

CARL: A Convolutional Neural Network Powered Self-Driving Car

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Autonomous vehicles have the potential to vastly increase road safety and reduce the environmental impact of personal vehicles. While this technology is still in development, rapid progress has been made in areas such as processing speed and machine learning integration¹. The goal of this project was to create an autonomous vehicle that incorporates cutting edge machine learning techniques on a smaller scale, while still being accessible. To meet this goal, we developed CARL, the Convolutional Autonomous dRiving vehicle. CARL was built using a 3D printed chassis and accessible electronics, including a Raspberry Pi Model 3 and an Arduino Uno. A custom lightweight convolutional neural network, called CARLnet, was developed for the purpose of guiding the car around an arbitrarily shaped paper track. CARLnet was trained on approximately 8000 images and achieved over 95 percent accuracy in training. In testing, the car was able to drive around a track autonomously without human intervention. All data was processed using the car's onboard computer.

Awards Won:

Air Force Research Laboratory on behalf of the United States Air Force: First Award of \$750 in each Intel ISEF Category