

Learning How Objects Function via Co-Analysis of Interactions

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1 Supplementary material

We present additional details of our evaluation in this supplementary material.

Evaluation graphs. Figure 1 shows the property weights learned for each category of objects. In Figure 2, we plot the rank consistency (RC) obtained with training sets of different sizes. Moreover, Figure 3 shows the precision-recall plots for the recognition of each individual category.

User study. Figure 4 presents two example queries used in our user study, where the objective is to collect from users a functionality score between an object and a category.

Dataset. Figures 5–9 show all the scenes that appear in our dataset, organized into the respective classes.

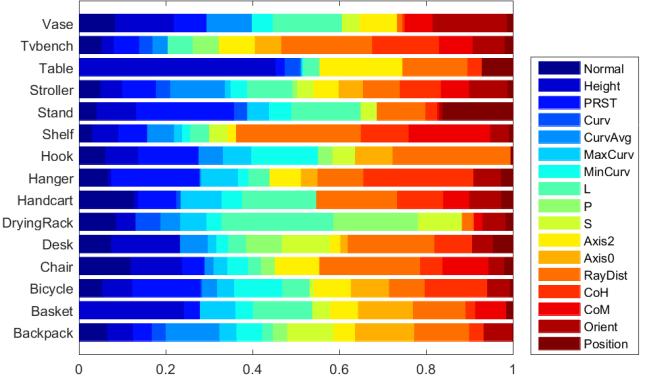


Figure 1: Weights of the unary and binary properties, learned for the model of each category. Note that no property has a zero weight for all classes.

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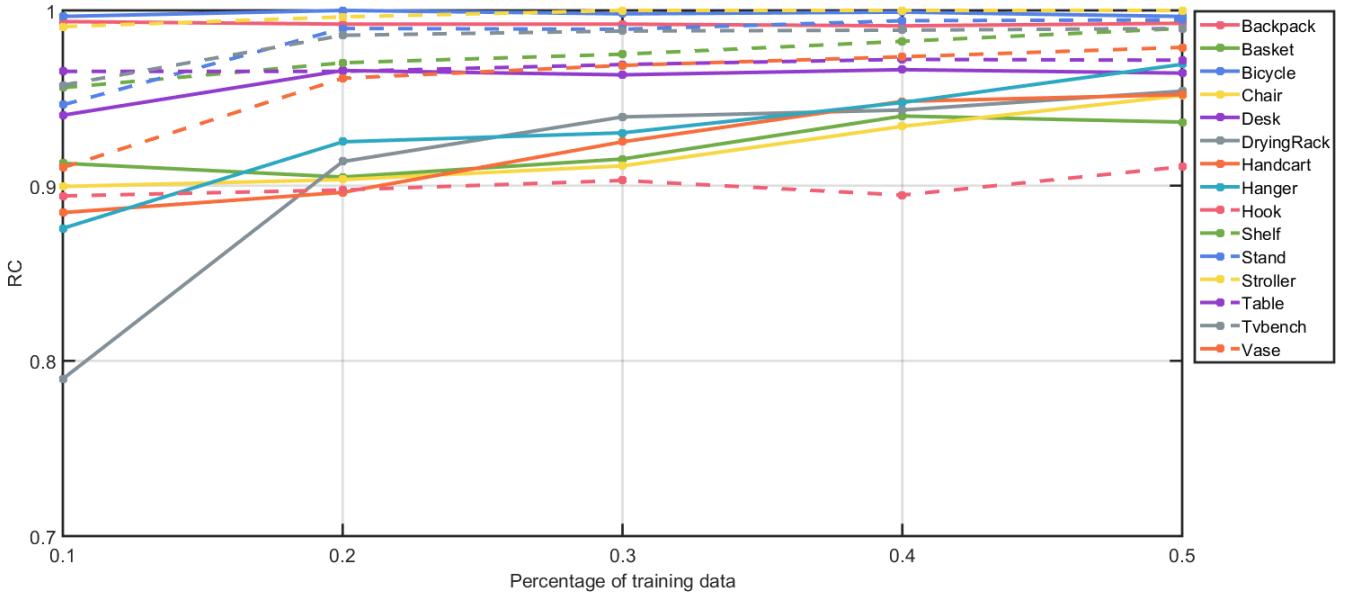


Figure 2: Effect of the size of the training set on the ranking consistency (RC), for the model of each category. After training, we apply the prediction and compute the RC on a separate test set composed of 10% of the shapes in the dataset. Note how, with a training set composed of 20% of the shapes in the dataset, we are already able to obtain a high-quality functionality model.

