



Interactive poster

Cell-type-specific dysfunction underlies schizophrenia, Alzheimer's, and autism, yet we lack a basic description of what these cell populations compute.

We constructed population coding similarity matrices (linear CKA) for 100+ neural populations spanning 12 Cre lines, 6 visual areas, and 4 cortical layers, from 43,018 neurons in 243 mice (Allen Brain Observatory), under four stimulus conditions: static gratings, drifting gratings, natural scenes, and natural movies.

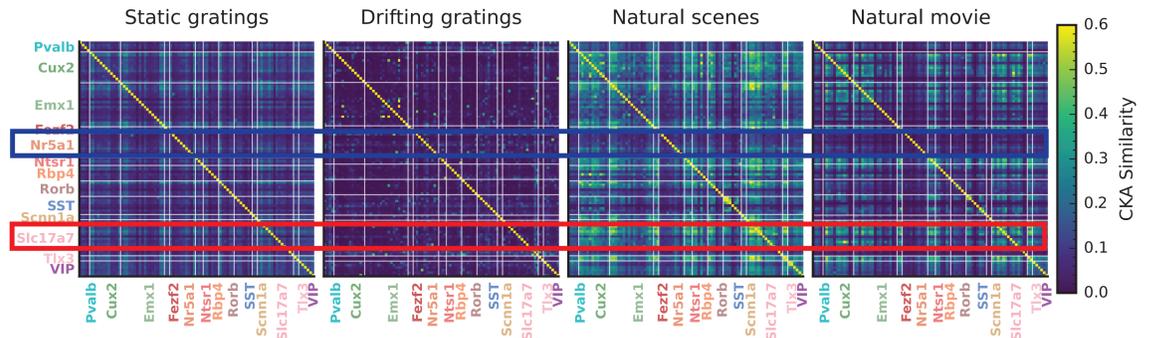
We analyze these matrices using two complementary approaches that extract different information from the same high-dimensional similarity space:
Embedding populations in low-dimensional space
Averaging pairwise similarity across populations sharing each Cre-line identity

- > Inhibitory populations cluster in response to natural scenes but not static gratings
- > Natural scenes and natural movies produce consistent cell-type coding structure.
- > VIP bridges inhibitory and excitatory codes.
- > Shared representational structure across cell types is largely driven by fidelity to sensory input.
- > Cross-animal consistency is stimulus-type-selective.

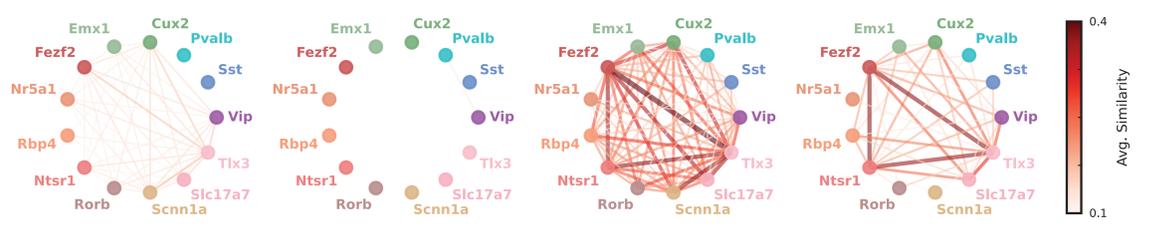
Cortical layer alone does not dictate population-level coding: In layer 5, Nr5a1 is not similar to Slc17a7, Tlx3, Fezf2

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Population coding similarity matrices rearranged by cre-lines



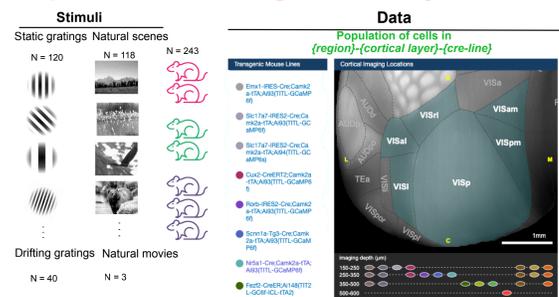
Average population coding similarities between pairs of cre-lines



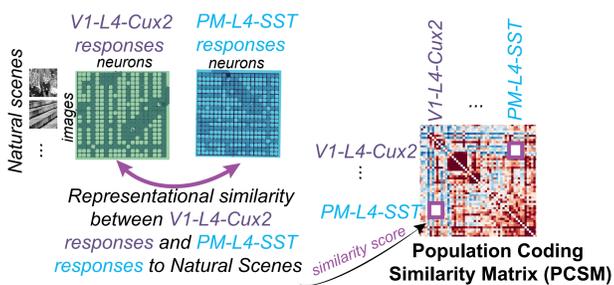
Inter-cell-type similarity is consistent across natural scenes and natural movies, suggesting a shared organization for naturalistic inputs

