Purifying Water with Artificial Intelligence: An Innovative Solution for Efficient, Cost-Effective Filtration

Brockman, Michael (School: Bartlesville High School)

More than 2 billion people on Earth lack clean drinking water (UNDP Human Development Report 2019). Right now, randomly packed structures are the way to filtrate. The philosophy behind these structures is either expensive or not efficient. This project aims to establish an innovative artificial intelligence methodology that converts bacterial and flow-rate data into a testable filtration system for water. This allows for cost-effective, 3D printable systems to be made available to communities that are in need of clean water. Goal nodes along with node layer architecture were established to utilize data from bacterial and physics simulation. A function X, Y, Z vectors was designed to replicate a filter within these simulations. After this, the neural network system was allowed to manipulate the vectors and algorithms that predicted dependent values to bring the measured results closer to their respective goal node. In the final iteration, my data noted an improvement of CFU amount from 3384 (one gallon, at rest) to ~187. Toxicity decreased from 1 TU (on a scale of zero to one), to ~0.02 TU. Flow rate was 2:37 for one gallon. Loss rate began at 1.6 (MSE) and decreased to ~.2 (MSE) after 250 generations, then steadily decreased. The data suggests a decrease in concentration of bacteria within the solution, which results in a decrease in toxicity which suggest safety in living organisms intaking it. The simulated flow rate is an improvement from the ~1 gal / hour flow rate biosand filters in third world countries perform.

Awards Won: