UDSv4 dVoice and Q&A Session

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Thursday, October 17, 2024

2024 Fall ADRC Meeting

UDSv4: Defining a new standard for the field

Aligned with key scientific advances

NACC

Clinical Task Force

ADRD Disease Modifying Drugs

Form A4a: ADRD-Specific Treatments

Social Determinants of Health

A1a: Social Determinants of Health

ATN

- **A: Amyloid**
- **T: Tau**
- **N: Neuro-degeneration**

New Concepts

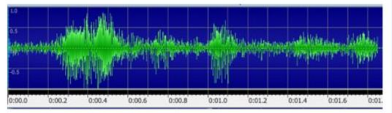
- **Subjective Cognitive Decline**
- **Mild Behavioral Impairment**
- **Addition of the new verbal learning test**

More Inclusive

- **More inclusive gender and sexual orientation questions**
- **Captures multi-racial identity**

Digital Voice

- **Neuropsychological exam**



Kind AJH, Buckingham WR. Making Neighborhood-Disadvantage Metrics Accessible - The Neighborhood Atlas. N Engl J Med. 2018 Jun 28;378(26):2456-2458. doi: 10.1056/NEJMp1802313. PMID: 29949490; PMCID: PMC6051533.

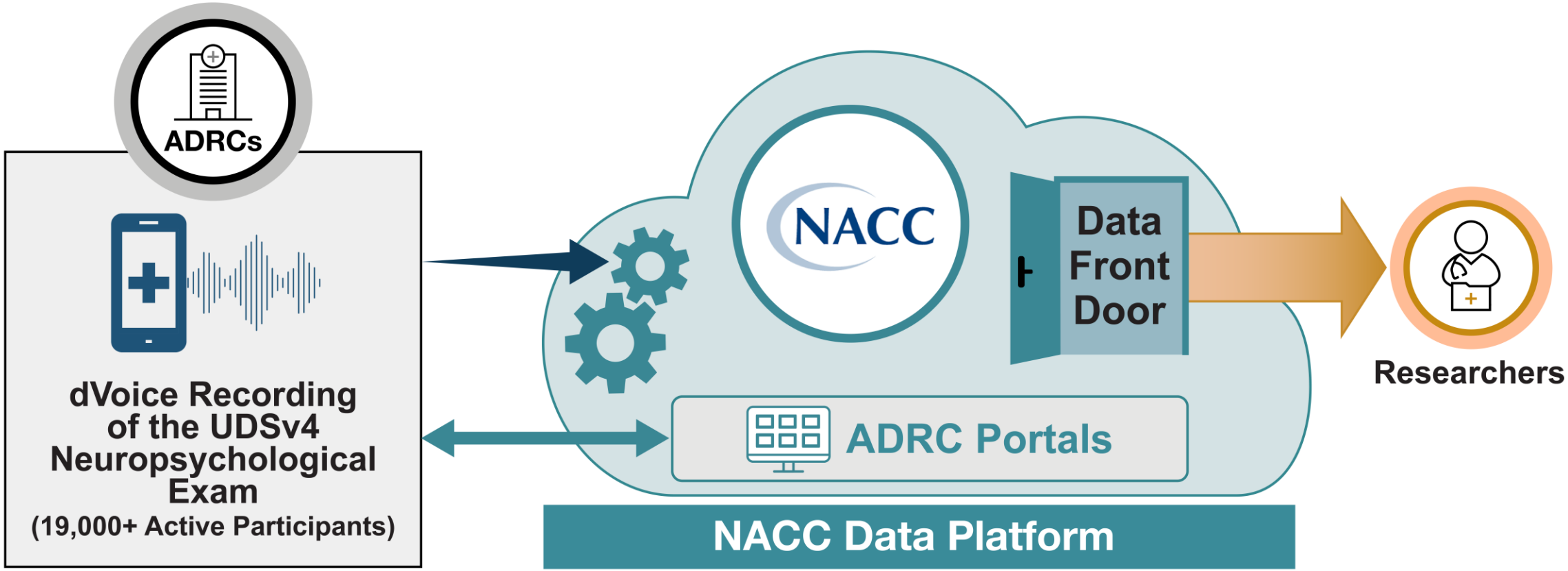
dVoice Forms and Guidelines

- **UDSv4 Digital Voice Webpage –** Provides a central hub for ADRCs interested in learning more about digital voice data collection as part of UDSv4
- **Digital Voice Start-up Checklist -** A guide for ADRC's and other interested groups in getting started to collect digital voice audio recordings as part of the UDSv4 cognitive exam for research analysis.
- **IRB Protocol and Informed Consent Language -** Provides ADRC's with guidelines, example IRB protocol and informed consent language, and helpful suggestions to aid centers in obtaining regulatory compliance for the collection and storage of digital voice data
- **Digital Voice Recording Manual -** Provides in-depth instructions and best practices for collecting, storing, and processing the audio data
- **FAQ**

View available resources:

