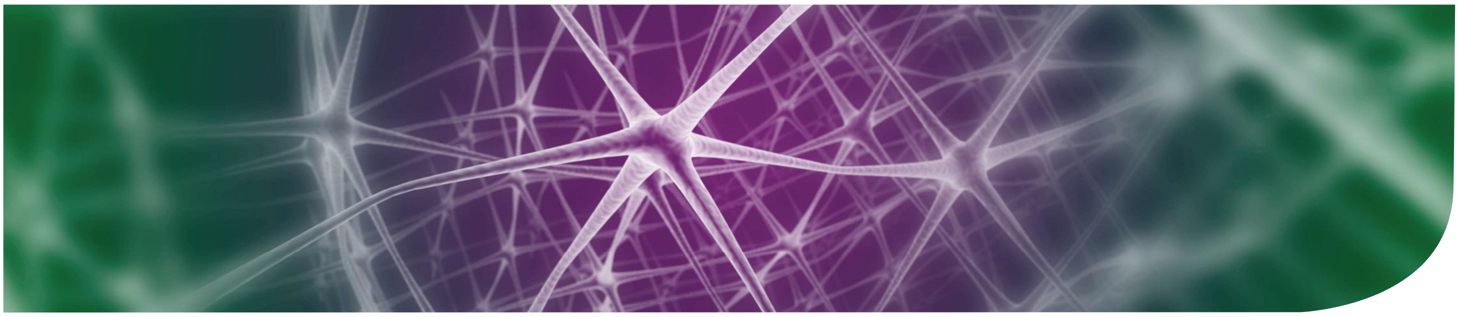

Improving intracortical visual prostheses using complex coding and spontaneous activation states (I-See)

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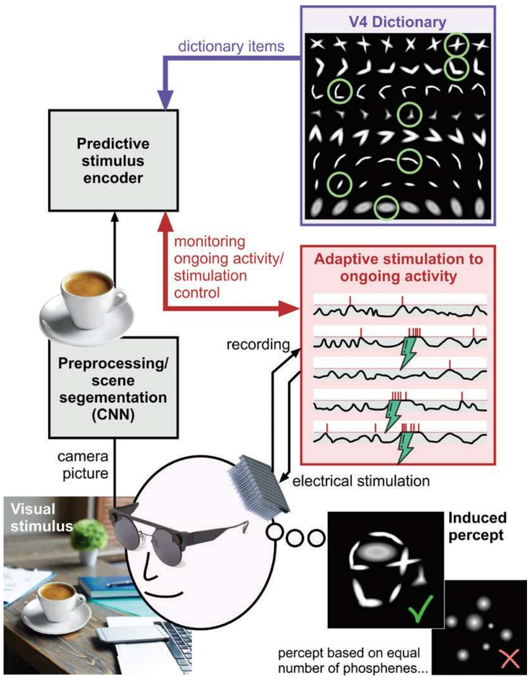
The lives of many individuals are strongly impaired by missing the sense of vision. One putative option to help them are cortical prostheses. For restoring vision, such devices convert visual scenes into patterns of electrical activity which are then transferred to the visual cortex (typically area V1). This approach aims at using thousands of electrodes, each eliciting the percept of a circular flash of light (phosphene).

Our project evaluates alternative ideas: First, we will stimulate neural populations in visual area V4 with the goal to achieve more specific percepts (e.g. corners, edges, curves) than phosphenes, while using a smaller number of activated stimulation electrodes. Our second aim is to make use of ongoing activation states in cortex that exist even without a visual stimulus. By devising an intelligent stimulation algorithm which boosts these states at the right moment in time we plan to achieve more 'natural' percepts with much lower stimulation currents.



Supported by a strong backbone of computational and theoretical neuroscience approaches, our project encompasses developing subthreshold stimulation techniques in mice, testing novel stimulation paradigms in non-human primates, evaluating sparse stimulus encoding schemes in healthy humans, and assessing brain anatomical and functional constraints of cortical prostheses in the blind.