: zhangshaohu.github.io
: github.com/zhangshaohu

SHAOHU ZHANG

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EDUCATION

Ph.D. candidate in **Computer Science** — North Carolina State University — 8/2017–12/2022
Research area: sensor sensing, IoT, applied machine learning, privacy and security.

MS. Computer Science (non-degree) & Civil Engineering — South Dakota State University — 5/2017
Research area: ITS, sensor sensing, and transportation data analysis and visualization.

B.A. Marine Fishery — Zhejiang Ocean University, China — 6/2010

SKILLS AND INTERESTS

- Experience in Spatial & Temporal Data Mining, Sequence Modeling, iOS/Android App Development, Microcontroller programming, Differential Privacy, Cloud Computing, Machine Learning, and Deep Learning.
- Proficient in MatLab and Python, familiar with C++ and Java, experience in C, Objective C, Swift, R, and SAS.
- ML frameworks: Scikit-learn, Pytorch, Tensorflow, and Keras.
- ML experience: Data analytic and visualization, natural language processing, supervised/unsupervised modeling, federated learning.
- Interests: machine learning, sensor sensing, IoT, privacy and security.

CERTIFICATE

- **Deep Learning Professional Certificate by Deeplearning.ai:** Neural Networks and Deep Learning, Improving Deep Neural Networks, Structuring Machine Learning Projects, Convolutional Neural Networks, and Sequence Models.
- **IT Security Specialist by LinkedIn:** Cybersecurity, Cloud Computing, Network Administration, Network Security, Incident Response, Information Security, and Cryptography.
- **Google Cloud Fundamentals: Core Infrastructure by Google Cloud**
- **Faster Python Code by LinkedIn.**

EMPLOYMENT AND SELECTED PROJECTS

- **Research Assistant, Wolfpack Security and Privacy Research (WSPR) Lab, NCSU** — 12/2019–present
  VoicePrivacy: Currently working on the usability and feasibility study of voice privacy-preserving (e.g., gender, emotion, accent and age) in IoT devices by applying deep learning and speech processing algorithms **(Python, NLP, neural networks)**.

  HeadTalk (**Finalist of Facebook proposal** the 2021 Towards Trustworthy Products in AR, VR, and Smart Devices, PI: Anupam Das): proposed and developed a device-free and non-obtrusive acoustic sensing system to thwart both the misactivation of voice assistants and replay attacks. The proposed acoustic sensing technique can accurately infer the direction of the voice and thereby associate addressability with voice commands, allowing VAs to record and transmit audio data only when they detect a human speaker facing them from a distance **(Linux, Python, Matlab, and SVM)**.

  HandLock (RAID'21): proposed and developed the concept of using a gesture-based authentication system for smart home voice assistants called *HandLock*, which uses built-in microphones and speakers to generate and sense inaudible acoustic signals to detect the presence of a known hand gesture. *HandLock* can act as a second-factor authentication for performing sensitive activities such as making online purchases through voice assistants. **(Linux, Python, Matlab, and RF)**.

- **Teaching Assistant, Security and Privacy, NCSU** — Spring'21 and Fall'20
  Interacted and guided students in overview of the challenging and emerging research topics (e.g. **differential privacy and federated learning**) in privacy.

- **Teaching Assistant, Internet of Things, NCSU** — Spring'20 and Spring'19
  Assisted and guided students working on interesting projects such as Visible Light Communication and IoT projects implemented on Arduino, Raspberry Pi, smartphone, smartwatch, and **IBM/AWS cloud**.

- **Research Assistant, Wolfpack Interactive, Sensing and Networking Lab (WiSN) Lab, NCSU** — 8/2017–12/2019
  Speech Reconstruction: reconstructed the speech by training and learning high-resolution speech and the vibration response from the VR accelerometer and achieved 20% speech recognition accuracy through Google Speech-to-Text API. **(C++, Python, Matlab, TensorFlow, Keras, and CNN)**.

  WiFi Home Sensing (MASS'20): a home security system detects the door/window/human movement (over 90% accuracy) utilizing WiFi signals **(Linux, Matlab, SVM, DTW, and Networking)**.