bit.ly/UDSv4_DigitalVoice

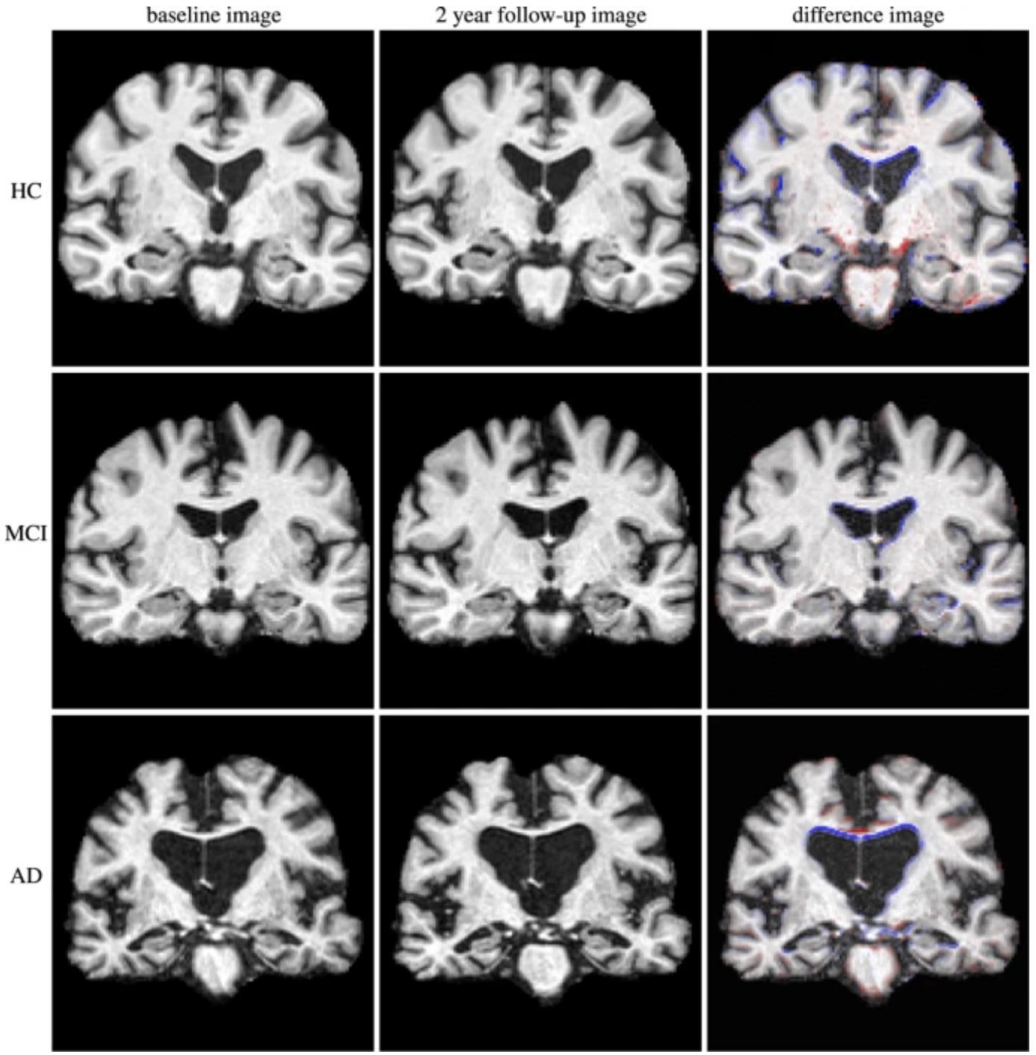
UDSv4 dVOICE Recordings



QC, De-ID, Analysis, Update Governance

Why Imaging? You Can See the Progression

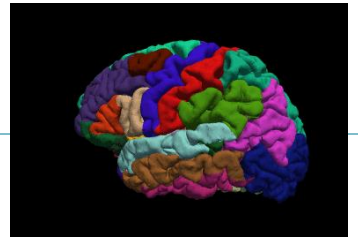
Figure 1



Ledig, C., Schuh, A., Guerrero, R. *et al.* Structural brain imaging in Alzheimer's disease and mild cognitive impairment: biomarker analysis and shared morphometry database. *Sci Rep* **8**, 11258 (2018). https://doi.org/10.1038/s41598-018-29295-9

Data from Alzheimer's Disease Neuroimaging Initiative

Freesurfer: A History Reminder*

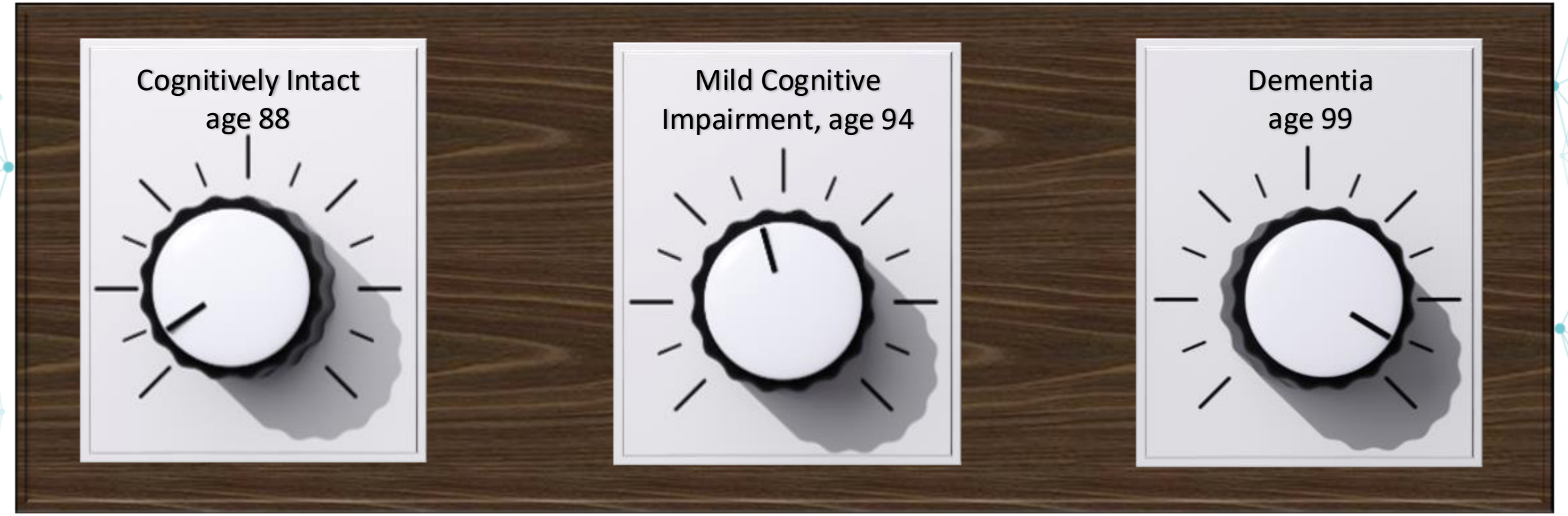


- First Team: Bruce Fischl, Anders Dale, Martin Sereno, Doug Greve
- 1999: First release
  - v1. cortical based analysis: segmentation and surface reconstruction
  - v2. cortical based analysis: inflation, flattening, surface-based coordination system
  - v3. high resolution intersubject averaging, coordinate system for cortical surface
- 2000: Cortical thickness
- 2001: Automated manifold surgery: constructing geometrically & topological correct models of cortex
- 2002: Whole brain segmentation
- 2004: Automated parcellation
- 2006: Automated labeling of gyral-based regions of interest
- 2022: 57,541 copies downloaded worldwide

