Ronghua Xu, Ph.D.

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Biographical Sketch

About me

- Ronghua Xu is an Tenure-Track Assistant Professor of Applied Computing at Michigan Technological University. He earned a Ph.D. and an M.S. in Electrical and Computer Engineering at the Binghamton University - State University of New York (SUNY) in 2023 and 2018 respectively. He also received an M.S. in Mechanical and Electrical Engineering from Nanjing University of Aeronautics & Astronautics in 2010 and a B.S. in Mechanical Engineering from Nanjing University of Science & Technology, China in 2007. Before joining Binghamton University, he worked at Siemens on software development, system integration, and test automation from June 2010 to June 2016.

Research Interests

- Blockchain and Distributed Ledger Technology, Internet-of-Things (IoT), Machine Learning (ML), Cloud/Fog/Edge Computing Paradigm.
- Blockchain and smart contract enabled security solutions to Internet of Things (IoTs)
- Intelligence, assurance and resilience of next generation network.

Education

Jun 2018 – Aug 2023
- **Ph.D., Electrical and Computer Engineering**, Binghamton University-SUNY, Binghamton, NY, USA.
  Dissertation title: *A Secure-by-Design Federated Microchain Fabric for Internet-of-Things(IoT) System*
  Advisor: Prof. Yu Chen

Aug 2016 – May 2018
- **MS, Computer Engineering**, Binghamton University-SUNY, Binghamton, NY, USA.
  Thesis title: *Capability Based Access Control Strategies to Deter DDoS Attacks Exploiting IoT Devices*
  Advisor: Prof. Yu Chen

Sep 2007 – Mar 2010
- **MS, Mechanical and Electrical Engineering**, Nanjing University of Aeronautics & Astronautics, Nanjing, China.
  Thesis title: *Research on Form-to-function Mapping and Re-creative Design Method Based on Function Ontology*
  Advisor: Prof. Dunbing Tang

Sep 2003 – Jul 2007
- **BS, Mechanical Engineering**, Nanjing University of Science & Technology, Nanjing, China.

Employment History

August 2023 – Now
- **Tenure-Track Assistant Professor.** Michigan Technological University, MI, USA.

August 2018 – August 2023
- **Graduate Researcher.** Binghamton University-SUNY, NY, USA.

May 2021 – August 2021
- **Technical Intern.** PSE System & Hardware Division, ZF North America, Inc., MI, USA.

Employment History (continued)

June 2010 – June 2016 ◇ **Software Engineer.** Department of Software Development, Research & Development Division, Siemens Numerical Control Ltd., Nanjing, China.

Teaching Experience

Instructor ◇ **Blockchain Fundamentals and Applications (SAT5980),** Spring 2024
◇ **Digital Forensics (SAT4816-5816),** Fall 2023.
Teaching Assistant ◇ **Digital Logic Design (EECE-251),** Fall 2018, 2019.
◇ **Sophomore Design (EECE-287),** Spring 2019, 2020.
Guest Lecturer ◇ **Senior Design I (EECE 487),** Fall 2022.
◇ **Computer Network Architecture (EECE-453/553),** Fall 2018 - 2022.
◇ **Network Security (EECE-658),** Spring 2018 - 2019.

Skills

Languages ◇ Strong reading, writing and speaking competencies for English, Mandarin Chinese.
Coding ◇ C/C++, Java, Python, C#, VB, tclsh, bash, powershell, SQL, XML/XSL, LaTeX, …
Databases ◇ MySQL, PostgreSQL, SQLite.
Web Dev ◇ HTML, CSS, JavaScript, Flask Web Server.
Misc. ◇ Academic research, teaching, training, consultation.

Research Publications

Journal Articles

1 Liu, X., **Xu**, **R.**, & Chen, Y. (2024). A decentralized digital watermarking framework for secure and auditable video data in smart vehicular networks. *Future Internet*, *16*(11), 390. doi:10.3390/fi16110390

2 Qu, Q., Hatami, M., **Xu**, **R.**, Nagothu, D., Chen, Y., Li, X., … Chen, G. (2024). The microverse: A task-oriented edge-scale metaverse. *Future Internet*, *16*(2), 60. doi:10.3390/fi16020060

3 **Xu**, **R.**, Nagothu, D., Chen, Y., Aved, A., Ardiles-Cruz, E., & Blasch, E. (2024). A secure interconnected autonomous system architecture for multi-domain iot ecosystems. *IEEE Communications Magazine*, *62*(7), 52–57. doi:10.1109/MCOM.001.2300354

