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ICMR, IndiaEmail: [singhmanjula.hq@icmr.gov.in](mailto:singhmanjula.hq@icmr.gov.in)

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

This document is the same as FGAI4H-E-005-A12 (the last time the document was updated), reproduced as Meeting N document for easier reference.

**Call for Topic Group Participation: AI against Tuberculosis**

The International Telecommunication Union (ITU)/World Health Organization (WHO) Focus Group on “Artificial Intelligence for Health” (FG-AI4H; <https://www.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 tools for tackling tuberculosis.

**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 ten topic groups. These are concerned with: AI and cardiovascular disease risk prediction, dermatology, falls among the elderly, histopathology, neuro-cognitive diseases, ophthalmology (retinal imaging diagnostics), psychiatry, snakebite and snake identification, symptom checkers, and tuberculosis.

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.

### **Topic group: AI against Tuberculosis**

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 labeled 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 tuberculosis (TB), which is a huge problem worldwide with about 50 % of the cases in BRICS countries. With an estimated 2.3 million reported cases in 2011 and an additional 1 million undocumented cases, India has the highest prevalence of TB in the world. Each year 2.8 million cases develop TB and about 1 million cases go unreported or undiagnosed. Solving the TB crisis has been a top public health priority for years. Machine learning (ML) techniques have been used world-wide for improving public health through development of better prognostic, diagnostic and predictive models. There is a need to detect the missed cases by early adoption of Computer Assisted Diagnosis (CAD) systems based on artificial intelligence (AI) technologies for TB detection. This will synergize with the global endeavours to close the gap in TB control.

ICMR has access to a large volume of high-quality clinical data from various extramural and intramural programs and TB prevalence surveys. The data range from text-based patient profiles to complex molecular sequences and structures and images. This large amount of validated data generated from various TB research activities would be used for development of the AI tool for radiographic detection of TB using advance machine learning and analytics. AI algorithm

developed using such data is likely to be robust and could be used in various diverse conditions including areas where the experts/medical doctors are not available.

Currently there are images of X-rays from TB cases available on the internet (public data), however large amount more robust data (X-rays) from confirmed TB cases would be required for deep learning and an undisclosed test data for evaluation of the tool.

More details about the activities of the topic group can be found in the documents C-023 using the hyperlink <https://extranet.itu.int/sites/itu-t/focusgroups/ai4h/docs/FGAI4H-C-023.docx>. These can be accessed with a free ITU account (cf. “Get involved”).

Current members of the topic group on tuberculosis include medical and technical AI experts from India. The topic group would benefit from further expertise of the medical and AI communities and from additional data. The group would like to have more information on deep learning techniques.

### **Relevance of the health topic**

- Artificial intelligence technologies, including deep learning (DL) and natural language processing (NLP), draw attention of many public health professionals because of its potential to ease the shortfall of health workers.<sup>4</sup> In India, the quality of TB care varies widely depending on the geographical location and the socioeconomic status of a patient, resulting in delayed or missed diagnosis of active TB cases.<sup>5</sup>
- There is approximately only one radiologist for every 100,000 population in India. In Zambia, also one of the high-TB/HIV-burden countries, there are only two radiologists in the country of over 11 million population.<sup>3</sup> The national goal to eliminate TB in India by 2025 and around the world by 2030 can be facilitated by early adoption of AI in TB control program, and successful use of AI in ending TB will help the world achieve the goals.
- There are various AI tools in development in India and there is need to have a robust AI tool with a high sensitivity and specificity which can be used as a screening tool.

### **Gold standard of current health topic handling**

Currently the X-rays are read by the radiologists and co-related clinically. The gold standard for diagnosis of TB is the microbiological confirmation either by culture or CBNAAT.

**Possible impact of AI in this topic:** Pulmonary TB being an infectious disease has the threat to spread in absence of its timely detection which is a major challenge. The current diagnostics available make it more challenging as many millions across the world are missed by the conventional method. Use of AI for radiographic detection of TB would have greater public health impact around the world in view of its potential to be used in remote areas for detection of TB.

### **Expected impact of the benchmarking:**

The benchmark dataset for the X-ray detection of TB should be representative of not only of one region but the entire world to be robust enough to have >95% sensitivity and 100% specificity. The benchmarking for the AI tool would help in generating such a dataset which could help in validation of AI tool across the world.

### **Ethical Considerations**

**Ethical considerations on usage of AI :** The radiographic detection of TB using AI must be 100% specific and >95% sensitive. Primarily the tool could be used for screening purposes in remote settings followed by the final diagnosis by other methods.

**Ethical consideration of and benchmarking including its data acquisition:** The major concern is about the data anonymization. The identifiers must be removed from the data and the data used for learning should be confirmed via gold standard tests. The data acquisition should be voluntary from the cases and their contacts

### **AI4H Topic group**

**Current topic group and topic status:** The radiographic detection of TB using AI tool is under development. The data set of 69000 X-rays from a prevalence survey in South India are available with ICMR and further a national prevalence survey in 500,000 population is about to start in India which could be used for the machine learning of the AI tool.

### **Other Contributors so far: Awaited**

The contributions and collaborators in this area are required to develop a robust AI tool for radiographic of TB across the world.

### **Get involved**

To join this topic group, please send an e-mail to the focus group secretariat ([tsbfgai4h@itu.int](mailto:tsbfgai4h@itu.int)) and the topic driver ([drmanjulasb@gmail.com](mailto:drmanjulasb@gmail.com)). Please use a descriptive e-mail subject (e.g.

"Participation

topic group AI against Tuberculosis"), 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://www.itu.int/go/fgai4h>), where you can also find the whitepaper, get access to the documentation, and sign up to the mailing list.

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