RC Autonomous Vehicle Project

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Overview

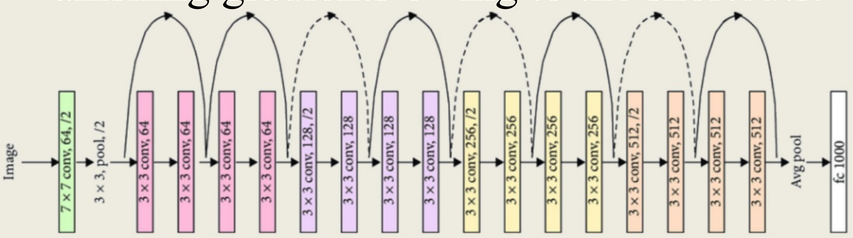
Autonomous vehicle equipped with an environment sensing system reduces the reliance on human control. Two models were trained with the images collected in the building of the University of Tennessee by the robot car. The accuracy of the model with TensorRT was higher than that with ImageAI. Thus, TensorRT was the chosen library working with the framework.

Objective

The objective of this project is the sign recognition. The classification was the function utilized to achieve self-driving. The car following and edge networking would be the long-term objectives performing in the future.

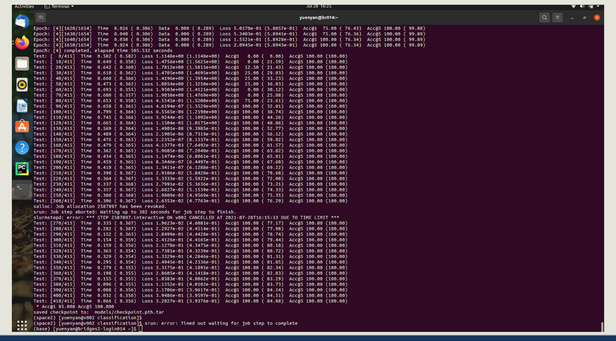
ResNet18

ResNet18 is the default model in the classification. It was pre-trained on the ImageNet dataset with 18 layers including 1 max pool layer, 16 convolution layers and 1 average pool layer. It prevents vanishing gradients owing to the shortcuts.



Procedure

This project was started by assembling a robot car with Jetson Nano, 3D paintings and components in the car kit. After setting up the Jetson Nano, we ran "communicate-with-arduino.py", which controlled the vehicle to move, and "collect-img.py", which controlled the camera to capture images, at the same time so as to collect data. Then, we trained models with ImageAI and TensorRT to perform classification.



Result

The accuracy of the model using ResNet18 network with TensorRT was higher. The model trained with ImageAI would give wrong predictions. As for TensorRT, the probability could be higher than 90%. It was more reliable.

Data

The images were captured in the College of Education in 2019. 16540 photos were classified into 6 classes which were "W", "L", "R", "TL", "TR" and "RE".

Conclusion

After comparing the accuracy of two models, the selected library was TensorRT. We will use it for classification in car-following as well. Hence, edge networking will be studied in order to achieve sharing information between vehicles.

Acknowledgement

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Reference

Almezhghwi, K., & Serte, S. (2020). Improved classification of white blood cells with the Generative adversarial network and deep convolutional neural network. *Computational Intelligence and Neuroscience*, *2020*, 1–12. https://doi.org/10.1155/2020/6490479