**Enhancing Environment Perception for Autonomous Driving with Quaternion Neural Networks.**

**Abstract:**Environment perception is a critical factor for remote sensing systems (RSS) and a central restricting aspect for the availability and performance of the system. For example, unpredictable impairments such as illumination, noise, and severe weather conditions, such as rain, snow, and haze, adversely influence the performance of RSS vision algorithms, including tracking, detection, and segmentation. This talk addresses the ill-posed nature of the above problem, which caused several remote scene perception challenges. The quality of remote-sensing imaging is a critical aspect that affects the performance of applications. The rapid development of deep convolutional neural networks (CNNs) has led to an increasing number of new architectures and played a significant role in our daily lives. However, the high complexity of real-valued networks imposes various application challenges. This talk provides an overview of the essential neural network areas and research challenges. The key advantages of QCNNs over real-valued networks are that they can efficiently process multidimensional inputs as entities, encode internal dependencies, and solve many tasks with up to four times less learning.   For example, they can efficiently (i) encode local relations within the input features, such as between the Red, Green, and Blue (R, G, B) channels of a single image pixel, while real-valued networks treat the color channels as independent entities by summing up the convolution results and output one single channel per kernel accordingly, (ii) describe the structural relations, by describing edges or shapes composed by groups of pixels while the real-valued networks capture local (color) and global (edges and shapes) features independently, (iii) to avoid overfitting. Also, in this talk, we will demonstrate a novel QCNN framework that exceeds state-of-the-art CNN's performance on intelligent remote sensing applications. Finally, he will present the future development roadmap.