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Comparison Against Task Driven Artificial Neural Networks Reveals Functional Organization of Mouse Visual Cortex

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The Allen Brain Observatory presents the first standardized in vivo survey of physiological activity in the mouse visual cortex, featuring representations of visually evoked calcium responses from GCaMP6-expressing neurons in selected cortical layers, visual areas and Cre lines.

In this work, we use data from regions of visual cortex (VISp, VISl, VISal, VISpm, VISam, VISrl) under natural scene stimuli.

We compare the representation between the data and deep neural networks (DNNs) and reveal functional properties of mouse visual cortex areas.

Allen Brain Observatory Enables Large Population Coding

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Schematic of Approach

Long data matrices: Way more neurons than testing images

Metric 1: Similarity of Similarity Matrices (SSM)

PCC: Pearson correlation coefficient.
SRC: Spearman rank coefficient.

Metric 2: Singular Value Canonical Correlation Analysis (SVCCA)

Reduce neuron dimension by PCA and take mean of top canonical correlation coefficients.

References


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