Philip A. Taffet

School Address

Department of Computer Science
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EDUCATION

Doctor of Philosophy, Computer Science   July 2021
Rice University, Houston, TX 77005
Thesis: Techniques for Measurement, Analysis, and Optimization of HPC Communication Performance
GPA 4.00

Master of Science, Computer Science   May 2018
Rice University, Houston, TX 77005
Thesis: Understanding Congestion in High Performance Interconnection Networks Using Sampling
GPA 4.33

Bachelor of Science, Mathematics   May 2017
Bachelor of Science, Computer Science
Rice University, Houston, TX 77005
Summa Cum Laude
Distinction in Research and Creative Works
GPA: 4.08

RESEARCH EXPERIENCE

Rice University   August 2017 - August 2021
Department of Computer Science, Houston, TX
Mentor: John Mellor-Crummey

- Explored methods for understanding network congestion and its impact on HPC applications
- Applied compressed sensing and other signal processing techniques to derive traffic sources and destinations
- Improved state-of-the-art for traffic-aware static routing using integer linear programming
- Developed and analyzed new approach for diagnosing network congestion
- Optimized approach to be practical in a next-generation interconnection network
- Used and modified network simulators as a platform for prototyping

Lawrence Livermore National Lab   Summer 2018, Summer 2017
Livermore Computing, Livermore, CA
Mentor: Ian Karlin

- Designed, executed, and analyzed experiments to explore the impact of network locality and congestion on performance of parallel applications

- Selected and tuned representative applications and problems
- Ran 1000+ node experiments during dedicated access time
- Mentored undergraduate student

Oak Ridge National Lab   Summer 2014
Future Technologies Group, Oak Ridge, TN
Mentors: Sarat Sreepathi, Jeff Vetter
- Created fine-grained profiling tool to collect memory-use heat maps and attribute use to variables
- Built and integrated new analysis and characterization tools for proxy applications

Rice University   Summer 2012, Summer 2013
Department of Computer Science, Houston, TX
Mentors: Laksono Adhianto, John Mellor-Crummey
- Designed and implemented a high-performance, interactive parallel server for offloading data processing of application performance profiles
- Integrated server and other new features into `hpctraceviewer`, an existing tool

INDUSTRY EXPERIENCE

Jump Trading   August 2021 - Present
Research and Development Team, Chicago, IL
Manager: Kevin Bowers
- Various projects; details under non-disclosure agreement

Jump Trading   Summer 2019
Linux and Research and Development Teams, Chicago, IL
Mentors: Larry Pezzaglia, Anthony Bonkoski
- Applied insights from my research to improve the health and performance of a production InfiniBand fabric
- Investigated and diagnosed congestion-based outages and slowdowns
- Built and integrated tooling for proactively addressing future fabric health issues

Chevron Corporation   Summer 2016
Emerging Technologies Team, Houston, TX
Mentor: Alex Loddoch
- Evaluated HPC performance analysis tools by creating a set of mini-programs that exhibit common performance issues
- Analyzed how well tools met Chevron's business needs
- Suggested performance improvements to HPC applications

Microsoft Corporation   Summer 2015
Azure Hyper-Scale Compute Team, Redmond, WA
Mentor: Rishi Sinha
- Designed, built, and integrated a browser-based status monitoring and management portal for Azure Service Fabric clusters
- Parallelized bulk file upload tool using task-based parallelism

- Work featured in Day 2 Keynote presentation at BUILD 2016

POSTERS AND PUBLICATIONS

- (PhD Thesis) Philip Taffet. *Techniques for Measurement, Analysis, and Optimization of HPC Communication Performance*. PhD thesis, Rice University, July 2021

- (Conference paper) Philip Taffet and John Mellor-Crummey. Understanding congestion in high performance interconnection networks using sampling. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '19, pages 43:1–43:24, New York, NY, USA, November 2019d. ACM. ISBN 978-1-4503-6229-0. doi: 10.1145/3295500.3356168. URL `http://doi.acm.org/10.1145/3295500.3356168`

- (Extended abstract) Philip Taffet and John Mellor-Crummey. Lightweight, packet-centric monitoring of network traffic and congestion implemented in P4. In *26th Symposium on High-Performance Interconnects*, HOTI '19, pages 54–58, August 2019b. doi: 10.1109/HOTI.2019.00026

