Multiband With Contaminated Training Data
Results on AURORA 2

TCTS
Faculté Polytechnique de Mons
Belgium

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INTRODUCTION

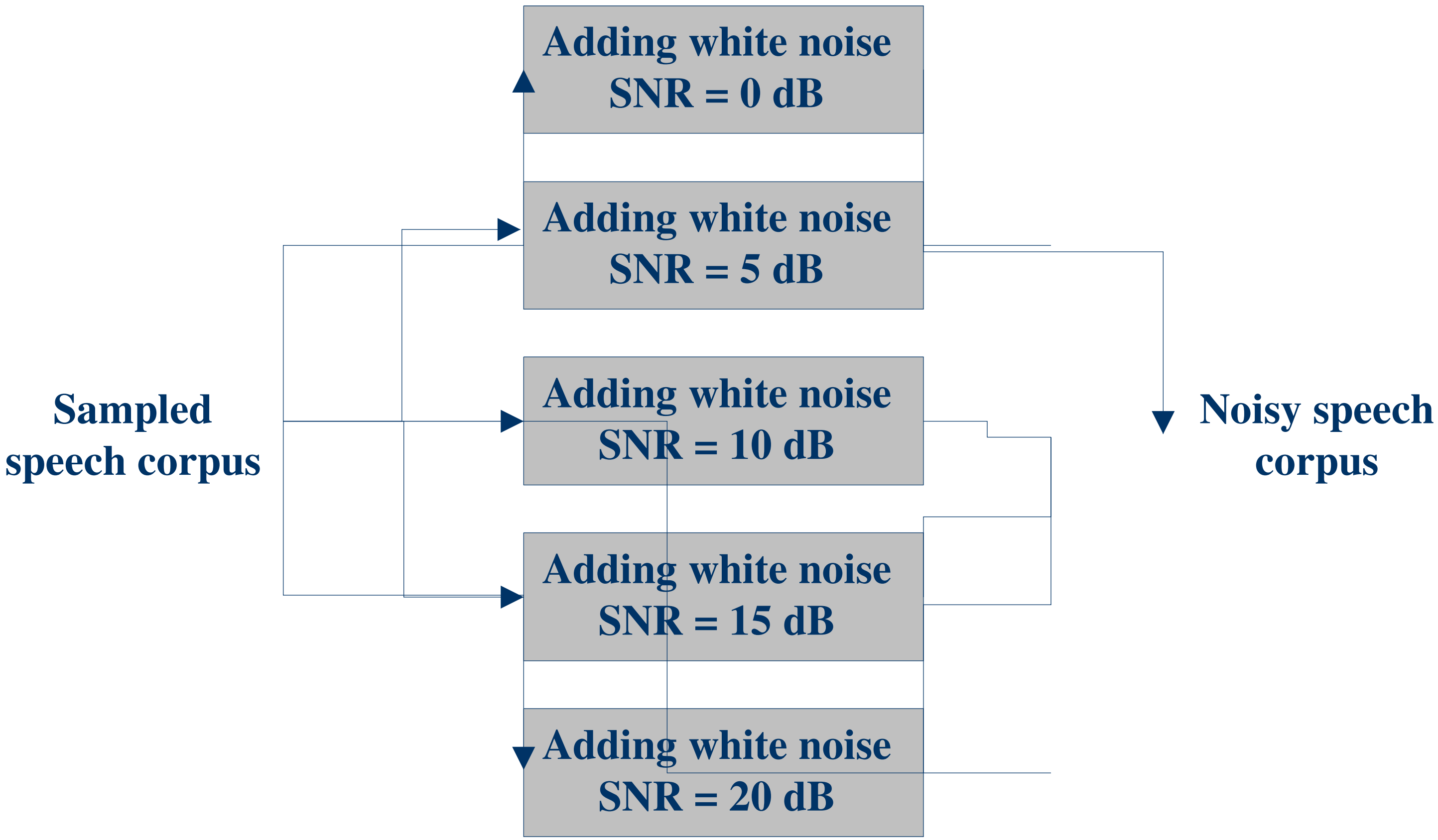
- The noise contamination of speech corpus leads to quasi–optimal performance when test noise conditions match training noise condition.