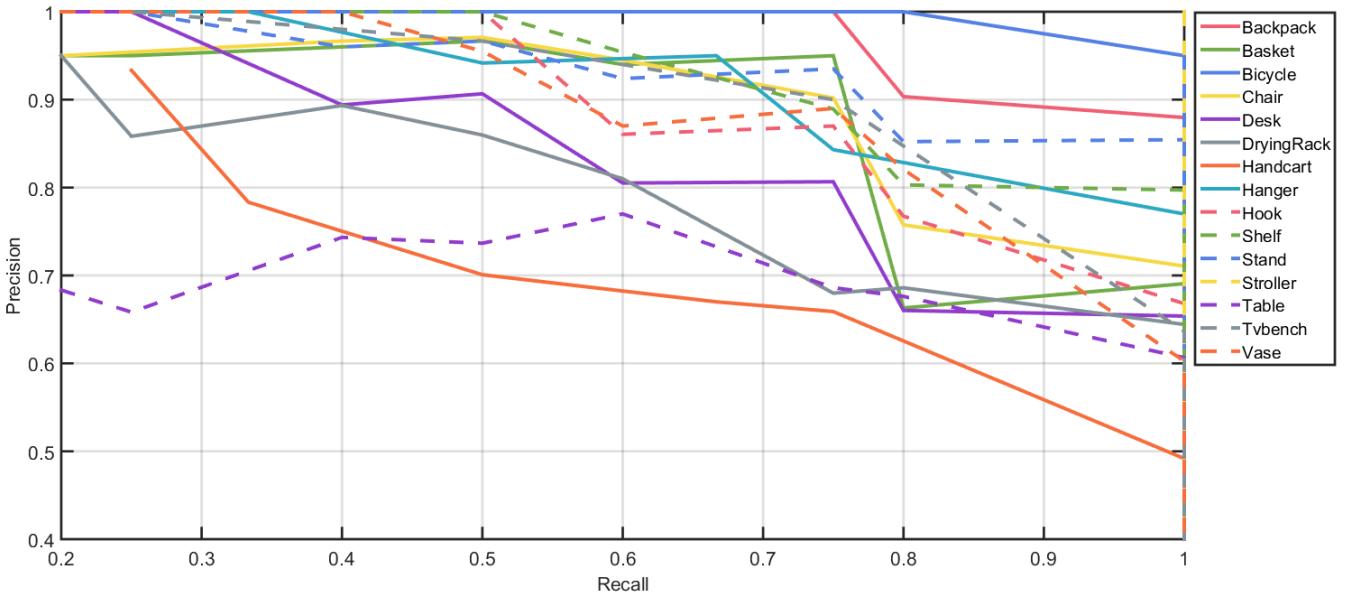
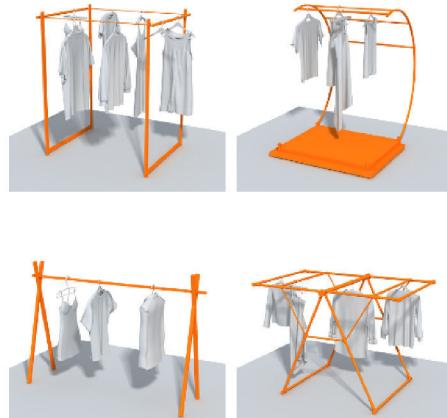


Figure 3: Object recognition performed with the functionality model learned for each category. The closer the lines are to point (1, 1), the higher the ranking quality. Note how, for almost all the classes, we obtain a precision of over 0.8 for a recall of up to 0.7.

Can the object to the left function as the orange objects in the scenes to the right?

