



**THE CHINESE UNIVERSITY OF HONG KONG**  
Department of Information Engineering  
*Seminar*

**Side Channel Analysis: A New Perspective for  
Vehicle Intrusion Detection System**

**By**

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**Date : 11 January 2024 (Thursday)**

**Time : 4:00pm – 5:00pm**

**Venue : Rm 833, Ho Sin Hang Engineering Building, CUHK**

*Abstract*

Intelligent connected vehicles (ICVs) have become the mainstream in the development of automobile industry. Many emerging technologies have been proposed to provide users with comfortable and convenient driving experience. Note that some of the communication interfaces are vulnerable and can be easily attacked. Although many malicious attacks can be carried out in various ways, their final step must be in the in-vehicle network, i.e., the controller area network (CAN) bus. In order to protect the security of CAN bus, it is of great importance to design an intrusion detection system (IDS) which can monitor the message transmission in real time. There are various defense mechanisms that have been proposed, but they cannot meet the high security requirements of safety-critical ECUs against in-vehicle network attacks. In this talk, we propose three vehicle IDS solutions from the perspective of side channel analysis, based on the unique voltage characteristics of each ECU, the clock skew of each ECU, and the correlation among data frames in CAN bus. They neither occupy the bandwidth and computing resources of CAN bus, nor need to modify the original CAN protocol. They can not only accurately detect malicious attacks, but also identify the attack source with high precision, thus realizing timely discovery and isolation of vehicle attacks.

*Biography*

Jiajia Liu is a full professor (Vice Dean) with the School of Cybersecurity, Northwestern Polytechnical University. He is the director of Shaanxi Provincial Engineering Laboratory of Cyber Security since 2021, and the director of Xi'an Unmanned System Security and Intelligent Communications ISTC Center since 2020. He was a full Professor at the School of Cyber Engineering, Xidian University, from 2013 to 2018. He has published more than 200 peer-reviewed papers in many high quality publications, including prestigious IEEE journals and conferences. He received IEEE ComSoc Best YP (Young Professional) Award in Academia in 2020, IEEE VTS Early Career Award in 2019, IEEE ComSoc Asia-Pacific Outstanding Young Researcher Award in 2017, IEEE ComSoc Asia-Pacific Outstanding Paper Award in 2019, Niwa Yasujiro Outstanding Paper Award in 2012, the Best Paper Awards from many international conferences including IEEE flagship events, such as IEEE GLOBECOM in 2016, 2019 and 2023, IEEE ICC in 2023, IEEE WCNC in 2012 and 2014, IEEE WiMob in 2019, IEEE IC-NIDC in 2018, AICON in 2019. He was also a recipient of the Tohoku University President Award 2013. His research interests cover a wide range of areas including intelligent and connected vehicles, mobile/edge/cloud computing and storage, Internet of things security, wireless and mobile ad hoc networks, and space-air-ground integrated networks. He has been actively joining the society activities, like serving as associate editors for IEEE Transactions on Wireless Communications (May 2018-Oct. 2023), IEEE Transactions on Communications (Sep. 2020-present), IEEE Transactions on Computers (Oct. 2015-Jun. 2017) and IEEE Transactions on Vehicular Technology (Jan. 2016-Jan. 2021), editor for IEEE Network (July 2015-present), editor for IEEE Transactions on Cognitive Communications and Networking (January 2019-present), guest editors of top ranking international journals like IEEE Transactions on Emerging Topics in Computing (TETC), IEEE Network Magazine, IEEE Internet of Things (IoT) Journal, etc., and serving as technical program committees of numerous international conferences like the general chair of HPSR 2022, and the leading symposium co-chair of AHSN symposium for GLOBECOM 2017, CRN symposium for ICC 2018, AHSN symposium for ICC 2019. He is the Chair of IEEE IOT-AHSN TC, and is a Distinguished Lecturer of IEEE Communications Society and Vehicular Technology Society.

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