- We observe that, in narrow frequency bands, the noise characteristics basically differ by their level only.

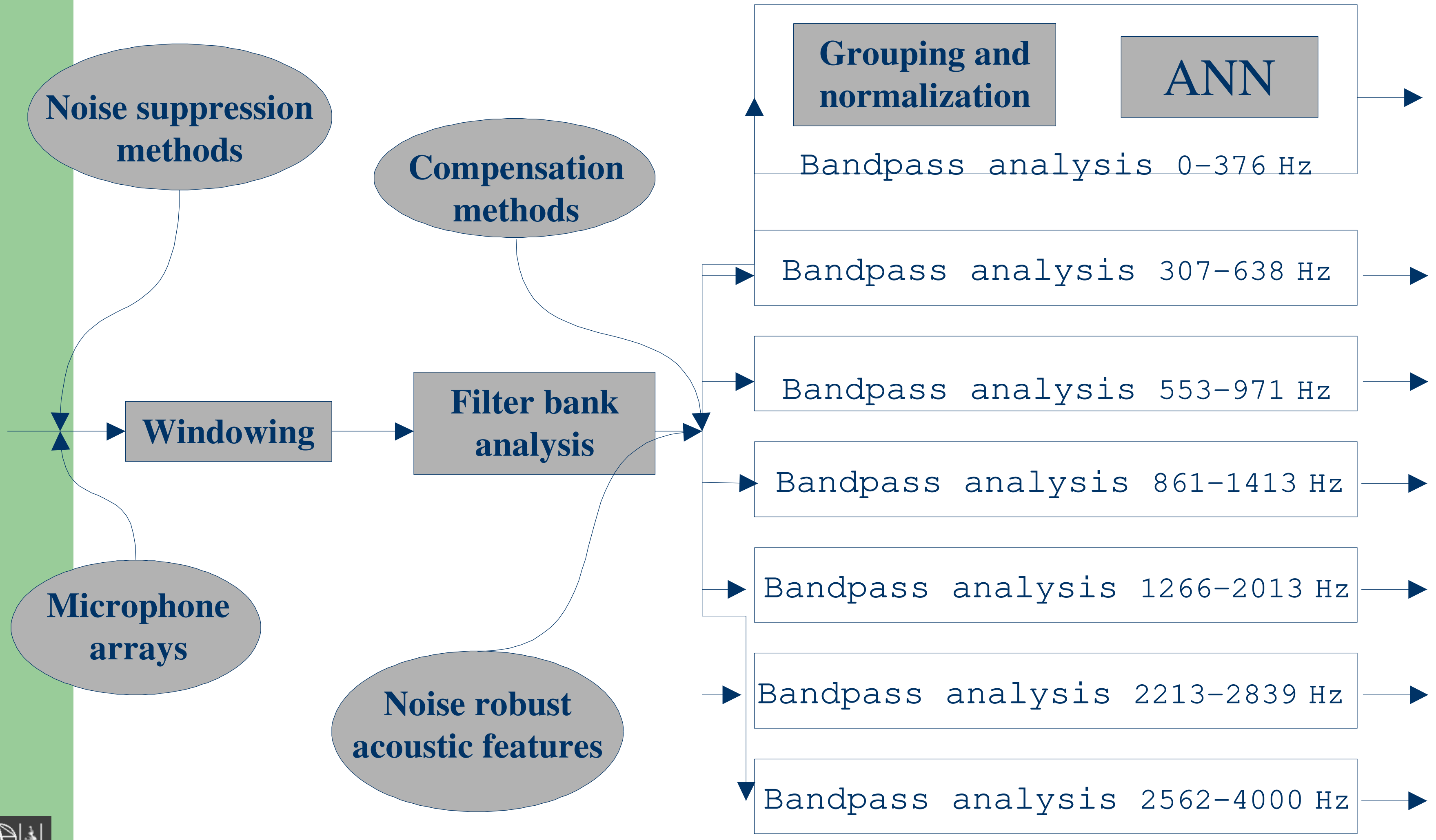
- Combining the multiband approach and the training data contamination can lead to models robust models for any kind of noises.

- We train models in each subband from data corrupted by white noise at different SNR. Subbands are then recombined using a MLP.

