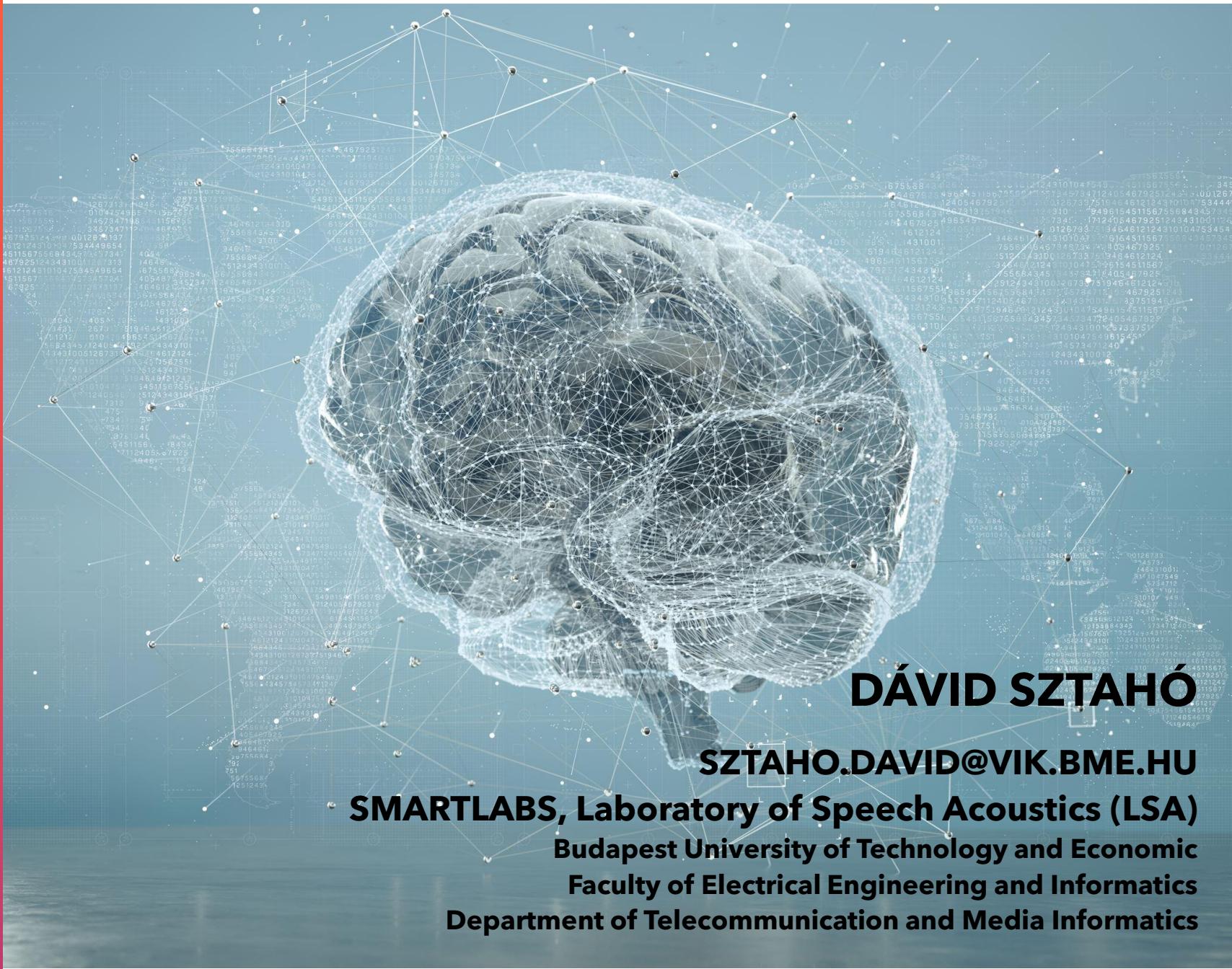


AI-BASED AUTOMATIC LANGUAGE INDEPENDENT DEMENTIA DETECTION PROJECT PLAN

LEVERAGING
ARTIFICIAL
INTELLIGENCE FOR
EARLY DEMENTIA
DIAGNOSIS



Why Early Dementia Detection Matters

Importance of Early Detection

Early dementia detection enables timely interventions and improves quality of life for patients and caregivers.