1/60

- 1 (No, it can't) 2 (Probably not) 3 (Not sure) 4 (May be possible) 5 (Yes, it can)

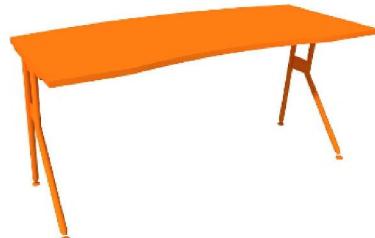


(a)

Can the object to the left function as the orange objects in the scenes to the right?

12/60

- 1 (No, it can't) 2 (Probably not) 3 (Not sure) 4 (May be possible) 5 (Yes, it can)



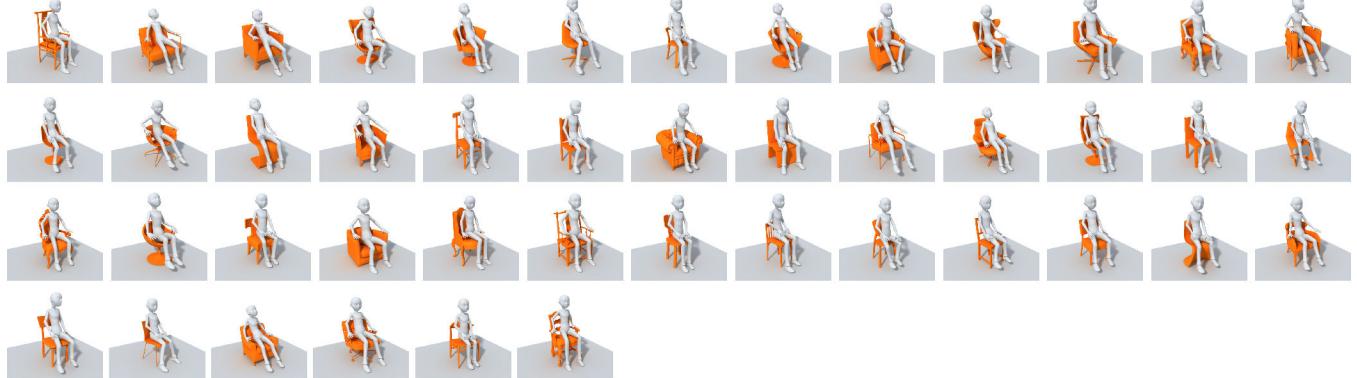
(b)

Figure 4: Two example queries from our user study.



Figure 5: All the shapes in our dataset (part 1/5). The central object for each category is highlighted in orange color.

