Articulatory normalization via imitation strategy in phone classification task

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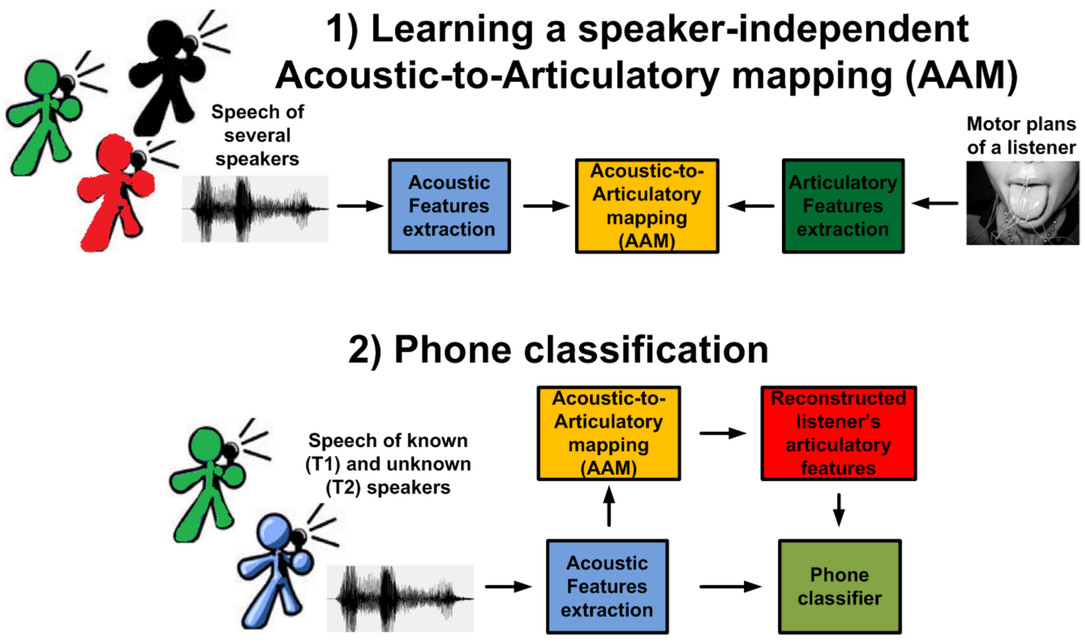
Introduction

Automatic Speech Recognition (ASR) systems classically apply normalization strategies that minimize inter-speaker variability by explicitly removing speakers' peculiarities ([1], [5]) or adapting different speakers to a reference model ([7]) or creating a compact adaptable and robust models ([2]) without exploiting speakers' variations in learning and recognition processes.

Approach

We propose a speaker normalization strategy that uses measured articulatory information and test it in a phone classification task ([4]).



Questions

1) Does the Articulatory normalization produce a more accurate phone classification w.r.t.

- no normalization strategy ?
- a corresponding acoustic normalization strategy?

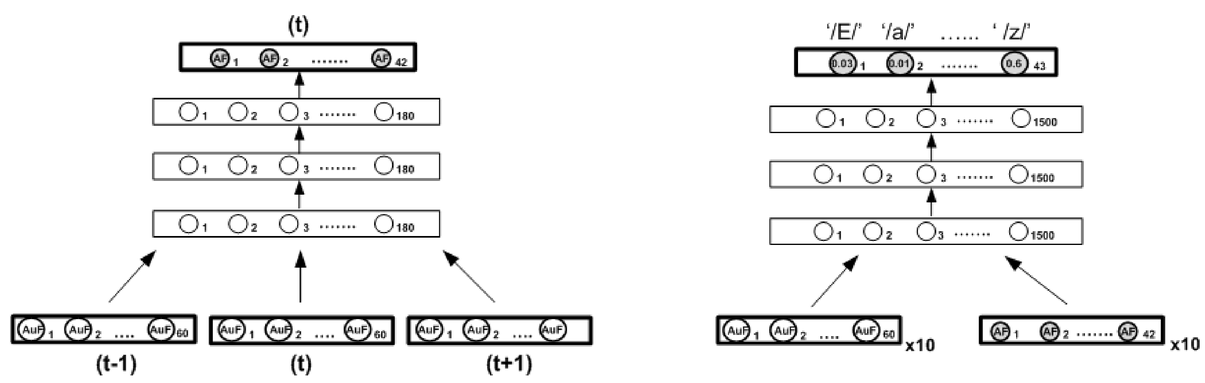
2) How can articulatory similarities affect the phone discrimination?

