

Speech-Based Detection of Alzheimer's Disease in Conversational German

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Motivation

- Worldwide population is ageing rapidly
- Percentage older than 60 years
- 4 – 8 % prevalence of dementia (population aged 60+)
- No known cure, but early therapy delays the disease
 - Large scale cognitive status monitoring
- State of the art diagnosing is costly and takes a lot of expert time

1950	8 %
2013	12 %
2050	21 %

→ Cognitive decline will become a mayor challenge

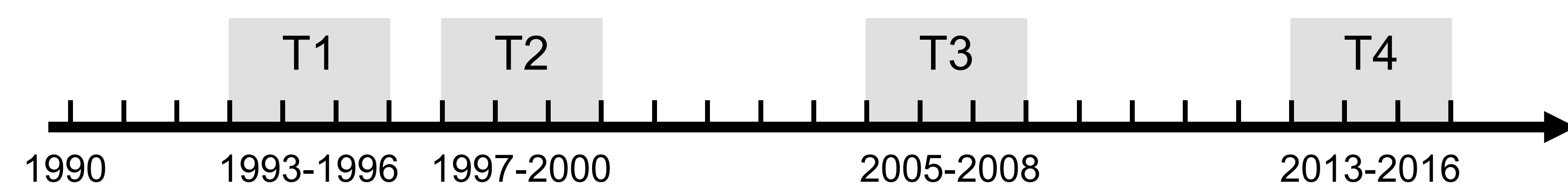
Dementia and Speech

- Dementia affects human speech and language
- Changes occur very early
- Promising candidate for new approaches to diagnose dementia
- Speech has been used to detect dementia
 - Carefully controlled lab conditions
 - Test recordings
 - Small number of subjects

Database: ILSE

- Biographic interviews
 - Semi-standardized
 - Several hours duration
- Cognitive diagnoses made by psychiatrists
- Four measurements
 - Over time some participants developed dementia
- Real world data set
 - Natural prevalence of dementia
 - Highly unbalanced
- Selected data:
 - Cognitive diagnoses available
 - Transcription available

	Diagnoses		
	control	AACD	AD
Measurement 1	51	4	-
Measurement 2	19	8	-
Measurement 3	10	1	5
Total	80	13	5



Features



- Pause-based features
 - Mean silence duration
 - Mean speech duration
 - Silence rate
 - Silence count ratio
 - Silence-to-speech ratio
 - Mean silence count
- Pause- and text-based features
 - Silence-to-word ratio
 - Long-silence-to-word ratio
 - Word rate
 - Phoneme rate

Experiment

- Extract features per interview
- Stack features
 - 10 dimensional feature vector
- 98 samples
 - unbalanced data set
- Three-class classification problem: control ↔ AACD ↔ AD
- LDA classifier
 - 3-fold cross-validation

Results

- Accuracy: 85,7%
- Unweighted average recall 0.66

	precision	recall	F-score
control	0.88	0.96	0.92
AACD	0.60	0.23	0.33
AD	0.80	0.80	0.80

