p-229

Saturday

Novel approaches to characterizing acoustic and linguistic features of FTD speech

R'mani Haulcy, Fjona Parllaku, Katerina Placek, Yuan Gong, Courtney Lewis, Sandra Rojas, Amy Brodtmann, Adam Vogel, Marco Vilela, Brian Tracey, Brian Subirana, James Glass

State of the art
Speech analysis has emerged as a powerful tool for characterizing progression of neurodegenerative disease and is particularly relevant to frontotemporal dementia. Typically, hand-crafted acoustic features are extracted capturing variability in pitch, amplitude and timing, and linguistic analysis are extracted including parts of speech analysis and measures of sentence complexity. While deep learning (DL)-derived acoustic and linguistic embeddings dominate current speech recognition technology, these methods are less widely applied in disease characterization.

Methodology
We analyzed a speech dataset collected at the University of Melbourne consisting of 102 FTD subjects and 152 normative controls, consisting of monologue, picture description, syllable repetition, and phonation tasks. Because the dataset contains limited longitudinal data, we focus on diagnosis classification as a means of discovering which speech features are most sensitive to disease. For a baseline comparison, we extract a set of acoustic and linguistic features commonly used in the literature. We additionally explore newer DL embeddings for linguistic analysis, novel methods for characterizing repetition tasks, and models exploiting emotions analysis.

Results
While more standard approaches are able to discriminate FTD from healthy subjects, discrimination is improved by incorporating linguistic embeddings and new characterization of repetition tasks. In monologue tasks, FTD subjects follow a different time course in predicted emotions than normative controls, with a trend toward decreased “happy” scores over time.

Conclusion
Both hand-crafted and DL-derived features can be used to characterize speech in FTD. A current limitation of DL is lack of interpretability, which we address in ongoing work.

Conflicts of interest

Katerina Placek, Marco Vilela and Brian Tracey are full-time employees of Takeda Phamaceuticals, Inc.