Shih-Hao Tseng

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Education

Cornell University (CU), Ithaca, NY, U.S.A. Aug. 2013 - Dec. 2018
PhD in Electrical and Computer Engineering (Advisor: Dr. A. Tang)
- Dissertation: Orchestrating Inter-Datacenter Bulk Transfers with CodedBulk

National Taiwan University (NTU), Taipei, Taiwan Sept. 2008 - June 2012
Bachelor of Science in Engineering (minor in Economics)
- GPA: 92.20/100.00; ranking 2nd in a class of 226

Research Interests

- Networked systems, in-network processing, edge computing, Internet of Things, scheduling algorithms.
- Control theory, deployment architecture, controller synthesis, stability and optimization.
- Network simulation and emulation, controller performance evaluation.

Experience

California Institute of Technology, Pasadena, CA, U.S.A. Oct. 2018 - Oct. 2021
Postdoctoral Scholar Research Associate
- Led the project of freshness-driven network control.
- Mentored graduate students on parallel model predictive control and formal test-case generation.
- Derived realization-stability lemma that unifies existing controller synthesis methods.
- Investigated the controller deployment architecture for cyber-physical systems.
- Developed efficient computation technique via dynamic programming and flexible Python framework for system level synthesis.

Cornell University, Ithaca, NY, U.S.A. Aug. 2014 - Aug. 2018
Graduate Research Assistant/Teaching Assistant
- Built CodedBulk to boost the throughput of inter-datacenter bulk transfers using network coding.
- Studied time-aware network management under software-defined networking.
- Helped teach Introduction to Probability and Inference for Random Signals and Systems.

The Chinese University of Hong Kong, Shatin, NT, Hong Kong June 2017 - Aug. 2017
Research Assistant
- Developed efficient scheduling algorithms for hybrid packet/circuit networks.

AT&T, Middletown, NJ, U.S.A. June 2016 - Aug. 2016
Student Intern - Technical II
- Developed routing algorithms to stabilize carrier-grade hybrid software-defined networks.

Skills

Programming Languages: Proficient in C, C++, Python and Verilog; working knowledge of Basic, HTML, Java, JavaScript, MySQL, and PHP.
Programming Skills: Working knowledge of Linux based C++ socket, kernel scheduler, GPU parallelization, and multithreaded programming.
Simulation Tools: Proficient in control system (MATLAB) and network simulations (NS-3).
Languages: Fluent in English; native in Mandarin Chinese and Taiwanese Hokkien; basic understanding of Cantonese, French, German, Spanish, and Japanese.

Honors and Awards

Winner of the AT&T SDN Network Design Challenge 2016
- Awarded to the top team providing the most efficient and cost effective routing solution to carrier-grade networks.

Jacobs Fellowship (CU) 2014

Studying Abroad Scholarship (Ministry of Education, Taiwan(R.O.C.)) 2013

Honorary Member of the Phi Tau Phi Scholastic Honor Society 2012
- Presented to seniors from each college in Taiwan ranking within top 1% of their department.

President's Awards (NTU) 2009, 2010, 2011, 2012
- Four-time recipient; awarded to students ranking within top 5% of their department.

Outstanding Project Award 2011
- Awarded to the top 10 teams of Cross-Strait Finals of 2011 Innovate Asia Competition (FPGA design).

Patent

[p1] U.S. Patent 10,411,990 B2: "Routing Stability in Hybrid Software-Defined Networking Networks," September 10, 2019.

Book

[b1] A. Tang and **S.-H. Tseng**, *Traffic Management in Computer Networks: A Systems Approach*, in preparation.

Journal Articles

[j1] **S.-H. Tseng** and J. Anderson, "Synthesis to Deployment: Cyber-Physical Control Architectures," in submission, [Online] arXiv:2012.05211.

[j2] **S.-H. Tseng**, S. Han, and A. Wierman, "In-Network Freshness Control: Trading Throughput for Freshness," in submission, [Online] arXiv:2106.02156.

[j3] **S.-H. Tseng**, A. Tang, G. Choudury, and S. Tse, "Routing Stability in Hybrid Software-Defined Networks," in *IEEE/ACM Trans. Netw.*, 2019.

