Object Classification with ImageNet

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Problem
➢ We live in a world of images that would take us years to sort through.
➢ We need a system that can classify the millions of images we have at our disposal.
➢ That is where computer vision comes in; more specifically, deep learning neural networks.

Deep Learning Neural Networks
➢ Using deep learning, we are capable of teaching a neural network the ability to sort through and label images for us.
➢ Intelligent neural networks already surpass the accuracy of a human but we want them to be even more accurate.

Methods
➢ For our research, we used the validation dataset from ImageNet to test current neural architectures.
➢ Rather than adding more layers to the current architecture, we focused our research on modifying the amount of crops the network uses when identifying an image in order to increase its accuracy.

Figure 1: Image Classification on Real World

Results
➢ The accuracy of a classifier is measured in top-1 and top-5 error rates.
➢ An error occurs if the first predicted class (top-1) or one of the five predicted classes (top-5) does not match the ground truth label.
➢ There was a decrease in the classifier’s error rate as we increased the number of crops used.

<table>
<thead>
<tr>
<th>Neural Architecture</th>
<th>Top-1 Error</th>
<th>Top-5 Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>ResNet-200 (Center Crop)</td>
<td>21.66</td>
<td>5.79</td>
</tr>
<tr>
<td>Resnet-200 (10-Crop)</td>
<td>19.89</td>
<td>4.81</td>
</tr>
<tr>
<td>ResNet-200 (144-Crop)</td>
<td>19.15</td>
<td>4.37</td>
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</tbody>
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Conclusions
Our research shows that we are able to achieve a better error rate using our classifier just by increasing the number of crops on each image being analyzed. However, the rate at which the classifier analyzes the dataset will decrease (longer runtime).

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References