Limitations of Traditional Methods

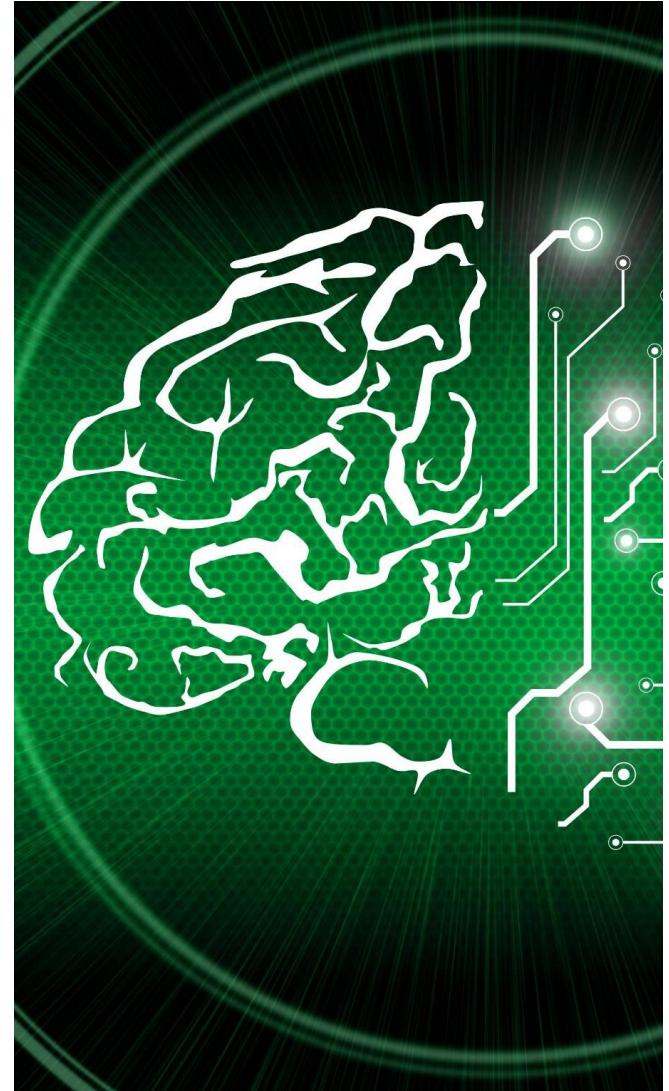
Traditional diagnostic tools like brain PET scans are expensive and not scalable for mass screening.

Speech as a Biomarker

Speech and language changes are early indicators of cognitive decline and useful biomarkers for dementia detection.

AI and Multimodal Diagnostics

AI-based speech and text analysis combined with other biomarkers create scalable, multilingual detection tools.



Detailed Approach for Acoustic and NLP Biomarkers

Acoustic Speech Modeling

Utilize unsupervised models like wav2vec2 and wavLM to extract speech embeddings for dementia classification.

Fluency Marker Extraction

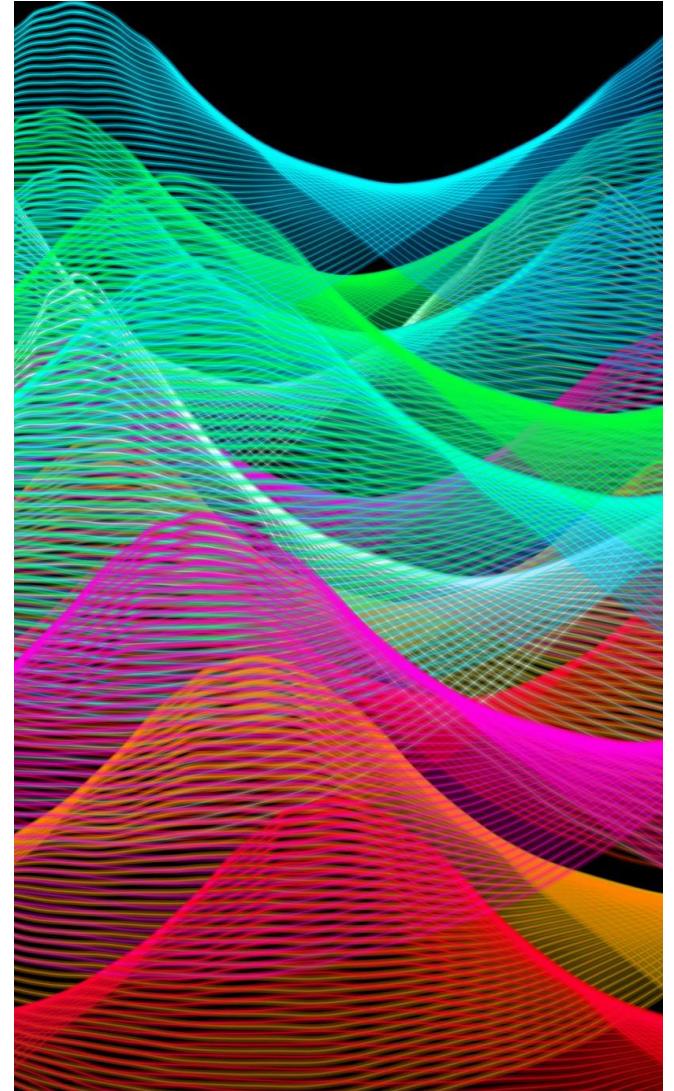
ASR systems detect hesitations, restarts, and phoneme repetitions as indicators of cognitive decline.

