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Testing Bayesian inference models of perception

Background

Perception is inherently a process of inference, we do not have direct access to the states of the world but have to use the available information (whether visual, auditory, haptic etc.) to interpret the world. As such the brain has to have internal models of how the perceptual stimuli are generated. The mammalian nervous system has an ability to perceive and interact with its physical environment that is as of yet unrivalled by any computer algorithm.

We assume that it achieves such performance through the use of optimal Bayesian statistics (parametric and non-parametric) and test different models against the behaviour of human subjects, as well as fMRI.

Aims and Methods

Through a combination of theoretical models and experimental tests of human perception we can get a thorough understanding of how humans are able to perceive their environment.

Improving our knowledge of human perception can also lead to development of new algorithms to be used in computer vision, machine learning etc.

Methods primarily include computational modeling and psychophysical experiments.

The sub-goals and methods of the project can be adapted to the interests of the student, including the potential use of fMRI.

Relevance

The project lies in the intersection between cognitive psychology, machine learning and statistics and will be of relevance for researchers in both theoretical and experimental psychology and neuroscience as well as computer science and statistics.

Training

The research activity will be based in the Department of Psychology. The candidate will gain a deeper understanding of human perception, Bayesian inference, machine learning and psychophysics, as well as potentially fMRI.

Suitable for

PhD and MSc by Research students.

References and Further Read

Beierholm, U.R., 2014. *Bayes Optimality of Human Perception, Action and Learning: Behavioural and Neural Evidence*. Lecture notes in computer science, 8603, pp.117–129.

Beierholm, U.R., 2015. *Bayesian models of perception* in Encyclopedia of Computational Neuroscience, Springer, NY.

Körding, K.P. et al., 2007. *Causal inference in multisensory perception*. Plos One, 2(9), p.e943.

Shams, L. & Beierholm, U.R., 2010. *Causal inference in perception*. Trends in Cognitive Sciences, 14(9), pp.1–8.