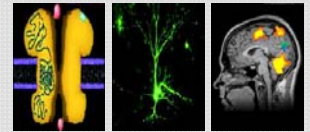


SFB 874 / IGSN

CONFERENCE



Cortical and subcortical representation of sensory and cognitive memory

April 28 - 29, 2015 Ruhr University Bochum

Tuesday,

Session 2:

April 28, afternoon (13:15 – 16:15)

**Categorization learning at the interface between
perception and cognition**

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The geometry of high-level visual representations

Vision can be understood as the transformation of representational geometry from one visual area to the next, and across time, as recurrent dynamics converge within a single area. The geometry of a representation can be usefully characterized by a representational distance matrix computed by comparing the patterns of brain activity elicited a set of visual stimuli. This approach enables us to compare representations between brain areas, between different latencies after stimulus onset, between different individuals and between brains and computational models. Results from fMRI suggest that the early visual image representation is transformed into an object representation that emphasizes behaviorally important categorical divisions more strongly than accounted for by visual-feature computational models that are not explicitly optimized to distinguish categories. Twenty-eight computational model representations, ranging from classical computer-vision features to neuroscientifically motivated models like HMAX, failed to fully explain the strong categorical divisions in IT. A deep convolutional neuronal network trained by supervised techniques on over a million category-labeled images came closest to explaining the IT representation. The categorical clusters appear to be consistent across individual human brains. However, the continuous representational space is unique to each individual and predicts individual idiosyncrasies in object similarity judgements. MEG results further suggest that the categorical divisions emerge dynamically, with the latency of categorically peaks suggesting a role for recurrent processing.

