BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

APPLICATION OF MACHINE LEARNING TECHNIQUES IN THE DETECTION OF BIOLOGICAL MICRO-ORGANISMS IN WATER.

BY

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A final year project report submitted to the Department of Water Resources Engineering as a partial fulfillment of the requirements for the award of a Bachelor of Science degree in Water Resources Engineering.

ABSTRACT.

This study investigates the use of machine learning methods to identify biological microbes in water. Biological contamination of water is a major global concern as it can cause water-borne illnesses and even death. Traditional methods for detecting microorganisms in water involve manual processes and are time-consuming and expensive. For automating this procedure and cutting the time and expense associated with detection, machine learning presents a promising solution. In this paper, we discussed the present status of research on the detection of biological microbes in water using machine learning approaches such artificial neural networks, support vector machines, and decision trees. In addition, we go over the drawbacks of this strategy and suggest potential remedies to address them. According to our research, machine learning has the power to transform the way biological microbes are detected in water and enhance public health results.

DECLARATION.

I **MUGABI DANIEL**, declare that this research proposal is my original work, except where due acknowledgement has been made. I declare that this work has never been submitted to this University or to any other institution for funding for partial fulfilment for any award.

Signature: .....

Date: .....15th February...2024..

SUPERVISOR APPROVAL

This research proposal submitted as a partial fulfilment for the award of Bachelors Degree of science in Water Resources Engineering of Busitema University, with my approval as the academic supervisor.

Name: Dr. Godliver Owomugisha .....

Signature: ..  .....

Date: 13-11-2023 .....

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ML	Machine Learning.
AI	Artificial Intelligence.
ELISA	Enzyme-Linked Immunosorbent Assay.
KNN	k-nearest neighbors.
MLP	Multi-layer perceptron.
QDA	Quadratic discriminant analysis.
LR	Logistic regression.
SVM	Support vector machine.
BiGHAM	Binarized-Greyscale-Hybrid Algorithm.
GUI	Graphical User Interface.
IDE	Integrated development environment.

1 CHAPTER ONE.

1.1 Introduction.

This chapter includes the background of the study, statement of the problem, purpose of the study, objectives of the study, scope of the study which includes the conceptual scope, geographical scope and time scope and finally the justification of the study.

1.2 Background of the study.

Microorganisms are among the earliest living entities on Earth, having initially surfaced about 3.5 billion years ago. Bacteria, viruses, fungi, some small protozoa, and microscopic algae are examples of microorganisms. These organisms, which are closely related to humans, can be used for both good and bad purposes in a variety of industries, including food, medicine, agriculture, industry, environmental protection, and others (Qu et al., 2019).

There are many microbes that are harmful and can infect humans, plants, and other living things with disease. They are to blame for spreading a number of terrible diseases, including typhoid, cholera, and diarrhea (Rani et al., 2022).

Many individuals have trouble getting access to clean water. In developed nations, where access to clean water and sanitation are not the norm, waterborne diseases are frequent, a clean and treated water supply to every home may be the standard in Europe and North America. More than 1.5 million children die each year from diarrheal infections, and 2.5 billion people lack access to better sanitation. According to the WHO, the mortality of water associated diseases exceeds 5 million people per year. From these, more that 50% are microbial intestinal infections, with cholera standing out in the first place (Cabral, 2010).

More than 4 million people pass away from diseases contracted through microorganisms each year, and the majority of these deaths are brought on by water tainted with bacteria. Although there are many ways to use water in daily life, the biggest risk to human life arises from direct contact with water, such as in swimming pools where sewage is mixed in with the water, offices, and other public places (Inamori & Fujimoto, n.d.).

The microorganism's identification is time-consuming. There will always be a need for a specialist and someone who is knowledgeable with the complexities of taxonomy and other microbial traits, like smell. With the development of machine learning models and statistics, it is now possible to

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