

LANGaware: Non-invasive Speech-based Screening for Cognitive Impairment with PET-confirmed Validation

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90.0%

Weighted F1 — MCI vs. PET-confirmed labels

83.9%

Weighted F1 — SCI vs. PET-confirmed labels

2,621

Analyzed speech data points

600+

Multimodal digital biomarkers

NEW IDEAS
AMYLOID-PET

Validated within the nationwide New IDEAS amyloid-PET study

★ The ONLY New IDEAS add-on study to pass peer review

Embedded as a digital speech **add-on**, LANGaware benchmarked its non-invasive biomarkers **head-to-head against PET-confirmed diagnoses** — gold-standard, imaging-defined ground truth across geographically diverse U.S. clinical sites.

Peer-reviewed

Amyloid-PET labels

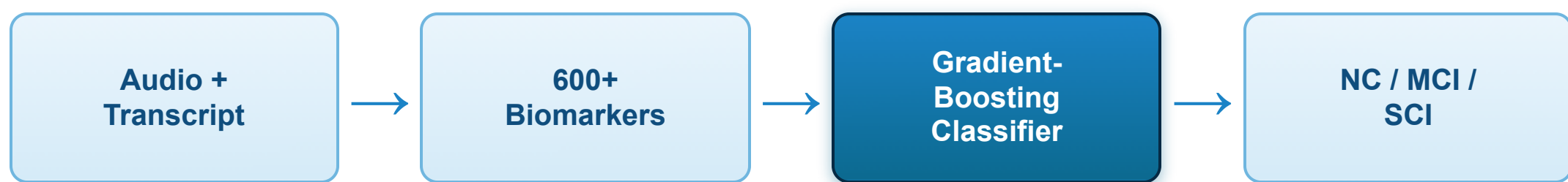
Multi-site U.S. cohort

Background & Aims

- ◆ Neurodegenerative conditions — including dementia and mild cognitive impairment (MCI) — manifest early as **subtle alterations in speech and language**, often preceding measurable functional decline.
- ◆ We extend prior validation to an English-speaking U.S. cohort carrying **gold-standard, amyloid-PET-confirmed diagnoses** from the New IDEAS study.
- ◆ Objective: establish the **robustness, generalizability, and translational readiness** of the non-invasive LANGaware screen against imaging-defined ground truth.

Approach & Methods

- ◆ Population: **2,621 analyzed data points** — standardized verbal elicitation tasks captured remotely through the LANGaware platform across geographically diverse U.S. sites.
- ◆ Each participant completed a structured battery of **18 elicitation tasks** spanning picture description, event narration and over-learned narrative.
- ◆ A multimodal AI framework jointly models **acoustic signal and ASR transcript**, deriving **>600 proprietary biomarkers** across vocal, lexical, syntactic, semantic and pragmatic dimensions.
- ◆ Gradient-boosting classifiers separate three cognitive strata — NC, MCI, SCI — with generalization assured via **nested 5-fold cross-validation**.

