

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

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*) co-presenters

Abstract

Typhoid fever is one of the severe infectious human diseases in Africa. Out of an estimated 11–21 million cases of typhoid fever and 200,000 deaths occur worldwide each year. Other elements contribute to this situation and particularly in rural areas where patients to doctors ratio is very low, lack of medical facilities and costly tests. There are a number of tests available presently, from molecular to immunological and biochemical to microbiological. However, Users are unsatisfied due to delays in getting test results and Imprecise diagnosis. 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. There is therefore, an urgent need to develop a rapid, highly sensitive and cheap diagnostic tool for diagnosis of typhoid fever. The absence of a reliable diagnosis pushes rural populations towards self-medication with all the consequences that this entails, in particular drug poisoning which can lead to death. As such, we want to develop a new method to diagnose Typhoid early, quickly, and with accurate results at a low cost. We propose a hybrid diagnosis method with a Deep Learning algorithm applied on blood serum images which seems to be the best accepted test by laboratory technicians. We use CNNs as algorithms on the collected images to train the algorithm. We use a second algorithm Rough Set Theory. This algorithm based on symptoms variables which are structured data collected from medical doctors allow us not only to confirm the diagnosis but above all to determine the level of severity of the disease and serve as a Decision Support System. The two algorithms will be part of a mobile app connected to an optical microscope, the phone camera will scan images from the slides on the microscope and classify them into Normal or Infected. In a series of rapid spotlights, we present tools and frameworks that serve as cornerstones for the envisioned diagnostics system including: **1) Values, influences and forces that shape the diagnostics 2) AI solutions to be used; 3) Data sources 4) Ethics and governance model.**

We aim to encourage participants to actively add tools and frameworks within the discussion and highlight their experiences and challenges with using open source softwares in medical diagnostics.

Session type: Regular Presentation/Lecture

Session length: 20 min + discussion

Expected prior knowledge / intended audience: None to basic prior informatics knowledge will be required. This lecture shall provide a valuable contribution to Free Open-Source Software activities in the medical domain.

Speaker bio:

JAFSIA Elisee is the head of the Electromechanical and Artificial Intelligence department at MboaLab in Cameroon. JAFSIA is holder of a MSc in Material sciences from the University of Yaounde I as well as a MEd in Physics from the Higher teacher's training college of Yaounde. He is currently member of the DIDA (Digital diagnostics for better healthcare in Africa) network and the technical lead for the OpenFlexure Microscope project in the MboaLab.

Co-Presenters bio:

Stephane Fadanka is a Molecular Biology researcher and a fervent advocate of Open Science in Africa with a particular interest in synthetic biotechnology. He has prior experience on improving existing typhoid diagnosis test.

Bidosessi Emmanuel AGOSSOU is a computer science engineer, with interest in software development and Artificial Intelligence.

Nodira Ibramigova is a software developer with experience in developing Android applications.

Thomas Hervé Mboa Nkoudou holds a PhD in Scholarly communication, he is deeply engaged to promote DIYbio. He will support the scale up and implementation of the innovation.

Links to code / slides / material for the talk (optional): Slides will be provided in time for FOSDEM

Links to previous talks by the speaker

Local manufacturing of open-source devices for medical labs in Africa: prototyping stage in Cameroon.

[https:// fosdem.org /2021/schedule/event/prototypingincameroon/](https://fosdem.org/2021/schedule/event/prototypingincameroon/).