- (Workshop paper) Philip Taffet, Sanil Rao, Edgar A. León, and Ian Karlin. Testing the limits of tapered fat tree networks. In *2019 IEEE/ACM Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS)*, PMBS' 19, pages 47–52, November 2019. doi: 10.1109/PMBS49563.2019.00011

- (Invited Poster) Philip Taffet and John Mellor-Crummey. Understanding congestion in high performance interconnection networks using sampling. In *Salishan Conference on High Speed Computing*, Gleneden Beach, OR, April 2019c

- (Poster) Philip Taffet and John Mellor-Crummey. Understanding congestion in high performance interconnection networks using sampling. In *The Exascale Compute Project (ECP) Annual Meeting*, Houston, TX, January 2019a

- (Poster) Philip Taffet, Sanil Rao, and Ian Karlin. Exploring application performance on fat-tree networks in the presence of congestion. In *30th International Conference for High Performance Computing, Networking, Storage and Analysis (SC 18)*, Dallas, TX, November 2018b. URL `https://sc18.supercomputing.org/proceedings/tech_poster/poster_files/post250s2-file2.pdf`

- (Master's Thesis) Philip Taffet. Understanding congestion in high performance interconnection networks using sampling. Master's thesis, Rice University, April 2018

- (Poster) Philip Taffet, Ian Karlin, Edgar A Leon, and John Mellor-Crummey. Understanding the impact of fat-tree network locality on application performance. In *2018 Oil & Gas High Performance Computing Conference*, Houston, TX, March 2018a

- (Conference paper) Yamin Arefeen, Philip Taffet, Daniel Zdeblick, Jorge Quintero, Greg Harper, Behnaam Aazhang, Joseph Cavallaro, and Mehdi Razavi. Real-time, data-driven system to learn parameters for multisite pacemaker beat detection. In *2017 51st Asilomar Conference on Signals, Systems, and Computers*, pages 98–102, October 2017. doi: 10.1109/ACSSC.2017.8335145

- (Poster) **Best student poster finalist.** Philip Taffet, Ian Karlin, Edgar A Leon, and John Mellor-Crummey. Understanding the impact of fat-tree network locality on application performance. In *29th International Conference for High Performance Computing, Net-*

working, Storage and Analysis (SC 17), Denver, CO, November 2017. URL `http://sc17.supercomputing.org/SC17%20Archive/src_poster/poster_files/spost153s2-file2.pdf`

- (Conference paper) Laksono Adhianto and Philip Taffet. Addressing challenges in visualizing huge call-path traces. In *2016 45th International Conference on Parallel Processing Workshops (ICPPW)*, pages 319–328, Philadelphia, PA, August 2016. doi: 10.1109/ICPPW.2016.53

- (Conference paper) Sarat Sreepathi, M. L. Grodowitz, Robert Lim, Philip Taffet, Philip C. Roth, Jeremy Meredith, Seyong Lee, Dong Li, and Jeffrey Vetter. Application characterization using Oxbow toolkit and PADS infrastructure. In *Proceedings of the 1st International Workshop on Hardware-Software Co-Design for High Performance Computing*, Co-HPC '14, pages 55–63, Piscataway, NJ, USA, 2014. IEEE Press. ISBN 978-1-4799-7564-8. doi: 10.1109/Co-HPC.2014.11. URL `http://dx.doi.org/10.1109/Co-HPC.2014.11`

- (Poster) Philip Taffet. Scalable client-server visualization of callpath traces for large-scale parallel executions. In *25th International Conference for High Performance Computing, Networking, Storage and Analysis (SC 13)*, Denver, CO, November 2013

HONORS

- 2020-21 Best Research Presentation in Computer Science Graduate Research Seminar
- 2018-19 Ken Kennedy Institute Cray Graduate Fellowship
- Computer Science Outstanding Student Researcher Fellowship, Rice University
- Full tuition assistantship, Rice University
- Phi Beta Kappa Honor Society

OTHER INTERESTS

Distance running, teaching/coaching, travel, hiking, mathematics, entrepreneurship