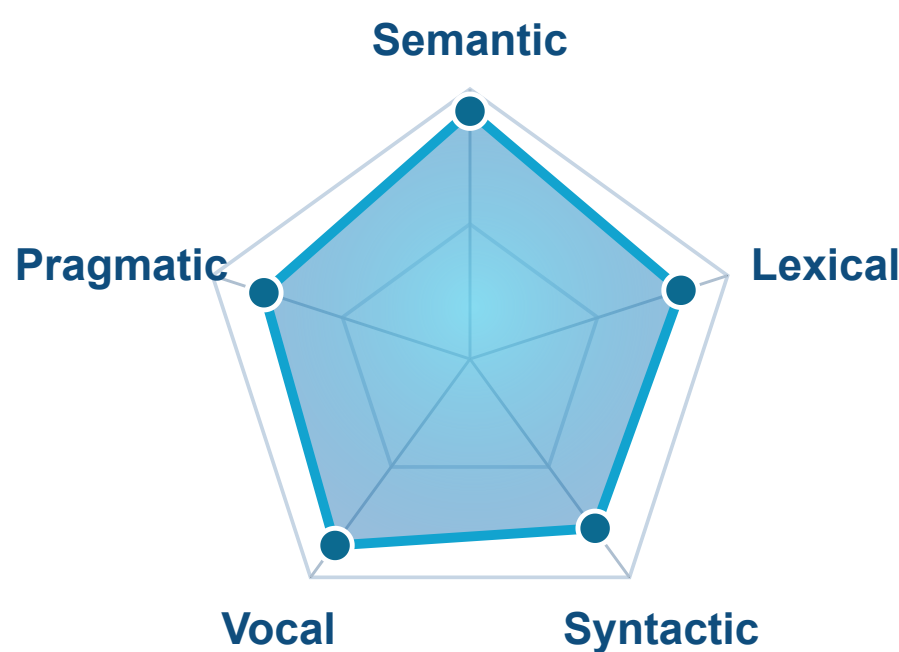


Multimodal Digital Biomarkers

- ◆ Fully non-invasive: derived from brief, remotely administered speech — **no venipuncture, no imaging** at the point of screening.
- ◆ Over 600 engineered features capture the **acoustic and linguistic signatures** of cognitive change.
- ◆ Rigorous feature selection isolates the markers most discriminative between impaired and control cohorts.

LANGaware Analytics Platform

- ◆ **Cohort Comparison** — situates individual performance against matched patient and control distributions.
- ◆ **Model Interpretation** — attributes each prediction to specific speech and language dimensions.
- ◆ **Configurable dashboards** — from population-level overviews to granular single-patient views.

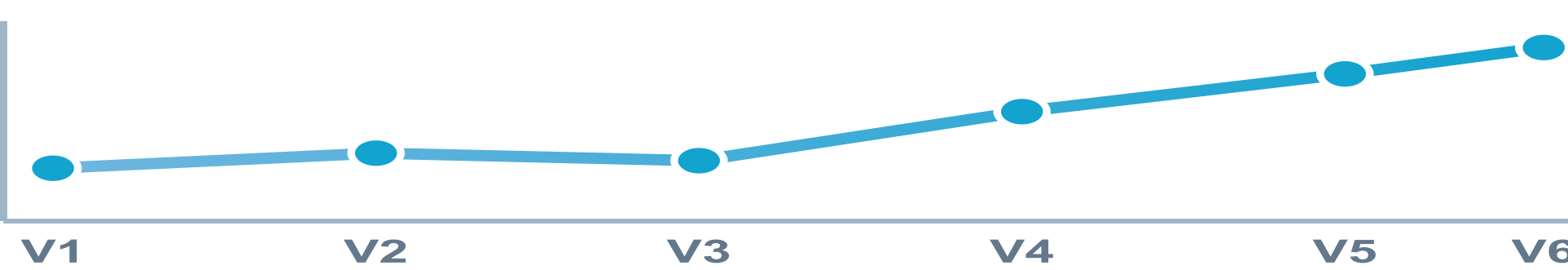


PET-confirmed Validation Cohort

- ◆ Diagnoses anchored to **amyloid-PET imaging** from New IDEAS — an imaging-defined clinical reference standard.
- ◆ Cohort weighted toward **MCI and SCI**, enabling direct head-to-head benchmarking of speech-derived labels against PET.
- ◆ Demonstrates concordance between a low-cost, scalable screen and gold-standard neuroimaging.

