Unraveling the visual and semantic components of object representation

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Components of object “semantics”
- Past studies associate semantic activation with visual and non-visual areas, but intermingling picture and word stimuli (e.g., Just et al., 2010)
- BOLD responses were associated with object semantics for pictures vs. words presented in separate conditions
- Analyses of neural data included MVPA within a “searchlight” procedure and correlations with stimulus image similarity as measured by a variety of computer vision methods

Methods
- Participants shown words or images for 60 objects, 6 x each word
- BOLD signals recorded with slow event-related design (2 sec TR, partial coverage)
- Compared voxel population responses within and between classes (pictures vs. words)

Searchlight analysis
- Constructed “searchlight”—123 voxel sphere—centered at each voxel (Kriegeskorte et al., 2006)
- Compared voxel population responses within and between classes (pictures vs. words)

Picture – word contrast for single objects

Computer vision (CV) models of voxel object encoding
- Learned map of from CV-based features to voxel responses via
- Compared match between predicted and measured voxel activities for each model

Discussion
- In ventral pathway, coding more consistent for visual rather than semantic information
- Object contours (Shock graphs) predict BOLD activity in anterior visual regions
- Object sub-regions’ features (SIFT, Geo. blur) predict some subjects’ BOLD activity in distinct visual regions

References

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