John Sonchack

Curriculum Vitae

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Research

My focus is on improving the safety, intelligence, and efficiency of distributed systems. I take a multi-disciplinary and collaborative approach, applying the tools best suited to each individual problem, often drawing from programming languages and machine learning. I'm also passionate about building open source tools that accelerate innovation within the research community and lower barriers of entry to novel technology.

Education

Ph.D., Computer and Information Science *2020*
University of Pennsylvania
Thesis: Balancing Performance and Flexibility in Hybrid Telemetry Systems
Advisor: Jonathan M. Smith

M.S.E., Computer and Information Science *2011*
University of Pennsylvania
Areas of study: Network Security and Machine Learning
Advisor: Jonathan M. Smith

B.S., Mathematics *2009*
Villanova University
Areas of study: Statistics and Quantitative Finance
Mentors: Paul Pasles, Klaus Volpert

Publications

Peer-reviewed papers

1. Mary Hogan, Devon Loehr, John Sonchack, Shir Landau Feibish, Jennifer Rexford, David Walker, Mina Tahmasbi Arashloo, et al. (2024). Automated Optimization of Parameterized Data-Plane Programs with Parasol. *IEEE/ACM Transactions on Networking (ToN)*.
2. Liangcheng Yu, Xiao Zhang, Haoran Zhang, John Sonchack, Dan Ports, and Vincent Liu (2024). Beaver: Practical Partial Snapshots for Distributed Cloud Services. In: *18th USENIX Symposium on Operating Systems Design and Implementation (OSDI 24)*. Santa Clara, CA: USENIX Association, pp.233–249.
3. Vaibhav Mehta, Devon Loehr, John Sonchack, and David Walker (2023). SwitchLog: A Logic Programming Language for Network Switches. In: *Practical Aspects of Declarative Languages*. Springer Nature Switzerland, pp.180–196.
4. Liangcheng Yu, John Sonchack, and Vincent Liu (2022a). Cebinae: scalable in-network fairness augmentation. In: *Proceedings of the ACM SIGCOMM 2022 Conference*, pp.219–232.
5. Liangcheng Yu, John Sonchack, and Vincent Liu (2022b). OrbWeaver: Using IDLE Cycles in Programmable Networks for Opportunistic Coordination. In: *19th USENIX Symposium on Networked Systems Design and Implementation (NSDI 22)*, pp.1195–1212.
6. John Sonchack, Devon Loehr, Jennifer Rexford, and David Walker (2021). Lucid: A Language For Control in the Data Plane. In: *ACM Conference on Special Interest Group on Data Communication (SIGCOMM)*, pp.296–309.

7. Nik Sultana, John Sonchack, Hans Giesen, Isaac Pedisich, Zhaoyang Han, Nishanth Shyamkumar, Shivani Burad, André DeHon, and Boon Thau Loo (2021). Flightplan: Dataplane Disaggregation and Placement for P4 Programs. In: *18th USENIX Symposium on Networked Systems Design and Implementation (NSDI 21)*. USENIX Association, pp.571–592.
8. Nofel Yaseen, John Sonchack, and Vincent Liu (2020). tpprof: A Network Traffic Pattern Profiler. In: *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, pp.1015–1030.
9. Liangcheng Yu, John Sonchack, and Vincent Liu (2020). Mantis: Reactive Programmable Switches. In: *ACM Conference on Special Interest Group on Data Communication (SIGCOMM)*, pp.296–309.
10. Henri Maxime Demoulin, Nikos Vasilakis, John Sonchack, Isaac Pedisich, Vincent Liu, Boon Thau Loo, Linh Thi Xuan Phan, Jonathan M. Smith, and Irene Zhang (2019). TMC: Pay-as-you-Go Distributed Communication. In: *Asia-Pacific Workshop on Networking (APNET)*.
11. Oliver Michel, John Sonchack, Eric Keller, and Jonathan M Smith (2019). PIQ: Persistent Interactive Queries for Network Security Analytics. In: *ACM International Workshop on Security in Software Defined Networks & Network Function Virtualization (SDN-NFV Sec.)*
12. Nikos Vasilakis, Ben Karel, Yash Palkhiwala, John Sonchack, André DeHon, and Jonathan M Smith (2019). Ignis: scaling distribution-oblivious systems with light-touch distribution. In: *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*.
13. Hans Giesen, Lei Shi, John Sonchack, Anirudh Chelluri, Nishanth Prabhu, Nik Sultana, Latha Kant, Anthony J McAuley, Alexander Poylisher, André DeHon, et al. (2018). In-network computing to the rescue of faulty links. In: *ACM SIGCOMM 2018 Morning Workshop on In-Network Computing (NetCompute)*.
14. Oliver Michel, John Sonchack, Eric Keller, and Jonathan M Smith (2018). Packet-level analytics in software without compromises. In: *USENIX Workshop on Hot Topics in Cloud Computing (HotCloud)*.
15. John Sonchack, Adam J Aviv, Eric Keller, and Jonathan M Smith (2018). Turboflow: Information rich flow record generation on commodity switches. In: *European Conference on Computer Systems (EuroSys)*. [**awarded best student paper**].
16. John Sonchack, Oliver Michel, Adam J Aviv, Eric Keller, and Jonathan M Smith (2018). Scaling hardware accelerated network monitoring to concurrent and dynamic queries with* flow. In: *USENIX Annual Technical Conference (ATC)*.
17. John Sonchack and Jonathan M Smith (2018). PathMiner Powered Predictable Packet Processing. *NDSS Workshop on Binary Analysis Research (BAR)*.
18. Nofel Yaseen, John Sonchack, and Vincent Liu (2018). Synchronized network snapshots. In: *ACM Conference on Special Interest Group on Data Communication (SIGCOMM)*.
19. John Sonchack and Adam J. Aviv (2016). Exploring Large Scale Security System Reproducibility with the LESS Simulator. *Journal of Computer Security*.
20. John Sonchack, Adam J. Aviv, and Eric Keller (2016). Timing SDN Control Planes to Infer Network Configurations. In: *ACM International Workshop on Security in Software Defined Networks and Network Function Virtualization (SDN-NFV Sec.)*
21. John Sonchack, Adam J. Aviv, Eric Keller, and Jonathan M. Smith (2016). Enabling Practical Software-defined Networking Security Applications with OFX. In: *Network and Distributed System Security Symposium (NDSS)*.
22. John Sonchack, Anurag Dubey, Adam J. Aviv, Jonathan M. Smith, and Eric Keller (2016). Timing-based Reconnaissance and Defense in Software-defined Networks. In: *Annual Computer Security Applications Conference (ACSAC)*.
23. John Sonchack, Adam J. Aviv, and Jonathan M. Smith (2015). Cross-Domain Collaboration for Improved IDS Rule Set Selection. *Journal of Information Security and Applications*.