- **Research Assistant, Civil Lab for Operations and Safety Engineering in Transportation, SDSU** 1/2017–7/2017
  Naturalistic Driving Data project (TRR'20): main investigator to evaluate causal relationships between perception-reaction times, emergency deceleration rates, and crash outcomes by mining the Naturalistic Driving Data **(Java, Logistic regression, and Causal inference)**.

- **Research Assistant/Mobile App Developer, Wireless Embedded and Networked Systems Lab, SDSU** 8/2015–12/2016
  A WiFi-based traffic monitoring system (ICCCN'17): designed and implemented a WiFi-based traffic monitoring system to classify vehicles, measure vehicle speed, and perform vehicle lane detection using WiFi signals **(Linux, Matlab, SVM, and Networking)**.

- **Research Assist./Mobile App Developer, Civil Lab for Operation & Safety Engr. in Transportation, SDSU** 08/2013–08/2015
  – Accident analysis, mapping and visualization.
  – Develop mobile App to acquire sensors data.

Personal Projects

- **e-Climbing:** A Gym Wall Climbing Management System via a website, powered by **Jave** and **MySQL** to manage the historical sales, customer information and visit records.
- **DriverMonitor:** A realtime teenage driver behaviour monitoring system integrating OBII sensor, smart watch, smartphone, and Raspberry Pi, which examines over time novice teenage driving performance and risk, including kinematic risky driving and speeding. Implemented on **Python** and **Java** , front-end using **Flask** in **IBM Cloud**.

Selected Publications

1. **Shaohu Zhang**, Anupam Das, Speaker Orientation-Aware Security and Privacy Control for Voice Assistants, **IMWUT'22** (Under Review).
2. **Shaohu Zhang**, Anupam Das, Enabling 2-FA for Smart Home Voice Assistants using Inaudible Acoustic Signal, **RAID'21**.
3. **Shaohu Zhang**, Raghav Venkatnarayan, Muhammad Shahzad, *A WiFi-based Home Security System*, **IEEE MASS**'20.
4. Jonathan Wood, **Shaohu Zhang**, *Evaluating Relationships Between Perception-Reaction Times, Emergency Deceleration Rates, and Crash Outcomes using Naturalistic Driving Data*, **Journal of Transportation Research Record**, 2020.
5. Jonathan Wood, **Shaohu Zhang**, Identification and Calculation of Horizontal Curves for Low-Volume Roadways using Smartphone Sensors, **Journal of Transportation Research Record**, 2018
6. Muhammad Shahzad, **Shaohu Zhang**, *Augmenting User Identification with WiFi Based Gesture Recognition*, **Ubicomp**'18.
7. **Shaohu Zhang**, Myounggyu Won, Sang H. Son, Low-cost and Non-intrusive Traffic Monitoring System Using WiFi, **ICCCN**'17
8. Myounggyu Won, **Shaohu Zhang**, Appala Chekuri, Sang H. Son, Enabling Energy-Efficient Driving Route Detection Using a Built-in Smartphone Barometer Sensor, **IEEE ITSC**'16
9. **Shaohu Zhang**, Myounggyu Won, Sang H. Son, Low-cost Realtime Horizontal Curve Detection Using Inertial Sensors of a Smartphone, **IEEE VTC**'16.
10. 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. **TRB**'15.

Achievements

- **COE Enhancement Fee Travel Award:** North Carolina State University, 2020.
- **NSF Student Travel Grant:** SenSys'16, MobiCom'17 and CCS'21.
- **Sigma Xi Graduate Research Award:** South Dakota State University, 2016.
- **Outstanding Undergraduate Thesis Award:** Zhejiang Ocean University, China, 2010.

Professional Service

- **Conference Review/sub-review:** IEEE SP'21, USENIX Security Symposium'21/22, NDSS'21, CCS'21, ASIA CCS'20 & 21.
- **Journal Review:** ACM IMWUT, IEEE IoT Journal, ACM Trans. IIS; IEEE Trans. Mobile Computing.
- NCSU Data Privacy Month 2021, Privacy Check-up Sessions, co-chair, Feb 2021.