Transformer-based NLP Analysis

Fine-tune BERT models to analyze semantic, syntactic, and pragmatic anomalies in patient speech.

Integrated Multimodal Biomarkers

Fuse acoustic and linguistic features using explainable AI to improve detection accuracy and interpretability.



Partners with Existing Expertise

AFFILIATION

FIELD

EXPERTISE

SMARTLABS - Laboratory of Speech Acoustics
Budapest University of Technology and Economic
Faculty of Electrical Engineering and Informatics
Department of Telecommunication and Media Informatics

speech and text

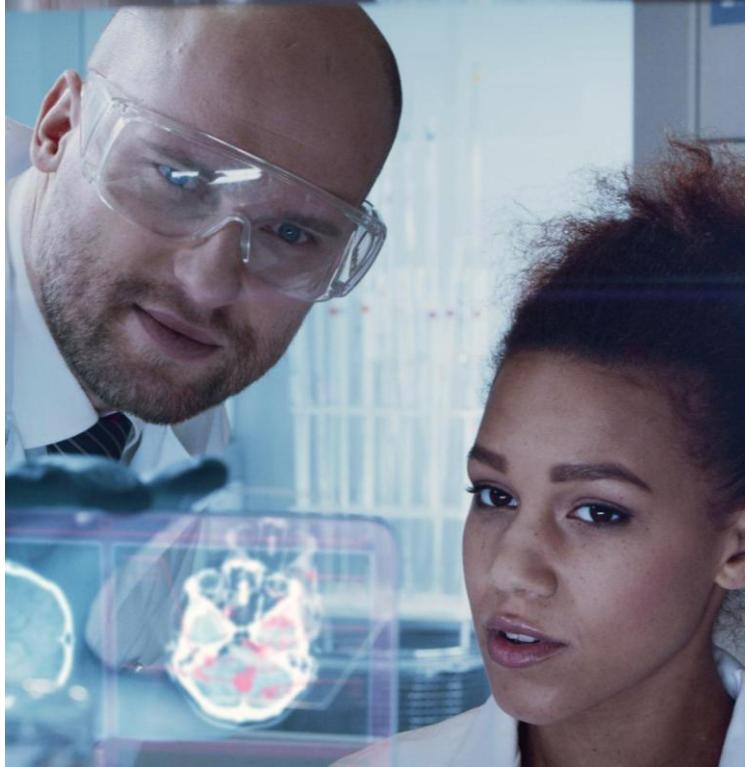
pathological speech processing for diagnostics
AI powered healthcare systems using speech and text
speaker recognition
paralinguistic analysis
machine learning and deep learning in speech technology

Processing of Speech and Images (PSI)
KU Leuven
Faculty of Engineering Science / Dept. Electrical
Engineering

automatic speech recognition (also for pathological speech)
spoken language understanding
speech assessment and relating bio-signals (e.g., EEG)

Biomarkers Beyond Speech and Text

BIOMARKER TYPE	EXAMPLES	PARTNER EXPERTISE NEEDED
Neuroimaging	MRI, PET scans	Radiology, Imaging Analysis
Genetic	APOE4 allele	Genomics, Bioinformatics
Blood-based	Amyloid-beta, Tau proteins	Clinical Chemistry, Lab Diagnostics
Cognitive Tests	MMSE, MoCA	Neuropsychology
Longitudinal Data	Patient follow-up records	Clinical Research, Data Management



Partner Contributions and Expected Outcomes

Consortium Partner Contributions

Partners provide expertise in clinical research, neuroimaging, genetics, and biomarker analysis to support the project.

Collaborative Benefits

Collaborators gain access to advanced AI methods, joint publication opportunities, and clinical tool development participation.

Funding and Sustainability

Consortium explores funding sources like EU Horizon to ensure project sustainability and scalability.

Expected Outcomes

Deliverables include a multilingual AI system for dementia detection, a prototype, and clinical integration roadmap.