

# Evidence towards surround suppression in perception of complex visual properties

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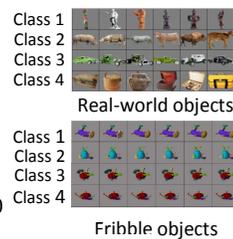
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## Cortical perception of complex visual properties

- The visual features encoded by mid- and high-level cortical visual regions are not obvious
- Single-unit studies indicate V4 and IT selectivity for combinations of local edges, based on simple synthetic stimuli (Hung, 2012; Yamane, 2008)
- We used realtime fMRI to explore cortical responses to specific features within restricted visual feature spaces for complex real-world or novel objects

## Methods

- Participants shown photos of real-world or synthesized Fribble objects (Williams, 2000), each divided into 4 classes
- BOLD signals recorded with fast event-related design (2 sec TR, partial coverage) for 20 subjects

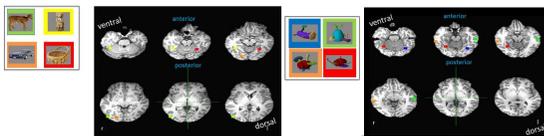


## Search for preferred visual properties

- For each subject, select 4 brain regions associated with 4 stimulus classes
- Search in relevant feature space for stimulus most activating brain region

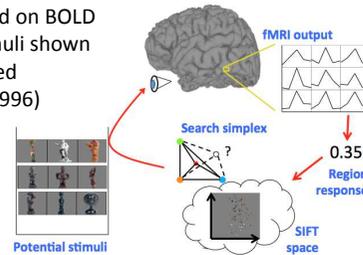


## Example voxel regions studied



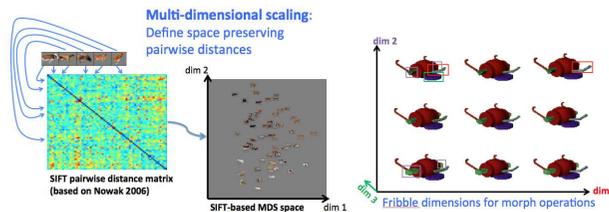
## Realtime stimulus selection

- Stimuli selected based on BOLD response to past stimuli shown with simplex simulated annealing (Cardoso 1996)



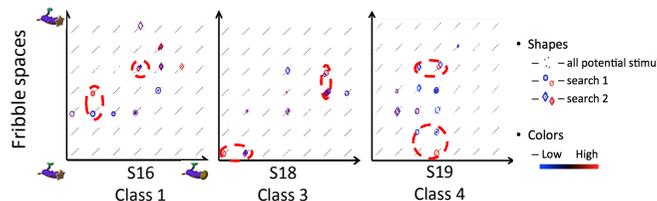
## Visual feature space

Feature spaces defined to capture visual similarity metric

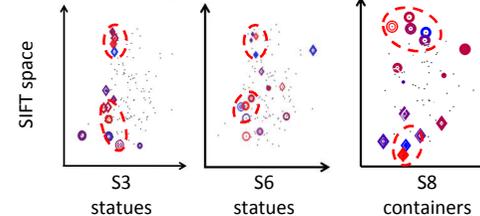


## Selectivities in visual feature space

Evidence of multiple selectivities and surround-suppression in both Fribble-morph space (below) and SIFT space (next column)

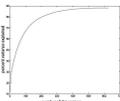


## Selectivities in visual feature space (continued)



## Constraints on SIFT-based space

- MDS creates 600+ dimensional space
- Required search time grows with number of dimensions
- Used 4 dimensions in our study

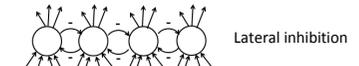


## Selected and anti-selected objects



## Discussion

- Multiple selectivity centers for 125-voxel ROI within human LOC
- Evidence of surround-suppression, similar to that observed in low-level vision



- Room for improvement to definition of SIFT space
- Analysis and visualization of complex visual spaces is necessary to advance our understanding of high-level perceptual processes such as visual object recognition

## References

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