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14h15, Room

Computational Neuroscience Seminar

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Perceiving is Believing: Bayesian inference in unexpected places

The past century or more of research into perception has been dominated by two different computational metaphors: the Hemholtzian description of a process of inference about the external causes of sensations (in its modern guise often expressed in terms of Bayesian probabilistic reasoning), and a more mechanistic, processing-based view often rooted in engineering operations such as accumulation and cross-correlation. Many mid- and high-level perceptual phenomena seem to be well-understood inferentially, but the processing-based metaphors have remained dominant for perception based on 'early' sensory computations.

Here I will present evidence that inference plays a substantial role in two perceptual domains where most current theories rely on signal-processing-based models. The first part of the talk (work with Misha Ahrens) involves judgements about short intervals of time. I will show that an inferential view can help to make sense of experiments where the nature of a stimulus being timed has a pronounced effect on observers' estimates of its duration, while naturally respecting the scalar properties of interval estimates. Three new behavioural experiments support the proposed inferential model. In the second part (work with Phillipp Hehrmann and Vincent Adam) I will discuss the percept of acoustic pitch. Again, an inferential view helps to reconcile a variety of reported behavioural phenomena, and makes predictions regarding the distribution of octave-step errors that are borne out by new experiments.

Thus, even apparently 'simple' percepts may rely on sophisticated processes of inferential reasoning, and so may depend on general neural mechanisms for pattern recognition and probabilistic processing, rather than solely on simple dedicated circuits.