Full Name (English):	**Aifei Liu**	
Affiliated Institution and Title (English):	**Xi'an Jiaotong-Liverpool University (XJTLU)**	

Biography
(Please provide in paragraph form within 500 words.)

Dr Aifei Liu is currently an Associate Professor at the School of Al and Advanced Computing, Xi'an Jiaotong-Liverpool University (XJTLU), Suzhou, China.
Dr Liu received her PhD in June 2012, from the School of Electronic Engineering, Xi'dian University, China. She worked on array signal processing as her PhD dissertation topic, aiming to develop robust direction of arrival (DOA) estimation methods in the presence of array imperfections. From Feb 2013 to June 2017, she worked as a Research Fellow at the School of Electrical and Electronic Engineering, Nanyang Technological University (NTU). She was engaged in two projects relevant to joint temporal-spatial target detection by airborne radar and radar co-existence with communications. From Aug 2017 to Dec 2021, she worked as an Associate Professor at the College of Underwater Acoustic Engineering, Harbin Engineering University (HEU). Her research focus was developing robust and accurate target detection methods for underwater vector sensor arrays. From Jan 2021 to Feb 2025, after she joined the School of Software at Northwestern Polytechnical University (NPU), she expanded her research from traditional signal processing theory to deep neural networks (DNN) and developed several DNN models by integrating the knowledge of array signal processing into the DNN models.
Her research interests are the DNN theory and signal processing theory and their applications on radar, sonar, and communications, and applying these theories in other applications such as anomaly detection in different events.

Speech Title (English):

Pros and Cons of Deep Neural Networks on Detection of Targets by Sensors Array

Speech Abstract
(Please provide in paragraph form within 500 words.)

Most traditional array signal processing algorithms are derived from assumed mathematical models and matrix theory, with strict mathematical proofs and strong reliability. However, to achieve high-resolution estimation, it is necessary to involve matrix decomposition or high-dimensional optimization, which requires a high computational load and is difficult to implement in real-time. In contrast, deep learning-based methods utilize deep neural networks (DNNs) to map from the array covariance matrix to spatial spectra or direction-of-arrival (DOA), where the operations of deep neural networks only require multiplication and addition, making the computation simple.

This speech first introduces the advantages and disadvantages of traditional array signal processing methods. It then presents the applications of DNNs in the detection of targets by the sensor array, including two main categories: classification-based DNN and regression-based DNN. It specifically focuses on lightweight deep neural networks embedded with the domain knowledge of sensor arrays and introduces the DNN framework for the simultaneous implementation of source number detection and DOA estimation.
Finally, this speech talks about the advantages and disadvantages of fully connected DNN, CNN, and transformer-based DNN, from the perspective of estimation accuracy, computational complexity, and generalization. In addition, it also discusses the possibility and demonstrates the effect of applying transfer learning to DNN frameworks for improving the generalization of the DNN model.