

Classifying Bike-Friendly Roads using Google Street View Images

Cyclists use route-planning software to plan rides on safe, “bike-friendly” roads. Route-planning programs (such as Google Maps, Strava) optimize routes for cyclists by preferring roads designated as bike-friendly. The designation of bike-friendly roads may come from public records (Department of Transportation), open-source communities (OpenStreetMap), or privately-owned data sources (Google Maps, Strava). However, roads are not always classified correctly, and many geographical regions are not supported by these programs.

This project aims to classify Google Street View road images as bike-friendly or not. This is interesting because it builds upon extensive research on applying deep learning to detect and classify images on roads, and uses publicly available Street View data. If successful, this project could have important applications: it could be used to improve the accuracy of maps of bike-friendly roads, thereby improving cyclist safety.

We will develop labeled training data by combining road information (including the classification of bike-friendly) from the OpenStreetMap API with Google Street View images. Specifically, we will pull training data from geographic locations with prevalent and well-labeled bike-friendly roads; to avoid selection bias, we will extract images for both labels from comparable roads (e.g. only use secondary/tertiary highways, and pull from the same neighborhoods).

We will use convolutional neural networks that have been pre-trained on similar “street view” images, such as the KITTI, Berkeley DeepDrive, or Cityscapes datasets. To inform this research We will review previous research in using CNNs for lane detection¹, and applications of CNNs to Google Street View data for symbol recognition² and car classification³.

Accuracy will be determined by the neural network classification error. A “successful” model should be able to outperform a naïve guess.

The group includes Josh Sennett and Evan Rourke. Josh and Evan will work together on all steps of the design, implementation, and write up of the neural network and results. However, Josh will lead the collection of a labeled dataset; Evan will lead pre-training and using supplemental data sources; and Josh and Evan will work together on building the neural network and writing up results.

¹ Kim J., Lee M. (2014) Robust Lane Detection Based On Convolutional Neural Network and Random Sample Consensus. In: Loo C.K., Yap K.S., Wong K.W., Teoh A., Huang K. (eds) Neural Information Processing. ICONIP 2014. Lecture Notes in Computer Science, vol 8834. Springer, Cham

² Goodfellow, Ian J., et al. "Multi-digit number recognition from street view imagery using deep convolutional neural networks." *arXiv preprint arXiv:1312.6082* (2013).

³ Gebru, Timnit, et al. "Using deep learning and google street view to estimate the demographic makeup of the us." *arXiv preprint arXiv:1702.06683* (2017).