# Detecting Microbial Contaminants in Water Using Artificial Intelligence and Deep Learning Algorithms in order to Prevent the Spread of Waterborne Illnesses

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Water contamination is one of the most prevalent problems in the world right now. The World Health Organization estimates that, currently, 2 billion people use a contaminated water source. Among these individuals, over 4 million die from unsafe drinking water. The prevention of waterborne illnesses relies upon knowing what water is contaminated and what water is safe and sanitary. Current methods for detecting bacterial contaminants involve laboratory testing, which is expensive (>$500), inefficient (often taking multiple days for the consumer to receive the results), and not easily accessible to everyone. This project was conducted in two stages. The goal of Stage 1 was to use artificial intelligence and deep learning algorithms to detect microbial contaminants in water, with an accuracy rate of 95% in under 1 minute. The MATLAB software was used to develop a Convolutional Neural Network (CNN) to identify contaminants in water. Transfer learning and scratch learning with RGB and grayscale images were tested to see their effect on the accuracy and training time of the system. The goal of Stage 2 was to develop and deploy an inexpensive system (<$15) to classify water sources worldwide and display the classification on a map. To minimize the cost, several commercial and open-source technologies were evaluated to train the CNN and develop and serve the web application. The trained model was deployed on the Cloud as a containerized web application. The location and classification of the water source were displayed on a map in real time.

**Awards Won:**

Oracle Academy: Award of $5,000 for outstanding project in the systems software category.

University of Arizona: Renewal Tuition Scholarship