Alexander Marder, PhD

Assistant Research Scientist

Center for Applied Internet Data Analysis (CAIDA)
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RESEARCH INTERESTS:

- Evaluating and improving the security and resilience of communication networks
- Using data science to reveal and measure performance characteristics of networks
- Identifying common failure modes for distributed and replicated applications

EDUCATION:

Ph.D. University of Pennsylvania — December 2019
PhD Computer and Information Sciences
Thesis: "Sharp Snapshots of the Internet's Graph with HONE"
Advisor: Jonathan M. Smith, PhD

M.S. University of Pennsylvania — May 2014
Computer and Information Sciences

B.S. Brandeis University — May 2012
BS Computer Science
Thesis: "Course Recommender System"
Advisor: Timothy J. Hickey

GRANTS:

5G Traffic Sovereignty: Operating Through an Adversarial Internet
PI with Ricky Mok and kc claffy
NSF Convergence Accelerator 2022 Joint NSF/DOD Phase 1 for Track G, $750,000
July 2022 – June 2023

Detection and Analysis of Infrastructure Bottlenecks in a Cloud-Centric Internet
Co-PI with Ricky Mok and kc claffy
NSF CNS Core Medium, $1,200,000
October 2022 – September 2025

Measurement Capabilities for the Modern Internet
PI
NSF CRII, $175,000
May 2021 – May 2023

RESEARCH EXPERIENCE:

Assistant Research Scientist November 2020 – Present

CAIDA / UCSD, La Jolla, California

- Demonstrated the possibility of intentional and targeted physical attacks against weak points in U.S. communications infrastructure without insider information
- Revealed single points of failure in Internet access networks with the potential for widespread outages
- Awarded NSF funding to investigate where traffic goes between cloud applications and users
- Designed a machine learning approach to automatically extract information from natural language that operators use to convey information about infrastructure deployments

Postdoctoral Fellow September 2019 – October 2020

CAIDA / UCSD, La Jolla, California

Advisors: kc claffy and Alex C. Snoeren

- Designed and implemented a new technique to scaleably infer when two IP addresses belong to the same router
- Designed a technique to recognize virtual private networks
- Developed skills to conduct new large-scale Internet measurements

Research Assistant August 2014 – August 2019

University of Pennsylvania, Philadelphia, PA

Advisor: Jonathan M. Smith

- Devised and implemented two constraint satisfaction algorithms to infer network boundaries from Internet path measurements
- Released (and continue to maintain) the latter implementation; currently used for CAIDA's semi-annual Internet Topology Data Kit dataset releases
- Developed skills to process large quantities of data, along with the skills to recognize useful information and account for misleading information

PUBLICATIONS: Peer-Reviewed

Alexander Marder, Zesen Zhang, Ricky Mok, Ramakrishna Padmanabhan, Bradley Huffaker, Matthew Luckie, Alberto Dainotti, kc claffy, Alex C. Snoeren, Aaron Schulman. "Access Denied: Assessing Physical Risks to Internet Access Networks" Usenix Security. 2023

Ben Du, Gautam Akiwate, Thomas Krenc, Cecilia Testart, **Alexander Marder**, Bradley Huffaker, Alex C. Snoeren, and kc claffy. "IRR Hygiene in the RPKI Era" Passive and Active Measurement Conference. 2022.

Matthew Luckie, Bradley Huffaker, **Alexander Marder**, Zachary Bischof, and kc claffy. "Learning to Extract Geographic Information from Internet Router Hostnames" Conference on emerging Networking EXperiments and Technologies (CoNEXT). 2021

Zesen Zhang, **Alexander Marder**, Ricky Mok, Bradley Huffaker, Matthew Luckie, kc claffy, and Aaron Schulman. "Inferring Regional Access Network Topologies: Methods and Applications" Internet Measurement Conference. 2021. [long]

Alexander Marder, kc claffy, Alex C. Snoeren. "Inferring Cloud Interconnections: Validation, Geolocation, and Routing Behavior" Passive and Active Measurement Conference. 2021.

Matthew Luckie, **Alexander Marder**, Marianne Fletcher, Bradley Huffaker, kc claffy. "Learning to Extract and Use ASNs in Hostnames" Internet Measurement Conference. 2020. [short]

Alexander Marder. "Alias Pruning by Path Length Estimation (APPLE)" Passive and Active Measurement Conference. 2020.

Alexander Marder, Matthew Luckie, Bradley Huffaker, kc claffy. "vrfinder: Finding Outbound Addresses in Traceroute" SIGMETRICS. 2020.

Alexander Marder, Matthew Luckie, Amogh Dhamdhere, Bradley Huffaker, kc claffy, Jonathan M. Smith. "Pushing the Boundaries with bdrmapIT: Mapping Router Ownership at Internet Scale" Internet Measurement Conference. 2018. [long]

Alexander Marder, Jonathan M. Smith. "MAP-IT: Multipass Accurate Passive Inferences from Traceroute" Internet Measurement Conference. 2016. [long]

INVITED TALKS:

Alexander Marder. "How do Clouds Use IXPs?" Euro-IX Meeting. December 2020.

TEACHING EXPERIENCE:

Mentor Fall 2019 – Spring 2020

Course: Early Research Scholars Program
Computer Science Department, University of California, San Diego

- Mentored undergraduate students as part of a course designed to increase underrepresented minority completion of the computer science major
- Helped the students conduct a research project investigating allegedly stolen IP address space from African networks
- Taught students important research and Internet data science techniques

Teaching Assistant Fall 2017 – Spring 2018

Course: Senior Project
Computer and Information Science Department, University of Pennsylvania

- Helped groups of seniors select and scope an academic yearlong project
- Met with groups regularly throughout the year to advise and assess progress
- Graded projects at the end of the year and selected groups to represent the department at the School of Engineering and Applied Sciences competition

Teaching Assistant Spring 2014

Course: Introduction to Computer Systems
Computer and Information Sciences, University of Pennsylvania

- Graded assignments and tests
- Held weekly office hours

Teaching Assistant Fall 2013

Course: Technology and Policy
Law School and School of Engineering and Applied Sciences, University of Pennsylvania

- Graded assignments for undergraduate engineering students
- Interacted with students during weekly office hours

PROFESSIONAL SERVICE:

National Science Foundation
Proposal Review Panel 2022

Program Committee
Internet Measurement Conference 2021
Passive and Active Measurement Conference 2020