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Efficient coding of texture images in the mouse visual cortex

Wednesday, July 5, 2023 3:00 PM (50 minutes)

The neural mechanisms underlying natural vision remain poorly understood. Here, we examined the processing of a class of natural images—textures—across mid-level visual areas in the mouse ventral cortical stream. First, we established that mice are capable of perceptually distinguishing between different textures and simpler stimuli matched for spectral content. Then, using GCaMP imaging, we found that the secondary visual area (LM) showed a greater selectivity for the higher-order statistics of textures compared to the primary visual area (V1). We also found that textures were encoded in neural activity subspaces whose relative distances correlated with the statistical complexity of the images and with the mice's ability to discriminate between them. These dependencies were more pronounced in LM, where the texture-related subspaces were more tightly clustered, enabling better stimulus decoding. Our results provide insights into the neural underpinnings of texture vision and demonstrate a link between stimulus statistics, neural representations, and perceptual sensitivity, indicative of efficient coding computations.

Presenter: BENUCCI, Andrea

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