Material and Methods

Dataset: Italian corpus of simultaneous recording of speech and the trajectories of 7 articulators (UI, LI, LL, UL, TT, TB, TD) tracked by electromagnetic articulography. It includes 3120 single word utterances pronounced by 5 female subjects ([6]).

Acoustic-to-Articulatory Mapping* — 4-layer DNN ([3])

Phone classifier

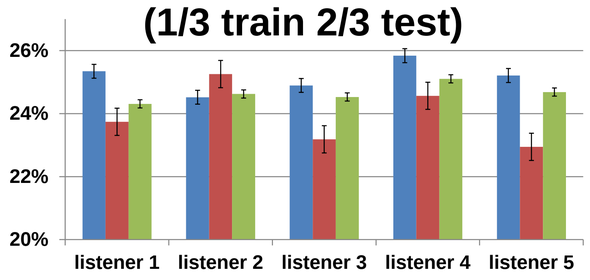


**An identical DNN is also used during acoustic normalization to perform Acoustic-to-Acoustic Mapping.*

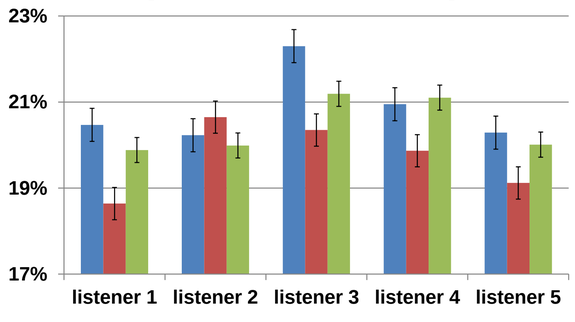
Results

1) Phone Classification Error

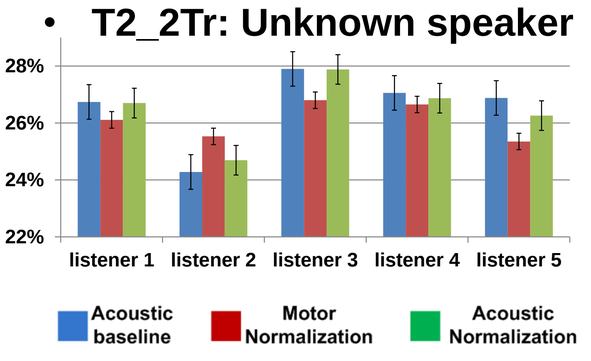
- **T1_1Tr: Known speaker (1/3 train 2/3 test)**



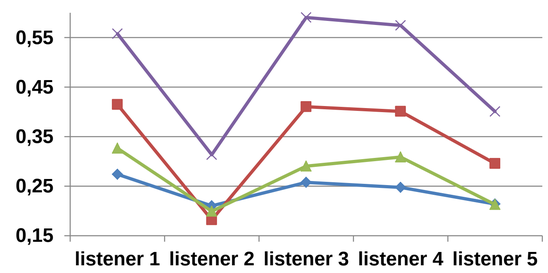
- **T1_2Tr: Known speaker (2/3 train 1/3 test)**

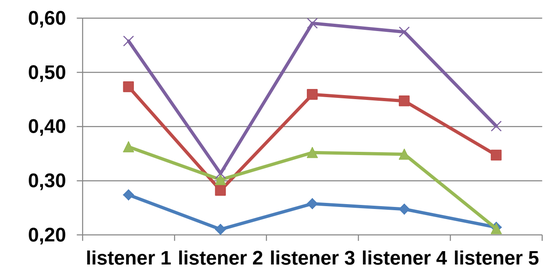


- **T2_2Tr: Unknown speaker**



Pearson Correlations





2) Articulatory similarities

	Correlation (pval)	
PER reduction/	**T1_1Tr**	**T1_2Tr**
Pearson corr	**48%** (0.032)	42.5% (0.06)
Pearson corr	**54.5%** (0.013)	41.9% (0.07)
Pearson corr	28% (0.23)	4% (0.8)

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