Assistant Professor
UNC Pembroke

SHAOHU ZHANG, PH.D.

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RESEARCH INTERESTS

- **Trustworthy & Explainable AI**: designing context-aware mobile systems to bridge CPS and AI for reliable and adaptive interactions.
- **Cybersecurity**: fingerprinting and human biometric security, with a focus on safeguarding privacy and authentication through embedded sensors in digital devices.
- **Mobile Computing/Sensing Systems**: sensing with ubiquitous modalities, such as WiFi, camera, IMU, and sound in intelligent transportation and smart homes.
- **LLM and NLP**: speech privacy, privacy policy and compliance, and LLM applications.

EDUCATION

North Carolina State University (NCSU), Raleigh, NC   2023
- Ph.D. Computer Science

South Dakota State University (SDSU), Brookings, SD   2017
- MS. Computer Science (non-degree)
- MS. Civil Engineering

Shanghai Maritime University (SMU), Shanghai, China   2012
- MS. Transportation Planing and Management (Supply Chain Management)

Zhejiang Ocean University (ZJOU), Zhoushan, China   2010
- B.A. Marine Fishery Science and Technology

WORK EXPERIENCE

Assistant Professor in Computer Science and Cybersecurity, University of North Carolina at Pembroke   08/2023-Present

Wolfpack Security and Privacy Research (WSPR) Lab, NCSU, Raleigh, NC   01/2020–05/2023

Graduate Research/Teaching Assistant (worked on digital security and privacy with my advisor Prof. Anupam Das)

Wolfpack Interactive, Sensing and Networking Lab (WiSN) Lab, NCSU, Raleigh, NC   08/2017–12/2019

Graduate Research/Teaching Assistant (worked on WiFi sensing with Prof. Muhammad Shahzad)

Department of Civil and Environmental Engineering, SDSU, Brookings, SD   08/2015–07/2017

Graduate Research Assistant(worked transportation safety with Prof. Xiao Qin and Prof. Jonathan Wood)

Department of Computer Science and Electrical Engineering, SDSU, Brookings, SD   08/2015–12/2016

Graduate Research Assistant (worked on mobile systems with Prof. Wei Wang and Prof. Myounggyu Won)

Logistics Engineer, China Railway Materials Commercial Corp, Shanghai, China   06/2012 – 08/2013

Marketing Research Intern, SITC Logistics, Shanghai, China   04/2012 – 05/2012

Instructor, Shanghai Maritime University, Shanghai, China   09/2011 – 07/2012

PROPOSAL/AWARDED FUNDING

- **S-STEM: ACT: Accessible Cybersecurity Training (Co-PI)**
  Total: $1,183,406
  Sponsor: NSF 25-514
  Under Review

- **Collaborative Research: CISE-MSI: RDP: CPS: Digital Twin-Assisted 3D Resilient UAV Systems through Sensing, Communication, Control Co-design (Co-PI, collaborated with University of Miami and NCSU)**
  Total: $600,000
  Sponsor: NSF 24-536
  Under Review

- **AI Adoption in Agriculture: Barriers and Opportunities for Small Farms in NC (PI)**.
  Total: $85,000
  Sponsor: North Carolina Collaboratory.
  Pre-award

- **CC* Strategy-Campus: Enhancing Research and Educational Infrastructure by Establishing an HPC at UNCP (PI)**.
  Total: $100,000
  Sponsor: NSF CC*.
  Under Review

- **Cyber Escape Rooms: Fostering Student Engagement and Boosting Student Prospects Enrollment in Cybersecurity and Computer Science Programs (Co-PI)**.
  Total Award: $10,000
  Sponsor: UNCP.
  Duration: 01/01/2024 – 05/31/2024

- **Neighborhood Microscope: Leveraging Big Data Sources to Examine Health and Well-being in Urban and Rural NC Neighborhoods (PI)**.
  Total Award: $86,000
  Sponsor: North Carolina Collaboratory.
  Duration: 01/01/2024 – 06/30/2025

Previous proposal with my advisor as the main student contributor.
- **Physical Context-aware Voice Assistant for Smart Homes.**
  Lead PI: Dr. Anupam Das (NCSU)
  Total Award: $75,000
  Sponsor: Proposals for 2022 Towards Trustworthy Products in AR, VR, and Smart Devices, Meta Company

PUBLICATIONS

J Journal, **C** Conference, <u>*</u> indicates the students I advise.