4 Nagothu, D., **Xu**, **R.**, Chen, Y., Blasch, E., & Aved, A. (2022). Deterring deepfake attacks with an electrical network frequency fingerprints approach. *Future Internet*, *14*(5), 125. doi:10.3390/fi14050125

5 **Xu**, **R.**, & Chen, Y. (2022a). μDfl: A secure microchained decentralized federated learning fabric atop iot networks. *IEEE Transactions on Network and Service Management*. doi:10.1109/TNSM.2022.3179892

6 **Xu**, **R.**, Chen, Y., Chen, G., & Blasch, E. (2022). Sausa: Securing access, usage, and storage of 3d point cloud data by a blockchain-based authentication network. *Future Internet*, *14*(12), 354. doi:10.3390/fi14120354

7 **Xu**, **R.**, Wei, S., Chen, Y., Chen, G., & Pham, K. (2022). Lightman: A lightweight microchained fabric for assurance-and resilience-oriented urban air mobility networks. *Drones*, *6*(12), 421. doi:10.3390/drones6120421

8 Qu, Q., **Xu**, **R.**, Chen, Y., Blasch, E., & Aved, A. (2021). Enable fair proof-of-work (pow) consensus for blockchains in iot by miner twins (mint). *Future Internet*, *13*(11), 291. doi:10.3390/fi13110291

9 **Xu**, **R.**, Nagothu, D., & Chen, Y. (2021a). Decentralized video input authentication as an edge service for smart cities. *IEEE Consumer Electronics Magazine*, *10*(6), 76–82. doi:10.1109/MCE.2021.3062564

10 **Xu**, **R.**, Nagothu, D., & Chen, Y. (2021b). Econledger: A proof-of-enf consensus based lightweight distributed ledger for iovt networks. *Future Internet*, *13*(10), 248. doi:10.3390/fi13100248

11 **Xu**, **R.**, Nikouei, S. Y., Nagothu, D., Fitwi, A., & Chen, Y. (2020). Blendsps: A blockchain-enabled decentralized smart public safety system. *Smart Cities*, *3*(3), 928–951. doi:10.3390/smartcities3030047

12 **Xu**, **R.**, Chen, Y., Blasch, E., & Chen, G. (2019). Exploration of blockchain-enabled decentralized capability-based access control strategy for space situation awareness. *Optical Engineering*, *58*(4), 041609. doi:10.1117/1.OE.58.4.041609

13 **Xu**, **R.**, Chen, Y., Blasch, E., & Chen, G. (2018c). Blendcac: A smart contract enabled decentralized capability-based access control mechanism for the iot. *Computers*, *7*(3), 39. doi:10.3390/computers7030039

Conference Proceedings

1 Nagothu, D., **Xu**, **R.**, & Chen, Y. (2023). Dema: Decentralized electrical network frequency map for social media authentication. In *Disruptive technologies in information sciences vii* (Vol. 12542, pp. 57–72). SPIE.

2 Nagothu, D., **Xu**, **R.**, Chen, Y., Blasch, E., & Ardiles-Cruz, E. (2023). Application of electrical network frequency as an entropy generator in distributed systems. In *Naecon 2023-ieee national aerospace and electronics conference* (pp. 233–238). IEEE.

3 Ogunbunmi, S., Hatmai, M., **Xu**, **R.**, Chen, Y., Blasch, E., Ardiles-Cruz, E., … Chen, G. (2023). A lightweight reputation system for uav networks. In *International conference on security and privacy in cyber-physical systems and smart vehicles* (pp. 114–129). Springer.

4 Qu, Q., **Xu**, **R.**, Sun, H., Chen, Y., Sarkar, S., & Ray, I. (2023). A digital healthcare service architecture for seniors safety monitoring in metaverse. In *2023 ieee international conference on metaverse computing, networking and applications (metacom)* (pp. 86–93). IEEE.

5 Wei, S., Huang, H., Chen, G., Blasch, E., Chen, Y., **Xu**, **R.**, & Pham, K. (2023). Rodad: Resilience oriented decentralized anomaly detection for urban air mobility networks. In *2023 integrated communication, navigation and surveillance conference (icns)* (pp. 1–11). IEEE.

