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ITU-T Focus Group on AI for Health

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DOCUMENT

Source: TG-Malaria Topic driver

Title: Att.2 – CfTGP (TG-Malaria) [same as Meeting L]

Purpose: Engagement

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Abstract: Calling on members of the medical and artificial intelligence communities with a vested interest in “Malaria detection”. Become engaged in the group dedicated to establishing a standardized benchmarking platform for “AI for Malaria detection” within the International Telecommunication Union (ITU)/World Health Organization (WHO) Focus Group on “Artificial Intelligence for Health” (FG AI4H).

This version of CfTGP is the same as seen in Meeting L, reproduced for Meeting N for easier reference.

ITU/WHO Focus Group on artificial intelligence for health (FG-AI4H)

Call for Topic Group Participation: “AI-Based detection of Malaria”

The International Telecommunication Union (ITU)/World Health Organization (WHO) Focus Group on “Artificial Intelligence for Health” (FG-AI4H; <https://itu.int/go/fgai4h>) seeks engagement from members of the medical and artificial intelligence (AI) communities (including clinicians, technologists, entrepreneurs, potential benchmarking data providers, machine learning experts, software developers, researchers, regulators, policy-makers, companies/institutions, and field experts) with a vested interest in shaping the benchmarking process of AI-Based detection of Malaria.

1 About FG-AI4H

Over the past decade, considerable resources have been allocated to exploring the use of AI for health, which has revealed an immense potential. Yet, due to the complexity of AI models, it is difficult to understand their strengths, weaknesses, and limitations. If the technology is poorly designed or the underlying training data are biased or incomplete, errors or problematic results can occur. AI technology can only be used with complete confidence if it has been quality controlled through a rigorous evaluation in a standardized way. Towards developing this standard assessment framework of AI for health, the ITU has established FG-AI4H in partnership with the WHO.

Thus far, FG-AI4H has established 16 topic groups. The topic groups are: AI and cardiovascular disease risk prediction, child growth monitoring, dermatology, falls among the elderly, histopathology, neuro-cognitive diseases, ophthalmology (retinal imaging diagnostics), psychiatry, radiotherapy, snakebite and snake identification, symptom assessment, tuberculosis, volumetric chest computed tomography, Malaria, Bacterial Infections and Child growth monitoring.

Each topic group agrees upon representative benchmarking tasks in a pragmatic, best-practice approach, which can later be scaled and expanded to similar tasks. Every benchmarking task should address a health problem of relevance (e.g. impacting a large and diverse part of the global population or challenging to treat) and for which AI technology would provide a tangible improvement relative to the current practice (e.g. better care, results, and/or cost/time effectiveness).

For a rigorous and sound evaluation, undisclosed test data sets must be available (or have to be collected) for each task. All data must be of high quality and compliant with ethical and legal standards. In addition, the data must originate from a variety of sources so that it can be determined whether an AI algorithm can generalize across different conditions, locations, or settings (e.g. across different people, hospitals, and/or measurement devices). The format/properties of the data serving as input to the AI and of the output expected from the AI, as well as the benchmarking metrics are agreed upon and specified by the topic group.

Finally, the AI-to-be-evaluated will be benchmarked with the undisclosed test data on FG-AI4H computing infrastructure. Here, the AI will process single samples of the undisclosed test data set and predict output variables, which will be compared with the "ground truth." The results of the benchmarking will be provided to the AI developers and will appear on a (potentially anonymized) leaderboard.

2 Topic group: AI-Based detection of Malaria

A topic group is a community of stakeholders from the medical and AI communities with a shared interest in a topic. The objectives of the topic groups are manifold:

1. To provide a forum for open communication among various stakeholders,
2. To agree upon the benchmarking tasks of this topic and scoring metrics,
3. To facilitate the collection of high-quality labelled test data from different sources,
4. To clarify the input and output format of the test data,

5. To define and set-up the technical benchmarking infrastructure, and
6. To coordinate the benchmarking process in collaboration with the Focus Group management and working groups.

The primary output of a topic group is one document that describes all aspects of how to perform the benchmarking for this topic. (The document will be developed in a cooperative way by suggesting changes as input documents for the next FG-AI4H meeting that will then be discussed and integrated into an official output document of this meeting. The process will continue over several meetings until the topic description document is ready for performing the first benchmarking.)