1. **(J)** <u>Ruoyu Zhao</u>, Xiantao Jiang, F. Richard Yu, Victor C.M. Leung, Tao Wang, and **Shaohu Zhang**. Leveraging Cross-Attention Transformer and Multi-Feature Fusion for Cross-Linguistic Speech Emotion Recognition. IEEE Internet of Things Journal (Under Review)

2. **(C)** <u>Zhouyu Li</u>, Ruozhou Yu, Anupam Das, **Shaohu Zhang**, Huayue Gu, Xiaojian Wang, Fangtong Zhou, Aafaq Sabir, Dilawer Ahmed, and Ahsan Zafar. INSPIRE: Instance-level Privacy-preserving Transformation for Vehicular Camera Videos. Proceedings of the 32nd International Conference on Computer Communications and Networks. **IEEE ICCCN'23** (CORE ranking: B, acceptance rate: 55/181=30%).

3. **(C) Shaohu Zhang**, Zhouyu Li, Anupam Das. VoicePM: A Robust Privacy Measurement on Voice Anonymity, *16th ACM Conference on Security and Privacy in Wireless and Mobile Networks.* **ACM WiSec 2023** (CORE ranking: B, acceptance rate: 34/134 =25%).

4. **(C) Shaohu Zhang**, Aafaq Sabir, Anupam Das. Speaker Orientation-Aware Privacy Control to Thwart Misactivation of Voice Assistants, *The 53rd Annual IEEE/IFIP International Conference on Dependable Systems and Network.* **IEEE DSN 2023** (CORE ranking: A, acceptance rate: 47/235=20%).

5. **(C) Shaohu Zhang**, Anupam Das. Enabling 2-FA for Smart Home Voice Assistants using Inaudible Acoustic Signal, *In 24th International Symposium on Research in Attacks, Intrusions and Defenses, pp. 251-265. 2021.* **RAID'21** (CORE ranking: A, acceptance rate: 33/138=23.9%).

6. **(J)** Jonathan Wood, **Shaohu Zhang**. Evaluating Relationships Between Perception-Reaction Times, Emergency Deceler-

ation Rates, and Crash Outcomes using Naturalistic Driving Data. *Journal of Transportation research record 2675, no. 1 (2021): 213-223.* **TRR'21** (CiteScore: Q2, acceptance rate: 20%).

7. **(C) Shaohu Zhang**, Raghav Venkatnarayan, Muhammad Shahzad. A WiFi-based Home Security System. *In 2020 IEEE 17th International Conference on Mobile Ad Hoc and Sensor Systems (MASS), pp. 129-137*. **IEEE MASS'20** (CORE ranking: B, acceptance rate:28%).

8. **(J)** Jonathan Wood, **Shaohu Zhang**. Identification and Calculation of Horizontal Curves for Low-Volume Roadways using Smartphone Sensors. *Journal of Transportation Research Record, 2672(39), 1-10. 2018.* **TRR'18** (CiteScore: Q2, acceptance rate: 20%).

9. **(C+J)** Muhammad Shahzad, **Shaohu Zhang**. Augmenting User Identification with WiFi Based Gesture Recognition. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 2(3), pp.1-27, 2018.* **IMWUT/Ubicomp'18** (CORE ranking: A*, acceptance rate:18%).

10. **(C) Shaohu Zhang**, Myounggyu Won, Sang H. Son. Low-cost and Non-intrusive Traffic Monitoring System Using WiFi. *In 2017 26th International Conference on Computer Communication and Networks (ICCCN), pp. 1-9. IEEE, 2017.* **ICCCN'17** (CORE ranking: B, acceptance rate:28.6%).

11. **(C)** Myounggyu Won, **Shaohu Zhang**, Appala Chekuri, Sang H. Son. Enabling Energy-Efficient Driving Route Detection Using a Built-in Smartphone Barometer Sensor, *In 2016 IEEE 19th International Conference on Intelligent Transportation Systems (ITSC), pp. 2378-2385. IEEE, 2016.*

12. **(C) Shaohu Zhang**, Myounggyu Won, Sang H. Son. Low-cost Realtime Horizontal Curve Detection Using Inertial Sensors of a Smartphone. *In 2016 IEEE 84th Vehicular Technology Conference (VTC-Fall), pp. 1-5. IEEE, 2016.* (CORE ranking: B).

13. **(C)** Xiao Qin, **Shaohu Zhang**, Wei Wang. Advanced Curve-speed Warning System Using an In-Vehicle Head-Up Display. *Proceedings of 94th Transportation Research Board Meeting, Washington, D.C, 2015.*

POSTER ABSTRACT/SHORT PAPER

1. **Shaohu Zhang**, Zhouyu Li, Anupam Das. Privacy Measurement of Physical Attributes on Voice Anonymity, *The 30th Annual International Conference on Mobile Computing and Networking Nov. 18-22, 2024, Washington, D.C., USA.* **MobiCom'24**.

2. **Shaohu Zhang**, Aafaq Sabir, Anupam Das. POSTER: Enhancing Security and Privacy Control for Voice Assistants Using Speaker Orientation, *16th ACM Conference on Security and Privacy in Wireless and Mobile Networks.* **WiSec'23**.