Chair



Desk



Drying Rack

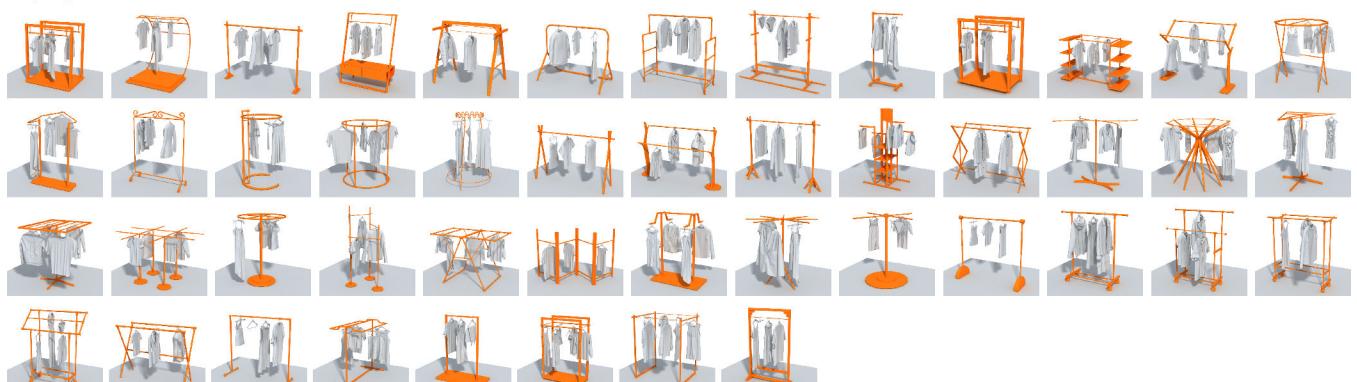
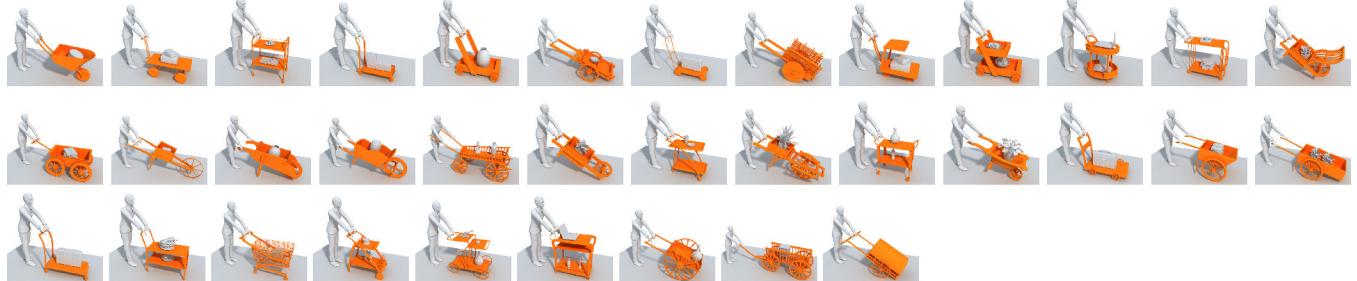


Figure 6: All the shapes in our dataset (part 2/5). The central object for each category is highlighted in orange color.

Handcart



Hanger



Hook

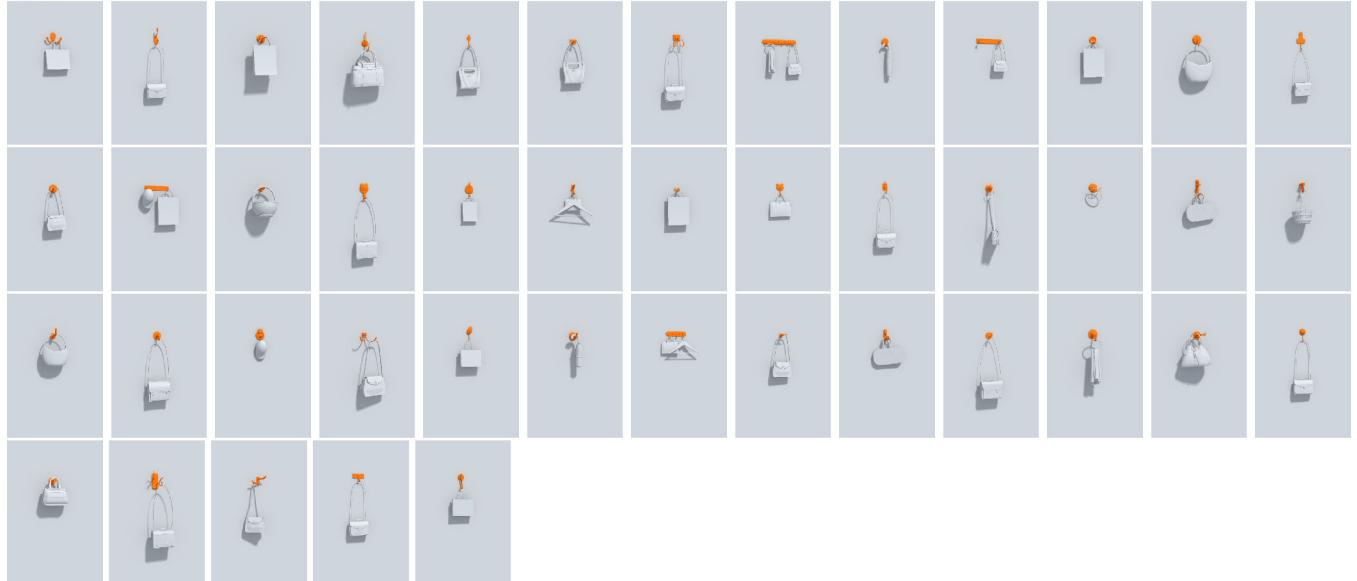
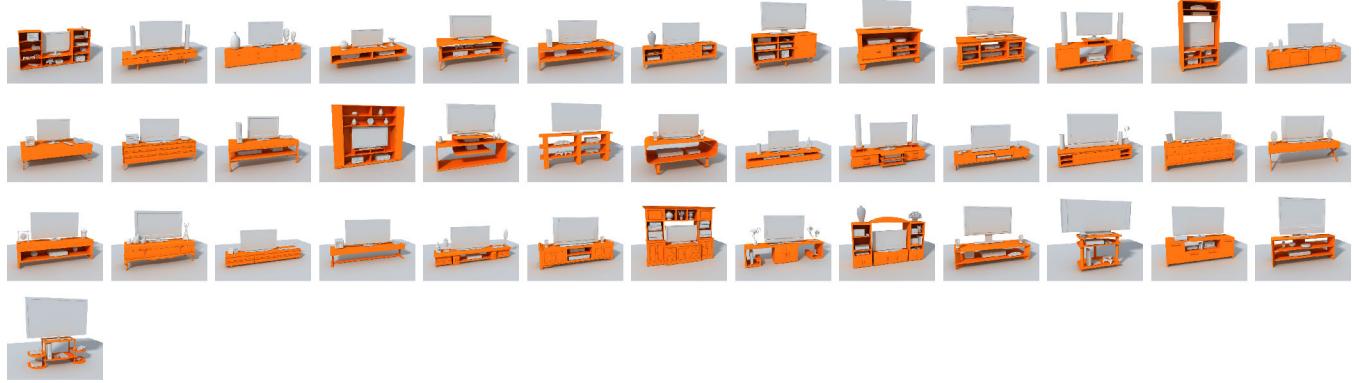


