Detection of Harmful Microorganisms in Drinking Water Using Deep Learning

Kamala Krishnamoorthy, Keerthan (School: Fort Richmond Collegiate)

Water is one of the most essential facets of human life, yet billions of people worldwide, especially in remote areas, do not have access to safe drinking water. Harmful microorganisms in contaminated drinking water can lead to various diseases, including diarrhea, hepatitis A, and others, leading to nearly a million water-contamination-related deaths annually. Many current methods of detecting microorganisms are generally bulky and require electricity, in addition to resources with limited accessibility. In this project a deep learning-based mobile phone application was developed to quickly detect any harmful microorganisms found in drinking water samples and subsequently alert the user. To achieve this, an artificial neural network was trained on a dataset of harmful and non-harmful waterborne microorganisms. The trained artificial neural network was able to achieve an accuracy of ~93% on sample testing data. The application was designed to utilize an inexpensive and easily accessible paper microscope to enhance the magnification ability of phone cameras. The results show that a combination of using a deep learning- based application in conjunction with a paper microscope can provide a viable solution for testing drinking water. The use of a smartphone app enables informed decision-making about drinking water and provides users with a sense of control, allowing multiple tests to be done repeatedly.

Awards Won: