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Liming Zhang received the B.S. degree in Computer Software at Nankai University, China and M.S. degree in Signal Processing at Nanjing University of Science and Technology, China. She received her PhD degree in image processing at University of New England, Australia. She is currently an assistant professor in Faculty of Science and Technology, University of Macau. Her research interests include Computer vision, Image processing, Artificial intelligence, Machine learning, and Deep learning. She has published over 100 papers, including IEEE Transactions on Image Processing, IEEE Transactions on Signal Processing, CVPR, ect. The main contribution lies on new image and signal processing methodology – adaptive Fourier decomposition (AFD)-based signal and image processing methods and new deep network development. The image and video compression results based on stochastic AFD (SAFD) exceed the current international image and video compression standards JPEG, JPEG2000, MPEG, and also exceed the compression results of the popular deep networks. SAFD-based deep networks also perform well in alleviating the scarcity of training data.

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Speech Title (English):

Adaptive Fourier Decomposition (AFD): A New Sparse Learning Method in Signal and Image Processing

Speech Abstract

Sparse representation is a widely used machine learning method that represents signals based on dictionaries. It can be divided into two types based on the dictionary construction: analytic or learning-based spare representation. The dictionaries used in analytic methods are predefined, while those used in learning-based methods are obtained through training. The former has a formulaic decomposition process but no adaptivity to the image, the latter has the advantage of adaptivity, but the learned dictionary is unstructured. Adaptive Fourier decomposition (AFD) is a newly developed sparse representation theory initialized in Macau that combines the advantages of both types: the dictionary is predefined using interpretable mathematical kernels, and the decomposition is achieved by adaptively choosing atoms in the dictionary. Stochastic AFD (SAFD) combines AFD and random signal theory to learn the common sparse representation of multiple images at once. It has been used for image and video compression, and the results exceed the current international standards for image and video compression, including JPEG, JPEG2000, and MPEG. It is also used to construct SAFD based deep network. In this talk, the general principle of AFD and its applications in signal and image processing will be introduced.