**MBAOLAB**

A collaborative space located in Cameroon that aims to make life better through Open science.

**MISSION**

To assist in local development and improve living conditions through Open Science.

* provide community and lifelong education for the population, as well as formal education for the younger generations;
* serve as a platform for exchanges on issues related to local context;
* mediate between local communities and academia;
* propose solutions that meet the needs of communities, using local knowledge and open digital technologies;
* raise public awareness of environmental issues;
* facilitate access to basic health care.

**VISION**

To make local development needs to be thought of by and for the members of a given community. To do so, it is important to break the unenthusiastic spirit that exists among many Cameroonians, by training healthy, educated citizens capable of critical thinking on issues related to their immediate environment.

## **PROJECT TITLE:**

## **IMPROVE DIAGNOSTICS OF TYPHOID THROUGH OPEN SCIENCE: AN ARTIFICIAL INTELLIGENCE-BASED TECHNIQUE**

**TASK:**

**CREATE CONTENT FOR THE PLATFORM**

**TYPE OF PLATFORM: - BLOG**

**IMPROVING THE DIAGNOSIS OF TYPHOID FEVER THROUGH OPEN SCIENCE - AN ARTIFICIAL INTELLIGENCE BASED APPROACH.**

Typhoid Fever also known as Enteric fever is a disease that affects humans and has been around for a while. It is caused by the bacteria *Salmonella typhi.* Once a person is infected, the bacteria is carried into the bloodstream and intestinal tract and it is shed in stool. It is mainly transmitted through infected food or contaminated water. Its common symptoms are weakness, constipation, pain and loss of appetite.

Typhoid fever is rare in industrialized countries yet it remains a major source of disease in children in developing countries. Because of its highly communicable nature, residents of poor communities lacking good water and sanitation systems are those mostly affected. It is estimated that a total of 400,000 cases occur annually in Africa.

The environment plays a large role in the development of this disease. General sanitation, temperature, air pollution, and water quality are among factors that influence the spread of this disease. Also, socio economic factors such as population density, overcrowding and poverty rate play a large role.

**PROBLEMS IN THE DIAGNOSIS OF TYPHOID FEVER**

As someone who lives in Africa, I was mis-diagnosed with Typhoidabout two years ago. I had previously treated malaria and exhausted my doses, but the symptoms still persisted so I visited the clinic. I explained my symptoms to the doctor, and my blood sample was taken which was tested for Typhoid. The results came out and it was positive for the disease.

I wasn’t convinced I had the disease as I’ve been eating clean home made food and wasn’t exposed to anyone ill. I decided to get a second opinion from another doctor in a different hospital. He explained how unreliable the widal test is for Typhoid and prescribed a different malaria medicine for me. Apparently, I had grown resistant to previous medicine, because I felt well again after completing the new dose.

A lady who also experienced something similar also shared her experience in this article <https://nigeriahealthwatch.com/its-not-typhoid-tackling-misdiagnosis-of-typhoid-fever-in-nigeria/>

Some well-known and conventional Method of Diagnosis of Typhoid Fever are :

* Microbiological cultures: The isolation of the causative organism, *Salmonella enterica serovar Typhi* (*Salmonella Typh*i), is the gold standard for the diagnosis (WHO, 2018). Body fluids like blood, bone marrow, stool, urine, rose spots, gastric and intestinal secretions may be cultured. Blood culture gives a definitive diagnosis. But, the use of bacteriological cultures for the diagnosis of typhoid infection is cost-intensive and technically difficult, hence the need for other diagnostic tests.
* Antibody detection tests: These are rapid serologic tests designed for early and easy point-of-care use. The Widal Test is based on the measurement of antibodies (agglutinins) against somatic (O) and flagellar (H) antigens of Salmonella typhi in the sera of patients. Widely used in many developing countries because of its low cost, Widal test is limited by lack of standardized methods of assay and misinterpretation of results. This has led to the overestimation of the number of patients presenting with acute febrile illnesses diagnosed with Typhoid fever.

A systematic review by Mengist and Tilahun (2017) revealed poor reliability, low sensitivity and specificity of the Widal test. Although this test is no longer commonly performed in developed countries like the United States, it is still in common use in many developing countries where Typhoid fever is still endemic.

So, misdiagnosis is usually experienced since most health care facilities use only the Widal test without confirmation of results with a second test method. In addition, the diagnosis of Typhoid involves several levels of uncertainties. Patients cannot tell exactly how they feel, doctors and nurses cannot tell exactly what they observe.

**USING ARTIFICIAL INTELLIGENCE FOR A MORE EFFECTIVE TYPHOID DIAGNOSIS.**

According to unesco.org, The idea behind Open Science is to allow scientific information, data and outputs to be more widely accessible (Open Access) and more reliably harnessed (Open Data) with the active engagement of all the stakeholders (Open to Society). This would help in bridging the gap between science and technology between and within countries and fulfilling the human right to science.

Artificial Intelligence is the simulation of Human intelligence by computer systems. It is the ability for computers to perform tasks such as problem solving, analytical thinking and decision making.

Augmented Intelligence combines human and Artificial Intelligence. The aim of Augmented intelligence is to help humans rather than replace them.

In this project, Augmented intelligence makes more sense than artificial intelligence, especially in the case of a tropical disease such as Typhoid. This is because it highlights the enhanced capabilities of a human when augmented with the right tools and technologies. In a sensitive industry such as healthcare, human intelligence cannot be replaced. Augmented intelligence specifies systems that augment human intelligence rather than attempt to replace them. Combining AI systems with an irreplaceable human clinician can advance better diagnosis.

We propose to use the microcultures test with the blood which seems to be the best accepted by the laboratory technicians. We will use CNNs as algorithms on the collected images to train the algorithm.

Everything will depend on the volume of images we are able to collect, if we have few we will use transfer learning to automate the test of microbiological cultures. This test is 61% reliable and to reinforce the reliability of this test we will use the second algorithm which is a fast decision tree learner.

This algorithm based on 18 symptoma variables will allow us not only to confirm the diagnosis but above all to determine the level of severity of the disease.