Yunming Xiao

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RESEARCH INTERESTS

I am broadly interested in computer networks. My current research focuses on enhancing the security, privacy, and reliability of Internet infrastructure and services.

EDUCATION

Ph.D. Candidate, Computer Science — Sep 2019 - *Jun 2024 (Expected)*
Northwestern University, Evanston, IL
Thesis: *Revising System Premises For a Secure and Private Web*
Advisor: *Prof. Aleksandar Kuzmanovic*

B.Eng., Computer Science — Sep 2015 - Jun 2019
Beijing University of Posts and Telecommunications, Beijing, China
GPA: 3.7/4.0 (87/100), Graduated with Honors

RESEARCH AND WORK EXPERIENCE

Northwestern University, Evanston, IL — Sep 2019 - *Present*
Research Assistant, Advisor: *Prof. Aleksandar Kuzmanovic*

- *[Privacy] PDNS: A Fully Privacy Preserving DNS*
  - Proposed and developed PDNS, a novel DNS system that provides full privacy preservation to users by leveraging the single-server Private Information Retrieval (PIR) techniques
- *[Privacy] Snatch: Streaming Analytics at the Network Edge*
  - Proposed and developed Snatch, a system that enhances user privacy and accelerates online streaming analytics by breaking the current arrangement and leveraging semantic cookies
- *[Privacy] Monetizing Spare Bandwidth: the Case of Distributed VPNs*
  - Performed the first systematic measurement study of the decentralized VPNs ecosystem
- *[Security & Privacy] Decoding the Kodi Ecosystem*
  - Perform the first systematic measurement study of Kodi's decentralized ecosystem
  - My system SafeKodi has received multiple media coverage and is used by over 30K users
- *[Reliability] TENSOR: Lightweight BGP Non-Stop Routing*
  - Proposed TENSOR which achieves BGP non-stop routing without relying on kernel modification
  - TENSOR has been deployed in Tencent data centers, serving BGP sessions with 6,000+ ASes
- *[Reliability] Fast And Practical Network Failover By Deterministic Re-Pathing*
  - Proposed a fast and practical network failover solution based on *deterministic* flow re-pathing

Hewlett Packard Labs, Milpitas, CA — May - Aug 2022 (Full time) & Jan 2023 - *Present* (Part-time)
Research Intern, Networking and Distributed Systems Lab, Host: *Dr. Puneet Sharma*

- *Conspirator: A SmartNIC Aided Control Plane for Distributed Machine Learning Workloads*
  - Proposed a SmartNIC-aided control framework for machine learning workloads orchestration

→ *Winner of the HPE Best-in-Class Technical Competition Award*

Google, New York City, NY — Sep - Dec 2022
Software Engineering Intern, Technical Systems & Infrastructure (TI)

- Built the first prototype for migrating the network transport for Keystore service from gRPC to Pony Express

Nokia Bell Labs, Murray Hill, NJ (Remote) Jun - Aug 2021
Networking Bell Labs Summer Intern, Host: *Dr. Matteo Varvello, Dr. T.V. Lakshman*
- *[Security] FIAT: Frictionless Authentication of IoT Traffic*
  - Built FIAT, a third-party system that frictionlessly authorizes IoT traffic by learning recurring traffic and validating human actions behind less predictable traffic

Bytedance, Beijing, China Mar - Jul 2019
Infrastructure R&D Intern
- Worked on Cronjob and FaaS systems of Bytedance Cloud

Tsinghua University, Beijing, China Mar 2018 - Mar 2019
Research Assistant, Host: *Prof. Wenfei Wu*

King Abdullah University of Science and Technology, Jeddah, KSA Jul - Oct 2018
Visiting Student, Host: *Prof. Marco Canini*

Beijing University of Posts and Telecommunications, Beijing, China Jul 2017 - Feb 2018
Research Assistant, Host: *Prof. Bin Wu, Prof. Jingyu Wang*

GRANTS AND AWARDS

Co-lead the development of NSF grant CNS-2310927: "Privacy-Preserving and Censorship-Resistant Domain Name System" ($750K, PI: Aleksandar Kuzmanovic, Co-PI: Xiao Wang).

Co-lead the development of NSF grant CNS-2226107: "Enabling Streaming Analytics at the Network Edge" ($400K, PI: Aleksandar Kuzmanovic).

EuroSys Best Student Paper Award, 2024
Northwestern University PhD Terminal Year Fellowship, 2023
Travel Grant For ACM HotNets'23
HPE Best-in-Class Technical Competition Award, 2022
Distinguished Undergraduate Student in Beijing, 2019

PUBLICATIONS

(* Equal Contribution)

Conference Publications

- [C9] C Miao, Z Zhong, **Y Xiao**, F Yang, S Zhang, C Lu, J Geng, Y Wang, X Zhou, Y Jiang, Z Bai, C Yang:
  MegaTE: Extending WAN Traffic Engineering to Millions of Endpoints.
  To appear in *SIGCOMM'24*.

