## Title

**Effects of attention on visual processing between cortical layers and cortical areas**

## Primary field

Perception & Action

## Primary methodology

Computational Modelling

## Background

Visual attention is a cognitive computation crucial in improving perceptual abilities. Despite the wealth of previous studies on the neurophysiology of visual attention, we still have an incomplete knowledge of how different layers of cortical visual circuits differentially modulate and interact, when attending to specific spatial locations, and how these interactions affect their visual coding and visual information transmission properties.

## Methods

Electrophysiological recordings performed in Newcastle University using multi-contact probes allowed to access neural activity of V1 and V4 in 3 macaque monkeys, while animals performed a top-down spatial attention task. Laminar depth alignment was referenced to the earliest inward current following stimulus onset. The effects of attention on Local Field Potentials (LFPs) were quantified in terms of spectral power, spectral coherence, mutual information between attended visual locations and LFPs in the time/frequency domain, and transmission of visual information across layers.

## Results

Attentional modulations of the spectral features that we considered did not show major differences across layers. We found that the main effect of attention on V1 LFPs consisted of a shift in spectral power peak in the low gamma frequency range (~40-60Hz) towards higher frequencies. In V4 we found an overall decrease in power for frequencies below 20Hz and an increase for frequencies above 20Hz. We were particularly interested in quantifying the information about attended stimulus location carried by LFP signals and its directed flows across different layers, for specific frequency bands. We found very robust patterns of theta-band(4-8Hz) information that preferentially flowed from supragranular to granular layers in V1.