

+1 (619) 647 - 0592  
[ccanel@cmu.edu](mailto:ccanel@cmu.edu)  
[ccanel.com](http://ccanel.com)  
[linkedin.com/in/christophercanel](https://www.linkedin.com/in/christophercanel)

# Christopher Canel

CMU Computer Science Dept.  
5000 Forbes Avenue  
Pittsburgh, PA 15213

## EDUCATION

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**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

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**CMU Computer Science Department** May 2019 – Present  
*PhD Student* Pittsburgh, PA

*Advisor:* Professor **Srinivasan Seshan**, Department Head

- 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*).
- Identified how new reconfigurable datacenter network (RDCN) technologies that change configuration on microsecond timescales have broken the underlying assumptions in many congestion control algorithms.
- Extended the Etalon RDCN emulator to demonstrate the efficacy of dynamically resizing top-of-rack switch virtual output queues and explicit endhost notification in improving RDCN utilization.

**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)

- Leadership role coordinating research and engineering activities 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.
- Developed systems to remove redundant computation and increase accuracy when many deep neural network classifiers process the same input.
- Designed and build architectures to fix challenges in scheduling computation pipelines across a hierarchy of machines from the edge to the cloud while limiting wide area network bandwidth use.
- Installed 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**

- Designed a new software 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.
- Demonstrated the superior performance and resource utilization of this architecture versus that of Spark.
- Modeled our system architecture for theoretical performance analysis.

## PUBLICATIONS

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### 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

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#### 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

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#### Qualcomm, Inc.

May 19, 2014 – August 15, 2014

*Interim Engineering Intern, AllPlay Team*

*San Francisco, CA*

- Leadership role on an intern team: assisted other projects, coordinated milestones, presented to executives.
- Developed new features in the embedded firmware of the AllPlay wireless audio streaming system.
- Coordinated networked audio devices to form ad hoc multichannel surround sound systems.

#### 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.
- Modeled 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.

### TEACHING EXPERIENCE

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#### CMU 15-441/641: Networking and the Internet (in progress)

Fall 2020

*Teacher's Assistant*

*Instructors:* Professor **Peter Steenkiste**, Professor **Justine Sherry**

- Designed all concept-based assignments, taught recitation classes, and held weekly office hours.
- Presented three lectures on the network transport layer and the transmission control protocol.

### OTHER ACTIVITIES

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#### CMU Research Server Management

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

- Lead developer on a top-10 team (out of 62) in the IdeaQuest month-long intern innovation competition.
- Developed a controller that aggregated and analyzed data from multiple Internet of Things devices.

**TECHNICAL EXPERTISE**

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**Skills:** Networked systems architecture and development, performance analysis, team management**Concepts:** Computer networking, distributed systems, operating systems, machine learning**Programming Languages:** Python, C++, C, Scala, Java, L<sup>A</sup>T<sub>E</sub>X**Tools:** Git(Hub), Rietveld, Emacs, Eclipse, tmux, scikit-learn, Adobe CC (Ai, Ps, Pr), Apple Final Cut**Systems:** ns-3, Apache Spark & HDFS, TensorFlow, PyTorch, Amazon Web Services, Canonical MAAS**Other skills:** System administration, graphic design, photography, video production