

Dementia Diagnosis using Text and Speech Data

Introduction

- 1 Early detection of dementia is critical for providing effective support and ensuring quality-of-life
- 2 We developed ACOUSTICS (AutomatiC classificatiOn of sUbjectS with demenTIa and healthy Controls using text transcriptions and Speech data)
- 3 It is end-to-end ensembled deep learning-based pipelines to diagnose dementia on the basis of audio and text samples.

Data Labeling and Preprocessing

- 1 **Datasets:** Dementia Bank Pitt Corpus (PITT) and Wisconsin Longitudinal Study (WLS).

	Train		Test	
	Non-Dementia	Dementia	Non-Dementia	Dementia
PITT	171	152	71	65
WLS	63	16	30	7

- 2 We leveraged the provided toolkit to preprocess the transcription and audio. We also resampled the audio from 44.1kHz to 16KHz.
- 3 We extracted the log-mel spectrogram framewise for analysis window of 1s duration with a shift of 50mS from the audio files as additional features.

Text Model

- 1 We generated a deep learning model using **pre-trained Transformer-based architectures focusing on the Bidirectional Encoder Representations from Transformers (BERT) model**
- 2 We implemented a classification layer to get binary class labels corresponding to "positive" and "negative" based on our label.

Speech Model

- 1 We generate a deep learning model using log-mel spectrogram features. We have adopted a **miniature version of the Xception network**.
- 2 The speech-image classification problem is helpful in the context of AD, given that Spatio-temporal structures of the audio signal are being made use of to get insights.

Evaluation

- 1 We ensembled two models to better identify the subject's state.
- 2 The ensemble model contains both the speech and textual parameters to provide a more robust solution for the Dementia classification.
- 3 The two models have been ensemble based on the unequal weighted average of their accuracies at the classification layer to provide a single output prediction.
- 4 Our ensemble model indicates **89.8%** accuracy.

ACOUSTICS Flow

