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Christopher Canel

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EDUCATION

Carnegie Mellon University; School of Computer Science July 2016 – Present
Ph.D. in Computer Science

University of California, Berkeley; College of Engineering August 2011 – May 2015
B.S. in Electrical Engineering and Computer Science — Upper Division Technical GPA: **3.70** / 4

RESEARCH EXPERIENCE

CMU Computer Science Department May 2019 – Present
PhD Student *Pittsburgh, PA*
Advisor: Professor **Srinivasan Seshan**, Department Head

- Investigated how new reconfigurable datacenter network technologies that change configuration on microsecond timescales have broken the underlying assumptions in many congestion control algorithms.
- Designed machine learning models that enable a network traffic receiver to determine whether an incoming flow is fairly sharing its bottleneck link.
- Architected a receiver-side monitor that forces a sender to transmit fairly by pacing ACK packets *(WIP)*.

CMU Computer Science Department; FAWN Group, Parallel Data Lab July 2016 – May 2019
PhD Student *Pittsburgh, PA*
Advisors: Professor **David G. Andersen**, **Michael Kaminsky** (Intel Labs)

- Assumed a leadership role in the Intel Science and Technology Center for Visual Cloud Systems.
- Architected systems to answer machine learning–based queries about large amounts of streaming video generated by geo-distributed sources, such as cameras in a smart city.
- Researched techniques to remove redundant computation and increase accuracy when many deep neural network classifiers process the same input.
- Investigated challenges in scheduling computation pipelines across a hierarchy of machines from the edge to the cloud while limiting wide area network bandwidth use.
- Built and managed a testbed of 30+ servers and cameras, including two real-world deployments.

UC Berkeley Networked Systems Lab September 2014 – June 2016
Research Assistant *Berkeley, CA*
Advisors: Professor **Sylvia Ratnasamy**, Professor **Scott Shenker**

- Researched a new architecture for large scale distributed data analytics platforms designed to make performance more understandable and predictable.
- Developed a disk scheduler as part of a new execution engine for Apache Spark.
- Evaluated the performance and resource utilization of our new architecture versus that of Spark.
- Modeled our system architecture for theoretical performance analysis.

PUBLICATIONS

Peer-reviewed conference publications:

- Adapting TCP for reconfigurable datacenter networks. Matthew K. Mukerjee, **Christopher Canel**, Weiyang Wang, Daehyeok Kim, Srinivasan Seshan, Alex C. Snoeren. In *Proceedings of the 17th USENIX Symposium on Networked Systems Design and Implementation (**NSDI '20**)*. Santa Clara, CA. February 25–27, 2020.
- Scaling video analytics on constrained edge nodes. **Christopher Canel**, Thomas Kim, Giulio Zhou, Conglong Li, Hyeontaek Lim, David G. Andersen, Michael Kaminsky, Subramanya R. Dulloor. In *Proceedings of the 2nd SysML Conference (**SysML '19**)*. Palo Alto, CA. March 31–April 2, 2019.
- Mainstream: Dynamic stem-sharing for multi-tenant video processing. Angela Jiang, Daniel L.-K. Wong, **Christopher Canel**, Lilia Tang, Ishan Misra, Michael Kaminsky, Michael A. Kozuch, Padmanabhan Pillai, David G. Andersen, Gregory R. Ganger. In *Proceedings of 2018 USENIX Annual Technical Conference (**USENIX ATC '18**)*. Boston, MA. July 11–13, 2018.
- Monotasks: Architecting for performance clarity in data analytics frameworks. Kay Ousterhout, **Christopher Canel**, Sylvia Ratnasamy, Scott Shenker. In *Proceedings of the 26th ACM Symposium on Operating Systems Principles (**SOSP '17**)*. Shanghai, China. October 28–31, 2017.

Peer-reviewed workshop publications:

· Performance clarity as a first-class design principle. Kay Ousterhout, **Christopher Canel**, Max Wolffe, Sylvia Ratnasamy, Scott Shenker. In *Proceedings of the 16th Workshop on Hot Topics in Operating Systems (**HotOS '17**)*. Whistler, BC, Canada. May 8–10, 2017.

