Receptive fields mapped with natural and artificial stimuli in macaque monkey V1

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Abstract:
Our visual system processes natural stimuli that are very complex in spatial and temporal aspects. However, properties of visual neurons in the primary visual cortex (V1) are primarily studied with artificial stimuli with simple and well characterized properties. Few studies had used both artificial and natural stimuli to map V1 receptive fields, but it remains unclear whether natural and artificial maps are comparable. We addressed this question by using both stimulus types to measure the receptive field of neurons in macaque monkey V1. The artificial stimulus is a binary white noise, and the natural stimulus is a movie recorded from a camera attached to the head of the cat walking in forest. The movie has lower spatial and temporal frequencies compare to white noise. The frequency power of the movie is higher along the vertical than the horizontal axis, so we also rotate the movie by 90 degrees. We used a multi-electrode matrix to record from different layers of V1 simultaneously. Receptive fields were calculated by reverse correlation. Preliminary result shows the size of receptive fields tend to be larger for natural maps. Overall, receptive fields of V1 neurons are not fixed and can vary with different stimulus ensembles.