



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Saurabh Narain	Project Number S0822
Project Title A Cloud Based Machine Learning Wearable Device to Monitor, Predict, and Prevent Cardiac Arrest	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Sudden cardiac arrest (SCA) is a condition in which the heart experiences irregular heartbeats known as arrhythmias. When SCA occurs, it is fatal, killing people within minutes. SCA is the leading cause of death in the US, accounting for more than 360,000 deaths every year. SCA immobilizes the victim, rendering them incapable of asking for assistance. This medical emergency needs immediate CPR followed by the use of an defibrillator, but most of the time, the required help does not arrive quick enough to save the victim. My solution is a wearable device that detects if a person is experiencing SCA and notifies the user's family using communication methods such as a phone call, text, or social media. Once the phone call is received, the family can immediately engage emergency services to save the victim.</p> <p>Methods/Materials My wearable device works by using an optical pulse sensor to capture the user's pulse rate. The user's pulse rate is sent to the cloud, where it is processed using a machine learning algorithm to identify whether or not the user is suffering from SCA. If the user is identified as suffering from SCA, my cloud based application will notify the user's family. I have verified authenticity of my pulse sensor data by comparing it with pulse rate data from a blood pressure monitor and oximeter with 95% accuracy. I have tested my device using simulated pulse rates of a victim to make sure that it detects SCA and sends notifications correctly. I used a laptop running the Arduino IDE, a cloud based application called Thingspeak, an OLED display, and an ESP-8266 microcontroller to create my wearable device.</p> <p>Results During my project, I discovered differences between the pulse rate of a person undergoing SCA and a person in a normal state. By identifying these differences, I was able to create a machine learning algorithm to identify whether or not a person is suffering from SCA and notify the family if SCA is detected.</p> <p>Conclusions/Discussion I am able to make an inexpensive device that can monitor, predict, and prevent SCA for less than \$20. In the future, I plan to miniaturize my wearable device and improve the machine learning algorithm to minimize false predictions of SCA. Other devices exist, but they are bulky, invasive, and cannot be used all the time for continuous monitoring. My device addresses all these problems, making it a practical solution to monitor, predict, and prevent SCA.</p>	
Summary Statement I have created an inexpensive cloud based machine learning wearable device to monitor, predict, and prevent sudden cardiac arrest.	
Help Received None. I designed, built, and tested the wearable device myself.	