



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Aaron O. Feldman	Project Number J1403
Project Title Saving Lives One Swimmer at a Time	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to develop a computer system that can reliably detect when a swimmer is underwater and possibly drowning.</p> <p>Methods/Materials A video was taken with the swimmer under water as well as above the water. The video was split up into still images. Then a program written in Python processed the images. The program compared a baseline image in which the swimmer was known to be absent/not visible to other images, attempting to detect whether the swimmer was visible in the other images. For a given image, the program concluded that the swimmer was visible if and only the region (a 50x100 pixel box) with the largest summed differences exceeded a specified threshold.</p> <p>Sometimes when the swimmer is submerged, the error level exceeds the threshold because the program has detected moving lane lines. An improved program was developed that minimizes the impact of this or similar motion. The new program modifies the evaluation image by swapping closely-spaced pixels to minimize error levels, essentially moving the lane lines back to their original location in the baseline image.</p> <p>Results As expected, images with the swimmer above water have a higher error level than those with the submerged swimmer; although it can minimize or eliminate the errors associated with moving lane lines, pixel-swapping cannot eliminate the error associated with the swimmer because the swimmer is not visible in the baseline image.</p> <p>Conclusions/Discussion It is possible to set a threshold which can be compared against error levels to accurately determine whether the swimmer is not visible and hence underwater.</p>	
Summary Statement In this project, a computerized image processing system was developed to reliably detect when a swimmer is underwater and possibly drowning.	
Help Received Father helped teach Python programming language	