Training partially connected MLPs for MULTIBAND systems

TCTS

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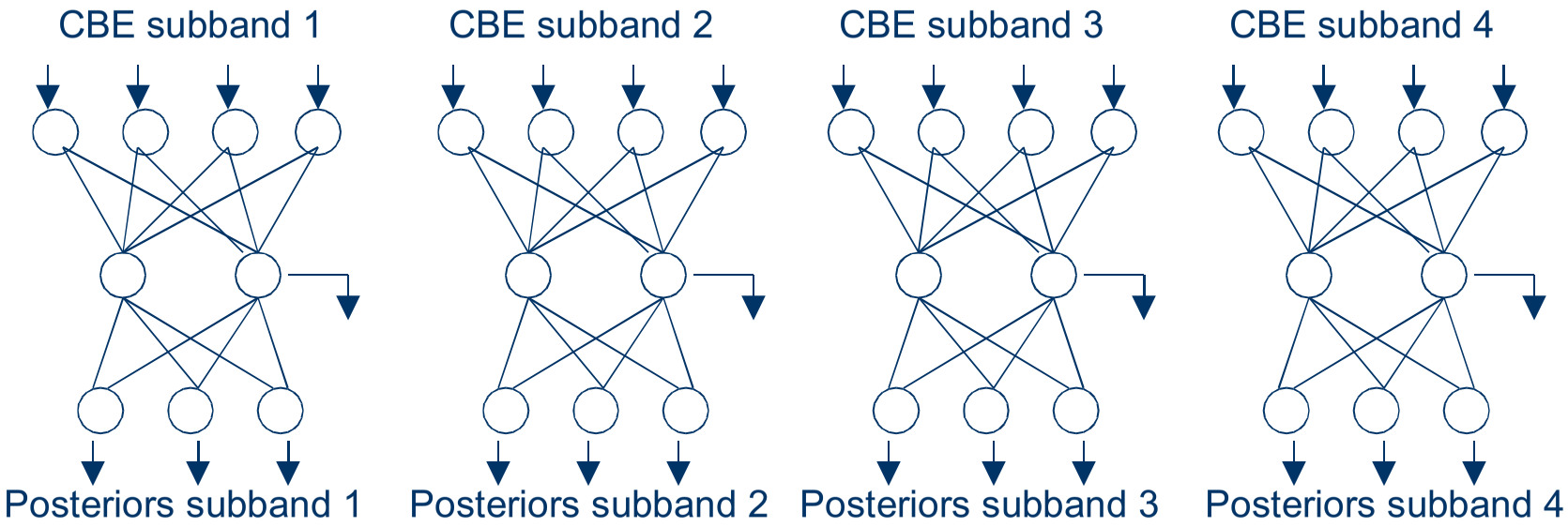
Basic multiband system

