Ramakrishnan Sundara Raman

Network Security Researcher

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Professional Summary

- 5+ years of experience working in the intersection of computer security, privacy, and networking research, specializing in conceiving and developing *large-scale systems* to detect and prevent powerful online reachability attacks like Internet censorship, geoblocking, and HTTPS interception through billions of measurements worldwide.
- Achieved significant *real-world impact* through rapid study of network attacks and the creation of the world's largest open-source censorship observatory, Censored Planet, which has published 20TB+ data about Internet censorship in 200 countries, benefiting industry partners, researchers, and journalists.
- Published 12 top-tier academic papers and garnered media coverage in over 50 news articles, including prestigious outlets such as BBC, Ars Technica, and the Associated Press.
- Seasoned speaker and winner of several accolades including the prestigious IRTF Applied Networking Research Prize (ANRP), a Rackham Predoctoral PhD Fellowship, an Open Tech Fund Information Controls Fellowship, and a Deans' MLK Spirit Award.

Work Experience

- **Security Researcher** as a PhD Candidate at *University of Michigan* August 2018 – Present
  - Architected and built the Censored Planet Observatory, world's largest network measurement platform continuously monitoring network interference across *200+ countries*. Collected and analyzed more than *60 billion measurement data points* spanning over *5 years* of longitudinal measurement.
  - Expert in identifying and leading *rapid-response investigations* of evolving network events, such as the network changes in Russia following the invasion into Ukraine in 2022 and the HTTPS interception attack in Kazakhstan in 2019, the latter of which prompted momentous changes in major browsers such as Mozilla Firefox and Google Chrome.
  - Developed network measurement methods and open-source tools to study *network devices* worldwide that enable large-scale attacks such as censorship and surveillance. Tools and data actively used by many research groups such as the Citizen Lab.
  - Developed *machine learning models* to discover censorship events and optimize measurements.
  - Published 12 research papers in top-tier security and networking venues and contributed to multiple research grants (including DARPA, NSF) and third-party blogposts (including APNIC, ISOC Pulse), and presented 12 talks.
  - Mentored 8 undergraduate and 4 graduate students on various research projects, and taught a graduate-level computer and network security course with 28 students.
  - Spearheaded and executed several industry-academia collaborations notably with Google Jigsaw for large scale measurement data analysis and Mozilla Firefox for defense against HTTPS interception.
  - **Awards:**
    - *IRTF Applied Networking Research Prize*, for advancing research on censorship devices through open-source tools.
    - *Rackham Predoctoral Fellowship*, from the University of Michigan for dissertations that are unusually creative, ambitious, and impactful.
    - *HotPETs 2022 Best Talk Award*, for talk on building a public, live censorship dashboard.
    - *University of Michigan CSE Graduate Student Honors Runners Up Award*, for impactful censorship research.
    - *CSE Honorable Mention*, for excellence in teaching.
- **Research Intern** at *Cloudflare Inc.* July 2022 – September 2022
  - Developed a large network monitoring system that identifies anomalous network events such as connection tampering attacks in *large-scale network traffic* at the rate of millions of packets per second.
  - Developed *network data analysis methods and tools* for detecting large-scale traffic tampering passively from an operator's point of view.
  - Built production dashboards and reports showcasing significant network events such as the effects of the protests in Iran on Internet traffic.

- **Senior Fellow in Information Controls** at *The Citizen Lab* November 2021 – July 2022
  - Researched novel measurement methods for locating and examining network devices that performed surveillance and censorship.
  - Collaborated with the expert team at the Citizen Lab, a research group focused on network forensics.
  - Published several open-source tools and fingerprint datasets actively used by several researchers and industry collaborators such as PrivacyCo.
  - **Awards:** *OTF Information Controls Fellowship*, a prestigious award for furthering research on censorship devices.
- **Associate Consultant** at *Microsoft Global Delivery* July 2017 – May 2018
  Contributed to large enterprise resource planning tools for business applications that can deliver value to large organizations.
- **Research Intern** at *The University of Maryland* March 2017 – July 2017
  Facilitated a measurement platform and analysis tools that identifies last-mile residential Internet outages in areas affected by severe weather conditions in real-time.

Core Skills

- **Security, Privacy, and Networking:** Golang, Python, Ruby, C++, Network packet analysis (Wireshark, p0f, Nmap, ZMap), Web Development, Web Scrapers (Selenium), Android (Permissions, Privacy policies).
- **Data Science:** *Methods:* Measurement data analysis, Time series analysis, Anomaly detection, Real-time alerting tools; *Systems:* Google Bigquery, Apache Beam, Google Data Studio, Clickhouse, Grafana; *Libraries:* Pandas, NumPy, SciKit-Learn, SQL, Matplotlib, Plotly; *Certifications:* Introduction to data science using python (Coursera certification).
- **Machine Learning:** Reinforcement learning using Upper Confidence Bound (UCB) and Decision Tree clustering using DBSCAN.

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Education

- **PhD Candidate, University of Michigan** in *Computer Science and Engineering*
  CGPA: 3.95 out of 4 2018 – Present
- **Bachelor of Technology, Vellore Institute of Technology** in *Computer Science and Engineering*
  CGPA: 9.69 out of 10 2013 – 2017
  Awards: 2nd rank out of 648 in CSE

Selected Publications (2 of 12)

- **Global, Passive Detection of Connection Tampering**
  R. Sundara Raman, L.H. Merino, K. Bock, M. Fayed, D. Levin, N. Sullivan, L. Valenta
  ACM SIGCOMM, September 2023
- **Censored Planet: An Internet-wide, Longitudinal Censorship Observatory**
  R. Sundara Raman, P. Shenoy, K. Kohls, and R. Ensafi
  ACM Conference on Computer and Communications Security (CCS), November 2020

Activities

- **Outreach Chair** at *CSEG*, UM CSE's graduate student organization June 2020 – May 2022
  - Collaborated with other student organization such as FEMMES to organize educational workshops for underrepresented groups.
  - Devised and led outreach events that aimed at spreading knowledge about computer science in various schools, colleges and groups.
  - **Awards:** *North Campus Deans' MLK Spirit Award 2023*, for exemplifying the leadership and vision of Dr. King.
- **Administrator** of the Security Reading Group (SECRIT) in UM CSE June 2019 – June 2021
- **Program Committee Member** at *IEEE Symposium on Security and Privacy (S&P) 2024* and *ACM SIGCOMM 2021 Free and Open Communications on the Internet (FOCI)*
- **Session Chair** at *ACM SIGCOMM 2021 Free and Open Communications on the Internet (FOCI)*