Accepted abstracts:

· Adapting TCP for reconfigurable datacenter networks. Matthew K. Mukerjee, **Christopher Canel**, Daehyeok Kim, Srinivasan Seshan. In *Proceedings of the ACM SIGCOMM 2019 Workshop on Optical Systems Design (**OptSys '19**)*. Beijing, China. August 19, 2019.

· Picking interesting frames in streaming video. **Christopher Canel**, Thomas Kim, Giulio Zhou, Conglong Li, Hyeontaek Lim, David G. Andersen, Michael Kaminsky, Subramanya R. Dulloor. *SysML Conference (**SysML '18**)*. Palo Alto, CA. February 15–16, 2018.

· Efficient multi-tenant inference on video using microclassifiers. Giulio Zhou, Thomas Kim, **Christopher Canel**, Conglong Li, Hyeontaek Lim, David G. Andersen, Michael Kaminsky, Subramanya R. Dulloor. *SysML Conference (**SysML '18**)*. Palo Alto, CA. February 15–16, 2018.

PRESENTATIONS

Adapting TCP for Reconfigurable Datacenter Networks

· USENIX NSDI 2020. Santa Clara, CA. February 26, 2020. video

· ACM SIGCOMM 2019 Workshop on Optical Systems Design. Beijing, China. August 19, 2019. video

Scaling Video Analytics on Constrained Edge Nodes

· SysML Conference 2019. Palo Alto, CA. April 1, 2019. video

· CMU Parallel Data Lab Retreat 2018. Bedford Springs, PA. October 29, 2018.

· CMU Parallel Data Lab Retreat 2017. Bedford Springs, PA. October 23, 2017.

PROFESSIONAL EXPERIENCE

Qualcomm, Inc. May 19, 2014 – August 15, 2014
Interim Engineering Intern, AllPlay Team *San Francisco, CA*

· Developed new features in the embedded firmware of the AllPlay wireless audio streaming system.

· Used the AllJoyn open source platform to coordinate networked speakers.

· Assumed a leadership role among my fellow interns and assisted with their projects.

Qualcomm, Inc. May 20, 2013 – August 13, 2013
Interim Engineering Intern, CoreBSP (Board Support Package) Idle Power Team *San Diego, CA*

· Developed a workflow for analyzing the power usage of a modem's low power modes, which are used to save energy by powering down certain subsystems when they are not in use.

· Analyzed current and voltage data to calculate linear equations to determine which low power mode a modem should enter given a specific set of real-world conditions.

OTHER ACTIVITIES

Machine room maintenance August 2017 - Present

· Managed four racks of servers and networking hardware in a machine room on the CMU campus.

· Performed hardware and software installation/troubleshooting in support of multiple research projects.

2nd place, CMU STARS Space Innovation Challenge November 2019

· Leader of the 2nd place team (out of 7) in the Space Innovation Challenge case interview competition.

· Developed a technical design and business plan to mine lunar ice to produce rocket fuel.

· Presented our proposal to executives from Blue Origin and Astrobotic.

Qualcomm Intern IdeaQuest July 2014

· Member of a top-10 team (out of 62) in the IdeaQuest month-long intern innovation competition.

· Developed a technical demo using AllJoyn to facilitate interactions between four Android smartphones.

TECHNICAL EXPERTISE

Programming Languages: Python, C++, C, Scala, Java, LaTeX
Concepts: Distributed systems, computer networking, operating systems, machine learning
Tools: Git(Hub), Rietveld, Emacs, Eclipse, `tmux`, scikit-learn, Adobe CC (Ai Ps Pr), Apple Final Cut Pro
Systems: ns-3, Apache Spark & HDFS, TensorFlow, PyTorch, Amazon Web Services, Canonical MAAS
Other skills: System administration, graphic design, photography, video production