

# 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&amp;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**

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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**

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(\* Equal Contribution)

**Conference Publications**

- [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

- [W7] **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.
- [W6] 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.

- [W5] 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.  
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

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- [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

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### 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

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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

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### 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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