This topic group is dedicated to AI-Based detection of Malaria.

Malaria is one of the top 10 causes of death in the sub Saharan Africa. According to the World Health Organization report of 2016, of the 438,000 Malaria deaths registered, an estimated 92% of all Malaria cases resulted in deaths, two thirds of which occurred among children under five years of age. Referring also to records from WHO report of 2015, Malaria accounted for 480,000 deaths, 90% of which were from Africa, 7% from S.E Asia and 2% from Eastern Mediterranean region. Although there were fewer Malaria cases in 2017 than in 2010 according to WHO report of 2017, data for the period 2015–2017 highlighted that no significant progress in reducing global Malaria cases was made in this timeframe. Malaria is thus of major concern to public health.

Despite this high endemicity, the most popular gold standard conventional microscopy method of diagnosis is not a match to the big volume cases of Malaria in developing countries. This has many times resulted into poor diagnosis at the laboratory level leading to either late diagnosis, misdiagnosis of the disease as well as drug resistance. This has immensely contributed to the endemicity of Malaria in developing countries. The method is labor intensive and sandwiched with the lack of enough skilled lab technologists in most health facilities has equally hampered efforts to curb Malaria. The traditional conventional microscopy method is further prone to results that are subjective and often vary significantly by the different Microscopists hence the need for timely and more accurate detection interventions for the gold standard microscopy method. The topic group thus encourages more research that seeks to improve the development, validation, feasibility, and effectiveness of AI Based Malaria detection solutions that are relevant to highly Malaria endemic countries.

Currently we have access to images of thick blood smear slides that have been annotated by laboratory experts from Mulago referral hospital, however large more amounts of data of both thick blood smear and thin blood smear images from different Health facilities in different malaria endemic countries would be required for machine learning models and an undisclosed test data for evaluation of the tool.

Benchmarking of “AI-based detection of Malaria” aims at considering many aspects that concern the entire process of detection. These span from the data collection pipeline, the data, the analysis engine, the output, the evaluation measures, the test data set and the framework design. The topic will in future benchmark on the benefits from multiple data sets whose factors could potentially improve the detective index of the AI based detection model.

This topic group on “AI based detection of Malaria” currently involves an interdisciplinary network between the health team at Mulago Referral Hospital with expertise in Microscopy and the technical AI and 3D printing experts from the AI and Data Science research group at Makerere University.

The topic group would benefit from further expertise of the medical and AI communities and from additional data.

We aim to extend the topic of Malaria detection to all Malaria endemic Countries, while bringing together AI solutions and data from different countries. Contributions to this topic group can be of different forms:

1. By helping on the collection of labelled data from different sources. Microscopic Image datasets (both from thin blood smear image and thick blood smear images) and any other data directly linked to Malaria endemicity from sources like (environment, clinical records) that could improve the detection confidence is of high value. The ultimate goal is to make a strong malaria detection model given data from different systems and countries.
2. By providing AI models and approaches related to Malaria detection.
3. Suggestions on scoring metrics.
4. Contributing to the development of a viable and accepted benchmarking framework.
5. By supporting and advising the group on different aspects (data, methods, benchmarking, etc.) of this topic
6. Extension of the solution to improve disease surveillance and prediction.

All aspects will be discussed during regular focus group meetings and incorporated in the corresponding topic description document for this topic group.

More details about the activities of the topic group can be found in the Topic proposal document [FGAI4H-F-030](#) and the Topic Description Document [FGAIH-I-014-A01](#). This can be accessed with a free ITU account (cf. “Get involved”).

3 Get involved

To join this topic group, please send an e-mail to the focus group secretariat (tsbfgai4h@itu.int), the Topic group email (fgai4htgmalaria@lists.itu.int) and the Topic Driver (g.nakasirose@gmail.com). Please use a descriptive e-mail subject (e.g. "Participation topic group AI based detection Malaria, briefly introduce yourself and your organization, concisely describe your relevant experience and expertise, and explain your interest in the topic group).

Participation in FG-AI4H is free of charge and open to all. To attend the workshops and meetings, please visit the Focus Group website (<https://itu.int/go/fgai4h>), where you can also find the whitepaper, get access to the documentation, and sign up to the mailing list.
