Predicting the Behavioral Similarity Structure of Visual Actions

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Question

What makes some actions seem more similar than others?



Approach:

Characterize action similarity space



Relate this mental space to the brain



Stimuli

A wide sample of everyday actions



120 2.5s videos of 60 actions sampled from the American Time Use Survey

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E1: Measure Action Similarity Space

Sort the actions according to their similarity



Modeling Results

Which features might predict similarity judgments?



Body Parts





Computationa Image Features Oliva & Torralba, 2001

Select the body part involved in the action

How well can these models predict behavior?



Semantic structure and body part features predict action similarity judgments well

Low-level gist features and visual areas of the brain do poorly

N = 20,replicated with N = 16





What is this action

Semantic Category



Super- and sub-category labels from American Time Use Survey

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E2: Measure Other Similarity Spaces

Sort the actions according to...



Preliminary Modeling Results

What features do subjects consider when judging actions? Predict unguided similarity judgments using guided similarity judgments



Without explicit guidance, subjects sort actions based primarily on the actors' goals

Upcoming Questions

Which similarity spaces are housed in visual cortex?

Are noise ceilings higher with explicit instructions?

How do these guided similarity judgments map onto our hypothesized feature spaces?

N = 5Visual similarity

Goal similarity

N = 5

Movement similarity N = 4

E3: Measure Action Groups

Is the mental action similarity space categorical?

Task: Make groups of similar videos



Results



evidence for categorical representations?

Conclusions

Action similarity judgments are best predicted by higher-level properties that describe what they do, not how they look

These judgments do not draw directly on visual system representations

Jozwick (2017), Groen (2017)



Instead, they may draw on categorical representations housed elsewhere in the brain



N = 11,replicated with N = 10

