UNIVERSITY OF MINNESOTA
Driven to Discover℠

SALSA - Automated Speech Assessment

For Quantitative Neuropsychological Cognitive Assessment

Technology No. z08194

IP Status: Issued US Patent; **Application #:** 12/652,535

SALSA is a software program that automates quantitative analysis of spontaneous speech and language for use in assessing neuropsychological cognitive impairment caused by a variety of factors.

Quantitative Speech Assessment across a Wide Range of Metrics

SALSA speech assessment software analyzes spontaneous speech samples produced in response to several types of stimuli including picture descriptions, recall of a story, or a spontaneous narrative on a given topic, or timeseries data such as from wearable devices (heart rate, etc.). Specifically, the software automatically assesses speech fluency composed of several prosodic characteristics including filled and silent pause density and their duration, variability in voice pitch and repetitions. Through this prosodic assessment, the software is able to analyze a patient's speech and language characteristics to provide important and quantitative neuropsychological insight on the patient.

Automated Speed Analysis Improves Cognitive Assessment Efficiency

Current methods for cognitive testing based on spontaneous speech are limited to general and subjective speech characteristics that can be assessed by hand. These characteristics typically consist of subjective rating scales – on a scale of 1-5, is the speech fluent? On the other hand, quantitative speech and language assessment methods tend to be extremely labor-intensive. Calculating even something as deceptively simple as the mean pause or word duration in a 60 seconds sample of continuous speech would require considerable effort and specialized tools to perform manually. SALSA automates this otherwise labor-intensive speech analysis process and thus reduces the burden on human resources and may allow less qualified personnel to administer such an assessment. Moreover, the output of this technology is strictly quantitative

and would likely have a greater value in the assessment of neuropsychological impairment. Furthermore, this technology is well aligned with current trends towards electronic health records and greater sharing of medical information because it provides a standard and transferable analysis. Though the ease and effectiveness of SALSA's automated analysis and its ability to provide a comprehensive assessment across a number of criteria make this technology potentially valuable for a wide variety of applications, it has already displayed its effectiveness in a number of specific roles.

Speech Analysis in the Assessment of Neuropsychological Impairment

The quantitative speech assessment and analysis provided by SALSA may be used in characterizing speech and language manifestations of a number of neurological, psychiatric, and speech disorders. The intended application of this technology is for characterizing speech produced by patients with dementia, schizophrenia, epilepsy, autism spectrum disorders, aphasia, apraxia and in assessing the cognitive effects of medications.

Status

- SALSA available in Python 3.0, with enhanced API to work with any timeseries data
- Available on App Store for iPad (Swift 5 compatible)

Researchers:

Serguei Pakhomov, PhD , Assistant Professor, Department of Pharmaceutical Care & Health Systems, College of Pharmacy

References

Pakhomov, Serguei VS, Wrenda Teeple, Anne M. Mills, and Michael Kotlyar., https://doi.org/10.1037/pha0000089, Experimental and clinical psychopharmacology 24, no. 5 (2016): 341.