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DOCUMENT

Source: TG-MSK Topic Drivers

Title: Att.2 – CftGP (TG-MSK)

Purpose: Engagement

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Abstract: Calling on members of the medical and artificial intelligence/machine learning (AI/ML) communities with an interest in the applications of AI/ML for Musculoskeletal medicine. We encourage engagement in the topic group dedicated to establishing a standardised benchmarking guidelines and ultimately platform for AI/ML application in Musculoskeletal medicine within the International Telecommunication Union (ITU) / World Health Organisation (WHO) Focus Group on “Artificial Intelligence for Health” (FG-AI4H).

Call for Topic Group Participation: AI for Musculoskeletal Medicine (TG-MSK)

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/machine learning (AI/ML) communities (including clinicians, technologists, entrepreneurs, potential benchmarking data providers, machine learning experts, software developers, scientists and researchers, regulators, policy-makers, companies/institutions, field experts, government and government body representatives and other interested parties) with a vested interest in shaping the benchmarking process of AI/ML for MSK Medicine.

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 standardised 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 several topic groups. The list of topic groups can be found on <https://www.itu.int/en/ITU-T/focusgroups/ai4h/Pages/tg.aspx>.

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 generalise 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/via FG-AI4H computing infrastructure. Here, (as one of possible ways) 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 anonymised) leaderboard.

2 Topic group: AI for Musculoskeletal (MSK) Medicine (aka TG-MSK)

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 (a “topic description document” aka TDD) 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/ML applications for MSK medicine.

2.1 Brief overview of the topic group

The topic group focuses on prevention strategies, triage¹ (in particular identifying urgency), diagnosis, prognosis and treatment of musculoskeletal (MSK) conditions with the applications of artificial intelligence (AI) and machine learning (ML) approaches including computer vision (CV), augmented and virtual reality (AR/VR), natural language processing (NLP)/understanding and other approaches.

Primary prevention: early risk assessment, prognosis, risk detection of MSK trauma/deterioration and movement deficiencies using ML, CV, NLP to parse a patient’s input, as well as to incorporate existing electronic health records (EHR) and data analysis (including data from wearables with the patients’ consent).

Triage and diagnosis: assist in identifying the causes of a patient’s signs and symptoms including pain, with the use of chatbots and similar approaches as for **primary prevention**.

Treatment: use of AI with CV and AR to enable self-management and, where clinician's guidance/oversight/involvement is required, to assist in such management. AR and CV technology provide more effective treatment and improve patient engagement and experience with the help of speech-to-text and text-to-speech capabilities (in combination with the use of common technology by showing exercise reminders for example).

2.2 Relevance of the topic group

Painful MSK conditions affect 20-33% of the world's population [1]. According to the WHO, “MSK conditions are the leading contributor to disability worldwide, with low back pain being the single leading cause of disability globally. ... MSK conditions significantly limit mobility and dexterity, leading to early retirement from work, reduced accumulated wealth and reduced ability to participate in social roles. The greatest proportion of non-cancer persistent pain conditions is accounted for by MSK conditions. ... MSK conditions are commonly linked with depression and increase the risk of developing other chronic health conditions” [1].

Up to 30% of consultations carried out by primary care doctors in the UK (as an example) are for MSK conditions [2]. Together with the worldwide shortage of health professionals (including doctors and physiotherapists) [3], it is clear there is a pressing need to introduce, support and grow the potential use of reliable, safe, accurate solutions powered by AI and ML which is evidence-informed and co-produced with lived experience. This need exists across the world and the solutions must be accessible and affordable in order to provide universal coverage. The latter is especially important in the light of existing inequalities: AI applications have the power to reduce them but it also should be ensured that they do not worsen any inequalities.

There have been several developments in the last few years that are particularly relevant for this area:

¹ Note that there are other definitions, in particular in relation to MSK medicine. One task of the topic group is to define and investigate this further.

- The development of the next generation of CV and NLP techniques. (In particular, recent CV technology that allows fairly accurate pose recognition using just one camera e.g. a smartphone camera, without the need for special equipment.)
- The spread of mobile devices with high-resolution cameras and with powerful microprocessors.
- The spread of wearable technology and the resulting accumulated data.

2.3 More info about the topic group

More details about the activities of this new topic group can be found in latest version of the topic description document draft (document FG-AI4H-P-026-A01) that has been prepared for Meeting P of the focus group. That document will be (is) accessible with a free ITU account (see “Get involved”) on the page with the documents of Meeting P via the following URL: <https://extranet.itu.int/sites/itu-t/focusgroups/ai4h/docs/Forms/220919.aspx> .

3 Get involved

To join this topic group, please send an e-mail to the focus group secretariat (tsbfgai4h@itu.int) and the topic drivers, Peter Grinbergs (EQL, UK) and Yura Perov (Independent contributor, UK), and their associate(s) (tgmskorg@googlegroups.com). Please use a descriptive email subject (e.g. "Participation in the topic group MSK medicine"), briefly introduce yourself and your organisation (being an independent contributor is fine too), concisely describe your relevant experience and expertise, and describe 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, register your ITU account², get access to the documents, and sign up to mailing lists (including the topic group’s list fgai4htgmsk@lists.itu.int).

A References

- [1] "Musculoskeletal conditions" on WHO website. <https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions>. Accessed on 24 June 2020.
- [2] "Musculoskeletal" page on NHS England website. <https://www.england.nhs.uk/elective-care-transformation/best-practice-solutions/musculoskeletal/>. Accessed on 24 June 2020.
- [3] "Health workforce requirements for universal health coverage and the Sustainable Development Goals", Human Resources for Health Observer, Issue No. 17. <https://www.who.int/hrh/resources/health-observer17/en/>

² See info here: <https://itu.int/en/ITU-T/focusgroups/ai4h/Pages/reg2.aspx>