The computational architecture of the human auditory cortex

Propositions of the thesis

The Computational Architecture of the Human Auditory Cortex

1. Before we can answer the question of how high-level auditory perceptual tasks are accomplished, we need to understand the low-level sensory representation of incoming sounds in the brain (i.e. which acoustic dimensions – or features – the brain encodes).

2. The sounds we encounter in our everyday life are acoustically much more complex and have greater behavioral relevance and familiarity than synthetic stimuli.

3. In system identification, the hypothesis about the encoded acoustic features is formalized as a computational model of auditory processing, rather than made explicit in the stimuli.

4. The cortical encoding of natural sounds entails the formation of multiple representations of sound spectrograms with different degrees of spectral and temporal resolution.

5. The encoding of spectral and temporal modulations in the human auditory cortex is *joint* and *frequency-specific*.

6. Auditory regions on the superior temporal plane encode a broader range of acoustic features compared to auditory regions along the superior temporal gyrus.

7. FMRI and model-based feature reconstruction techniques can be successfully combined to study the representation of natural sounds in distinct regions of the human auditory cortex.

8. If the goal is to match human performance in sound perception, then building algorithms that mimic the human brain is likely to be the most effective strategy.

9. If you try and take a cat apart to see how it works, the first thing you have on your hands is a non-working cat. (Douglas Adams)

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Maastricht, March 6th 2015