Unconstrained Foreground Object Search

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Motivation
Unconstrained Foreground Object Search

Applications: image editing, e.g., hole filling, image compositing

Our Problem
Novel Problem: We propose the problem of Unconstrained Foreground Object (UFO) Search, to search for foreground objects that are semantically compatible with a background image without any constraint on what objects to retrieve.

Related Work: Method [1] is constrained to retrieve objects that belong to a pre-specified semantic class.

Our UFO Search
Our Focus: semantic compatibility

The Background Encoder and Foreground Encoder project background images and foreground objects into a shared feature space respectively, such that compatible objects and backgrounds are near each other.

Key Challenge in Training: how to generate a sufficient number of positive samples per background image for training the encoder.

Solution: we introduce a Training Data Generation module, that consists of two mechanisms, to augment training data: 1) a Discriminator to identify a noisy set of compatible objects per background image, and 2) a Sampling module to accelerate the process above.

Dataset: CAIS [1] (8 object categories)

When only one object type is compatible, the top retrievals all come from that object type.

Dataset: MS-COCO [2] (79 object categories)

When many object types are appropriate, the top retrievals span multiple object categories.

Qualitative Results
Evaluation

<table>
<thead>
<tr>
<th>Method</th>
<th>P@5</th>
<th>P@10</th>
<th>P@15</th>
<th>P@20</th>
<th>P@25</th>
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<tbody>
<tr>
<td>UFO Search</td>
<td>41.83</td>
<td>40.33</td>
<td>39.39</td>
<td>38.96</td>
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<tr>
<td>No BG Training</td>
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<td>13.28</td>
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<td>No Discriminator</td>
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<td>Discriminator Only</td>
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<td>38.61</td>
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<td>Regression</td>
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<td>36.90</td>
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Our ablution study illustrates the benefit of our design choices for UFO Search.

Our user study reinforces the benefit of our design choices for UFO Search.