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Speech Title: Robust Detection of Underwater Targets and Seismic Event using Optical Fiber Distributed Acoustic Sensors: Theoretical and Experimental Study

Abstract: This talk presents a comprehensive theoretical and experimental investigation into the robust detection of underwater targets and seismic events using optical fiber Distributed Acoustic Sensors (DAS). Leveraging the inherent advantages of DAS technology—such as high sensitivity, long-range monitoring capability, and immunity to electromagnetic interference—we propose a framework for enhancing the signal-to-noise ratio (SNR) and improving detection accuracy in complex underwater and seismic environments. We initially deployed a water–land DAS system at the Xinfengjiang (XFJ) Reservoir in Guangdong Province, China, to monitor earthquake events. One year later, the DAS system was upgraded with two types of spiral sensor cables at the end of the submarine cable. To mitigate heteroscedastic noise, a robust bearing estimation method was developed for the DAS system. The proposed method relies on the generalized sparse covariance fitting and optimization framework, enabling accurate tracking of fast-moving vessels. The results demonstrate the potential of this technique to support the broader deployment of DAS in marine surveillance, offshore infrastructure monitoring, and earthquake early warning systems.