Figure 7: All the shapes in our dataset (part 3/5). The central object for each category is highlighted in orange color.



Figure 8: All the shapes in our dataset (part 4/5). The central object for each category is highlighted in orange color.

TV Bench



Vase

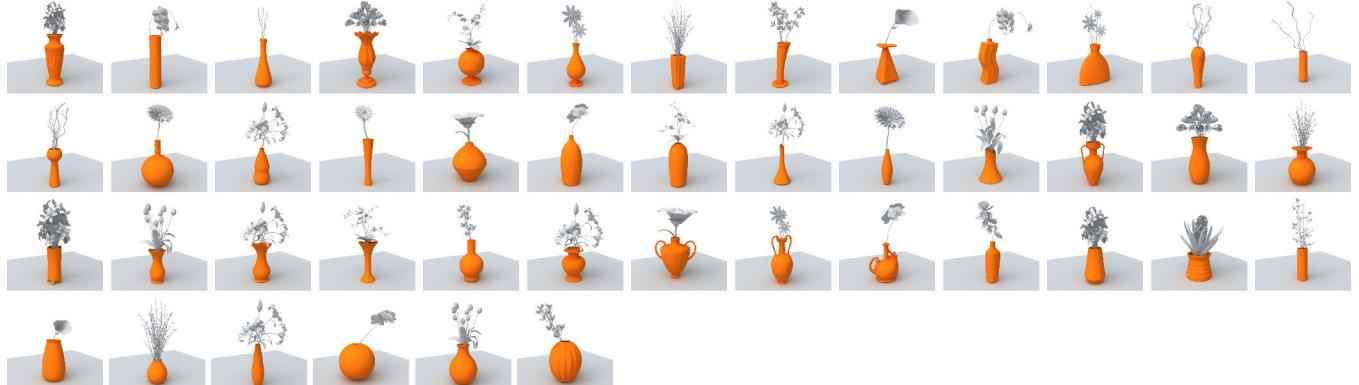


Figure 9: All the shapes in our dataset (part 5/5). The central object for each category is highlighted in orange color.