		Recent Photo
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Yubing Li is a Professor with the Institute of Acoustics, Chinese Academy of Sciences, Beijing, China. He received the B.S. degree in geophysics from Tongji University in 2011, dual Master's degrees from the University of Science and Technology of China and Paris Diderot University in 2014, and the Ph.D. degree from PSL Research University, Paris, in 2018.

Dr. Li is currently a recipient of the CAS Talent Program. He also serves as the Vice Chair of the Biomedical Ultrasound Engineering Branch of the Acoustical Society of China and is a member of the National Cardiovascular Imaging Professional Committee. He served as an area chair for the International Congress on Ultrasonics in 2023 and 2025. As a Principal Investigator, he leads several major research initiatives funded by the National Key R&D Program and the NSFC, focusing on the advancement of acoustic imaging, signal processing, and inverse problems.

Speech Title (English):

Musculoskeletal Ultrasound Computed Tomography Based on Full Waveform Inversion

Speech Abstract

Full-waveform inversion (FWI) represents a sophisticated framework for high-resolution acoustic parameter reconstruction using non-linear inverse problem theory. It offers a paradigm shift from conventional B-mode ultrasound, which typically relies on pulse-echo sequences under the assumptions of a homogeneous medium and straight- ray propagation. Such traditional approaches are fundamentally limited by diffraction-induced resolution constraints and phase aberrations, particularly in musculoskeletal cases characterized by high-contrast interfaces, such as cortical bone. These limitations frequently result in suboptimal image quality and impede the precise characterization of micro-lesions, thereby restricting the clinical utility of standard ultrasonography in musculoskeletal diagnostics. In this study, we propose a ultrasound computed tomographic (USCT) reconstruction scheme utilizing a circumferential ring-array configuration with full-matrix capture. This approach ensures the comprehensive acquisition of the total wavefield—including reflected, scattered, refracted, and transmitted components—to preserve the complete structural and material information of the target. The inversion process is formulated as an optimization problem governed by multi-parameter wave equations. By iteratively minimizing the residual between modeled and observed waveforms, we achieve sub-millimeter spatial resolution at a 1 MHz center frequency. The efficacy of the proposed method was validated through numerical simulations, tissue-mimicking phantoms, *ex-vivo* specimens, and *in-vivo* experiments. The results demonstrate that FWI yields high-fidelity acoustic parameter maps that exhibit strong structural correlation with magnetic resonance imaging data. This confirms the robustness of FWI-based musculoskeletal USCT and highlights its potential for the precise detection of micro-scale

pathologies, improved visualization of soft tissues adjacent to bone, and the quantitative assessment of biomechanical tissue properties.