6 **Xu**, **R.**, & Chen, Y. (2022b). Fairledger: A fair proof-of-sequential-work based lightweight distributed ledger for iot networks. In *2022 ieee international conference on blockchain (blockchain)* (pp. 348–355). IEEE. doi:10.1109/Blockchain55522.2022.00055

7 **Xu**, **R.**, Chen, Y., Li, X., & Blasch, E. (2022). A secure dynamic edge resource federation architecture for cross-domain iot systems. In *2022 international conference on computer communications and networks (icccn)* (pp. 1–7). IEEE. doi:10.1109/ICCCN54977.2022.9868843

8 Nagothu, D., **Xu**, **R.**, Chen, Y., Blasch, E., & Aved, A. (2021a). Defake: Decentralized enf-consensus based deepfake detection in video conferencing. In *2021 ieee 23rd international workshop on multimedia signal processing (mmsp)* (pp. 1–6). IEEE. doi:10.1109/MMSP53017.2021.9733503

9 Nagothu, D., **Xu**, **R.**, Chen, Y., Blasch, E., & Aved, A. (2021b). Detecting compromised edge smart cameras using lightweight environmental fingerprint consensus. In *Proceedings of the 19th acm conference on embedded networked sensor systems* (pp. 505–510). ACM. doi:10.1145/3485730.3493684

10 **Xu**, **R.**, & Chen, Y. (2021). Fed-ddm: A federated ledgers based framework for hierarchical decentralized data marketplaces. In *2021 international conference on computer communications and networks (icccn)* (pp. 1–8). IEEE. doi:10.1109/ICCCN52240.2021.9522359

11 Qu, Q., **Xu**, **R.**, Nikouei, S. Y., & Chen, Y. (2020). An experimental study on microservices based edge computing platforms. In *Ieee infocom 2020-ieee conference on computer communications workshops (infocom wkshps)* (pp. 836–841). IEEE. doi:10.1109/INFOCOMWKSHPS50562.2020.9163068

12 **Xu**, **R.**, Chen, Y., Blasch, E., Aved, A., Chen, G., & Shen, D. (2020). Hybrid blockchain-enabled secure microservices fabric for decentralized multi-domain avionics systems. In *Sensors and systems for space applications xiii* (Vol. 11422, 114220J). International Society for Optics and Photonics. doi:10.1117/12.2559036

13 **Xu**, **R.**, Chen, Y., & Li, J. (2020). Poster: Microfl: A lightweight, secure-by-design edge network fabric for decentralized iot systems. In *The network and distributed system security symposium (ndss)*. Retrieved from https://www.ndss-symposium.org/wp-content/uploads/2020/02/NDSS2020posters_paper_19.pdf

14 **Xu**, **R.**, Zhai, Z., Chen, Y., & Lum, J. K. (2020). Bit: A blockchain integrated time banking system for community exchange economy. In *2020 ieee international smart cities conference (isc2)* (pp. 1–8). IEEE. doi:10.1109/ISC251055.2020.9239045

15 Blasch, E., **Xu**, **R.**, Nikouei, S. Y., & Chen, Y. (2019). A study of lightweight dddas architecture for real-time public safety applications through hybrid simulation. In *2019 winter simulation conference (wsc)* (pp. 762–773). IEEE. doi:10.1109/WSC40007.2019.9004727

16 Lin, X., **Xu**, **R.**, Chen, Y., & Lum, J. K. (2019). A blockchain-enabled decentralized time banking for a new social value system. In *2019 ieee conference on communications and network security (cns)* (pp. 1–5). IEEE. doi:10.1109/CNS.2019.8802734

17 Nikouei, S. Y., **Xu**, **R.**, Chen, Y., Aved, A., & Blasch, E. (2019). Decentralized smart surveillance through microservices platform. In *Sensors and systems for space applications xii* (Vol. 11017, 110170K). International Society for Optics and Photonics. doi:10.1117/12.2518999

18 **Xu**, **R.**, Chen, S., Yang, L., Chen, Y., & Chen, G. (2019). Decentralized autonomous imaging data processing using blockchain. In *Multimodal biomedical imaging xiv* (Vol. 10871, pp. 72–82). SPIE. doi:10.1117/12.2513243

19 **Xu**, **R.**, Nikouei, S. Y., Chen, Y., Blasch, E., & Aved, A. (2019). Blendmas: A blockchain-enabled decentralized microservices architecture for smart public safety. In *2019 ieee international conference on blockchain (blockchain)* (pp. 564–571). IEEE. doi:10.1109/Blockchain.2019.00082

20 **Xu**, **R.**, Ramachandran, G. S., Chen, Y., & Krishnamachari, B. (2019). Blendsm-ddm: Blockchain-enabled secure microservices for decentralized data marketplaces. In *2019 ieee international smart cities conference (isc2)* (pp. 14–17). IEEE. doi:10.1109/ISC246665.2019.9071766

21 Nagothu, D., **Xu**, **R.**, Nikouei, S. Y., & Chen, Y. (2018). A microservice-enabled architecture for smart surveillance using blockchain technology. In *2018 ieee international smart cities conference (isc2)* (pp. 1–4). IEEE. doi:10.1109/ISC2.2018.8656968

