

An Unsupervised Learning Approach for Detecting Relapses from Spontaneous Speech in Patients with Psychosis



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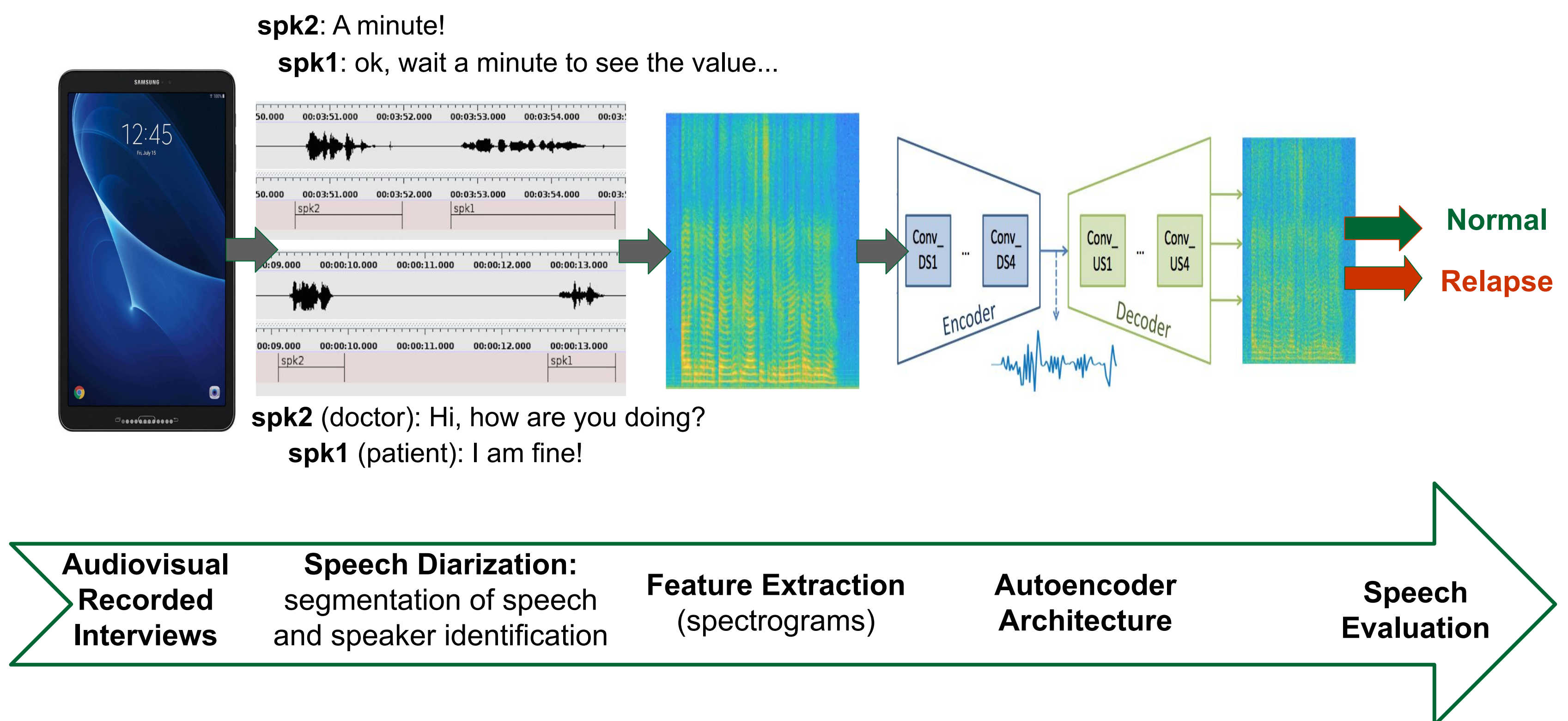
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<https://cvsp.cs.ntua.gr>, <https://eprevention.gr>