Population Coding Similarity Matrix

1



Geometry of cell-type-specific population response



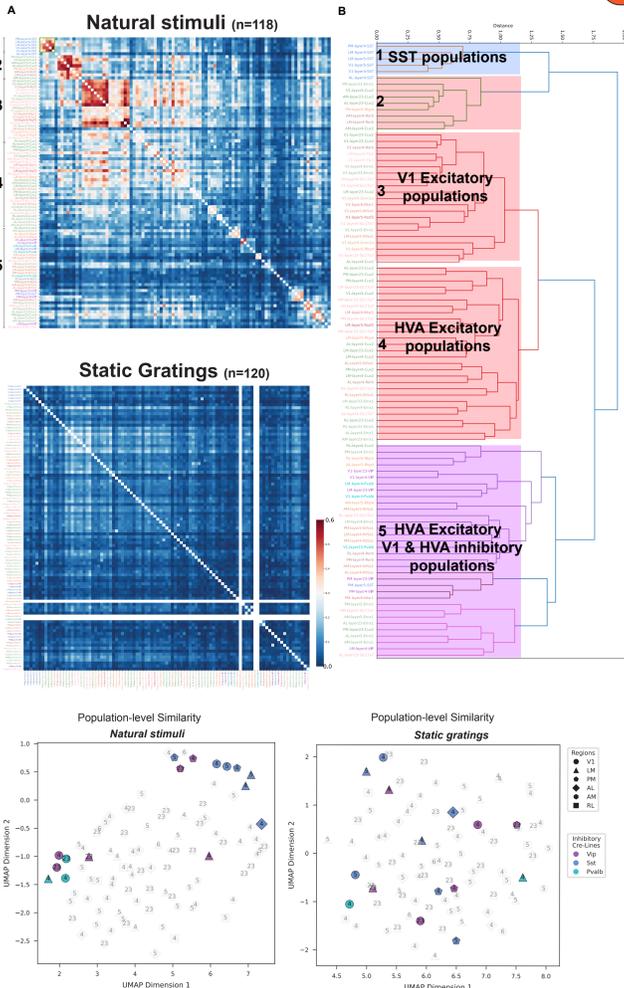
Shared representational structure across cell types is largely driven by direct sensory representation

4

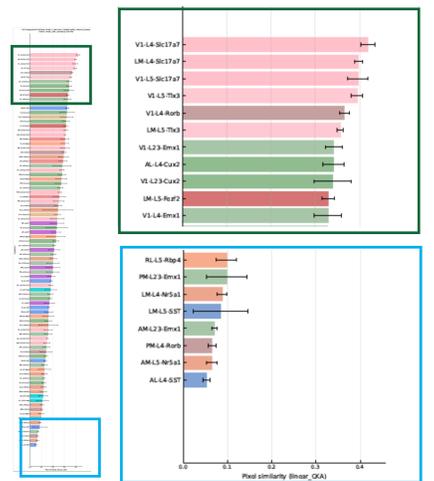
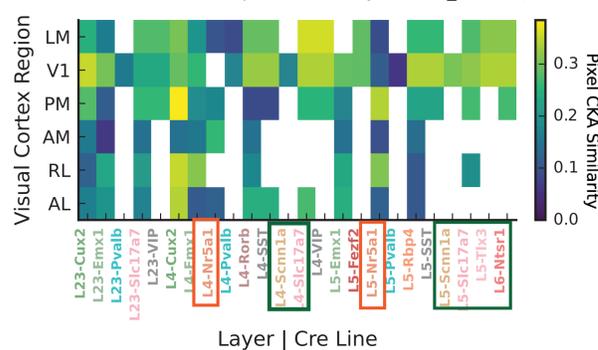


Specialized natural scene encoding in inhibitory cell type populations

2

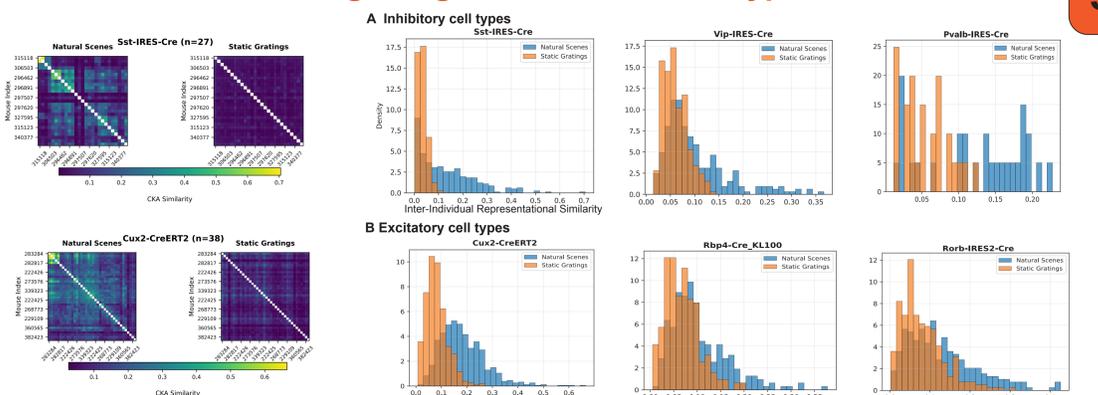


RF-Masked Pixel Space Similarity natural_scenes



Cross-animal representational consistency is higher for natural scenes than gratings across most cell types

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Population coding similarity matrices provide a framework for linking molecular identity to computational function, revealing organizational principles that are specific to naturalistic vision