3. **Shaohu Zhang**, Anupam Das. A 2-FA for home voice assistants using inaudible acoustic signal. *In Proceedings of the 27th Annual International Conference on Mobile Computing and Networking, pp. 834-836. 2021.* **MobiCom'21**.

4. **Shaohu Zhang**, Myounggyu Won, Sang H. Son. WiTraffic: Non-intrusive Vehicle Classification Using WiFi. *In Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems, pp. 358-359. 2016.* **SenSys'16**

TECHNICAL REPORT

1. Jonathan Wood *, **Shaohu Zhang**. Evaluating Relationships Between Perception-Reaction Times, Emergency Deceleration Rates, and Crash Outcomes Using Naturalistic Driving Data. *MPC-17-338, North Dakota State University - Upper Great Plains Transportation Institute, Fargo: Mountain-Plains Consortium, 2017.*

THESIS

1. Towards Context-aware and Trustworthy Voice Assistants. *Committee members: Prof. Anupam Das (Chair), Prof. William Enck, Prof. Muhammad Shahzad, Prof. Chau-Wai Wong. North Carolina State University, 2023.*

2. Identification, Calculation and Warning of Horizontal Curves for Low-volume Two-lane Roadways Using Smartphone Sensors. *Committee members: Prof. Jonathan Wood (Chair), Prof. Suzette Burckhard, Prof. Rouzbeh Ghabchi. South Dakota State University, 2017.*

1. Privacy Preserving on Voice Anonymity, University of Oklahoma, April 2025.
2. Human-Centered Cybersecurity: Designing Context-Aware and Trustworthy Solutions for Smart Ecosystems, North Carolina Agricultural and Technical State University, March 2025.
3. Human-Centered Cybersecurity: Designing Context-Aware and Trustworthy Solutions for Smart Ecosystems, Louisiana State University, March 2025.
4. Towards Context-aware and Trustworthy Voice Assistants, Thomas College of Business and Economics at UNCP, October 2024.
5. Speaker Orientation-Aware Privacy Control to Thwart Misactivation of Voice Assistants, The 53rd Annual IEEE/IFIP International Conference on Dependable Systems and Network, IEEE DSN 2023.
6. VoicePM: A Robust Privacy Measurement on Voice Anonymity, *16th ACM Conference on Security and Privacy in Wireless and Mobile Networks.* WiSec 2023 virtual.
7. Web Privacy in the Digital World. University of North Carolina, Pembroke, March 2023.
8. Enabling 2-FA for Smart Home Voice Assistants using Inaudible Acoustic Signal. *The 24th International Symposium on Research in Attacks, Intrusions and Defenses.* (RAID'21 virtual).
9. 2-FA for Smart Home Voice Assistants using Inaudible Acoustic Signal. *In Proceedings of the 27th Annual International Conference on Mobile Computing and Networking.* (Mobicom'21 virtual).
10. Security on Android Devices. *NCSU Data Privacy Month 2021.*
11. A WiFi-based Home Security System. *The 17th IEEE International Conference on Mobile Ad Hoc and Sensor Systems.* (MASS'20 virtual).
12. Identification and Calculation of Horizontal Curves for Low-Volume Roadways using Smartphone Sensors. *In the 97th Transportation Research Board Annual Meeting (TRB'18), Washington D.C.*
13. WiTraffic: Non-intrusive Vehicle Classification Using WiFi. *In the 14th ACM Conference on Embedded Networked Sensor Systems (SenSys'16), Stanford University.*
14. Horizontal Curve Detection Using Inertial Sensors of a Smartphone. *Sigma Xi Chapter, South Dakota State University, 2016*
15. Avoiding Roadway Departure Crashes with an In-Vehicle Head-Up Display. *In the TRB 94th Transportation Research Board Annual Meeting (TRB'15) Washington D.C.*

University of North Carolina at Pembroke, Pembroke, NC

- CSC 2920 Software Engineering (in-person & online) Spring 2024, Fall 2024, Spring 2025
- CYB 4030 Introduction to Digital Forensics, Spring 2024, Spring 2025
- CYB 4020 Network Security, Fall 2024
- CSC 1750 Introduction to Algorithms, Fall 2023
- CSC 1760 Introduction to Programming, Fall 2023
- CSC 1850 Object-oriented Programming, Fall 2023

Teaching Assistant / Lab Instructor, North Carolina State University, Raleigh, NC

- CSC/ECE 773 Advanced Internet Protocol (14 graduates), Spring 2023, Instructor: Prof. Khaled Harfoush
- CSC/ECE 573/591 Internet Protocol, Fall 2022, Instructor: Prof. Khaled Harfoush
- CSC 433 Privacy in the Digital Age, Spring 2021, Instructor: Prof. Anupam Das
- CSC 533 Privacy in the Digital Age, Fall 2020, Instructor: Prof. Anupam Das
- CSC/ECE 591/791, Internet of Things, Spring 2020, Instructor: Prof. Muhammad Shahzad
- CSC/ECE 573/591 Internet Protocol, Spring 2020, Instructor: Prof. Muhammad Shahzad
- CSC 453 Internet of Things, Spring 2019, Instructor: Prof. Muhammad Shahzad

