Review of the Ph.D. Thesis

Thesis title: **Classification Framework for Anomaly Detection in Medical Images**
Thesis author: **Jean Sebastien Mambou, M.C.A.**

Reviewer: **doc. Ing. Martin Černý, Ph.D.**
Reviewer's affiliation: **VŠB – Technical University of Ostrava, Faculty of Electrical Engineering and Computer Science, Department of Cybernetics and Biomedical Engineering**

Presented Ph.D. thesis is focused on framework design development and implementation focused in image processing using machine learning methods.

The purpose of the first three chapters is an introduction to the issue. It is a combination of an educational text and a review of contemporary scientific literature. The medical view of the issue is connected with the professional technical view. I do not consider the interweaving of individual literary styles and topics to be a suitable choice, sometimes it is difficult for readers to find their way around the text. However, the content of the chapter sufficiently fulfills the requirement to confirm the topicality of the topic of the dissertation and their goals.

The goals of the dissertation are defined clearly enough.

The core of the image analysis framework is described in Chapter Six. In it, the most beneficial part is a look at methods for automatic image analysis using machine learning approaches. A large number of results are indicated in this chapter, but I lack basic information about the size of training sets about the changes made in the detection algorithms. I would also welcome a clear statistical evaluation of the success of detection using different algorithms.

A beneficial part of the dissertation is the application of the proposed framework to the embedded system. It is somewhat inaccurate and misleading to call this implementation as the Internet of Things application (introduction to Chapter 7). From the following parts of the thesis, the expertise of author of the dissertation in this area is visible. I consider this part to be the core of the dissertation with a practical overlap. When implementing such systems, it is appropriate to consider established ways of working with medical data and to be very careful when choosing technologies. This will avoid subsequent certification issues.

Stylistically, the work is at an acceptable level, sometimes there are inaccuracies in citations and automatic references.

The author of the ph.d. thesis appropriately refers in the text to his scientific publications that are related to the dissertation, which I evaluate very positively. In total, the author of the dissertation refers to 3 own journal publications in impacted journals and 9 own conference articles.

The set goals of the dissertation were met.
Jean Sebastien Mambou, M.C.A. in the presented Ph.D. thesis proved the ability of independent scientific activity, at a very good level -

I recommend the Ph.D thesis of Jean Sebastien Mambou, M.C.A. to its defence.

Questions for the defence:

1. Provide a clear statistical evaluation of the detection success of the algorithms used for both case studies.

2. Specify the number of images you have used for training and testing of your algorithms in both your case studies. All MRI images had the same settings (sequence type, TR, TI, etc.)? Did you used images in DICOM format or any different one?

3. In most of countries, medical images are stored and distributed in PACS system. How is it possible to connect your framework with this widely used system?

4. You prefer to use as a storage cloud commercial solution (Amazon). Is it allowed to use such service for images of patients from European Union, without any conditions?

5. Could you use any IR camera in connection with raspberry PI for acquiring medical images from the view of valid regulations for Medical Devices?

Ostrava, 1.12.2021

doc. Ing. Martin Černý, Ph.D.