22 Nikouei, S. Y., Chen, Y., Song, S., **Xu**, **R.**, Choi, B.-Y., & Faughnan, T. (2018). Smart surveillance as an edge network service: From harr-cascade, svm to a lightweight cnn. In *2018 ieee 4th international conference on collaboration and internet computing (cic)* (pp. 256–265). IEEE. doi:10.1109/CIC.2018.00042

23 Nikouei, S. Y., Chen, Y., Song, S., **Xu**, **R.**, Choi, B.-Y., & Faughnan, T. R. (2018). Real-time human detection as an edge service enabled by a lightweight cnn. In *2018 ieee international conference on edge computing (edge)* (pp. 125–129). IEEE. doi:10.1109/EDGE.2018.00025

24 Nikouei, S. Y., **Xu**, **R.**, Nagothu, D., Chen, Y., Aved, A., & Blasch, E. (2018). Real-time index authentication for event-oriented surveillance video query using blockchain. In *2018 ieee international smart cities conference (isc2)* (pp. 1–8). IEEE. doi:10.1109/ISC2.2018.8656668

25 **Xu**, **R.**, Chen, Y., Blasch, E., & Chen, G. (2018a). A federated capability-based access control mechanism for internet of things (iots). In *Sensors and systems for space applications xi* (Vol. 10641, 106410U). International Society for Optics and Photonics. doi:10.1117/12.2305619

26 **Xu**, **R.**, Chen, Y., Blasch, E., & Chen, G. (2018b). Blendcac: A blockchain-enabled decentralized capability-based access control for iots. In *2018 ieee international conference on internet of things (ithings) and ieee green*

computing and communications (greencom) and ieee cyber, physical and social computing (cpscom) and ieee smart data (smartdata) (pp. 1027–1034). IEEE. doi:10.1109/Cybermatics_2018.2018.00191

27 **Xu**, **R.**, Lin, X., Dong, Q., & Chen, Y. (2018). Constructing trustworthy and safe communities on a blockchain-enabled social credits system. In *Proceedings of the 15th eai international conference on mobile and ubiquitous systems: Computing, networking and services* (pp. 449–453). doi:10.1145/3286978.3287022

28 **Xu**, **R.**, Nikouei, S. Y., Chen, Y., Polunchenko, A., Song, S., Deng, C., & Faughnan, T. R. (2018). Real-time human objects tracking for smart surveillance at the edge. In *2018 ieee international conference on communications (icc)* (pp. 1–6). IEEE. doi:10.1109/ICC.2018.8422970

Book Chapters

1 **Xu**, **R.**, Nagothu, D., & Chen, Y. (2024). Ar-edge: Autonomous and resilient edge computing architecture for smart cities. (pp. 1–21). doi:10.5772/intechopen.1005876

2 **Xu**, **R.**, Nagothu, D., & Chen, Y. (2023). Ecom: Epoch randomness-based consensus committee configuration for iot blockchains. In *Principles and practice of blockchains* (pp. 135–154). doi:10.1007/978-3-031-10507-4_7

3 **Xu**, **R.**, Chen, Y., & Blasch, E. (2021). Microchain: A light hierarchical consensus protocol for iot systems. In *Blockchain applications in iot ecosystem* (pp. 129–149). Springer.

4 Nagothu, D., **Xu**, **R.**, Nikouei, S. Y., Zhao, X., & Chen, Y. (2020). Smart surveillance for public safety enabled by edge computing. In *Edge computing: Models, technologies and applications* (pp. 409–433). doi:10.1049/PBPC033E_ch19

5 **Xu**, **R.**, Chen, Y., & Blasch, E. (2020). Decentralized access control for iot based on blockchain and smart contract. In *Modeling and design of secure internet of things* (pp. 505–528). doi:10.1002/9781119593386.ch22

6 Nikouei, S. Y., **Xu**, **R.**, & Chen, Y. (2019). Smart surveillance video stream processing at the edge for real-time human objects tracking. In *Fog and edge computing: Principles and paradigms* (pp. 319–346). doi:10.1002/9781119525080.ch13

Books

1 **Xu**, **R.**, Chen, Y., & Blasch, E. (2023). *Lightweight blockchain for internet of things: Rationale and a case study*. Bellingham, Washington 98227-0010 USA: SPIE Press.