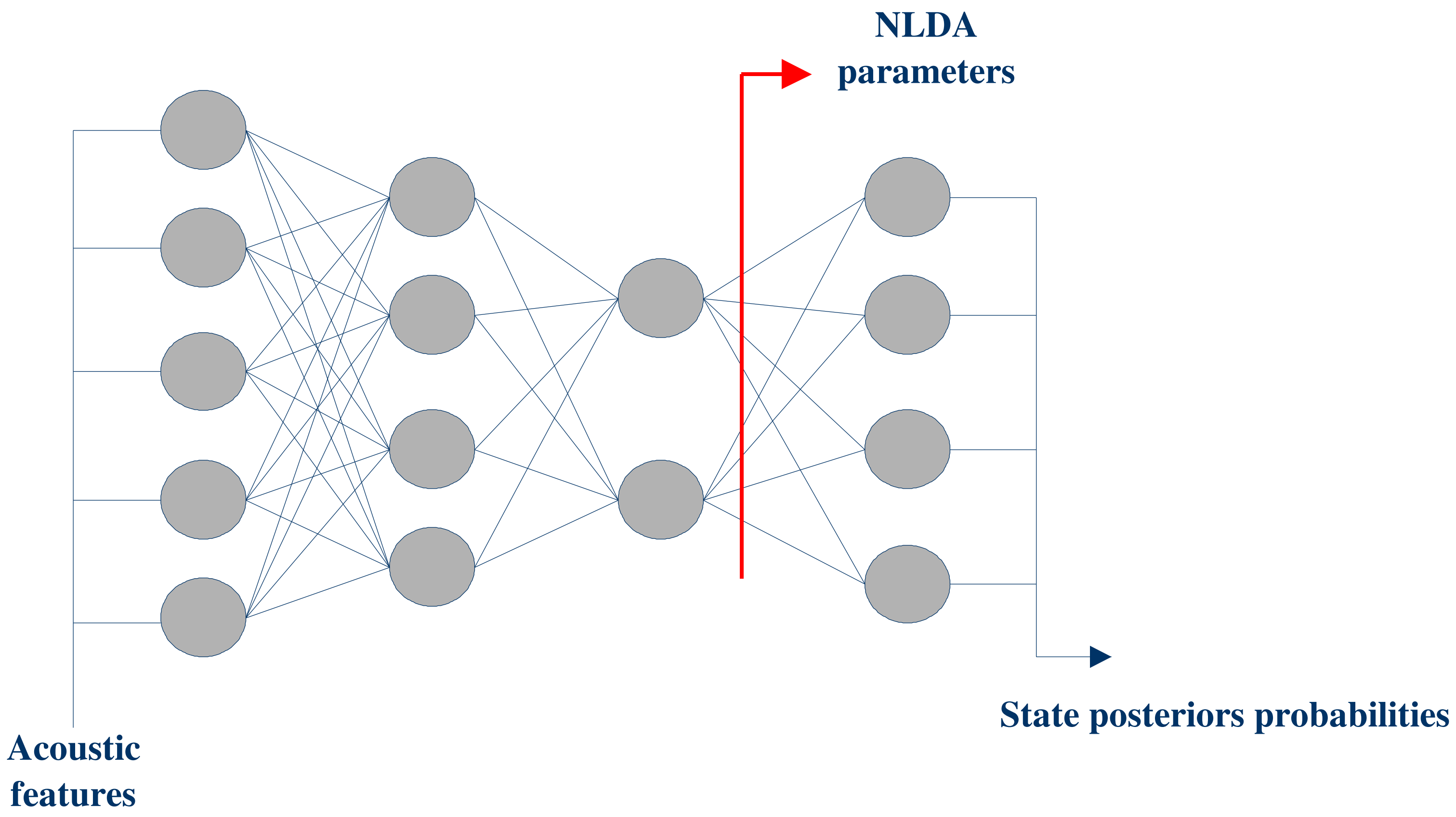
CONTAMINATED TRAINING CORPUS



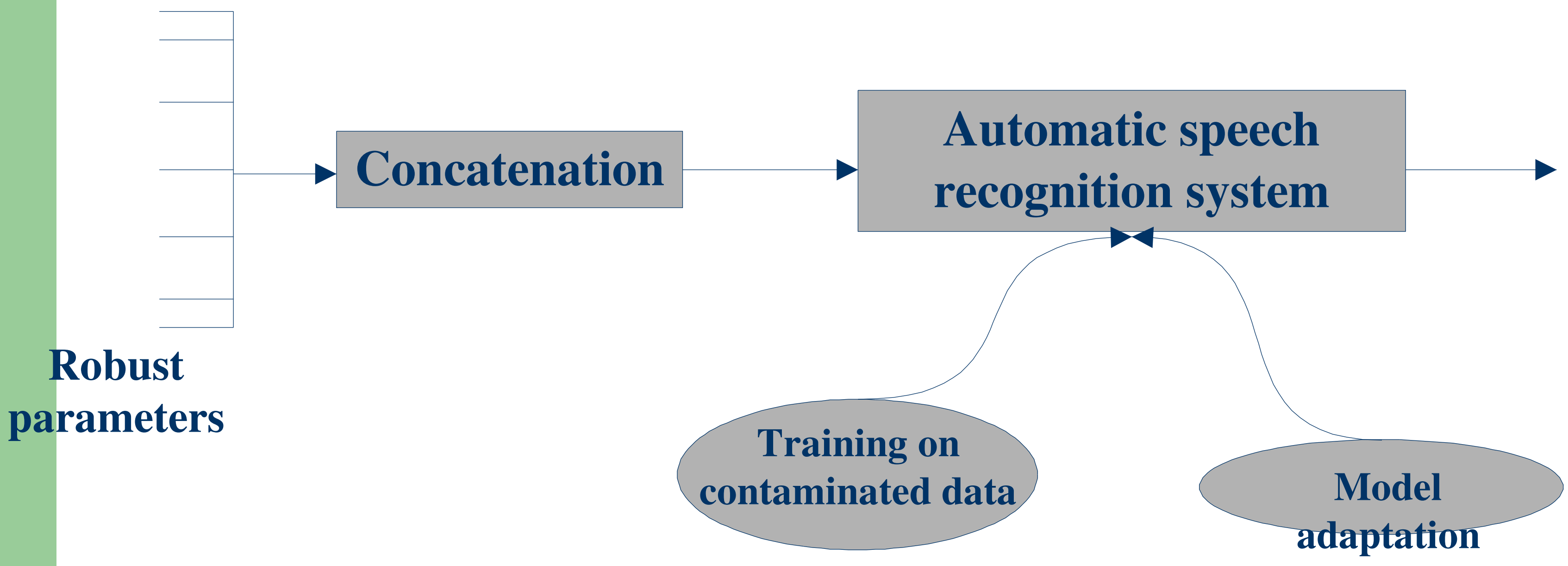
MULTIBAND ANALYSIS



NONLINEAR DISCRIMINANT ANALYSIS



ROBUST ASR


Concatenation
Automatic speech recognition system
Robust parameters
Training on contaminated data
Model adaptation

AURORA 2

Clean training set: 8440 utterances

Multi–condition training set: 8440 utterances

Contaminated training set: 8440 utterances corrupted by white noise + 4220 clean utterances.

Test set 'a': 4 different kinds of noises matching the multi–condition training set covering SNR from clean speech to –5 dB.

Acoustic models: Hybrid HMM/MLP trained on Daimler–Chrysler word models (127 HMM states).

Recognition: STRUT Viterbi decoder, no syntax

TEST CONDITIONS

Clean training set/J–RASTA

MLP: (15*13) x 1000 x 127 = 323,195 parameters

Multi–condition training set/J–RASTA

MLP: (15*13) x 1000 x 127 = 323,195 parameters

Contaminated training set/multiband

–7 subbands (15*4) x 1000 x 30 x 127
Recombination MLP: (3*210) x 1000 x 127
Total: 1,531,185 parameters

–7 subbands (15*4) x 150 x 30 x 127
Recombination MLP: 210 x 500 x 127
Total: 285,565 parameters

