I diagnose, therefore I am a Doctor? Will drilling computer software replace human doctors in the future?

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In August 2016, IBM Watson, an artificial intelligence (AI)-based software system of the company IBM, corrected a misdiagnosis made by numerous dermatology experts of the Medical Institute of the University of Tokyo. Watson – drilling information rather than surfing – compared the genome of the patient with millions of genome data and recognized correctly that she was suffering from an extremely rare kind of leukemia. Thanks to Watson, the doctors were able to treat the patient appropriately and saved her life.

Ever since, more and more applications using AI to solve medical problems have appeared. Famous examples of this spectacularly rapid progress are programs which can interpret MR images or the AI-based network convolutional neural network which can diagnose several forms of skin cancer even better than experienced oncologists could. Due to the recent developments, the question arises if future software will not only be able to support doctors but even diagnose and propose therapies – thus substituting human doctors. As a consequence, some people are asking why one should still educate and train human doctors when computers would be faster, more precise and also cheaper.

In this essay, I am going to discuss this hot topic and illustrate why human doctors will still be needed. Furthermore, I am going to suggest how the technical progress will change requirements for the medical education and training in the future.

The development of medical AI application is advancing daily. It seems unavoidable that, sooner or later, computers will be superior to human doctors in every single aspect. However, this is a deception as there are several aspects in which computers cannot replace human doctors.

Firstly, even though computers are able to process many data easily and precisely, this is limited to data that can be quantified and digitalized, such as imaging, laboratory measurements or genomics. For a diagnosis and the choice of therapy, however, it is as important to consider aspects like the patient’s appearance, behavior, individual history etc. At least so far, we are not expecting to have software that can gather and process all the quantitative and qualitative information in the foreseeable future. For this, human brains will still be needed.

Secondly, AI-based software systems have to be trained with prepared annotated data. These data are created by human specialists and an AI software is only as good as its training data set. So, if the training sets contain incorrect information or information with unexpected internal correlation, the results obtained from the AI software will display errors as well and will be misleading. Therefore, qualified human doctors are indispensable for both the development and clinical application of AI programs.

Finally, we must consider that doctors are not just human machines that are able to diagnose and treat diseases. As we are talking about human life and humans’ wellbeing, there will always be the social aspect! A computer does not show sincere empathy to a patient in a difficult family situation nor can a computer adjust to different family settings; a computer cannot communicate a bad prognosis humanly and carefully; a computer would choose the best therapy according to the diagnosis yet not consider the social and family context of the patient. Human doctors are not only drillers like computers, but also surfers, i.e. they can also use and integrate scientific information in their decision-making and recommending process which is not immediately related or obvious.

Thus, the interaction between a computer and the patient will never be the same as the interaction between two humans, i.e. between a doctor and a patient. For many people who get the diagnosis of an incurable disease, the doctor with his expertise is the person they can trust and who can give situational and individual advices. It would be a dystopian idea to see a computer collecting your data, processing them and then telling you “I am sorry Sir, but most probably you have cancer.” In my opinion, this is the main reason why computers will never replace human doctors: Medicine is dealing with humans. Thus, human interactions and emotions will always be part of it. A computer cannot create trust or empathy based on the acquired literature, and cannot feel, so it will not replace human doctors.

Although computer programs are not able to replace human doctors, it is beyond doubt that computer-based decision procedures can change the medical praxis immensely. As they are able to analyze data such as imaging or lab reports efficiently and precisely, they will facilitate and speed up those tasks and leave the doctors more time to focus on other aspects like the social component of the work, and provide a more personalized treatment with higher quality for the patient. With that, it is important to integrate these new possibilities in the curriculum of
medical education so future doctors will be able to use these powerful tools. Simultaneously, future doctors should be prepared for questions occurring with this development: Where and how will medical software potentially make mistakes? What should physicians do, when the human decision and experience and the output of a software do not agree? To find answers for those questions, it is necessary to not only know how to use these technologies but also to understand how and why they are working.

So metaphorically, the future doctor will be a surfer with broad knowledge who is able to use software as an excellent drilling tool.

To finish, I think the development of medical applications for computer programs can be compared to the invention of modern medical devices likes blood pressure meter or imaging facilities: Before those inventions, the doctor depended on his ability to observe and palpate a patient to make a diagnosis; with those devices quantifying the status of such a patient more precisely, the diagnosis became more reliable and efficient. However, this will not replace human doctors at all. In my opinion, the ability of software to process and diagnose specific scientific data and information will be a big support for doctors to make better decisions on diagnosis and treatment.

In summary, the advance in computer programs in medical application will have big impact on clinical routine and support doctors to be more efficient and precise, so their use and functioning should be integrated into medical education. However, they will not replace the human doctors in medicine.

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