Thomas Lin

E-Mail: t.lin (at) mail.utoronto.ca ● **Cell:** (647) 236-5273

Education

University of Toronto

- ***Ph.D. Candidate*** *(Electrical & Computer Engineering)* *Sept. '14 - Present*
  - Supervisor: Professor A. Leon-Garcia
- ***M.A.Sc.*** *(Electrical & Computer Engineering)* *Sept. '11 – Dec. '14*
  - Supervisor: Professor A. Leon-Garcia
  - Thesis: *Implementation and Evaluation of an SDN Management System on the SAVI Testbed*
- ***B.A.Sc.*** *(Computer Engineering)* *Sept. '06 – Jun. '11*
  - Capstone: *An iPad Application in Vehicular Networks*
  - Specializations: Computer Networking and Software Engineering

Research Interests

Software-Defined Networking, Software-Defined Infrastructure, Cloud & Datacentre Control and Management, Virtualization of Unconventional Resources, Network Function Virtualization

Engineering Experience:

- ***Infrastructure Testbed Developer & SysAdmin*** *(SAVI Network)* *May '12 - Present*
  - Developing a vendor-neutral cloud infrastructure control and management applications platform based using software-defined infrastructure
  - Supporting operations and management of the Canada-wide distributed applications SAVI cloud testbed
  - Expanding the capabilities of OpenStack cloud computing framework to support SDI, virtualized GPUs, FPGAs, SDRs, and Wi-Fi
- ***Research Assistant*** *(ECE Control Group)* *May '11 – Sept. '11*
  - Supervisor: Professor L. Pavel
  - Verified a Python-based simulation suite (provided by Alcatel-Lucent), used to model and simulate the setup, and run-time physical behaviour of optical networks
  - Documented various components of the simulation suite, their use cases, etc.
  - Assess an in-lab optical network setup using optical spectral analyzers, lasers, variable optical attenuators, bandpass filters, optical couplers, and optical amplifiers
- ***Multimedia Software Engineering Intern*** *(Qualcomm Canada)* *May '09 – Aug. '10*
  - Developed and maintained the user-space layers for a video processing driver
  - Liaised with engineers from client companies to ensure single code base can be used for a variety of smartphone operating systems
  - Implemented a flexible OMX-based test application for regression testing
  - Tracked and debugged build issues to ensure error-free code releases
  - Supported out-of-country integration teams with any issues relating to the latest release of video driver code

Publications:

Conference Papers

- **T. Lin**, S. Marinova, A. Leon-Garcia, "Towards an End-to-End Network Slicing Framework in Multi-Region Infrastructures," IEEE Conference on Network Softwarization (NetSoft), Virtual, 2020
  - Acceptance rate: 20.0%
- **T. Lin**, A. Leon-Garcia, "Towards a Client-Centric QoS Auto-Scaling System," *IEEE/IFIP Network Operations and Management Symposium (NOMS)*, Virtual, 2020
  - Acceptance rate: 29.6%
- L. Gavrilovska, A. Leon-Garcia, V. Rakovic, D. Denkovski, S. Marinova, V. Atanasovski, **T. Lin**, H. Bannazadeh, "Flash Crowd Management via Virtualized Network Resources (FALCON)," *NATO Science for Peace and Security (SPS) Cluster Workshop on Advanced Technologies*, Leuven, Belgium, 2019
- S. Marinova, **T. Lin**, H. Bannazadeh, A. Leon-Garcia, "End-to-end Network Slicing for 5G in Multi-Region, Multi-Tenant Cloud Platform," *3rd International Balkan Conference on Communications and Networking (BalkanCom),* Skopje, North Macedonia, 2019
- **T. Lin**, B. Park, H. Bannazadeh and A. Leon-Garcia, "Deploying a Multi-Tier Heterogeneous Cloud: Experiences and Lessons from the SAVI Testbed," *IEEE/IFIP Network Operations and Management Symposium (NOMS)*, Taipei, Taiwan, 2018
  - Acceptance rate: 29.6%
- **T. Lin**, N. Tarafdar, B. Park, P. Chow and A. Leon-Garcia, "Enabling Network Function Virtualization over Heterogeneous Resources," *19th Asia-Pacific Network Operations and Management Symposium (APNOMS)*, Seoul, South Korea, 2017
  - Acceptance rate: 36%
- N. Tarafdar, **T. Lin**, N. Eskandari, D. Lion, A. Leon-Garcia and P. Chow, "Heterogeneous Virtualized Network Function Framework for the Data Center," *27th International Conference on Field Programmable Logic and Applications (FPL)*, Ghent, Belgium, 2017
  - Acceptance rate: 24%
- P. Spachos, **T. Lin**, W. Li, M. Chignell, A. Leon-Garcia, J. Jiang and L. Zucherman, "Subjective QoE Assessment on Video Service: Laboratory Controllable Approach," *IEEE International Symposium on a World of Wireless Mobile and Multimedia Networks (WoWMoM)*, Macau, China, 2017
  - Acceptance rate: 27%
- **T. Lin**, B. Park, H. Bannazadeh and A. Leon-Garcia, "Enabling L2 Network Programmability in Multi-Tenant Clouds," *IFIP/IEEE International Symposium on Integrated Network Management (IM)*, Lisbon, Portugal, 2017
  - Acceptance rate: 29%
- N. Tarafdar, **T. Lin**, E. Fukuda, H. Bannazadeh, A. Leon-Garcia and P. Chow, "Enabling Flexible Network FPGA Clusters in a Heterogeneous Cloud Data Center," *ACM/SIGDA International Symposium on Field-Programmable Gate Arrays (FPGA)*, Monterey, California, USA, 2017
  - Acceptance rate: 24%
- B. Park, **T. Lin**, H. Bannazadeh and A. Leon-Garcia, "JANUS: Design of a Software-Defined Infrastructure Manager and its Network Control Architecture," *IEEE NetSoft Conference and Workshops (NetSoft)*, Seoul, South Korea, 2016