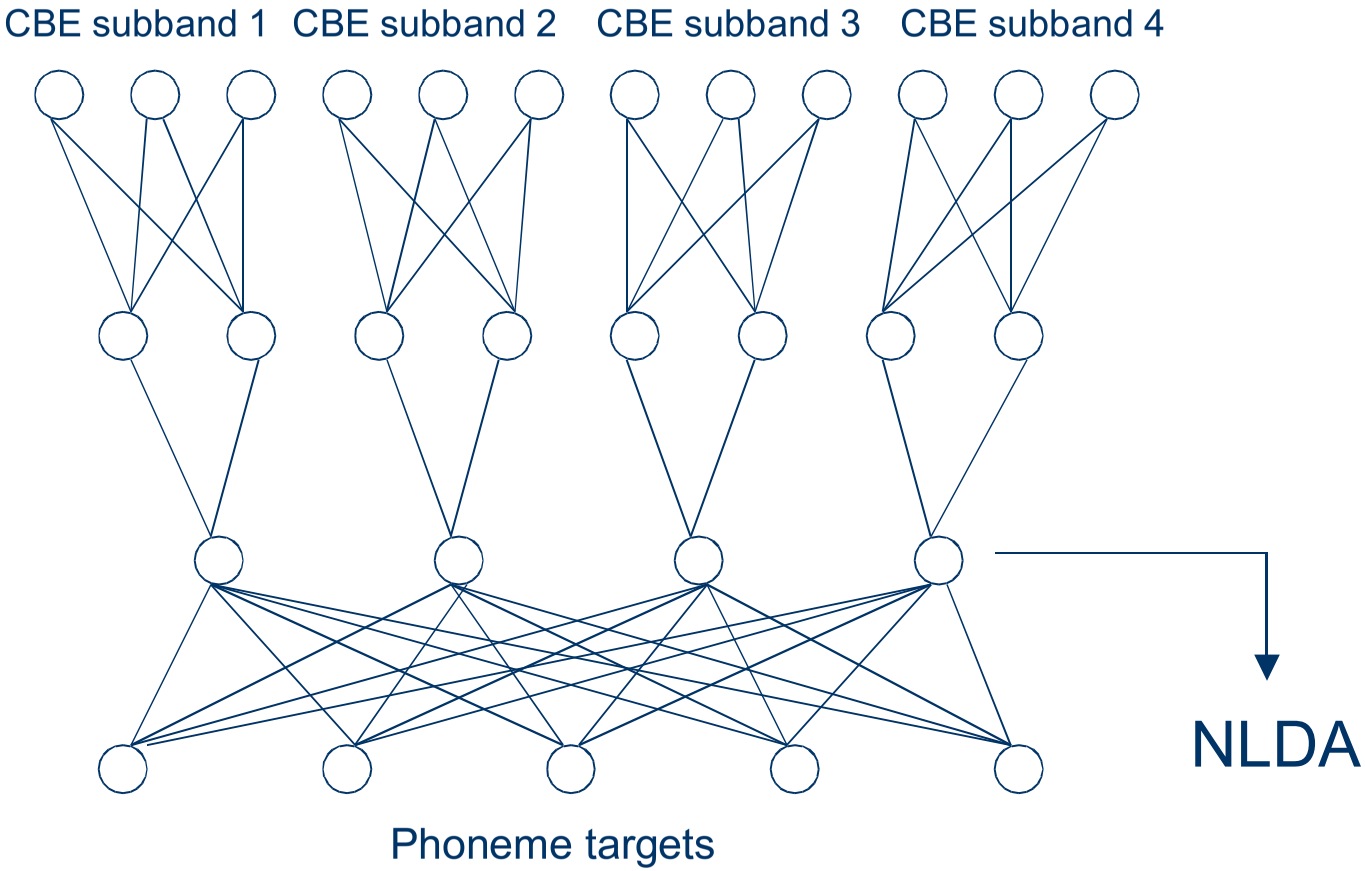
Training independent neural networks for each subband



Subband posteriors or eventually outputs of the last hidden layer (NLDA) can then be combined to take a global decision.

Partially connected MLPs

If all the subband neural networks are trained on the same targets, can we train all the subband NN in one step ?



TEST

4 subband experiment on AURORA 2 data. The systems are trained on white noise contaminated training data.

System 1, fullband NN:

1 MLP: 300 x 1000 x 33

System 2, independent NN:

4 networks (2 hidden layers): 75 x 200 x 30 x 33

A MLP is used to recombine the outputs of the last hidden layer of each subband MLP. This MLP is trained on phoneme targets: 120 x 1000 x 33

System 3, partially connected NN:

1 partially connected network: 300 x 800 x 120 x 33

Input vector is the concatenation of the four subbands.

A MLP is used to recombine the outputs of the last hidden layer. This MLP is trained on phoneme targets: 120 x 1000 x 33

TEST

4 subbands: 0−778 Hz, 707−1632 Hz, 1506−2709 Hz and 2122−4000Hz
Test on the effect off added noise on the posteriors after subband recombination. Noise N1 (subway) at 0 dB in subband 2 only compared to clean speech with the 3 systems.

	Full band system	Subband system independent MLPs	Subband system partial MLP
Noise in SB 2	0.1933	0.1580	0.1692

Deviation of posteriors relative to clean speech (MSE)

	Full band system	Subband system independent MLPs	Subband system partial MLP
Clean speech	1.8 %	2.0 %	2.2 %
Noise in SB 2	7.9 %	6.0 %	6.1 %

Word error rate – aurora test A, noise 1