US. Traffic Signs
Detection & Geospatial Localization

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Introduction

Our research aims to develop an automated system which processes a stream of images and classifies the types of signs present in the image and determines the GPS location of that sign. Furthermore, our project introduces one of the few large scale datasets to serve as a benchmark in the domain of Traffic Sign Recognition (TSR).

Figure 1. Our deep learning model pipeline.

Methods

Our system uses a heavily modified version of RetinaNet, a state of the art object detector using deep learning. We use a neural network which computes "similarity" between pairs of detections and the Hungarian Algorithm to condense similar detections into actual signs.

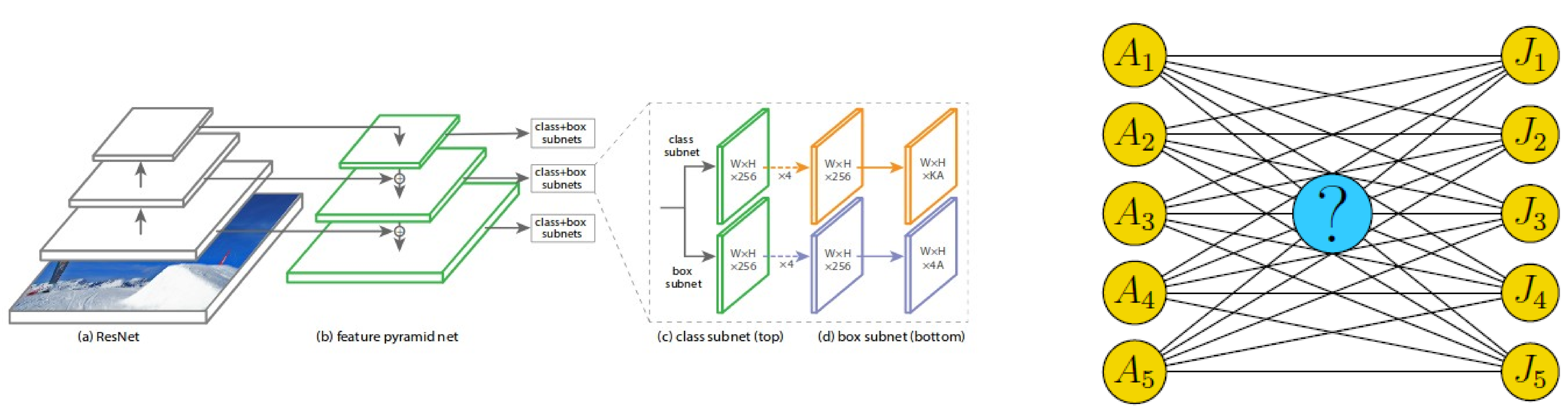
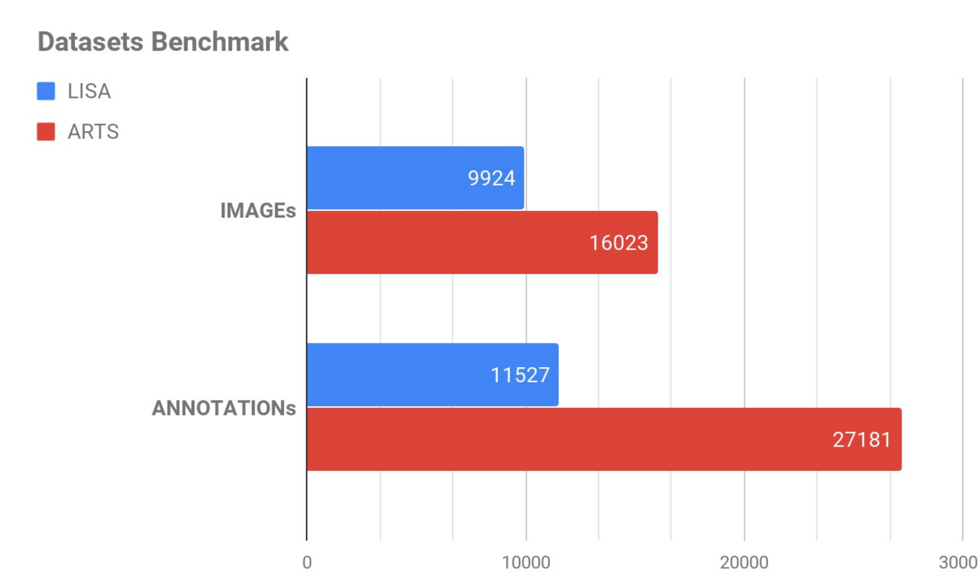


Figure 2. RetinaNet creates detections from its feature pyramid network (left) and the Hungarian Algorithm merges similar detections (right).

Results

Our dataset contains 176 classes of signs, over 51,000 images, and greater than 27,000 annotations, making it the largest TSA dataset available. When detecting and classifying signs, our best model currently achieves a 75th percentile mean average precision of 83%. The system scores an average of 5.32 meters' geospatial margin of error.



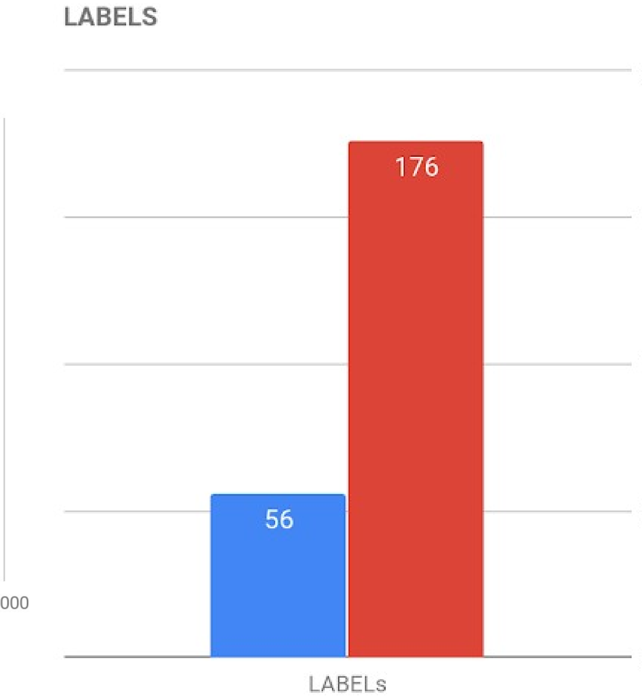


Figure 3. Our dataset has more images, annotations, and labels than LISA (the competing dataset).

Conclusion

Our system automates the task of locating road assets, and in the future could be used to make maintenance assessments. We also introduce a large TSR dataset to support future research in this field.

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References

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