Lecturer, Shanghai Maritime University, Institute of Advanced Technology, Shanghai, China

- International Multimodal Transportation, Spring 2012
- Customs Declaration, Fall 2011

- **Current PhD student**: Zhouyu Li (NCSU, speech privacy)
- **Current master student**: Ruoyu Zhao (SMU, speech emotion)
- **Current undergraduate student at UNCP**:
  Coraline Song (LLM privacy)
  Najmul Hasan (digital forensics, UNCP Spring 2024 Semester Long Undergraduate Research Fellowship)
  Andrew Cart (Computer Vision, LLM)
  Mohammad Kawsar(VR privacy, Mobicom'24 Travel Grant Award and Dr. Charles Humphrey Undergraduate Conference Travel Award).
- **Past undergraduate student**: Samuel Moore (CS, 09/2024-12/2024), Mushfique Rahman (CS, 01/2024-05/2024), Kay Anderson (Sociology, 01/2024-08/2024).

HONORS & AWARDS

- **Mentored Teaching Fellowship**, College of Engineering, North Carolina State University, 2023.

- **2022 Summer Graduate Fellowship**, College of Engineering, North Carolina State University, 2022.

- **Enhancement Fee Travel Award**, College of Engineering, North Carolina State University, 2020, 2023.

- **Graduate Research Award**, College of Engineering, North Carolina State University, 2018.

- **Student Travel Grant:** HotMobile'23, RAID'21, CCS'21, MobiCom'21, MobiCom'17, and SenSys'16.

- **Sigma Xi Graduate Research Award**, South Dakota State University, 2016.

- **Undergraduate Thesis Award**, Zhejiang Ocean University, China, 2010.

PROFESSIONAL ACTIVITIES

Co-Chair
- Co-chair, Privacy Check-up Sessions, NCSU Data Privacy Month 2021. North Carolina State University. Feb 2021

Technical Program Committee
- 8th Dependable and Secure Machine Learning Workshop (DSML 2025, co-hosted with DSN 2025), Naples, Italy, June 23-26, 2025.
- 2025 International Conference on Computing, Networking and Communications (ICNC 2025, Honolulu, Hawaii).
- The 25th Privacy Enhancing Technologies Symposium (PETS 2025 Washington DC).
- The First International Workshop on IoT Datasets for Multi-modal Large Model (IoT-MMLM 2024) In Conjunction with SenSys 2024, November 4-7 2024, Hangzhou, China
- The 2024 IEEE 100th Vehicular Technology Conference (VTC2024-Fall Washington DC).
- The 2nd ACM Workshop on Smart Wearable Systems and Applications (SmartWear2023) In Conjunction with MobiCom 2023. October 6, 2023, Madrid, Spain
- The 2023 IEEE 98th Vehicular Technology Conference (VTC2023-Fall Hong Kong).
- PhD Forum, The 53rd Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN'23).

Artifact Review Program Committee
- USENIX Security Symposium: 2023
- Privacy Enhancing Technologies Symposium (PoPETs): 2023
- ACM ASIA Conference on Computer and Communications Security (AsiaCCS): 2023
- Annual Computer Security Applications Conference (ACSAC): 2023
- ACM Conference on Security and Privacy in Wireless and Mobile Networks (ACM WiSec): 2022-2023

Community Service
- Judge, Region 4 North Carolina Science and Engineering Fair, 2024, 2025
- Judge, North Carolina Science and Engineering Fair (NCSEF), 2024, 2025

University Service
- Cybersecurity faculty hiring committee, UNCP, 2025

Conference Reviewer

- Privacy Enhancing Technologies Symposium (PETS): 2023-2025.
- ACM Conference on Computer and Communications Security (CCS): 2021-2023.
- Symposium on Security and Privacy (IEEE S&P): 2021, 2024.
- ISOC Networked and Distributed System Security Symposium (NDSS): 2021-2023.
- Annual Computer Security Applications Conference (ACSAC): 2022-2023.
- Security and Privacy in Wireless and Mobile Networks (WiSec): 2021-2024.
- ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys): 2019.
- Proceedings of Transportation Research Board Meeting: 2023-2025.

Journal Reviewer
- International Journal of Human-Computer Interaction (IJHCI): 2023, 2024
- ACM Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT): 2019, 2021, 2022.
- IEEE Internet of Things Journal: 2021-2025.
- ACM Transactions on Interactive Intelligent Systems: 2021.
- IEEE Transactions on Mobile Computing: 2021-2025.

Updated by 03/2025