COCO Attributes

Attributes for People, Animals, and Objects

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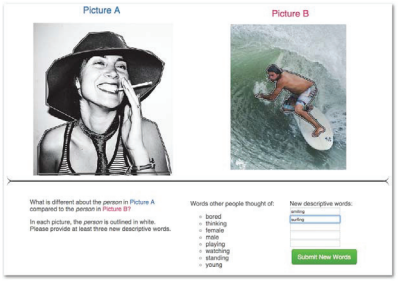
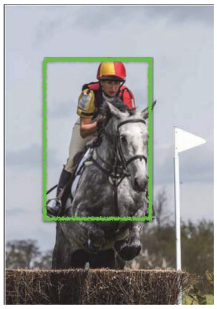
Objects with Attributes

What attributes are important to humans?



Which Attribute should we ask about next?

Attribute labels are sparse. The average object has only 9 attributes (out of 196). Given an object's category and known attributes, other attributes are more or less likely to be present.



Person
male, sporty, participating, sitting, moving, what's next?

Food
Carrot
healthy, tasty/delicious, fresh, what's next?

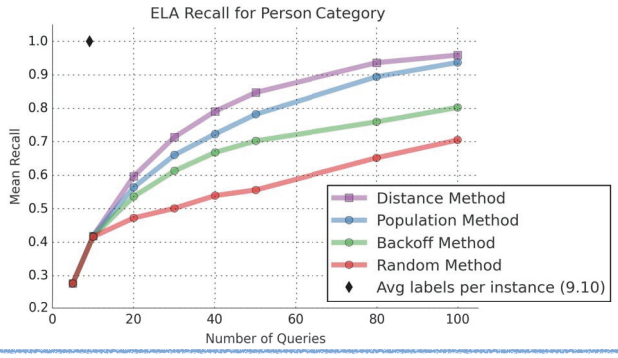
Efficient Labeling Algorithm (ELA) Exploiting Attribute Correlations

Input: Dataset $\mathcal{D}$ of unlabeled images, fully labeled training set $\mathcal{T}$, labels to annotate A
Output: Labeled dataset $\mathcal{D}'$

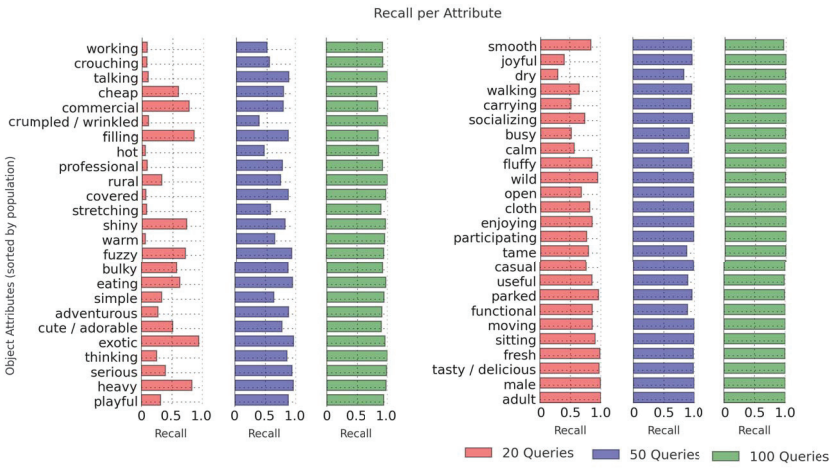
```
for I_j ∈ D do
    while NumLabels(I_j) < N do                ▷ I_j is an unlabeled image from D
        D_S = MatchingSubset(I_j, D)           ▷ Repeat annotation until N labels are acquired
        if isEmpty(D_S) then
            D_S = AltMatchingMethod(I_j, D)
        end
        Q_n = SelectAttributeQuery(D_S)
        I_j[n] = Annotate(Q_n)
    end
end
return D'
```

We don't have to annotate all the attributes!

Estimating Next Attribute Query when there are No Matching Examples in Exhaustive Set



Does the ELA work for every Attribute?



COCO Attribute Dataset Statistics:

- 84,000 images
- 180,000 unique objects
- 196 attributes
- 29 object categories
- 3.5 Million objection-attribute pairs

Comparing Classification: 1 vs. Rest and Multi-attribute estimation