UNIVERSITAS Miguel Hernández

# Seminario: Robust and Resilient Cooperative Perception for Connected and Automated Driving

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**Abstract:** Environmental perception is fundamental to safe and efficient autonomous driving. With Cooperative Perception (CP) enabled by V2X (Vehicle to Everything) networks, connected vehicles can exchange perceptual information to see through blind zones and deal with long-tail scenarios. In this talk, we propose a robust, reliable, and resilient CP framework for connected autonomous driving under V2X communication limitations. First, for robustness to localization error and communication delay, a calibration-free two-stage CP paradigm is proposed using deep metric learning. This fusion method only requires image data and is adaptive to the transmission rate. Then, to guarantee high reliability, hard AoI (Age of Information) constraints are considered in sensor scheduling of CP to guarantee the timeliness of perceptual information. The required channel resources are minimized in asynchronous status update settings. Next, to resiliently adapt to the dynamic traffic environment, a learning-while-scheduling approach is proposed to balance exploration and exploitation. An online sensor scheduling algorithm is designed based on restless MAB (Multi-Armed Bandit) theory to maximize the average CP gain with low scheduling overhead. Finally, two large-scale multi-view multi-modality datasets, called DOLPHINS and WHALES, are presented to assist further researches and verification of CP systems.

**Biography:** Zhisheng Niu graduated from Beijing Jiaotong University, China, in 1985, and got his M.E. and D.E. degrees from Toyohashi University of Technology, Japan, in 1989 and 1992, respectively. During 1992-1994, he worked for Fujitsu Laboratories Ltd., Japan, and in 1994 joined with Tsinghua University, Beijing, China, where he is now a professor at the Department of Electronic Engineering. During 1997-1998, he visited Hitachi Central Research Laboratory as a HIVIPS senior researcher. His major research interests include queueing theory and traffic engineering, wireless communications and mobile Internet, vehicular communications and smart networking, and green communication and networks.

Dr. Niu has been serving IEEE Communications Society since 2000, first as Chair of Beijing Chapter and then as Director of Asia-Pacific Board, Director of Conference Publications, Chair of Emerging Technologies Committee, Director of Online Contents, Editor-in-Chief of IEEE Trans. Green Commun. & Networks, and currently Senior Editor of IEEE J. Selected Areas in Communications. He received the Distinguished Technical Achievement Recognition Award from IEEE Communications Society Green Communications and Computing Technical Committee in 2018. He was selected as a distinguished lecturer of IEEE Communication Society as well as IEEE Vehicular Technologies Society. He is a fellow of both IEEE and IEICE.