Diagnosing and Classifying Aphasia: Employing Deep Learning to Accelerate Recovery in Aphasic Stroke Victims

Pinto, Marek (School: Santa Teresa High School)

Over 2 million Americans suffer from aphasia, a condition that affects stroke victim's ability to communicate. Aphasia has no medical cure, but it can be improved through extensive speech-language therapy. Speech-language pathologists must first administer extensive diagnostics to find a patient's Aphasia Quotient, a measure of aphasia's severity. The full kit for this diagnostic can be costly and requires an expert to administer. Furthermore, therapists must also classify aphasia to effectively correct the speech of a victim. In order to relieve stress on stroke victims and their families, this project uses novel deep learning techniques to diagnose and classify aphasia based on a voice sample from the patient. I obtained audio data of aphasia patients from the AphasiaBank dataset and sorted them into sets for training, validation, and testing. I trained a feed-forward artificial neural network using 192 audio features to predict the aphasia quotient and category of aphasia. After 100 epochs of training, my neural network could predict the Aphasia Quotient with a mean absolute error of 15 for training data and 17-18 for validation data. Using categorical crossentropy as a measure of accuracy for classification of type, the neural network had an accuracy of 98% for training data and 60% for validation data. This prototype could serve as a good diagnostic for aphasia patients without paying for expensive tests. The results could be sent straight to a therapist for a faster and more accurate, standardized way to find areas of improvement for aphasic stroke patients.

Awards Won:
Fourth Award of $500