Is it possible to determine what a person is seeing, experiencing, attending to, or actively remembering, from noninvasive measures of that person's brain activity? My lab has developed a novel decoding approach to extract information about orientation and motion direction from fMRI activity patterns in the human visual cortex. From these activity patterns, we can reliably predict whether a person is viewing a vertical or tilted grating, leftward or right motion, a pigeon or a sparrow. Here, I will describe how this approach can be successfully applied to read out subjective mental content, thereby opening new avenues for investigating the neural bases of conscious perception, feature-based attention and visual working memory. In ongoing studies, we find that feature-selective activity is dynamically altered at the earliest stages of visual processing, when subjects must attend to one of two stimuli or must actively maintain a specific visual pattern in working memory. The ability to decode the contents of a person's mental state from measured brain states brings scientists a step closer towards understanding the neural representations that underlie subjective visual experience.

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