Section VIII EDUCATION IN BIOMEDICINE, TELEMEDICINE AND E-HEALTH

Секція VIII ОСВІТА В ГАЛУЗІ БІОМЕДИЦИНИ, ТЕЛЕМЕДИЦИНИ ТА ОХОРОНИ ЗДОРОВ'Я

Vitaly LEVASHENKO[1], PhD, prof.,
Nataliia TITOVA[2], DSc, prof.
[1] University of Žilina Žilina, Slovakia, e-mail: vitaly.levashenko @fri.uniza.sk
[2] National University Odessa Polytechnic, Odessa, Ukraine, e-mail: titova.n.v@op.edu.ua

PECULIARITIES OF USING MACHINE LEARNING IN MEDICINE

Abstract. The publication examines the use of machine learning in medicine. It shows both positive and negative aspects that biomedical engineers may face in their future activities and should be considered.
Keywords: machine learning, medicine, artificial intelligence.

Relevance of research.

As medical and health-related programs begin to incorporate machine learning and deep learning into their curricula, a salient question arises about the extent to which these subjects should be taught, given that researchers and practitioners in these fields can, and often do, use various forms of technology without full knowledge of their inner-workings. For instance, a diagnostician need not necessarily be familiar with how magnetic fields are generated inside a scanner machine in order to interpret an MRI accurately. Similarly, surgeons can learn to operate robotic surgical systems effectively without ever knowing how to build, fix, or maintain one. We believe the same cannot be said about the use of artificial intelligence in medicine. For example, oncologists cannot be the mere end-users of a machine learning model which recommends the best course of treatment for a given cancer patient. They need to understand how these models work and, ideally, play an active role in developing them. Otherwise, one of two scenarios is bound to occur: either physicians will uncritically accept the model recommendations (which is a dangerous form of automation bias), or they will learn to distrust and ignore such recommendations to the detriment of their patients who could benefit from the "wisdom" of data-driven models trained on millions upon millions of examples.

Purpose of the study. Show the features of using machine learning in medicine.

Basic research materials.

It is clear that Machine Learning will also play a fundamental role in the development of educational healthcare systems. Learning health systems describe an environment that combines science, informatics, incentives, and culture for continuous improvement and innovation. In a practical sense, these systems; which can occur at any scale, from small group practices to large national providers, will combine diverse data sources with sophisticated ML algorithms. The result will be a continuous source of data-driven information to optimize biomedical research, health care, and improve the quality of care [1].

In machine learning, algorithms are used to model data. The machine then identifies patterns in the data and uses the patterns to build a model.

There is a lot of proprietary data in electronic medical records that can be used for these health care purposes.

If we consider in more detail:

1. Diagnostics. A Classification Algorithm is used here, which can help determine whether a patient is likely to have the disease or not. For example, machine learning can detect multiple sclerosis at an early stage.

2. Management. We use a Prediction Algorithm that allows machine learning to look at various factors to help predict how a patient's disease may progress. For example, analyzing calcium, hemoglobin and other numbers can help predict whether a patient with chronic kidney disease will need dialysis in five years, or searching for key words in notes in a patient's chart can predict suicide risk.

3. Discovery. A clustering algorithm can help make discoveries. For example, identifying different subgroups of patients with endometriosis so that you can tailor treatment.

A key aspect of machine learning is that it continuously refines the model by weighting the data with minimal human interaction, explained Herbert Chase, MD, professor of clinical medicine in biomedical informatics at Columbia University's Vagelos College of Physicians and Surgeons. He can detect troubles that lead to disease, which the doctor does not. For example, people who all worked in a factory with heavy metals in the atmosphere, or people in the same zip code, feel the same way. People with a certain disease take the same vitamins, or all have previously undergone surgery.[2]

But in the field of Machine Leaning, the main challenge is accurate prediction; “what”, not “how”. For example, in image recognition, the relationship between individual features (pixels) and the result does not matter much as long as the prediction is accurate. This is a critical aspect of machine learning techniques because the relationship between many inputs, such as pixels in an image or video and geolocation, is complex and usually non-linear. It is extremely difficult to clearly describe the relationships between predictors and outcomes when these relationships are nonlinear and when there are a large number of predictors, each of which makes a small individual contribution to the model.[1]

Of course, machines will not replace doctors. But machine learning will make their work more interesting and productive.

Conclusion

The notion that machine learning can rapidly and radically transform health care by automating mundane tasks and enhancing clinical decision-making is glamorous. Unfortunately, the reality of machine learning in health care is sobering, with many instances of poor implementations of machine-learned tools.[3] Finding machine-learned solutions that work requires careful engagement with the “messiness” of health care data and the complexity of clinical decisions and workflows. Machine learning does hold tremendous potential to meaningfully advance health care. A disciplined, inclusive, engaged and iterative approach to the development and adoption of these technologies is needed to truly benefit the patients we serve.

References

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