Professional Services

Conference Technical Program Committee (TPC)

- The 6th ACM International Workshop on BLockchain-enabled Networked Sensor Systems (BlockSys-24) (in conjunction with SenSys-20234.
- IEEE Fourth Intelligent Cybersecurity Conference (ICSC2024).
- IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE 2024).
- The 2nd International Workshop on Decentralized Physical Infrastructure Network (DePIN 2024).
- The 29th IEEE Symposium on Computers and Communications (ISCC 2024).
- The 2024 EAI International Conference on Security and Privacy in Cyber-Physical Systems and Smart Vehicles (SmartSP 2024)
- The 7th IEEE International Conference on Blockchain (Blockchain-2024).
- The 6th IFIP International Internet of Things (IoT) Conference (IFIP-IoT 2023)

Professional Services (continued)

- The 5th ACM International Workshop on BLockchain-enabled Networked Sensor Systems (BlockSys-23) (in conjunction with SenSys-2023).
- The 2023 EAI International Conference on Security and Privacy in Cyber-Physical Systems and Smart Vehicles (SmartSP 2023)
- The 6th IEEE International Conference on Blockchain (Blockchain-2023).
- Artificial Intelligence and Machine Learning Technologies for IoT (AMT) (IEEE WiMob-SPPDT'2023).
- The 6th International Workshop on BLockchain Enabled Sustainable Smart Cities (BLESS 2023) (in conjunction with ICCCN 2023 Conference).
- The 4th ACM International Workshop on BLockchain-enabled Networked Sensor Systems (BlockSys-22) (in conjunction with SenSys-2022).
- The 5th IEEE International Conference on Blockchain (Blockchain-2022).
- The 5th International Workshop on BLockchain Enabled Sustainable Smart Cities (BLESS 2022) (in conjunction with ICCCN 2022 Conference).
- WiMob Short Papers, Posters and Demos Track (IEEE WiMob-SPPDT'2022).
- The 4th IEEE International Conference on Blockchain (Blockchain-2021).
- The 4th International Workshop on BLockchain Enabled Sustainable Smart Cities (BLESS 2021) (in conjunction with ICCCN 2021 Conference).
- The 3rd IEEE International Conference on Blockchain (Blockchain-2020).
- The 3rd International Workshop on BLockchain Enabled Sustainable Smart Cities (BLESS 2020) (in conjunction with ISC2 2020 Conference).
- The 2nd International Workshop on BLockchain Enabled Sustainable Smart Cities (BLESS 2019) (in conjunction with ISC2 2019 Conference).
- The 1st International Workshop on Lightweight Blockchain for Edge Intelligence and Security (LightChain 2019).

Reviewer for Journals

- Elsevier Computer Communications
- Elsevier Computer Networks
- Elsevier Computers & Security
- Elsevier Pervasive and Mobile Computing
- Elsevier Blockchain: Research and Applications
- Elsevier Sustainable Cities and Society
- Elsevier International Journal of Intelligent Networks
- IEEE Access
- IEEE Internet-of-Things Journal (IoT-J)
- IEEE Transactions on Big Data (TBD)
- IEEE Transactions on Industrial Informatics (TII)
- IEEE Transactions on Dependable and Secure Computing (TDSC)
- IEEE Transactions on Network Science and Engineering (TNSE)
- MDPI Applied Sciences
- MDPI Sensor and Actuator Networks
- Hindawi Wireless Communications and Mobile Computing

Reviewer for Conferences

- IEEE International Conference on Computer Communications (INFOCOM)

Professional Services (continued)

- IEEE International Conference on Blockchain (Blockchain)
- IEEE Global Communications Conference (GLOBECOM)
- IEEE International Conference on Wireless and Mobile Computing, Networking And Communications (WiMob)
- IEEE International Performance Computing and Communications Conference (IPCCC)
- IEEE International Conference on Consumer Electronics (ICCE)
- IEEE International Conference on Communications (ICC)
- IEEE International Smart Cities Conference (ISC2)
- IEEE International Conference on Cloud Networking (CloudNet)
- ACM Conference on Embedded Networked Sensor Systems (SenSys)
- EAI SECURECOMM

Miscellaneous Experience

Awards and Achievements

2024 ◇ **ICC Rapid Seeding Awards**, Michigan Technological University.

2023 ◇ **Graduate Student Excellence Award in Research**, Graduate School, Binghamton University.

2019 ◇ **2019 Computers Best Paper Award**, Multidisciplinary Digital Publishing Institute (MDPI).

2018 ◇ **Outstanding MS Research**, Department of Electrical and Computer Engineering, Binghamton University.

On campus Services

- **Fall 2018 Leadership Volunteers**, International Student and Scholar Services (ISSS), Binghamton University.

Membership

- IEEE
- ACM