TOPIC:AI BASED DIABETES PREDICTION SYSTEM

Abstract

Purpose of Review:Artifcial intelligence (AI) can make advanced inferences based on a large amount of data. The main-stream technologies of the AI boom in 2021 are machine learning (ML) and deep learning, which have made significant progress due to the increase in computational resources accompanied by the dramatic improvement in computer performance. In this review, we introduce AI/ML-based medical devices and prediction models regarding diabetes.

Recent Findings: In the Feld of diabetes, several AI-/ML-based medical devices and regarding automatic retinal screening, clinical diagnosis support, and patient self-management tool have already been approved by the US Food and Drug Administration. As for new-onset diabetes prediction using ML methods, its performance is not superior to conventional risk stratification models that use statistical approaches so far.

How Is AI Used?

The flow is divided into three stages: input, analysis, and output. Of these, AI is incorporated in the analysis part as one of the analytical tools. In the past AI booms, rule-based algorithms such as an expert system were mainly used in medicine. However, the mainstream of the current AI boom is led by machine learning (ML) and deep learning, and the latter is a type of machine learning that has made significant progress in the last 10 years due to the increase in computational resources accompanied by the dramatic improvement in computer performance. Therefore, one must remember which kind of AI is being referenced, as AI from previous years refers to rule-based AI, whereas AI in the current medical Feld often refers to machine learning or deep learning. Given these circumstances, the term Medical devices using AI has recently been specified more clearly as AI-/ML-based medical devices. How Is AI Used? The flow is divided into three stages: input, analysis, and output. Of these, AI is incorporated in the Analysis part as one of the analytical tools. In the past AI booms, rule-based algorithms such as an expert System were mainly used in medicine. However, the mainstream of the current AI boom is led by Machine learning (ML) and deep learning, and the latter is a type of machine learning that has made Significant progress in the last 10 years due to the increase in computational resources accompanied by The dramatic improvement in computer performance. Therefore, one must remember which kind of AI is Being referenced, as AI from previous years refers to rule-based AI, whereas AI in the current medical Feld often refers to machine learning or deep learning. Given these circumstances, the term Medical Devices using AI has recently been specified more clearly as AI-/ML-based medical devices.

Relationship Between Statistics and Machine Learning

In statistics, we estimate the values in the ideal population using the data at hand based on many assumptions and per-form hypothesis testing to assess correlations or differences between groups. When building a model, candidates for model variables (i.e., risk factors) are already determined. In other words, statistics emphasizes the process of reaching reasonable conclusions, such as the validity of statistical models, accurate estimation of each parameter, or inference from the model. On the other hand, machine learning is used to maximize the performance of predicting answers to questions for which we do not yet know. In addition, even if the model variables are not straightforward or

difficult to verbalize, it is possible to discover, generate, and select features that maximize the output by converting the input variables to them.

AI Use in Current Diabetes Management

Next, we discuss the use of AI in medicine for diabetes, specifically in medical devices. The first AI-based medical device, Body Guardian, was cleared by the US Food and Drug Administration (FDA) in 2012 when approval was given to a patch-like electrocardiogram equipped with an AI-based arrhythmia detection algorithm. Since then, the regulations on programmed medical devices, including AI, have advanced in various countries, including the USA, Europe, China, and Japan. Thanks to the outstanding development of deep learning technology and advancements in clinical applications these days, the number of approved AI-based medical devices has dramatically increased in both the USA and Europe in the past few years Currently, there are dozens of FDA-cleared AI-based medical devices using AI/machine learning technology. While most of these approvals are linked to radiology, cardiology, and oncology, three AI based medical devices are related to diabetes management Japan, 12 types of AI-based medical devices have been approved as of 2020. However, all of them are for image analysis concerning radiology and diagnostic imaging, and there are no such medical devices approved for diabetes care.

Prediction of New-Onset Diabetes Using AI

Finally, the fourth category of AI usage in the diagnosis and treatment of diabetes is prediction and risk stratification. This category could be a part of pre-emptive medicine, accurately identifying individuals that are highly likely to develop a specific disease from the general population at the pre-illness stage. Thus, this technology would eventually eliminate the incidence of diabetes by implementing medical intervention for these people at a very early stage. Predicting the onset of diabetes does not happen with the advent of machine learning technology. To date, lots of diabetes onset prediction models have been created using statistics with known risk factors of diabetes in large cohorts. Abbatial. reported the usefulness of statistical models like logistic regression, Cox proportional hazard model, or Weibull distribution analysis to predict the onset of diabetes in non-diabetic individuals within 5 to 10 years .In this report, the accuracy of prediction for new-onset diabetes within 5 to 10 years was around 0.74 to 0.94 in the C-index [9]. Despite the variance of predictive performance because of different baseline characteristics in each cohort, this result may show a relatively high level of predictive performance just by the conventional statistical models.

Conclusion

AI aims to make accurate and advanced predictions for a large amount of knowledge data. As of 2021, AI most often refers to machine learning and deep learning, which have made significant progress with increased computational resources due to a dramatic improvement in computer performance. In diabetes diagnosis and treatment, AI-based medical devices have already been approved by the FDA and are available in other countries as well.