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Fast and robust decoding of visual information from intracranial field potentials in the human visual cortex

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The remarkable pattern recognition abilities of humans and other primates surpass the most sophisticated computational algorithms available today. The difficulty of the recognition problem stems from the need to achieve high selectivity in a fraction of a second while maintaining robustness to object transformations. We quantified, at high temporal resolution, the amount of information conveyed about objects and their transformations by intracranial field potentials from 1494 electrodes in eighteen human subjects. Subjects were presented with images containing one or more objects or with movies. Using a statistical classifier, we could accurately decode object category information in single trials as early as 100 ms after stimulus onset. Decoding performance was robust to changes in rotation, scale and clutter. Furthermore, visual information could also be decoded under dynamic viewing conditions and in the presence of background clutter. The results revealed that physiological activity in the human temporal lobe can account for some of the key properties of visual recognition, and they provide strong constraints for computational models of human vision.

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