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Department of Psychology

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Future proofing: Predictive processing in real-world scene viewing, understanding and memory

Background

An essential function of the human brain is to predict what we are about to see and how we can use that information. These predictions arise from knowledge about how the world works, acquired through life experience, including what objects to expect in everyday environments (real-world scenes) and where, and what actions to typically perform in them. Previous research has demonstrated that by creating conflict with what the individual expects (for instance, by including objects that are inconsistent with the scene, see Figure 1), we can reveal the contributions of predictions to multiple behaviours. Mixed findings, however, have been reported and fundamental issues are still open, especially when linking viewing behaviour to memory and when examining the ecological validity of lab studies.

Figure 1. Consistent vs. Inconsistent version of a living room scene. In the inconsistent scene, the table is replaced by the lawnmower.

Aims and Methods

Using cutting-edge eye-tracking and experimental behavioural techniques, the suggested project will examine how we use knowledge about the visual world to generate predictions that proactively shape our future experience in terms of awareness, attentional selection, information representation and memory retrieval. More specifically, it will seek to answer one or more of the following questions: to what extent predictions are flexible and how they can adapt to learning contingencies; how they interact with current task priorities and with low-level, perceptual factors in building memory traces; how their use changes across the lifespan, in different settings and in clinical populations. Around these questions, there is room for the candidate to customise the project according to their specific research interests.

Relevance

The project will enhance understanding of the interconnected processes underlying our ability to make sense of the world around us, and to remember it. Its outcomes will have interdisciplinary implications encompassing psychology, neurosciences, and computer science.

Training

The candidate's research activity will be based in Durham, Psychology. Besides a training in general research skills, the candidate will develop a deeper understanding of visual cognition in a variety of settings (laboratory, immersive virtual reality, real environments). The candidate will receive an advanced training in eye tracking and in statistics, in particular linear mixed effect models.

Suitable for

PhD and MSc by Research students.

References and Further Read

Ramzaoui, H., Faure, S., & Spotorno, S. (2022). Age-related differences when searching in a real environment: The use of semantic contextual guidance and incidental object encoding. *QJEP,75*(10),1948-1958.

Leroy, A., Faure, S., & Spotorno, S. (2020). Reciprocal semantic predictions drive categorization of scene contexts and objects even when they are separate. *Scientific Reports*, *10*(1), 8447.

Spotorno, S., & Tatler, B. W. (2017). The elephant in the room: Inconsistency in scene viewing and representation. *Journal of Experimental Psychology: Human Perception and Performance*, *43*(10), 1717.