



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Edward Yang	Project Number S1019
Project Title An Advanced Vehicle Warning System to Prevent Rear End Collisions	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The US Department of Transportation states, in one of its reports, rear-end collisions contribute to more than 33% of all car accidents. The objective of this engineering project is to create a low-cost rear vehicle warning system that can prevent rear end collisions from occurring that can be used commercially.</p> <p>Methods/Materials Previously, a prototype of this vehicle alarm system was built using only an LDM and Raspberry Pi. This year, the system is improved by developing a dynamic safety distance model using the actual speeds and stopping distances for both vehicles through the application of all the variables that affect vehicle stopping distance. A GPS is integrated into the system to obtain the actual speed of the installed vehicle and the road slope. Using the distance obtained by the laser distance meter, the speed of the following vehicle is accurately determined. Additionally, a camera is added to the system to take a picture of the following vehicle. Paired with a machine learning program that had been edited from source code found from SourceForge for object-detection by bikz05, it is able to recognize whether the following vehicle is a truck or a car because trucks require double the stopping distance of a car. The system was then tested by attaching it to a car and driving the car on a highway and in a neighborhood and in rainy and sunny weather.</p> <p>Results The system was able to successfully warn or alarm the rear vehicle when it was too close. The model that was created accurately predicted the distances at which the rear vehicle is or is not a safe distance away. The cost of the whole entire system was less than \$200 and is able to work under difference circumstances.</p> <p>Conclusions/Discussion This project successfully built a vehicle warning system and demonstrated the ability of the system to predict and warn when a rear-end collision may occur and validates the efficacy of the model that was created.</p>	
Summary Statement My project is a vehicle warning system that uses a novel model to calculate whether or not the rear vehicle is a safe distance away and warns the rear driver if the car is not.	
Help Received I designed my own vehicle recognition program after referencing Bikramjot Singh Hanzra#s (bikz05) object detector program as an example to create my own with.	