

Sign-Hunter: Classification and Geo-Localization of US Traffic Signs

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Introduction

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

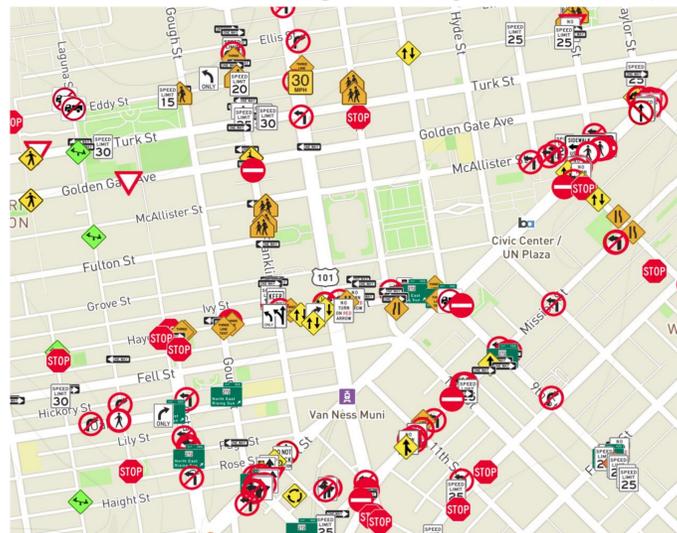


Figure 1. Our system classifies signs in images and localizes their GPS coordinates on a map.

Methodology

We extended a version of advanced Deep Learning architecture, RetinaNet, which detects and predicts GPS coordinates for signs using roadside images as input. We use a neural network which computes a similarity measure between pairs of RetinaNet detections in conjunction with the Hungarian Algorithm to condense similar detections into actual signs.

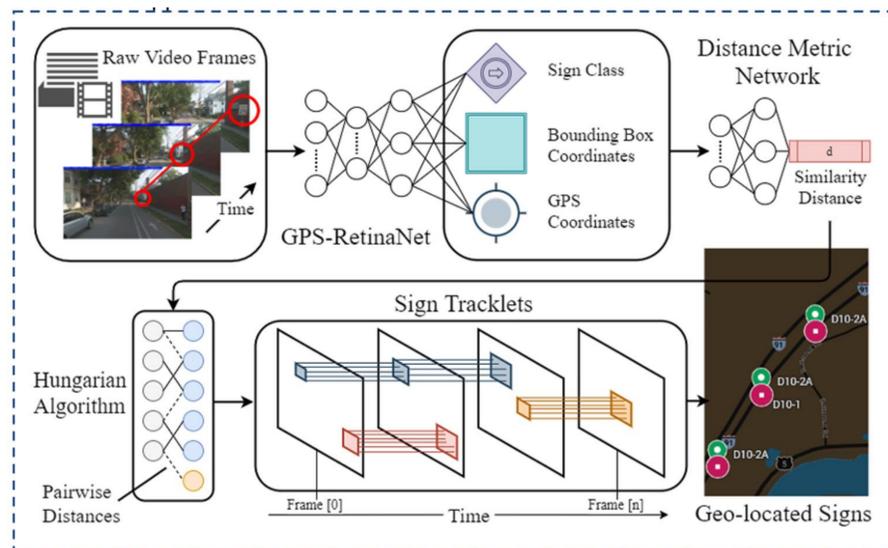


Figure 2. The full end-to-end data processing pipeline which converts raw images into sign localizations.

Results

Our dataset contains 181 classes of signs, over 80,000 images, and greater than 55,000 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 85%. The system scores a mean of 4.62 meters' geospatial margin of error.

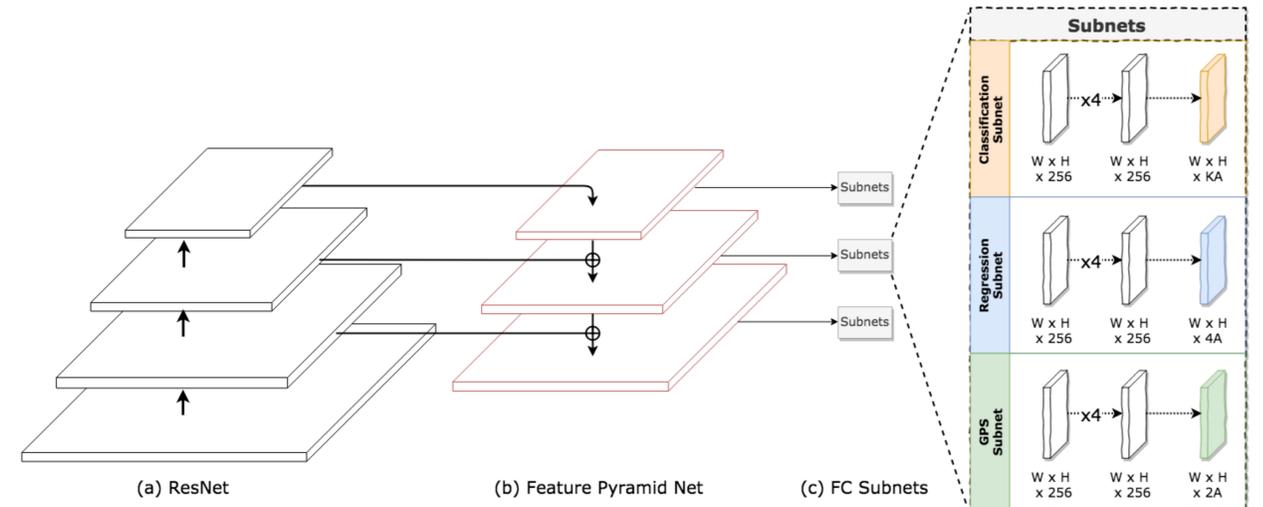


Figure 3. RetinaNet achieves high performance at classifying and localizing road signs.

Conclusions

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.

Acknowledgments

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References

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