    - Acceptance rate: 19%
- **T. Lin**, B. Park, H. Bannazadeh and A. Leon-Garcia, “SAVI Testbed Architecture and Federation,” *EAI International Conference on Future Access Enablers of Ubiquitous and Intelligent Infrastructures (FABULOUS)*, Ohrid, Macedonia, 2015
- **T. Lin**, H. Bannazadeh and A. Leon-Garcia, "Introducing Wireless Access Programmability using Software-Defined Infrastructure," *IFIP/IEEE International Symposium on Integrated Network Management (IM)*, Ottawa, Canada, 2015
    - Acceptance rate: 27%
- J. M. Kang, **T. Lin**, H. Bannazadeh and A. Leon-Garcia, “Software-Defined Infrastructure and the SAVI Testbed,” *EAI International Conference on Testbeds and Research Infrastructures for the Development of Networks & Communities (TRIDENTCOM)*, Guangzhou, PRC, 2014
    - Acceptance rate: 33%
    - Best Paper Award
- **T. Lin**, J. M. Kang, H. Bannazadeh and A. Leon-Garcia, "Enabling SDN Applications on Software-Defined Infrastructure," *IEEE Network Operations and Management Symposium (NOMS)*, Krakow, Poland, 2014
    - Acceptance rate: 29%
- J. M. Kang, H. Bannazadeh, H. Rahimi, **T. Lin**, M. Faraji and A. Leon-Garcia, "Software-Defined Infrastructure and the Future Central Office," *IEEE International Conference on Communications Workshops (ICC)*, Budapest, Hungary, 2013
    - Acceptance rate: 39%

Journals and Magazines

- S. Marinova, **T. Lin**, H. Bannazadeh, A. Leon-Garcia, “End-to-End Network Slicing for Future Wireless in Multi-Region Cloud Platforms,” in *Elsevier Computer Networks*, vol. 177, May 2020
- S. Marinova, V. Rakovic, D. Denkovski, **T. Lin**, V. Atanasovski, H. Bannazadeh, L. Gavrilovska, A. Leon-Garcia, “End-to-End Network Slicing for Flash Crowds,” in *IEEE Communications Magazine*, vol. 58, no. 4, pp. 31-37, Apr. 2020
- N. Tarafdar, N. Eskandari, **T. Lin** and P. Chow, “Designing for FPGAs in the Cloud,” *IEEE Design & Test*, vol. 35, no. 1, pp. 23-29, Feb. 2018

Book Chapters

- N. Tarafdar, **T. Lin**, D. Ly-Ma, D. Rozhko, A. Leon-Garcia and P. Chow, “Building the Infrastructure for Deploying FPGAs in the Cloud,” in *Hardware Accelerators in Data Centers*, C. Kachris, B. Falsafi, D. Soudris, Eds. Cham, Springer, 2018, pp. 9-33

Demos & Poster Presentations

- **T. Lin**, B. Park, H. Bannazadeh and A. Leon-Garcia, "*Demo Abstract: End-to-End Orchestration across SDI Smart Edges*," IEEE/ACM Symposium on Edge Computing (SEC), Washington, DC, USA, 2016
- B. Park, **T. Lin**, H. Bannazadeh and A. Leon-Garcia, “*OpenFlow Conflict Detection and Authorization in Multi-Tenant Clouds*,” 2016 SAVI AGM & Workshop
- B. Park, **T. Lin**, H. Bannazadeh and A. Leon-Garcia, “*SDI Manager Architecture and its SDN Functionalities*,” 2015 SAVI AGM & Workshop

- **T. Lin**, H. Bannazadeh and A. Leon-Garcia, "*End-to-End Traffic Control in the SAVI Testbed*," 2014 SAVI AGM & Workshop

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Invited Talks:

- "*The SAVI Testbed for Software-Defined Infrastructure*," IEEE Canadian Conference on Electrical and Computer Engineering (CCECE), Toronto, Canada, 2014

Teaching Experience:

