Traffic Sign Detection System Through Faster-RCNN Architecture

Jahdiel Alvarez, University of Puerto Rico-Mayaguez
Carnegie Mellon University

Introduction

✓ Federal institutions maintain an inventory of the traffic signs around a city. Human inspection is a costly process which can be automated.
✓ The goal is to develop a framework to correctly detect and classify multiple classes of traffic signs.

Faster R-CNN Detection

✓ We used the Faster R-CNN architecture [1] as our traffic sign detection model.

US Traffic Sign Datasets

✓ We trained on the LISA-TS Extension Dataset and NavLab’s Stop Sign Dataset [2].

US Signs Are Different

✓ Not all countries follow the Vienna Convention on Road Signs and Signals, such as the US. Therefore signage in this countries may vary drastically from the Vienna Convention standard.

Model Description

✓ Resnet-50, with PASCAL VOC weights
✓ Resize image to 960x960px, instead of 600x600px
✓ 4 Classes: Stop, Warning, No Turn, Speed Limit
✓ Fine-tuned the network for 53 epochs.
✓ LISA-TS Training Set: 2937 Images Testing Set: 734
✓ Image Size: 1280x768px Traffic sign sizes: 23 – 222 px
✓ Post-processing: ROI Position Filtering

<table>
<thead>
<tr>
<th></th>
<th>AP</th>
<th>AP_{stop}</th>
<th>AP_{warning}</th>
<th>AP_{no-turn}</th>
<th>AP_{speed limit}</th>
</tr>
</thead>
<tbody>
<tr>
<td>LISA-TS Ext.</td>
<td>0.830</td>
<td>0.857</td>
<td>0.752</td>
<td>0.919</td>
<td>0.792</td>
</tr>
</tbody>
</table>

Results

✓ Our model was able to obtain a mean average precision (mAP) of 80.10% with IoU of 0.5 on our testing set, which was 20% of the LISA-TS Extension labeled’s images.

Future Work

✓ Utilize a smaller network, in order to minimize the receptive field, given traffic signs are very small. Doing more training and obtaining more data are part of our future intentions.

Conclusion

✓ Our project provides the first public results for a deep learning method based on the 4 LISA-TS Extension super classes.
✓ Aggregated Channel Features (ACF) methods currently outperform deep learning methods. This might change by implementing our future works.

Future Work

✓ Thanks to my advisor Christoph Mertz.

References