storage.

TEACHING

Coordinator, UBC   January 2017 - April 2017
Department of Computer Science.

- Course: CPSC 490: Problem Solving in Computer Science.
- Co-taught a student seminar focusing on practical applications of advanced algorithms and data structures.
- Responsibilities included lecturing, and writing lecture notes and assignments.
- Website: `www.ugrad.cs.ubc.ca:~/cs490/2016W2/`

Teaching Assistant, UBC   September 2014 - April 2018
Department of Computer Science.
- Courses: Machine Learning (graduate), Machine Learning (undergraduate), Advanced Algorithm Design and Analysis, Intermediate Algorithm Design and Analysis, Advanced Operating Systems, Introduction to Computer Systems, Models of Computation.
- Responsibilities included lecturing, grading, and holding office hours and tutorials.

DISTINCTIONS

- UBC ACM programming team - Contestant: 2015 - 2018.
- UBC ACM programming team - Coach (Div. 2): 2017- 2018.
- ACM-ICPC PacNW Regionals (Div. 1): 13th (2017), 15th (2016).
- ACM-ICPC PacNW Regionals (Div. 2): 6th (2015).
- ACM-ICPC PacNW Regionals (Div. 2) - Coach: 1st, 3rd (2017).
- Microsoft College Code Competition: 2nd (2017), 6th (2016).
- NAIPC (Open Division USA/Canada): 15th (2017), 27th (2016).
- SFU Winter Programming Contest: 8th (2017).

SKILLS

- Programming languages: C++, Python, C, Julia, Matlab, Go.
- Software: PyTorch, NumPy, scikit-learn, Pandas, TensorFlow.

PAPERS

Workshop Papers and Preprints

[1] **Raunak Kumar**, Mark Schmidt. "Convergence Rate of Expectation-Maximization". 10th Neural Information Processing Systems (NIPS) Workshop on Optimization for Machine Learning. 2017.

Technical Reports

[2] Devon R. Graham , **Raunak Kumar**. *Approximating Steiner Trees in the Semi-Streaming Model*. Tech. rep. CPSC 536N Course Project. University of British Columbia, 2017.

PROJECTS

Gas Classifier
- Consulted for a company to detect dangerous gases based on sensor measurements as part of a smart air purification system.
- Cleaned the data, produced low dimensional visualizations, and implemented random forest and neural network classification leading to 99% accuracy on validation data.

Distributed File System
- Implemented a distributed file system using Go.
- Design based around client-side storage and client-side caching.

BlockArt
- Implemented a blockchain based system to support collaborative art projects using Go.
- System comprises a server, ink miners and art nodes. Ink miners mine ink to be used by art nodes to draw on a canvas.

Kernel
- Implemented basic functionality of a kernel using C and x86 assembly on the Bochs emulator.
- Features included memory management, process management, system calls, interrupt handling, signals and hardware interrupts.

Web Proxy Server
- Implemented a multi-threaded server application using C and Unix sockets.
- Server can access HTTP content from websites, block blacklisted websites and cache results.