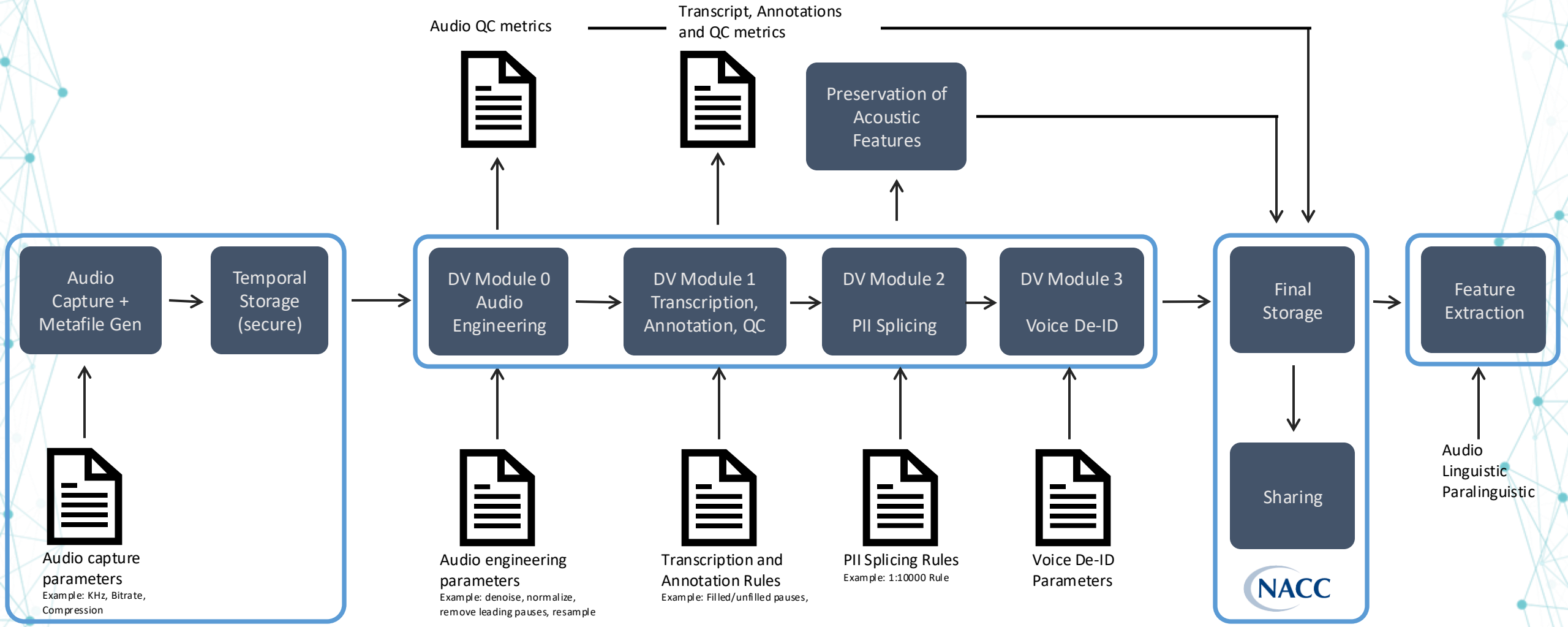
ADNI, UK Biobank, Human Connectome Project, Framingham Heart Study, ADRCs …Adolescent Brain Cognitive Development Study

Why Voice? You Can Hear the Progression

Prompt: *"How does yeast cause dough to rise?"*



”Freesurfer” of Digital Voice



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Collaborators:

