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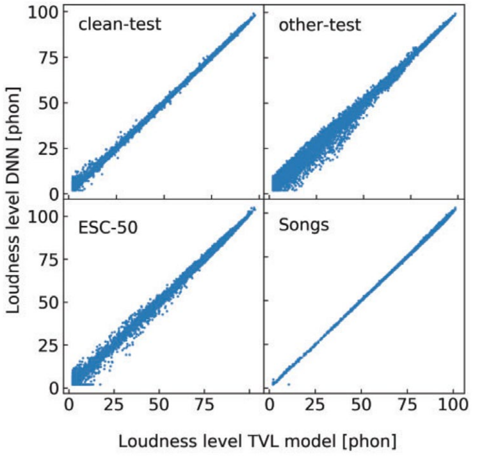
Deep neural network for perceived loudness calculation

Highly–accurate, faster than real-time perceived loudness analysis Case Ref: Moo-3793-19



The problem – perceived loudness models are computationally expensive and slow

The loudness of a sound perceived by a human listener typically differs from the physical sound level, depending on parameters such as sound level at different frequencies, duration, and time pattern.

The difference between physical level in dB and perceived loudness can be substantial. Existing loudness models either require manual calculations or are computationally expensive and slow and not able to achieve accurate real-time or faster than real-time calculations.

The solution – using DNN for perceived loudness measurements

Researchers at the University of Cambridge have developed a compact deep neural network model for predicting the perceived loudness of sound from its physical waveform. It was developed and evaluated using a well accepted but computationally expensive model, developed in Moore's group, the TVL model.

The DNN is:

1) Fast enough to allow faster than real-time processing
2) Accurate to within 0.5 phon
3) Works with any type of sound

Benefits

1. Has the potential to allow real-time control of perceived loudness levels in audio playback and broadcasting.
2. Comparable accuracy to computationally expensive model.
3. The loudness of real-world sounds (including music, speech, machine and appliance sounds) can be accurately predicted, at a low cost.

Development stage & applications

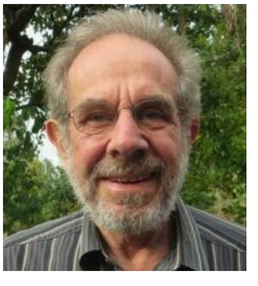
Simulation studies and proof of principle demonstrations show that this innovative approach can run several 100,000 computations per second, allowing 12 hours of audio recording to be analysed in a few minutes.

Potential applications include real time monitoring and control of audio playback / broadcasting, product design and testing, audio control for web conferencing software, home appliances and other applications that were previously limited by high cost and inaccuracies.

Commercialisation

The technology is protected by copyright and managed by Cambridge Enterprise. We are now looking for commercial partners interested in helping us develop this technology.

Professor Brian Moore



Brian Moore is Emeritus Professor in the Department of Psychology at the University of Cambridge. He specialises in mechanisms of normal hearing and hearing impairments; development of models of auditory perception, especially loudness perception.

Dr Josef Schlittenlacher

Josef Schlittenlacher used various AI techniques for hearing tests and hearing models in his postdoctoral research. He received awards from the German Organisation for Standardisation (DIN) and the European Acoustics Association for his work on loudness.

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