- [C8] **Y Xiao**, DZ Tootaghaj, A Dhakal, L Cao, P Sharma, A Kuzmanovic:
  Conspirator: SmartNIC-Aided Control Plane for Distributed ML Workloads.
  To appear in USENIX *ATC'24*.

- [C7] **Yunming Xiao**, Yibo Zhao, Sen Lin, Aleksandar Kuzmanovic:
  Snatch: Online Streaming Analytics at the Network Edge.
  In Proceedings of *EuroSys'24*. **Best Student Paper Award!**

- [C6] C Miao*, **Y Xiao***, M Canini, R Dai, S Zheng, J Wang, J Bu, A Kuzmanovic, Y Wang:
  TENSOR: Lightweight BGP Non-Stop Routing.
  In Proceedings of ACM *SIGCOMM'23*.

- [C5] **Yunming Xiao**, Matteo Varvello:
  FIAT: Frictionless Authentication of IoT Traffic.
  In Proceedings of ACM *CoNEXT'22*.

- [C4] **Yunming Xiao**, Sarit Markovich, Aleksandar Kuzmanovic:
  Blockchain Mining: Optimal Resource Allocation.
  In Proceedings of ACM Advances in Financial Technologies (*AFT'22*).

- [C3] **Yunming Xiao**, Matteo Varvello, Aleksandar Kuzmanovic:
  Monetizing Spare Bandwidth: the Case of Distributed VPNs.
  In Proceedings of the ACM on Measurement and Analysis of Computing Systems (*SIGMETRICS'22*).

- [C2] Marc Anthony Warrior, **Yunming Xiao**, Matteo Varvello, Aleksandar Kuzmanovic:
  De-Kodi: Understanding the Kodi Ecosystem.
  In Proceedings of The Web Conference 2020 *(WWW'20)*.

- [C1] **Yunming Xiao**, Haifeng Sun, Zirui Zhuang, Jingyu Wang, Qi Qi:
  Common Knowledge Based Transfer Learning for Traffic Classification.
  IEEE 43rd Conference on Local Computer Networks *(LCN'18)*.

Journal Publications

- [J5] **Yunming Xiao**, Matteo Varvello, Marc Anthony Warrior, Aleksandar Kuzmanovic:
  Decoding the Kodi Ecosystem.
  ACM Transactions on the Web *(TWEB)*. 2023.

- [J4] P Wang, Z Wei, H Qi, S Wan, **Y Xiao**, G Sun, Q Zhang:
  Mitigating Poor Data Quality Impact with Federated Unlearning for Human-Centric Metaverse.
  IEEE Journal on Selected Areas in Communications *(JSAC)*. 2023.

- [J3] Aritra Dutta, El Houcine Bergou, **Yunming Xiao**, Marco Canini, Peter Richtárik:
  Direct Nonlinear Acceleration.
  EURO Journal on Computational Optimization. 2022.

- [J2] P Wang, Y Zhao, MS Obaidat, Z Wei, H Qi, C Lin, **Y Xiao**, Q Zhang:
  Blockchain-Enhanced Federated Learning Market with Social Internet of Things.
  IEEE Journal on Selected Areas in Communications *(JSAC)*. 2022.

- [J1] **Yunming Xiao**, Bin Wu:
  Close spatial arrangement of mutants favors and disfavors fixation.
  PLoS Computational Biology, 15(9), e1007212. 2019.

Refereed Demos/Posters

- [D3] **Yunming Xiao**, Chenkai Weng, Ruijie Yu, Peizhi Liu, Matteo Varvello, Aleksandar Kuzmanovic:
  Demo: PDNS: A Fully Privacy-Preserving DNS.
  In Proceedings of *SIGCOMM'23*.

- [D2] **Yunming Xiao**, Matteo Varvello:
  FIAT: Frictionless Authentication of IoT Traffic.
  In Proceedings of ACM *CoNEXT'21*.

- [D1] **Yunming Xiao**, Matteo Varvello, Aleksandar Kuzmanovic:
  A First Look Into Distributed VPNs.
  In the 21st ACM Internet Measurement Conference *(IMC'21)*.

Un-refereed & Working Papers

- [W6] **Y Xiao**, A Kuzmanovic, Y Yang, X Li, D Gu, M Wan, C Pei, J Wang, C Miao:
  UPath: Unified Packet Tracing and Analysis for Heterogeneous Cloud Gateways.
  In Submission.