Massachusetts Institute of Technology

Alzheimer's Drug Discovery Foundation

Alzheimer's Disease EMORY ADRC Research Center

GRIP

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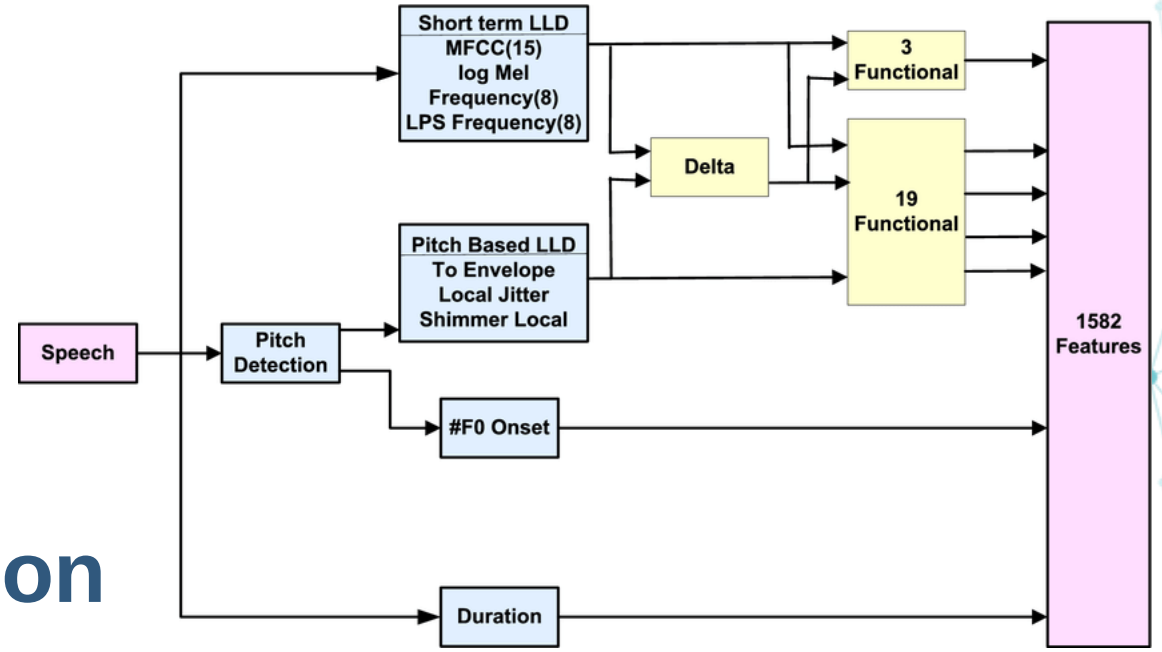
What Can Be Done Now: Audio

openSMILE
audio feature extraction

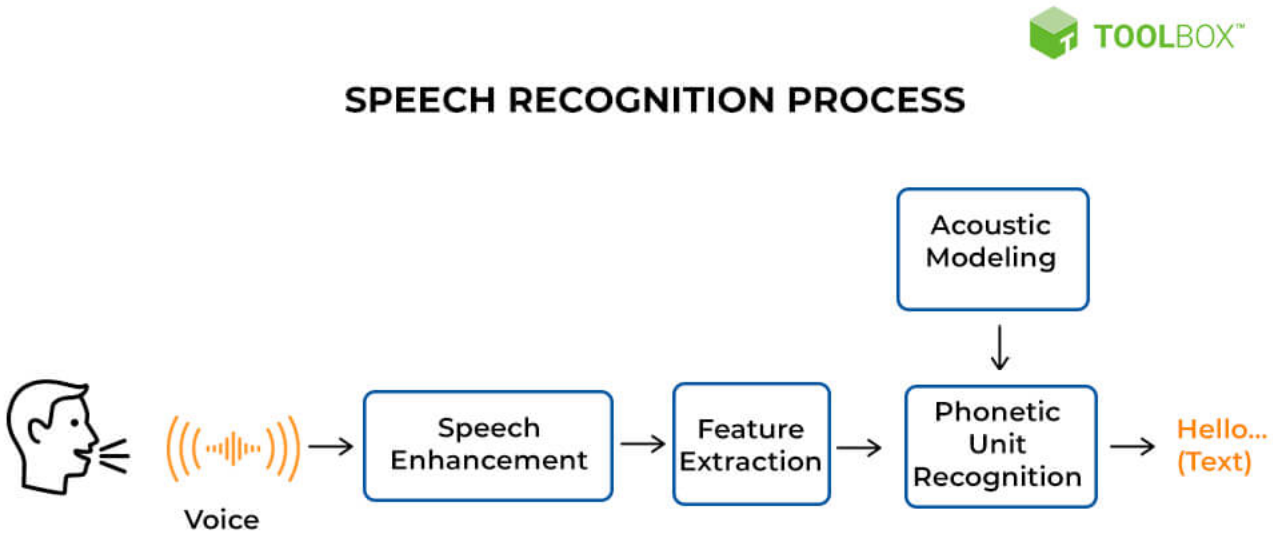


Automated Feature Extraction

Features

- Prosodic: rhythm, intonation, musical quality
- Spectral: phonetic patterns, speaker trains, sound spectrum
- Sound Quality: Jitter and shimmer", voice quality
- Cepstral: change in wave forms, harmonic frequencies

