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

# SHAOHU ZHANG

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## EDUCATION

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

MS. Computer Science & Civil Engineering — South Dakota State University — 5/2017
**Research area**: ITS, sensor sensing, and transportation data analysis.

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

## RESEARCH INTERESTS

- **Security and Privacy**: Side-channel attack and biometric authentication with a special focus towards embedded senors in the IoT devices.
- **Wireless Sensing**: WiFi signals based human/ object sensing applications to Intelligent Transportation Systems and smart home.
- **Mobile Computing**: pattern/ activity recognition relating to bridging Cyber-Physical System and Machine Learning using smartphones and other sensors.

## SKILLS AND INTERESTS

- Experience in ArcGIS, Mobile App Development, Microcontroller programming, Machine Learning, and Deep Learning.
- Proficient in MatLab and Python, familiar with C++, Java, SAS, and R.
- ML frameworks: Scikit-learn, Pytorch, Tensorflow/Keras.
- ML experience: Data analytic and visualization, supervised/unsupervised modeling.

## EMPLOYMENT

- **Research Assistant, Wolfpack Security and Privacy Research (WSPR) Lab, NCSU** — 12/2019–present
  **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)**.
- **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 DNN)**.
  **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, Wireless Embedded and Networked Systems (WENS) 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)**.
- **Logistics Engineer, China Railway Materials Commercial Corp, Shanghai, China** — Jun 2012 – Aug 2013
- **Lecturer, Shanghai Maritime University, Shanghai, China** — Sep 2011 – Jul 2012

## UNDER SUBMISSION

1. **Shaohu Zhang**, Anupam Das, Speaker Orientation-Aware Security and Privacy Control for Voice Assistants, **IMWUT'22** (Under Review).

## Conference Publications

1. **Shaohu Zhang**, Anupam Das, Enabling 2-FA for Smart Home Voice Assistants using Inaudible Acoustic Signal, **RAID'21**.
2. **Shaohu Zhang**, Raghav Venkatnarayan, Muhammad Shahzad, *A WiFi-based Home Security System*, **IEEE MASS**'20.
3. **Shaohu Zhang**, Myounggyu Won, Sang H. Son, Low-cost and Non-intrusive Traffic Monitoring System Using WiFi, **IC-CCN'17**
4. Myounggyu Won, **Shaohu Zhang**, Appala Chekuri, Sang H. Son, Enabling Energy-Efficient Driving Route Detection Using a Built-in Smartphone Barometer Sensor,In 19th IEEE International Conference on Intelligent Transportation Systems, **ITSC'16**
5. **Shaohu Zhang**, Myounggyu Won, Sang H. Son, Low-cost Realtime Horizontal Curve Detection Using Inertial Sensors of a Smartphone, In 84th IEEE Vehicular Technology Conference, **VTC'16**
6. 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

## Journal Publications

1. Jonathan Wood, **Shaohu Zhang**, *Evaluating Relationships Between Perception-Reaction Times, Emergency Deceleration Rates, and Crash Outcomes using Naturalistic Driving Data*, **Transportation Research Record (SCI IF=1.04)**, 2020.
2. Jonathan Wood, **Shaohu Zhang**, Identification and Calculation of Horizontal Curves for Low-Volume Roadways using Smartphone Sensors, Journal of Transportation Research Record **(SCI IF=1.04)**, 2018
3. Muhammad Shahzad, **Shaohu Zhang**, *Augmenting User Identification with WiFi Based Gesture Recognition*, **IMWUT/Ubicomp**'18.

## Poster Abstract

1. **Shaohu Zhang**, Anupam Das, A 2-FA for home voice assistants using inaudible acoustic signal, **MobiCom'22**.
2. **Shaohu Zhang**, Myounggyu Won, Sang H. Son,WiTraffic: Non-intrusive Vehicle Classification Using WiFi, **SenSys'16**

## Technical Report

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

## Thesis

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

## Talks & Presentation

1. 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.
2. WiTraffic: Non-intrusive Vehicle Classification Using WiFi, In the 14th ACM Conference on Embedded Networked Sensor Systems (SenSys'16), Stanford University
3. Horizontal Curve Detection Using Inertial Sensors of a Smartphone Sigma Xi Chapter, South Dakota State University, 2016
4. 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.

## PROFESSIONAL ACTIVITIES

- **Conference Review/subreivew:** BuildSys'19,IEEE SP'21; USENIX Security Symposium'21; NDSS'21; AsianCCS'20 & 21.
- **Journal Review:** ACM IMWUT'19; IEEE IoT Journal'21; ACM Trans. IIS'21; IEEE Trans. Mobile Computing'21.

## Teaching Experience

**North Carolina State University, Teaching Assistant**
CSC433 Privacy in the Digital Age, Spring 2021 CSC533 Privacy in the Digital Age, Fall 2020 CSC591/791,ECE591/791 Internet of Things, Spring 2020 CSC573/591 Internet Protocol, Spring 2020 CSC456 Internet of Things, Spring 2019

**Lecturer, Shanghai Maritime University, Institute of Advanced Technology, Shanghai, China**
Customs Declaration Theory and Practice, Fall 2011
International Multimodal Transport, Spring 2012