

# Siemens Competition

## Math : Science : Technology

### Regional Finalist

**Names:** Agastya Gupta

**High School:** Saratoga High School

**Mentor:** Dr. Paul Wang, Dr. Jeffrey Caves

**Project Title:** *An Inexpensive, Global, and Effective Means of Diagnosing Heart Disease via Computer Vision (Bioengineering)*

According to the World Health Organization, cardiovascular diseases are the number one cause of death and represent 30% of deaths worldwide. The Jugular Venous Pulse (JVP) is a critical indicator of cardiovascular diseases. Currently, identifying JVP accurately is a complex and expensive process fraught with errors, requiring highly experienced physicians to differentiate between the jugular venous pulse and the carotid arterial pulse to correctly identify the JVP. I developed a computer vision based diagnosis software that offers this same diagnosis based just on a video of a patient's neck. My software utilizes a customized MATLAB Computer Vision algorithm, combining Optical Flow, Blob Analysis, Median Filtration, Morphological Post-Processing, and Eulerian Video Magnification to isolate the JVP's biphasic pulse rhythm and determine its presence on the neck. I created a JVP simulator system to test the software in various lighting conditions to ensure detection in actual situations. The software could detect the pulse successfully on both the JVP simulator and human patients. The software will allow patients to monitor their heart with greater regularity, allowing for a rapid response to deteriorating symptoms. This solution provides an inexpensive, fast, portable, and global means of monitoring and managing cardiovascular health. The software is patent pending.