Kunal Mahajan

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EDUCATION

Columbia University — New York, NY
Ph.D. in Computer Science, **GPA: 4.19/4.0** — May 2020 (*Expected*)
- Advisors: Prof. Vishal Misra and Prof. Dan Rubenstein
- **Thesis:** Performance, Security and Pricing of Cloud Computing

Columbia University — New York, NY
M.S. in Computer Science — May 2016

University of Pennsylvania — Philadelphia, PA
B.S. in Computer Engineering (Honors), magna cum laude — May 2014
Minor: Mechanical Engineering and Applied Mechanics

INTERESTS

cloud computing, serverless computing, datacenter networking, virtualization platforms, performance modeling, peer-to-peer networks, network security, machine learning

AWARDS AND HONORS

Hewlett Packard Enterprise (HPE) Best-In-Class, 1st Place — Aug 2017

Columbia SIPA Public Policy Challenge Grant - Semifinalist — Oct 2016

Penn Engineering Excellence Service Award — May 2014

IEEE-Eta Kappa Nu Honor Society Member — Sept 2012 - May 2014

Benjamin Franklin Honor Scholar, University of Pennsylvania — Sept 2010 - May 2014

PUBLICATIONS

- Kunal Mahajan, Daniel R Figueiredo, Vishal Misra, and Dan Rubenstein. In Press. *Optimal Pricing for Serverless Computing*. In IEEE Global Communications Conference (Globecom). 2019.
- Kunal Mahajan, Saket Mahajan, Vishal Misra, and Dan Rubenstein. In Press. *Exploiting content similarity to address cold start in container deployments*. In ACM International Conference on emerging Networking EXperiments and Technologies (CoNEXT'19 Companion). 2019.
- Edin Kadric, Kunal Mahajan and Andre DeHon, *Energy Reduction through Differential Reliability and Lightweight Checking*, Proceedings of the 22nd IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM), Boston, MA, pp. 243-250, 2014.
- Edin Kadric, Kunal Mahajan and Andre DeHon, *Kung Fu Data Energy - Minimizing Communication Energy in FPGA Computations*, Proceedings of the 22nd IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM), Boston, MA, pp. 214-221, 2014.

INVITED CONFERENCES

Google Networked Systems Open House — April 12, 2018
Google Networking Research Summit — Feb 7-8, 2017

TECHNICAL SKILLS

Programming Languages - Python, Java, C++, C, MATLAB
Tools/Technologies - LaTeX, Git, IPFS, Docker, Kubernetes, Mininet, OpenVSwitch (OVS), Floodlight, SQL, Vim

PROFESSIONAL & RESEARCH EXPERIENCE

- **Hewlett Packard Enterprise (HPE)** — Palo Alto, CA
  Research Associate Intern — June 2017 - Aug 2017
- **Turbonomic** — New York, NY
  Development Intern — June 2015 - Aug 2015
  Technologies : Java, Mininet, OpenVSwitch
- **Columbia University**, Dept. of Computer Science — New York, NY
  Graduate Research Assistant — Jan 2016 - Present
  Technologies : Python, C++, C, Kubernetes, IPFS
- **University of Pennsylvania** — Philadelphia, PA
  Research Assistant
  Technologies : VHDL, MATLAB
  - Implementation of Computation Group, Prof. Andre DeHon — May 2013 - Dec 2013
  - Haptics Lab, Prof. Katherine Kuchenbecker — May 2012 - Dec 2012

Notable Projects

- **Datacenter Sender Adaptive Low-Latency Transport**
  Technologies : Python, C++, NS3 simulator, Bash
  - Developed a low (tail) latency network architecture to minimize flow completion times for short flows and maximize throughput for long flows
  - Designed architecture to work with any available flow size information, either full or none
  - Evaluated with existing transport protocols like DCTCP, TCP variants
- **Pricing analysis for Serverless Computing**
  Technologies : Python
  - Created a user model to analyze and determine the optimal allocation of VM and SC to minimize user costs for any user workload
  - Developed a cloud provider model to maximize profits assuming a rational user motivated to minimize costs
  - Identified the optimal pricing for serverless computing for the cloud provider
- **Live migration of Docker containers**
  Technologies : IPFS, Go, Python
  - Implemented live migration of Docker containers via content addressable storage peer-to-peer exchange and custom FUSE file system
  - The proposed system supports partial-delivery execution of containers as opposed to CRIU
- **SD-WAN multipath routing**
  Technologies : Python
  - Created a network controller for multipath routing in SD-WAN environment
  - The controller supports upto one-hop routes
  - The controller dynamically detects candidate routes and distributes traffic to maximize throughput using a global optimization problem formulation
- **Software-Defined Networking Flow Scheduler**
  Technologies : Java
  - Performed data analysis of datacenter packet traces
  - Developed novel routing algorithm for datacenter networks based on the analysis
  - Implemented the algorithm using Floodlight OpenFlow controller, Python
  - Evaluated flow completion times with existing routing algorithms (ECMP) on physical testbed

Teaching Experience

- **Head Teaching Assistant**, University of Pennsylvania — Fall 2013
  Electrical Circuits and Systems by Prof. Thomas Farmer
- **Teaching Assistant**
  - *Advanced Logic Design* by Prof. Steven Nowick — Spring 2015, Fall 2015
  - *Embedded Systems* by Prof. Rahul Mangharam — Spring 2013

Mentoring and Advising

Xingjian Wu, undergrad researcher	Spring 2018, Fall 2018
Ricardo Gutierrez, undergrad researcher	Fall 2017, Spring 2018
Boyu Wang, now PhD student at Princeton	Spring 2017
Aaron Zakem, now at Google	Fall 2016
Amelia Wang, now at Disney	Fall 2016

Extra-curricular

Indian Students Association at Columbia (ISAC), Columbia University
- *Vice-President* — Oct 2015 - Nov 2016
- *Digital Media Chair* — Oct 2014 - Sept 2015

Penn Latin and Ballroom Dance, University of Pennsylvania
Member — Sept 2013 - Jan 2014

Penn Alternate Spring Break, University of Pennsylvania
Habitat for Humanity Project at Port Charlotte, FL — Mar 2013

UPenn Badminton Club, University of Pennsylvania
- *Vice-President* — Apr 2012 - Mar 2013
- *Team Manager* — Apr 2011 - Mar 2012