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Machine Learning Psychomtric Function Testing

Nikki Metzger
Washington University in St. Louis

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Mentor: Dennis Barbour

Psychometric functions resulting from psychophysical tasks relate physical stimuli to perception. Current methods of psychometric function testing have been designed to be robust and precise, at the expense of efficiency and explanatory power. The Barbour Lab has developed a novel form of psychometric inference that can trade any of these properties for another, thereby yielding an extremely flexible estimator. The current study assessed the agreement between psychometric function thresholds obtained through the lab's novel machine learning (ML) audiometric testing procedure and those obtained from the conventional method of constant stimuli in fifteen participants. Test-retest reliability of the two methods was evaluated in each ear, totaling four tests per ear and eight tests per participant. The ML audiogram tested frequencies from 1,000 Hz to 4,000 Hz, while the method of constant stimuli tested solely 2,000 Hz. The estimated hearing thresholds of these two methods were compared at 2,000 Hz. The hearing thresholds estimated by the lab's ML audiometric testing procedure were very similar to those estimated by the method of constant stimuli: the mean absolute difference between the two different estimates was 4.15 dB SPL. Additionally, the mean absolute difference between repeated measurements of the ML audiogram was 3.80 dB SPL, while the mean absolute difference between repeated measurements of the method of constant stimuli was 2.17 dB SPL. The lab's ML audiometric testing procedure therefore appears to accurately estimate hearing thresholds at 2,000 Hz, suggesting that it also accurately estimates the hearing threshold at all frequencies within the tested range.