Individual Report

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Introduction

The goal of this project is to anticipate how a vehicle would do autonomous driving based on the analysis of the surroundings (position of nearby automobiles). We choose this problem because we want to explore the truth of autonomous driving and find out if there is space to improve self-driving to make this technique widespread. We divide our parts into data preprocessing, EDA, model training and prediction. We discuss together to find our dataset, try to see how to resize images and pre-processing data into best format to prepare for the model training. Mostly, we spend most time figuring out which network is best for us to use to predict autonomous driving. Lastly, we implemented the EfficientDet as our network.

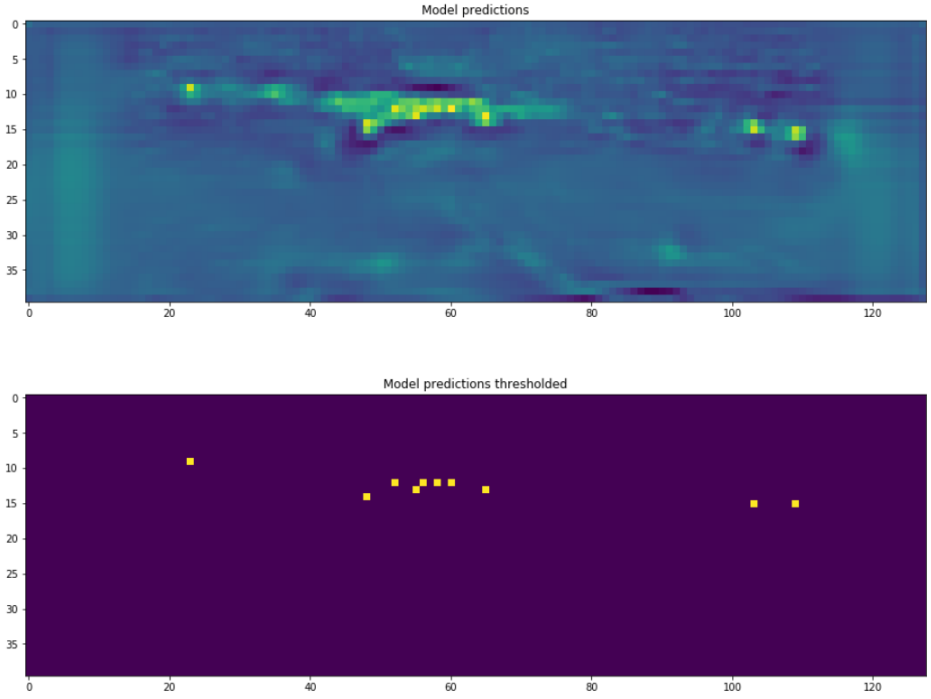
Individual work

For this project, I take charge of finding data, writing proposal, writing report making PowerPoint, do the EDA, do the data pre-processing and do the final prediction part of the model. For the EDA, I calculate the number of cars in each image and also I make a bar chart to see the percentage of car models in the whole dataset. Additionally, I try the data pre-processing through resizing, convert 3d to 2d and finding bounding box, but I failed in this part. Finally, I do the prediction part after the model was trained and saved.

Results

After the 10 epochs training, the training loss for our model is more than 20, which is really high. The main reason for the high loss comes from the BCE(Binary Cross Entropy) of the center point classification. Without BCE, the loss of the regression part is only about

0.4. The heatmap with the prediction targets looks good but not very clearly. After doing the threshold operation, each prediction dot can be discovered distinctly in the second figure. By ensuring the position of each car in one image, the prediction of autonomous driving can be done by avoiding existing cars in sight. For me in this project, I learn most skills about data-preprocessing with the images and the concept of EfficientDet. To deal with specific images of street cars, it is not suitable for us to resize images in normal way and this let me understand we have to deal with pictures in different ways under different circumstance. Also, for the efficientDet, I think it is a good network with feature pyramid extraction.



Summary and Conclusions

In conclusion, we borrowed the idea of predicting center points heatmap and regressing on the center point related features from the CenterNet. Due to the time limitation, our performance is not so good. In the future, we will try to figure how to simplify the procedure and modify the network to improve the predict performance.

Percentage of code: 18%

References

Tan, M., Pang, R., & Le, Q. V. (2019). EfficientDet: Scalable and Efficient Object Detection. *arXiv preprint arXiv:1911.09070*.

Data retrieved from https://www.kaggle.com/c/pku-autonomous-driving/overview

Tsung-Yi Lin, Piotr Dollár, Ross Girshick, Kaiming He, Bharath Hariharan, Serge Belongie.(2019). Feature Pyramid Networks for Object Detection.*arXiv:1612.03144*