Unbiased Metric Learning
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Approach Overview:
1. Learning feature spaces, where data from multiple domains are bridged together in different ways (capture common knowledge)
2. Validating out the best bridging using web images

Validation with Web Images:
I. Difficulty
   I. Test data can from unseen domains
   II. Test data can from multiple domains
   III. No domain knowledge of test data
II. Assumption: web images are less biased
III. Potential Issue: web images are only weakly-labeled

Experiments:
I. Cross-dataset classification: leave one dataset out as test set, learn from the other datasets

Table 1. K-nearest neighbor classification accuracy on all datasets. Metrics are learned on each dataset individually. The left-most column specifies the training dataset, while the up-most row specifies the test dataset.

<table>
<thead>
<tr>
<th></th>
<th>Train</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cal</td>
<td>Pas</td>
</tr>
<tr>
<td>Cal</td>
<td>0.87</td>
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<tr>
<td>Pas</td>
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<td>0.23</td>
</tr>
<tr>
<td>Lab</td>
<td>0.24</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Figure 1. Cross-dataset classification accuracy on T\textsuperscript{e}\textsuperscript{unseen} with validation on V\textsubscript{a}\textsuperscript{unseen}. This figure shows the learning is able to produce model with better generalization ability.

Figure 2. Cross-dataset classification accuracy of full model, compared with other metric learning approaches.

Figure 3. Cross-dataset classification accuracy of full model, compared with other metric learning approaches.