



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Karena Kong	Project Number S0817
Project Title Traffic Network Management: Novel Approach Using a Deep-Learning System Driven by Dynamic Data and an Adaptive Algorithm	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to create a traffic management system called VRAA (Visual Recognition based Adaptive Algorithm) that could determine the most optimal traffic light sequences to produce the most successive green light waves and reduce starvation using an adaptive algorithm and data input through an image processing sequence of live traffic footage.</p> <p>Methods/Materials I created an adaptive algorithm in Java that adjusted according to fluctuations in traffic flow. To begin, VRAA internalizes data points through the visual based car detection module. A clean background image is first captured followed by a series of frames depicting traffic flow, each individually taken using a 1 second timer. Both background image and captured frame are gray scaled and contoured to erase noise. Subtracting the background image leaves the remaining clusters that are fused and recognized as vehicle data points. VRAA's second module aims to simulate different worlds using data from prior module to depict traditional controls versus novel traffic smart controls, which adopt the adaptive algorithm.</p> <p>Results In all three modes, the smart control system showed a faster response and greater efficiency. Even under stress (contingent load), drive lanes saw a 9 second shorter wait time and travel time overall improved by 24%. The traffic management simulation also showed environment benefits and significant decreases of CO2 emissions when idling time at intersections are reduced#an 88,000 grams decrease in CO2 emissions for every thousand cars in the real load</p> <p>Conclusions/Discussion VRAA calculates the most optimal traffic light signaling to extend green waves by assessing four variable factors through novel mathematical algorithms. VRAA accounts for the starvation factor, priority queue, aging factor, and neighboring traffic for all possible sources and destination routes at an intersection. The smart traffic control consistently proves faster travel time and reduced traffic through a simulation process.</p>	
Summary Statement I created a traffic control system called VRAA that improves traffic flow through an interdisciplinary approach leveraging computational analysis of live traffic footage, using a novel adaptive algorithm, and validating improvements through	
Help Received I designed, built, and programmed VRAA myself. My parents reviewed some parts of this project and provided input.	