**PROJECT : Improve diagnostics of typhoid through Open Science: An Artificial Intelligence-based technique**

* **Project Description :**

**About Typhoid**

Typhoid or Enteric fever is one of the infectious human diseases in Cameroon and Africa. Outbreaks of typhoid fever caused by Salmonella typhi remains a serious health problem worldwide. There are a number of tests available presently, from molecular to immunological and biochemical to microbiological. 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 Typhi), 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.

So, misdiagnosis is usually experienced since most health care facilities use only 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.

**Relevance:**

Augmented intelligence makes more sense than artificial intelligence, especially in tropical diseases 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.

* **Project Goals :**

We propose to use the micro cultures 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 have, if we have few we will use transfer learning to automate the test of microbiological cultures.

1) Design interviews for practitioners in order to collect the associations of symptoms that confirm the disease and its level of severity.

2) Images collection taking into account the different ethnic groups, gender and age in order to have a heterogeneous dataset to allow us to avoid the biases that may arise and undermine the use of our solution.

3) Design the Convolutional Neural Networks to train images and Decision tree to train structured data

* **Objectives :**

As mentioned earlier, test is reliable at 61% 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 symptom variables will allow us not only to confirm the diagnosis but above all to determine the level of severity of the disease.

* **Why Open source?**

Open source projects are built collaboratively. Open source contributors work together publicly which creates a fun collaborative community around a project. It allows anyone to make innovative changes that reach many people.

Open source contributors work on a lot of different things! You can contribute by developing software or you might want to improve user experience by contributing design work. You can help with documentation, community management, marketing, identifying issues and reporting bugs, helping users, event organization, graphic design, and translations.

By contributing to this open source project you are actually committing to playing an active role in improving the world. You are creating real value. By contributing to open source, you are helping to build a better future. By helping others, you help yourself. By making the future better, you make the world a better place.

* **CONTRIBUTE**
* **How to contribute?**
* You can contribute to this project through the [project repository](https://github.com/Mboalab/Mboalab-Outreachy_December-to-March-2022-internship-round) on GitHub.
* *Both individual or collective contributions to a particular task are welcomed.*
* **Sending Contributions**
* Contributions can be sent after creating a folder highlighting contributor(s) name in the [Applicant's Contributions] folder which can be found in each task folder.
* Please get in touch with a mentor to guide you through the process in case of any difficulty.
* **Nature of Contributions**
* The nature of contributions varies greatly according to the selected task.
* In order to ensure a tailored, inclusive and open contribution process, applicants are encouraged to use the guidelines provided in each task description to propose the best format for their contributions.
* Participants are therefore welcome and should feel free to propose, innovate and adjust their contributions according to their own understanding. Mentors will always be there to guide and frame received ideas.
* **Code of Conduct**

**CODE OF ETHICS AND PROFESSIONAL CONDUCT**

This code of conduct will guide interactions amongst applicants and between applicants and mentors during this contribution phase of the program. It will ensure that the core values of the Mboalab community which are rooted in mutual respect, kindness, openness, and collaboration are upheld.

**HOW WE WORK**

We strive to make our community welcoming and open to everybody, regardless of scholarly or professional background, gender identity and expression, ability, physical appearance, body size, race, age, economic background, country of origin or employment, religion, and other characteristics. All contributing applicants are trusted to put an effort into the task that they take on. We encourage frequent communication especially in tasks that require the effort of a team: team members are encouraged to share their progress and thoughts with everyone in a friendly and convivial manner.

We accept failure but not lack of effort,

You are encouraged to keep their designated mentor and team members (where applicable) updated;

We follow the code of conduct and show deep respect to everyone who works with us;

We are considerate of the different cultural origins and preferences of team members.

We listen.

**A. Personal behaviour, integrity and values**

In line with Mboalab’s core values, applicants shall act with honesty, tolerance and respect. As we come from different backgrounds, it is important to be intentional about providing respectful, equitable space for our community to come together and engage in constructive, respectful discourse.

**B. Effective communication**

We begin interactions by acknowledging that we are part of a community with complementary goals. When something has happened and someone is uncomfortable, our first choice is to work through it with discussion. We listen to each other.

For active listening, we ask questions first, instead of making statements.

We give people time and space to respond.

We appropriately adjust our behaviour when asked to.

We know that repeating hurtful behaviour after it has been addressed is disrespectful.

We avoid this ourselves and help others identify when they are doing it.

**C. We practice consent**

Permission should be requested before privately contacting a fellow applicant or sending explicit messages. This is also applicable to sharing private discussions.

Ask first.

We respect everyone’s right to walk away at any time.

If you see or experience a violation of consent, please contact the mentor in charge of your task or any of the other three mentors or get in touch with a community coordinator via email at [thomasmboa@gmail.com](mailto:thomasmboa@gmail.com).

**D. Work spaces**

All applicants should be involved in promoting open knowledge. All opinions matter! Open discussion allows the most promising ideas to come to the fore, and for decisions to be reached on a consensus basis. Communication platforms like Whatsapp group chats are for work-related conversation only. As such contents such as adverts or videos for entertainment are prohibited.

* **Outreachy Program :**

Outreachy provides an opportunity for an online collaborative environment for learning, and remote mentoring with experienced FOSS contributors, many of whom are employed to work with free and open source software. The Outreachy travel stipend gives interns a chance to network with their community, give their first public tech talk, look for a job, or learn new skills.

The program is designed to support people from groups underrepresented in tech. We reach talented and passionate participants, who are uncertain about how to get started in free and open source software. We hope this effort will help many people learn how exciting, varied and valuable work on FOSS projects can be and how inclusive the community really is. This program is a welcoming link that will connect you with people working on individual projects in various FOSS organizations and guide you through your first contribution.