What Can Be Done Now: Text



”Hands free” Transcriptions

English

Non-English

No Speech

Science It Has Produced

Observational Study > J Med Internet Res. 2022 Dec 22;24(12):e42886. doi: 10.2196/42886.

Association Between Acoustic Features and Neuropsychological Test Performance in the Framingham

Front Dement. 2023; 2: 1214940.

PMCID: PMC11192548

Huitong Ding [1], Amiya
Sophia Lu [5], Xiao Mia

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10.14283/jpad.2022.66.

Prediction of Alzheimer's disease progression within 6 years using speech: A novel approach leveraging language models

nated

Identification of digital

> JMIR Aging. 2024 Aug 22:7:e55126.

Samad Amini, Boran Hao, Jingmei Yang, Cody Karjadi, Vijaya B. Kolachalama, Rhoda Au, Ioannis C. Paschalidis

, J Glass, S Hardy,

PMCID: PMC10657667

Published online 2023 Nov 7. Prepublished online 2023 Oct 11. doi: 10.3233/JAD-230560

PMID: 37840494

Detection of Mild Cognitive Impairment Semantic, Acoustic Voice Features: The I Heart Study

Huitong Ding [1 2], Adrian Lister [3], Cody Karjadi [1 2], Rhoda Au [1 2 4 5], H
Brian Bischoff [3], Phillip H Hwang [1 2 4]

Fusion of Low-Level Descriptors of Digital Voice Recordings for Dementia Assessment

Cody Karjadi,[a,b,c,1] Chonghua Xue,[b,1] Claire Cordella,[d] Swathi Kiran,[d,e] Ioannis Ch. Paschalidis,[e,f] Rhoda Au,[a,b,c,g,h] and Vijaya B. Kolachalama[b,e,h,i,*]