24. John Sonchack and Adam J. Aviv (2014). LESS Is More: Host-Agent Based Simulator for Large-Scale Evaluation of Security Systems. In: *Annual European Symposium on Research in Computer Security (ESORICS)*.
25. John Sonchack and Adam J. Aviv (2013). Bridging the Data Gap: Data Related Challenges in Evaluating Large Scale Collaborative Security Systems. In: *USENIX Workshop on Cyber Security Evaluation and Testing (CSET)*.
26. John Sonchack and Jonathan M. Smith (2011). Signature Correlations in Multiple Honeypot Defense System. In: *Proceedings of the Future Internet Workshop*.

Posters and technical reports

1. Oliver Michel, John Sonchack, Adam J Aviv, and Eric Keller (2018). Scalable, Hardware-Accelerated Network Analytics. In: *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*.
2. John Sonchack, Adam J. Aviv, Eric Keller, and Jonathan M. Smith (2015). OFX: Enabling OpenFlow Extensions for Switch-Level Security Applications. In: *ACM SIGSAC Conference on Computer and Communications Security (CCS)*.
3. John Sonchack (2014). *Openflow Control Platforms*. Tech. rep. University of Pennsylvania.
4. John Sonchack, Adam J. Aviv, and Jonathan M. Smith (2013). Parameterized Trace Scaling (poster). In: *USENIX Security Symposium (USENIX Security)*.
5. John Sonchack (2010). *Bot Detection Techniques*. Tech. rep. University of Pennsylvania.

Funding

- **NSF IMR: Tools for Programming Distributed Data-plane Measurements, 2022-current**
  Role: Senior Personnel
  Contribution: Co-authored proposal based on prior open-sourced work, advised and managed student research.
  Collaborating Organization: Princeton University, University of Virginia
- **DARPA OPS-5G: ProD3, 2020-2024**
  Role: Researcher (2020-2022), Principle Investigator (2022-2024)
  Contribution: Led research projects, developed open-sourced tools, managed student research, and presented updates at DARPA site visits and PI meetings.
  Collaborating Organizations: Princeton University, Peraton Labs
- **NSF SaTC: Active Security, 2014-2019**
  Role: PhD Student
  Contribution: Co-authored proposal, led multiple research projects.
  Collaborating Organizations: University of Pennsylvania, University of Colorado, Boulder

Teaching

- **Undergraduate REU Mentor**, Princeton University
  Computer Security, *2020-2024*
- **Guest Lecturer**, University of Pennsylvania
  Networked Systems (graduate level), *2016-2018*
- **Lead Teaching Assistant**, University of Pennsylvania
  Computer and Network Security (graduate level), *2011, 2012*
- **Reading Group Organizer**, University of Pennsylvania
  Programmable Networking and Security, *2014*

Mentored PhD Students

- **Liangcheng Yu**, University of Pennsylvania
  Senior Researcher at Microsoft Research Redmond
- **Devon Loehr**, Princeton University
  Software Engineer at Google

Professional Service

Program Committee Member / Reviewer

- USENIX Symposium on Networked Systems Design and Implementation (NSDI) program committee, *2025*
- IEEE/ACM Publications (Transactions on Networking, Letters of the Computer Society, Communications Letters, Software, Transactions on Dependable and Secure Computing, Transactions on Information Forensics & Security, Global Communications Conference), *2015-current*
- NSF Information and Intelligent Systems Division Panelist *2019-current*
- ACM/IEEE Symposium on Architectures for Networking and Communications Systems (ANCS), *2019*
- The International Conference on Internet Monitoring and Protection (ICIMP), *2018*, *2019*
- NSF Visioning Workshop on Programmable Security in a Software Defined World *2018*
- Security in Softwarized Networks: Prospects and Challenges (SecSoN), *2018*
- ACM International Workshop on Security in Software Defined Networks & Network Function Virtualization (SDN-NFV Security), *2017*
- Workshop on Cyber Security Experimentation and Testing (CSET), *2013-2015*
- Annual Computer Security Applications Conference (ACSAC), *2013*, *2014*

Professional Experience

Stateless, Inc.
Contractor, 2019
Project: design and implementation of hardware-accelerated network dataplanes.

Chubb Insurance
Consultant, 2012
Project: understanding and quantifying cyber security risks to large organizations.

Financial Software Systems
Intern, 2010
Project: modeling financial assets and building extensible pricing engines.