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Hearing the Walls of a Room: When Signal Processing and Machine Learning Meet Acoustics

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Close your eyes, clap your hands. Can you hear the shape of the room? Is the floor made of tiles or carpet? Answering such questions using only audio signals recorded by microphones form a set of multifaceted and open inverse problems, located at the narrow intersection between the fields of mathematics, acoustics and computer science. Progress on it could make the acoustic diagnosis of rooms simpler, cheaper and more accurate, or bring improvements to the fields of sound source localization, enhancement, synthesis or acquisition. This presentation will explore some facets of these questions from the angles of signal processing, machine learning and optimization, covering joint works performed in the MULTISPEECH team of Inria and the UMRAE team of Cerema over the past 4 years.

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