Course Development

- *ECE361: Computer Networks I* — *Fall '16; Summer '19 – Winter '20*
  - Created new set of OpenFlow-based labs, creating solutions, and thoroughly testing new lab environments prior to release to students
  - Complete course re-design (lectures, tutorials, and labs) focusing on solving fundamental problems in networking
  - Set of technical demos to show in tutorials and lectures to bring theory to reality
- *ECE1508: Network Softwarization: Technologies and Enablers* — *Winter '18, '19*
  - Created content pertaining to SAVI, overlays, NFV, SDN, and orchestration
  - Designed set of hands-on labs on SAVI related to the previous topics
- *APS105: Computer Fundamentals* — *Winter '16, '17*
  - Designed, implemented, and trial-ran a new computer-based examination system
  - Designed and implemented a computer-based student survey system for in-lab hours

Teaching

- *IEEE ComSoc Summer School* — *Summer '17*
  - Created and presented day-long series of lectures pertaining to SAVI, NFV, SDN, orchestration, monitoring, and container technology
  - Created set of hands-on tutorials on SAVI related to the above topics and guided students through exercises to bring theoretical concepts to reality
  - Presented set of demos to showcase SAVI SDI and use of heterogeneous resources

Teaching Assistant

- *ECE244: Programming Fundamentals* — *Fall '15 - '20*
  - Supported students in creating and debugging C++-based object-oriented programs
  - Marked laboratory assignments, midterms, and finals
- *ECE1508: Network Softwarization: Technologies and Enablers* — *Winter '18, '20*
  - Created and presented lectures pertaining to SAVI, overlays, NFV, SDN, and orchestration methods
  - Presented set of demos to showcase SAVI SDI and use of heterogeneous resources
  - Provided technical advice and assistance to student projects
  - Evaluated student's project presentations and reports
- *APS105: Computer Fundamentals* — *Fall '14, '15; Winter '16 - '20*
  - Guided students in resolving and debugging issues regarding during lab hours
  - Led tutorial sessions for groups of up to 30 students, as well as 1-on-1 sessions
  - Created new lab assignments and created questions for midterm and finals

- Marked assignments, quizzes, midterms, and finals
- *ECE297: Communication and Design* *Winter '14 - '20*
  - Supervised 4 to 5 groups of students in semester-long software project
  - Advised students on best approaches for tackling certain problems and suggested improvements on various aspects of their software
  - Marked milestones, code reviews, technical presentations, and final pitches
- *ECE361: Computer Networks I* *Winter '15; Fall '12, '16, '18, '19*
  - Led tutorial sessions and organized weekly TA meetings
  - Assisted students in resolving issues regarding labs and conducting in-lab grading
- *ECE1548: Advanced Network Architectures* *Fall '12, '13, '15 - '17*
  - Designed and implemented new cloud computing labs for the SAVI testbed, with topics on: OpenFlow, Orchestration, Monitoring, Testbed Federation
  - Consulted and aided students in overcoming various issues in their final projects
  - Extended and maintained capabilities of the SAVI network testbed upon which the student's final projects were deployed and tested on
  - Marked laboratory assignments and provided feedback on final projects
- *ECE461: Internetworking* *Fall '13, '14*
  - Assisted students in resolving issues regarding the labs during practical hours
  - Marked laboratory assignments
- *APS106: Fundamentals of Computer Programming* *Winter '12*
  - Conducted tutorials to a group of roughly 30 students
  - Assisted students in resolving issues regarding labs and conducting in-lab grading
- *ECE466: Computer Networks II* *Winter '12*
  - Thoroughly tested a new lab prior to release to students
  - Assisted students in resolving issues regarding the labs during practical hours

Tutoring

- *APS106: Fundamentals of Computer Programming* *Winter '12*
  - Volunteer basis
  - Assessed and identified knowledge gap of the students
  - Prepared customized exercises and lesson plans in 1-on-1 and small group sessions
- *APS105: Computer Fundamentals* *Fall '11*
  - Set up material review sessions with student along with sample code snippets
  - Assisted student in resolving issues regarding labs

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Technical Skills

Programming and Scripting

- C, C++, Python, Node.js, Go, Java, Matlab, CUDA-C, Obj-C, Assembly, Bash

Web Development

- HTML5 and JavaScript

Other CLI Systems and Languages

- Cisco IOS, Dell NOS, MySQL

Operating Systems

- Debian and CentOS-based Linux systems, Windows

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Volunteering Experience:

- ***Elected Residence House Representative*** *(New College)* *'08 – '09, '10 – '11*
  - Represent the house in meetings with the campus residence council
  - Liaise with other House Reps in organizing joint events, expressing the interests of the house and planned an approximate schedule for the upcoming weeks
  - Created and organized an informative welcoming event for new residents
- ***Operations Coordinator – Christmas In July Food Drive*** *Summer '08*
  - Corresponded with various groups and companies throughout the Greater Vancouver region to inform them of the food drive
  - Spread awareness of the event, advertising its purpose and goals to the public
  - Collected donations from homes and groups for delivery to the local food bank
- ***Elected Residence House Treasurer*** *(New College)* *'07 – '08*
  - Managed the bank account for one of the houses on campus residence
  - Collected funds, distributed reimbursements and subsidies
  - Reported up to date records of expenditures and income on a ledger form