■ [W5] C Miao, G Liu, J Wang, G Shan, S Li, **Y Xiao**, Y Wang, Z Chen, J Chen, P Fang, Y Zhang, J Wang, X Zhou:
MirrorNet: High-fidelity and Scalable Network Emulation for Software-defined WAN.
In Submission.

■ [W4] C Miao*, **Y Xiao***, D Gu, J Wang, Y Yang, M Wan, C Pei, A Kuzmanovic, Z Liu:
On the Seamless Migration of Stateful Cloud Gateway.
In Submission.

■ [W3] Y Liu*, **Y Xiao***, X Li, Z He, H Liu, W Dang, A Kuzmanovic, J Wang, C Miao:
Fast And Practical Network Failover By Deterministic Re-Pathing.
In Submission.

■ [W2] **Yunming Xiao**, Yiwei Du, Matteo Varvello, Pengfei Wang, Linghe Kong:
Third-Party Frictionless Authentication For Home IoT Traffic.
In Submission.

■ [W1] **Yunming Xiao**, Chenkai Weng, Ruijie Yu, Peizhi Liu, Matteo Varvello, Aleksandar Kuzmanovic:
PDNS: Enhancing DNS Privacy with Private Information Retrieval.
In Submission.

PATENTS

[P3] Diman Zad Tootaghaj, **Yunming Xiao**, Aditya Dhakal, Puneet Sharma:
A Smart-NIC aided Workload scheduling approach for virtualized GPU.
Filed on March 2024.

[P2] **Yunming Xiao**, Diman Zad Tootaghaj, Aditya Dhakal, Puneet Sharma:
Conspirator: A SmartNIC Aided Control Plane for Distributed Machine Learning Workloads.
Filed on September 2023. US 18/460,043.

[P1] Diman Zad Tootaghaj, **Yunming Xiao**, Aditya Dhakal, Puneet Sharma:
Job Allocations To Graphics Processing Units With Tenant Isolation.
Filed on April 2023. US 18/299,855.

TEACHING AND MENTORING EXPERIENCE

Teaching

Teaching Assistant, Northwestern University

- COMP_SCI 397/497: Selected Topics in Computer Networks – Spring 2021, 2022, 2023, 2024
- COMP_SCI 340: Intro to Computer Networking – Winter 2022
- COMP_SCI 110: Intro to Computer Programming – Fall 2020

Mentoring

- Mentoring undergraduate student Suting Chen (ShanghaiTech'24) in a CDN security project
- Mentored undergraduate student Yibo Zhao (ShanghaiTech'23, now PhD student at the University of Maryland) in the Snatch project [C7]
- Mentored undergraduate student Yiwei Du (DUT'23, now master student at Rice University) in the extension of FIAT project [C5]
- Mentored undergraduate student Peizhi Liu (Northwestern'23, now PhD student at UIUC) in the PDNS project [D3, W1]
- Mentored master student Ruijie Yu (Northwestern'22, now software engineer at Alibaba) in the PDNS project [D3, W1]
- Mentored undergraduate student Grayson Donnelly (Northwestern'25) in the extension of the Snatch project [C7]. He won the McCormick Summer Undergraduate Research Award in 2022.

INVITED & CONFERENCE TALKS

EuroSys 2024, "Snatch: Online Streaming Analytics at the Network Edge", Athens, Greece (Remote), April 2024.
Rice University, "Renovating Internet Services: A New Paradigm for a Secure, Private, and Reliable Online Infrastructure", Houston, TX, November 2023.
Illinois Institute of Technology, "TENSOR: Lightweight BGP Non-Stop Routing", Chicago, IL, October 2023.
SIGCOMM 2023, "TENSOR: Lightweight BGP Non-Stop Routing", New York City, NY, September 2023.
CoNEXT 2022, "FIAT: Frictionless Authentication of IoT Traffic", Rome, Italy (Remote), December 2022.
Nokia Bell Labs, "FIAT: Frictionless Authentication of IoT Traffic", Murray Hill, NJ, November 2022.
SIGMETRICS 2022, "Monetizing Spare Bandwidth: The Case of Distributed VPNs", Mumbai, India (Remote), June 2022.

SERVICE

Program Committee Member

ACM SIGCOMM 2023 Artifact Evaluation
ACM SOSP 2023 Artifact Evaluation
ACM SIGCOMM 2022 Artifact Evaluation

Reviewer

ACM SIGCOMM Computer Communication Review (CCR)
IEEE Journal on Selected Areas in Communications (JSAC)
Journal of Systems Architecture (JSA)
IEEE Transactions on Sustainable Computing
McGill Science Undergraduate Research Journal

REFERENCES

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