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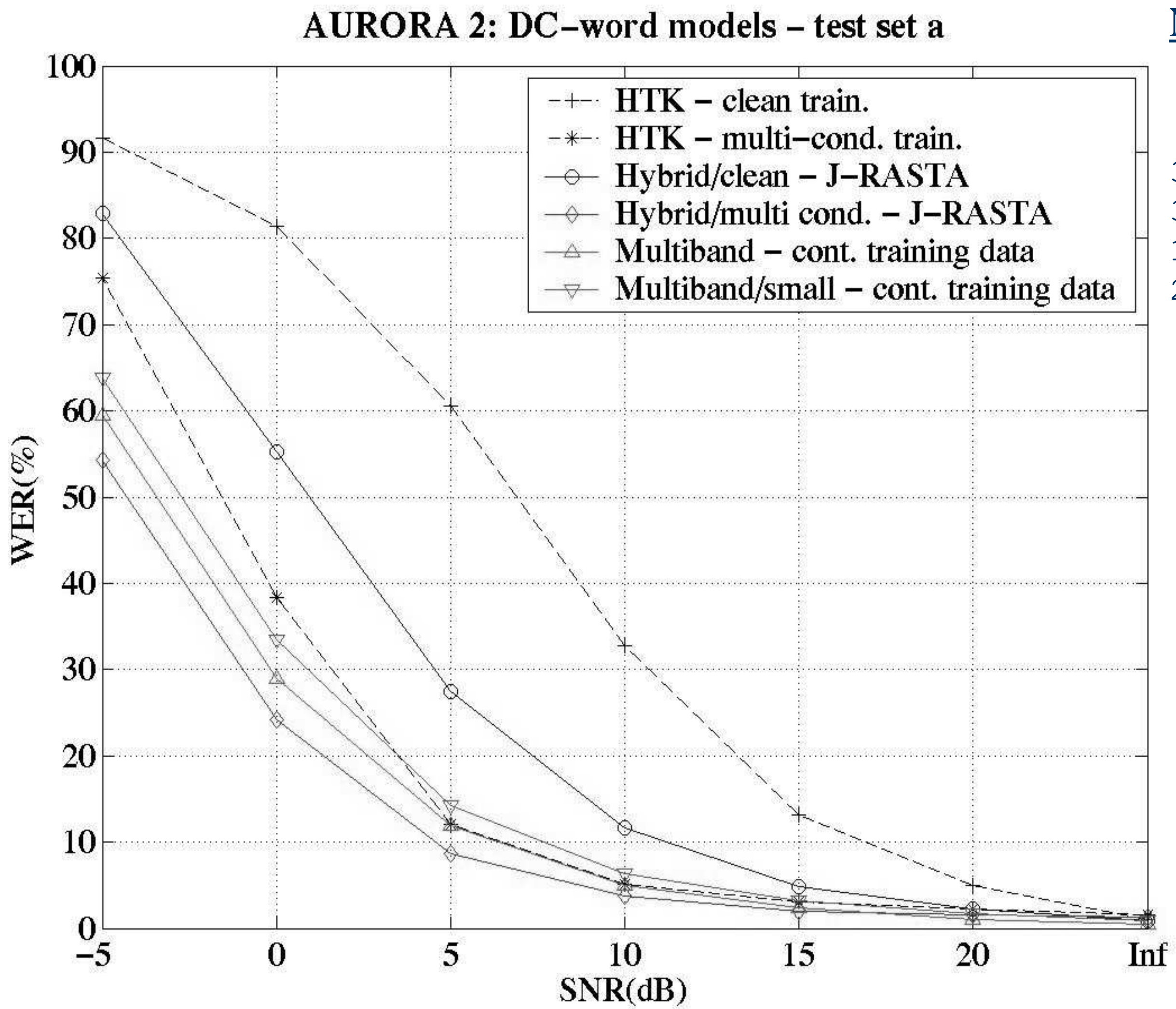
RESULTS



Number of parameters

323,195
323,195
1,531,185
285,565

CONCLUSIONS

The combination of the multiband paradigm and training data contamination has been tested on the reference task: AURORA 2.

We got up to 57% relative improvement compared to robust features such as J–RASTA PLP features.

Compared to matching noise condition training, WER are only 10% (relative) higher.

Test with a very « light » system led to a small degradation of recognition performance.

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