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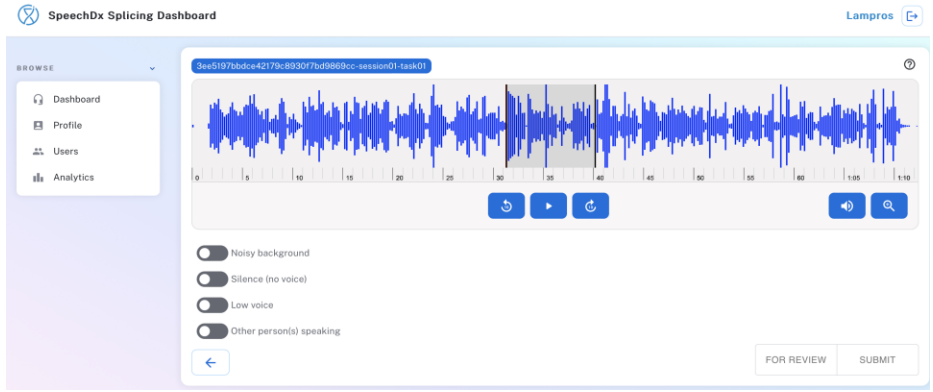
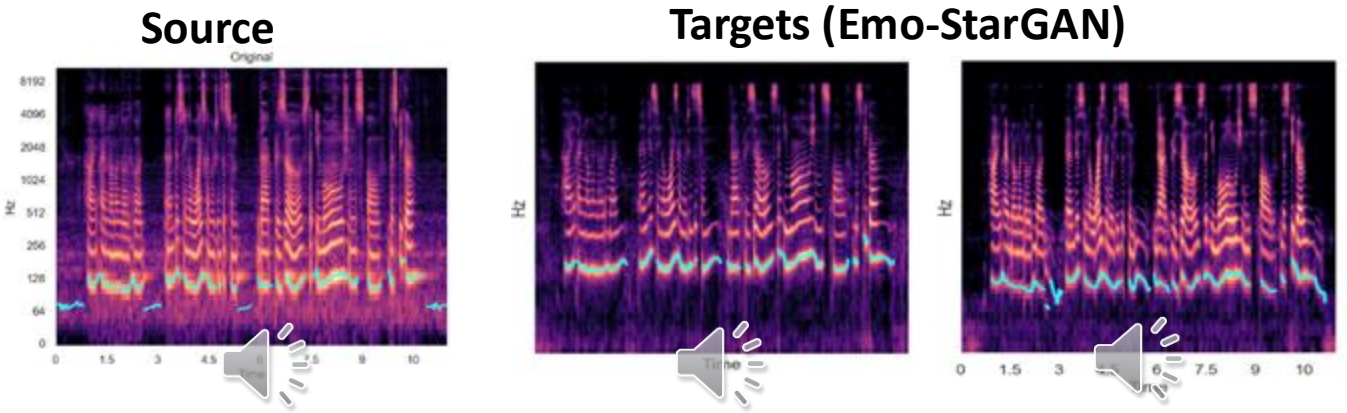
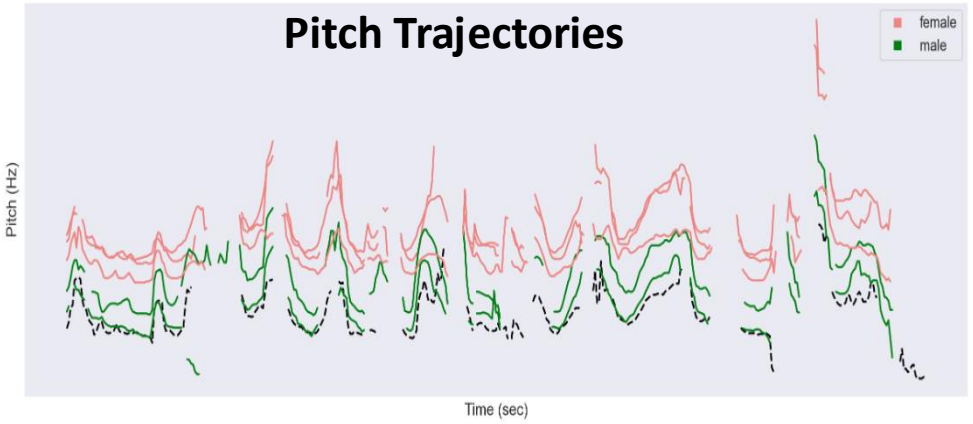
Coming Soon: De-identification Tools

- v1: Personal Identifying Information (PII) Splicing

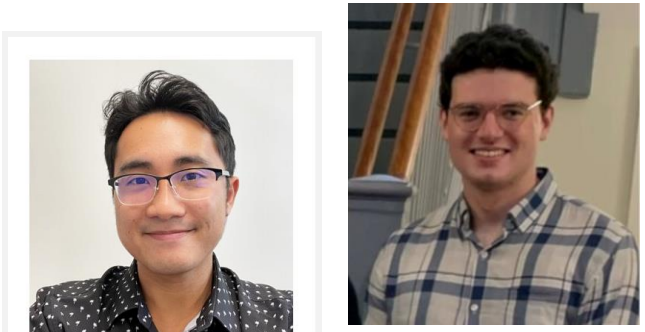
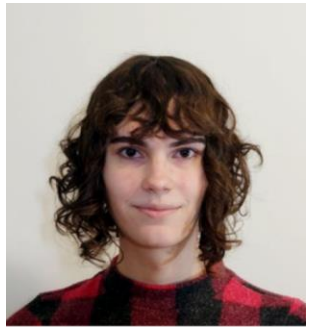


- v1: Voice Alterations





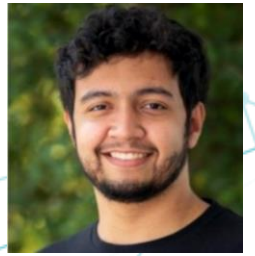
Thank you!

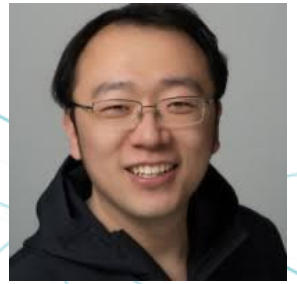













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