Methodology Overview



Evaluation Protocol

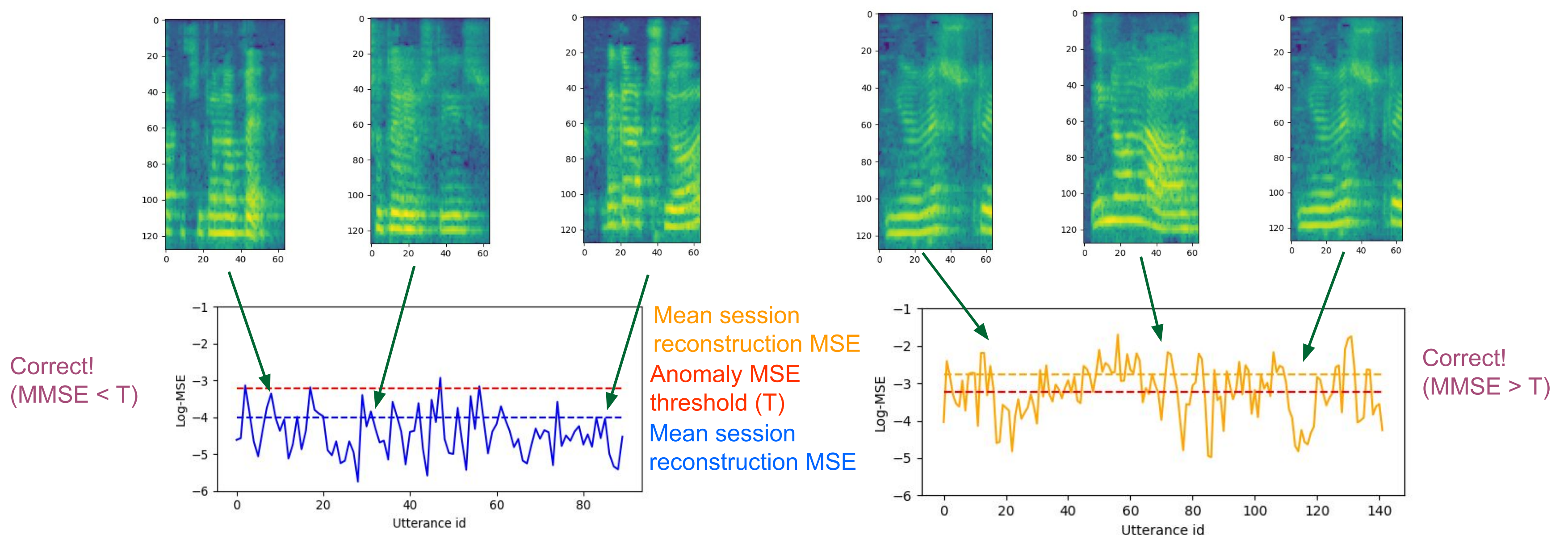
- 5 patients who experienced a relapse: 95 utterances, 8791 seconds
- Personalized modeling:** separate models were trained for each patient, using **only** speech segments corresponding to **clean data**.
- Performance was compared for each subject-dependent speech model between the speech segments corresponding to relapse, or pre-relapse periods, and “unseen” clean data.
- Mean Square Error (MSE) between the reconstructed and the true spectrograms was used as the evaluation metric, aggregated over each session in the testing set.

Results

- Smaller median reconstruction error for speech from stable sessions, compared to *relapsing* or *pre-relapsing* sessions.
- However, no differentiation between segments during *pre-relapsing* or *relapsing* periods.
- Correct classification in a percentage **higher than 70%** for three of the five patients, reaching **up to 80%** for one of the five patients.
- Global model -> Relapsing/pre-relapsing states not as easily discriminated from the stable ones, compared to the personalized models, *offering an indication that relapse markers in speech appear in a subject-specific manner*.

Patient ID	MMSE (C)	MMSE (P)	MMSE (R)	macro-F1
#1	0.00045	0.00212	0.00197	0.71
#2	0.00058	0.00349	0.00073	0.61
#3	0.00029	0.00097	0.00309	0.80
#4	0.00023	0.00086	0.00042	0.73
#5	0.00537	0.00270	0.00420	0.60
Global	0.00008	0.00008	0.00010	0.61

Per-session medians of the reconstruction mean-square error loss (MMSE) for each of the patients and for a subject-independent model, depending on whether the state of the patient during the sessions is clean (C), pre-relapsing (P), or relapsing (R), as well as macro-F1 scores regarding the classification of the patient state as stable (clean) or anomalous.



Acknowledgements

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For more information and project results, visit the project page: <https://eprevention.gr>

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