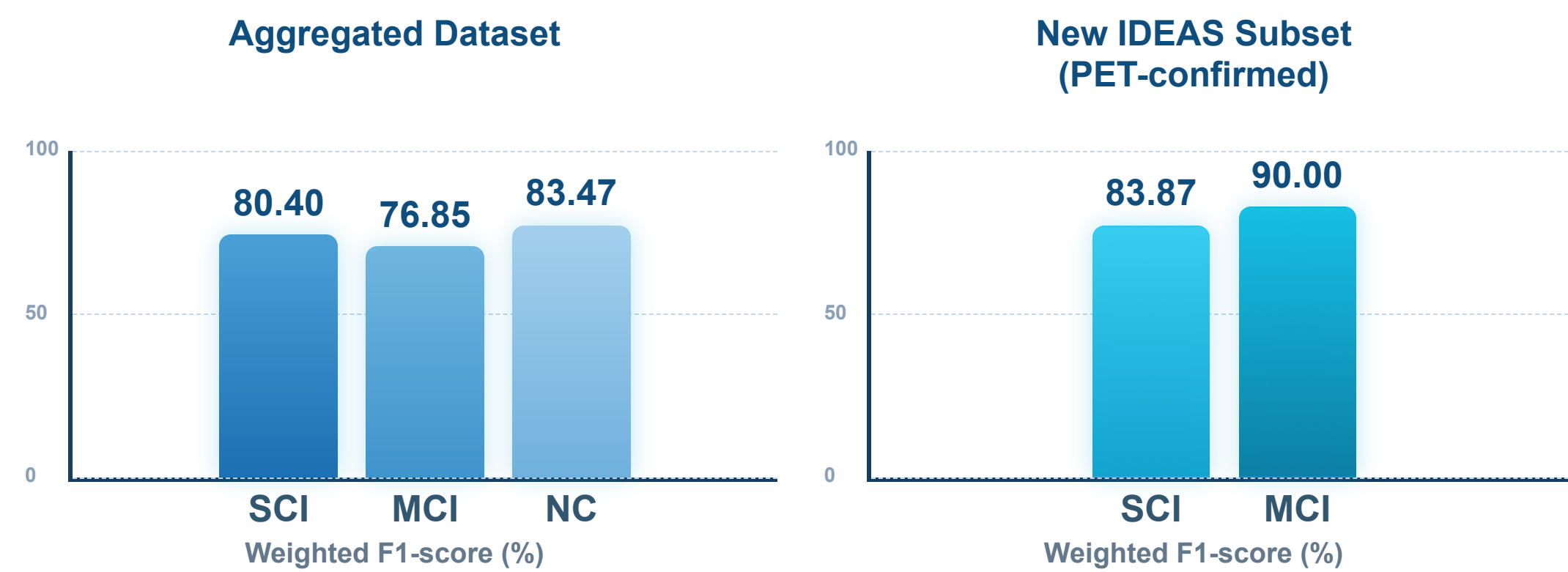
Longitudinal Monitoring

- ◆ Repeated remote assessments track cognitive status against elapsed time or patient visits.
- ◆ Enables close monitoring of disease progression and symptom evolution over time.
- ◆ Supports scalable, at-home follow-up between clinic appointments.



Experimental Results

A unified multiclass model (NC / MCI / SCI), trained on the aggregated dataset and benchmarked against **PET-confirmed New IDEAS labels**. Weighted F1-scores:



- ◆ Peak concordance on the **PET-confirmed MCI stratum** — the most clinically actionable, hardest-to-detect group — at **90.0%**.
- ◆ Stable performance **across heterogeneous populations and all cross-validation folds**.

Conclusions

- ◆ LANGaware delivers strong, **PET-aligned discrimination** of cognitive status from non-invasive speech alone.
- ◆ Concordance with amyloid-PET diagnoses evidences **robustness, generalizability and clinical credibility**.
- ◆ Positions LANGaware as an **accessible, scalable, low-cost first-line screen** — from primary care to specialist memory clinics.
- ◆ Enables **earlier identification** of impairment and better-targeted referral for definitive diagnostic workup.

Where LANGaware Fits

Primary Care	Neurology & Memory Clinics	Post-Diagnostic Services
◆ Early diagnosis ◆ Population screening ◆ Fewer unnecessary referrals	◆ Informed decisions ◆ Verify cognitive decline ◆ Differential diagnosis	◆ Progression monitoring ◆ Treatment-efficacy tracking ◆ Remote follow-up