|  |  |  |
| --- | --- | --- |
| ITU Logo | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATIONSTANDARDIZATION SECTOR**STUDY PERIOD 2017-2020 | FG-AI4H-E-005-A05 |
| **ITU-T Focus Group on AI for Health** |
| **Original: English** |
| **WG(s):** | N/A | Geneva, 30 May – 1 June 2019 |
| **DOCUMENT** |
| **Source:** | TG-Falls Driver |
| **Title:** | Call for Topic Group Participation: Standardized benchmarking of AI to prevent falls among the elderly |
| **Purpose:** | Engagement |
| **Contact:** | Topic driver: Inês Sousa | Email: ines.sousa@fraunhofer.pt  |

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

**Call for Topic Group Participation: AI to prevent falls among the elderly**

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 to prevent falls among the elderly.

# 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 thirteen topic groups. These are concerned with: 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 checkers, tuberculosis, and volumetric chest computed tomography.

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 to prevent falls among the elderly

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 AI to prevent falls among the elderly. Falls are one of the most common health problems in the elderly population, about a third of community-dwelling adults aged 65 years or older fall each year, and these events represent more than 50% of the hospitalizations due to lesions in this age group. Falls are also considered one of the main causes for loss of independence and institutionalization. In 10% of cases falls result in fractures, thus contributing to significant increases in morbidity and mortality. Direct health care costs associated with this phenomenon are high, reaching yearly costs of 25 billion euros in the European Union and 31 billion dollars in the United States of America. Falls have a multifactorial origin, however most of the fall risk factors are amendable by implementing falls prevention programs based on improving strength and balance and modifying behaviours. Even though, fall risk screenings and the implementation of such falls prevention programs are rarely part of the community-dwelling elder’s routine.

The current state of the art assessment of fall risk factors is based mainly in applying clinical scales, such as the Morse Fall Scale, Berg Balance Scale, and Performance Oriented Assessment of Mobility Problems in Elderly Patients. Despite being recommended by international health bodies, such as the National Institute for Health and Care excellence (NICE)[[1]](#footnote-1), multifactorial assessment of fall risk factors is still not widespread in the clinical practice. One of the reasons for this shortcoming is the difficulty in combining the multiple parameters evaluated in a meaningful scale that is able to differentiate those who are more likely to fall in a period of time following the assessment. Artificial Intelligence (AI) techniques can be of great value in generating models that combine multiple sources of data and enable the implementation and standardization of a multifactorial assessment of the risk of falling. This would enable to raise awareness for multifactorial assessment of fall risk factors, contribute to standardize fall risk assessment and create tools to easily implement it in the clinical practice.

There is previous work in this topic developed under the project FallSensing ([www.fallsensing.com](http://www.fallsensing.com)) where Fraunhofer AICOS, Coimbra Health School and Sensing Future Technologies, have collected a dataset of 537 test subjects, to whom a multifactorial assessment of fall risk factors was applied following a specific [protocol](https://www.researchprotocols.org/2018/8/e10304/). The screening includes questions about demographic and anthropometric data, health and lifestyle behaviours, a detailed explanation about procedures to accomplish 6 functional tests (grip strength, Timed Up and Go, 30 seconds sit to stand, step test, 4-Stage Balance test “modified,” and 10-meter walking speed), 3 questionnaires concerning environmental home hazards, and an activity and participation profile related to mobility and self-efficacy for exercise. After the assessment, the 403 of the participants received monthly phone calls over a 12-month period to record whether a fall occurred in this period. The dataset is thus annotated with the number and month of reported falls in the period of 12 months following the assessment. This annotation can be converted in a binary outcome, diving the dataset in fallers (subjects who fell at least once in the 12-month follow-up period), and non-fallers (remaining).

For the benchmarking task, participants should submit AI models to combine multiple fall risk factors assessed in community-dwelling adults aged over 50 years old and distinguish fallers from non-fallers, i.e. the subjects that suffered at least one fall in the year subsequent to the assessment from those who did not fall in that period. As possible metrics we are currently considering the Sensitivity, Specificity and area under the receiver operating characteristic curve (ROC AUC) applied to a binary classification problem (occurrence of at least one fall in subsequent year vs. non-occurrence of falls in that period). Other possible outcomes are the predicted time until the first fall (in months), or the probability of suffering a fall in a given period during the year after the assessment. The problem can also be formulated as multiclass classification, allowing to distinguish groups of first-time fallers after the assessment, recurrent fallers and non-fallers, for example.

Regarding data availability, there are 403 data samples annotated. All of the data is currently an undisclosed data set. Only a small part of it can be made publicly available (1 or 2%), however, since the data acquisition [protocol](https://www.researchprotocols.org/2018/8/e10304/) is published in an open access journal, it can be easily replicated by peers.

More details about the activities of the topic group can be found in the document [FGAI4H-C-014](https://extranet.itu.int/sites/itu-t/focusgroups/ai4h/docs/FGAI4H-C-014.docx?d=we6baf5af5e1b4257b5f660adf5f16c1a), which can be accessed with a free ITU account (cf. “Get involved”).

The topic group on AI to prevent falls among the elderly is lead by Inês Sousa, PhD in Biomedical Engineering, and Head of Intelligent Systems at Fraunhofer AICOS. The topic group would benefit from further expertise of the medical and AI communities and from additional data.

# Get involved

To join this topic group, please send an e-mail to the focus group secretariat (tsbfgai4h@itu.int) and the topic driver (ines.sousa@fraunhofer.pt). Please use a descriptive e-mail subject (e.g. "Participation topic group AI to prevent falls among the elderly"), 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.

1. <https://www.nice.org.uk/guidance/cg161/chapter/recommendations#multifactorial-assessment-or-multifactorial-falls-risk-assessment> [↑](#footnote-ref-1)