Editorial

Artificial intelligence and ophthalmology: where does the future lead?

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Artificial intelligence (AI) is a branch of computer science focusing on designing methods and frameworks that can simulate humans' way of thinking. Research area of AI includes robotics, image recognition, language recognition, computer vision, etc. Deep learning method is a class of machine learning algorithms that use a cascade of multiple layers of nonlinear processing units for feature extraction and transformation, which grant computers the ability to learn from and make predictions on data. Deep learning networks have been utilized in diagnosis of certain ophthalmic diseases. A recent study by Liu *et al.* showed us a very promising algorithm (CC-Cruiser) based on deep convolutional network, achieving excellent diagnostic accuracy of congenital cataract (1). Besides high accuracy of diagnosis, CC-Cruiser also provided doctors with a cloud platform to upload their pictures and get evaluation results. CC-Cruiser is not the first time for AI to be combined with ocular diseases. In 2015, Google released its first product on screening of diabetic retinopathy (DR) (2). Using deep convolutional network, machines are able to find traces of DR in fundus photos.

It seems that the era of AI has arrived. With invention of deep neural networks, machines become able to make diagnosis after learning through big data. However, before we can march forward, we must conquer several obstacles.

First, most of studies chose diseases that can be diagnosed by imaging tests. In ophthalmology, we have various diseases having no anatomical or structural anomalies, but functional abnormalities, which cannot be simply diagnosed by photo. For example, it won't be easy for machines to learn how to diagnose glaucoma, because it often has no structural abnormality but functional impairment. Second, machines learn from the diagnostic principles by humans, which means without humans' experience as the guide, machines won't achieve high learning efficiency and efficacy. Thus, it's possible for machines to catch up with humans, but nearly impossible to overtake humans. Third, current deep learning methods must be accompanied by large leaning sample size, which limits learning of rare diseases. It's convenient to capture a photo, but for other tests, such as OCT scans or visual fields, it's difficult to accumulate clinical data.

In conclusion, AI is a promising tool which can help humans in disease diagnosis and screening. But only after an evolution and optimization in basic theories of deep learning, can we obtain further progress in AI-assisted medical care.

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