Conference Papers

[c1] L. E. Conger and **S.-H. Tseng**, "Output-Feedback System Level Synthesis via Dynamic Programming," in submission, [Online] arXiv:2111.00098.

[c2] C. Amo Alonso and **S.-H. Tseng**, "Effective GPU Parallelization of Distributed and Localized Model Predictive Control," in submission, [Online] arXiv:2103.14990.

[c3] **S.-H. Tseng** and J. S. Li, "SLSpy: Python-Based System-Level Controller Synthesis Framework," in submission, [Online] arXiv:2004.12565.

[c4] **S.-H. Tseng**, "Realization-Stability Lemma for Controller Synthesis," in *arXiv:2112.02005*, 2021.

[c5] **S.-H. Tseng**, "A General Approach to Robust Controller Analysis and Synthesis," in *Proc. IEEE CDC*, 2021.

[c6] **S.-H. Tseng**, "Realization, Internal Stability, and Controller Synthesis," in *Proc. IEEE ACC*, 2021.

[c7] **S.-H. Tseng**, S. Agarwal, R. Agarwal, H. Ballani, and A. Tang, "CodedBulk: Inter-Datacenter Bulk Transfers using Network Coding," in *Proc. USENIX NSDI*, 2021.

[c8] **S.-H. Tseng**, C. Amo Alonso, and S. Han, "System Level Synthesis via Dynamic Programming," in *Proc. IEEE CDC*, 2020.

[c9] J. S. L. Li and **S.-H. Tseng**, "SLS-MATLAB Toolbox: Do-It-Yourself System Level Synthesis [Poster]," in *Proc. IEEE ACC*, 2020.

[c10] **S.-H. Tseng** and J. Anderson, "Deployment Architectures for Cyber-Physical Control Systems," in *Proc. IEEE ACC*, 2020.

[c11] **S.-H. Tseng**, "A Generic Solver for Unconstrained Control Problems with Integral Functional Objectives," in *Proc. IEEE ACC*, 2020.

[c12] **S.-H. Tseng**, "Perseverance-Aware Traffic Engineering in Rate-Adaptive Networks with Reconfiguration Delay," in *Proc. IEEE ICNP*, 2019.

[c13] J. Cheng, **S.-H. Tseng**, and A. Tang, "Worst-Case Latency Performance of Load Balancing Through Distributed Waterfilling Algorithm," in *Proc. CISS*, 2019.

[c14] N. Wu, **S.-H. Tseng**, and A. Tang, "Accurate Rate-Aware Flow-Level Traffic Splitting," in *Proc. Allerton*, 2018.

[c15] **S.-H. Tseng** and A. Tang, "Coflow Deadline Scheduling via Network-Aware Optimization," in *Proc. Allerton*, 2018.

[c16] **S.-H. Tseng**, B. Bai, and J. C. S. Lui, "Hybrid Circuit/Packet Network Scheduling with Multiple Composite Paths," in *Proc. IEEE INFOCOM*, 2018.

[c17] **S.-H. Tseng** and A. Tang, "A Local Search Algorithm for the Witsenhausen's Counterexample," in *Proc. IEEE CDC*, 2017.

[c18] **S.-H. Tseng**, E. Bitar, and A. Tang, "Random Convex Approximations of Ambiguous Chance Constrained Programs," in *Proc. IEEE CDC*, 2016.

[c19] A. Gushchin, **S.-H. Tseng**, and A. Tang, "Optimization-Based Network Flow Deadline Scheduling," in *Proc. IEEE ICNP*, 2016.

[c20] **S.-H. Tseng**, C. L. Lim, N. Wu, and A. Tang, "Time-Aware Congestion-Free Routing Reconfiguration," in *Proc. IFIP Networking*, 2016.

[c21] **S.-H. Tseng**, "Part-Time Emulation of Network Applications via Simulated Links," in preparation.

[c22] **S.-H. Tseng**, "Network-Calculus-Based Upper Bounds on Age of Information," in preparation.