ArticuRace: Closing the Global Speech Therapy Gap Through a Low-Resource and Interpretable AI Framework

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This experiment aimed to create an Artificial Intelligence (AI) method that rates /s/ pronunciations comparable to a speech therapist, and more accurate than adults untrained in speech therapy (teachers). This AI method was then used to provide user feedback in a speech therapy practice app. Five speech therapists and five teachers were given 20 pronunciations from the Ultrax Speech Sound Disorders Dataset, and asked to rate the clarity of the /s/ sound from "Normal" to "Very Poor". Therapist ratings were averaged to create an accepted standard, and teacher ratings were averaged to create a control group. Two AI methods were developed, one that calculates Mel-Frequency Cepstral Coefficients (MFCCs), and the other calculates spectral centroid, rolloff, and flatness. Both AI methods and the teacher ratings were compared to therapist ratings. The results showed that the teachers had higher Spearman Rank Correlations than both AI methods, and that the teachers also had a lower Mean Absolute Error (MAE) than both AI methods. An Independent Sample T-Test showed that there was no statistically significant difference between the teacher's MAE and the MAEs of both AI methods. After conducting multiple Two One-Sided Tests (TOSTs) and a Paired T-Test, both AI methods were statistically equivalent to a teacher. The results of this experiment were used to create ArticuRace, a speech therapy practice racing game that provides AI feedback equivalent to an adult untrained in speech therapy. ArticuRace is designed to engage users and to help provide access to speech therapy for people around the world.

Awards Won:
Second Award of $2,400