Acta Scientific Ophthalmology (ISSN: 2582-3191)

Volume 4 Issue 5 May 2021

Short Communication

Use of Artificial Intelligence and Machine Learning in Screening and Treatment of ROP in COVID Era

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Received: March 11, 2021

Published: April 01, 2021

Artificial intelligence is a term used for software that can imitate cognitive tasks such as comprehension and analysis of data and scientific problem solving [1]. This assists in reducing human involvement by a considerable degree and as a result helps in reducing human errors by doctors in a field where such errors would be fatal. The increasingly large influence of artificial intelligence in today's world is undeniable, as is its effect on society in making it a more technologically advanced civilization. As such, it was inevitable for this technology to leak into the world of healthcare to assist medical practitioners in efficient diagnosis and treatment. Research on the application of AI technology in healthcare began as early as the 1960s and soon enough its application extended to the branch of ophthalmology in an attempt to attain early diagnosis and cure for leading illnesses related to the eye.

AI is categorized into two main categories: machine learning and deep learning. The former mechanism* is built around the idea of improving itself based on the experiences it goes through - it requires a data set for training that can be input into the computer with its parts labeled by authoritative experts on the matter and may also be given a data set for validation to verify whether the rules the algorithm of the computer is making are accurate. The computer should thus be able to detect correctly the disease based on the past experience it has in its memory. On the flipside, deep learning technology is constructed with layers of artificial neural networks based on the structure and function of the brain where the technology is able to recognize its own shortcomings and improve accordingly (Figure 1). For the purpose of artificial intelligence in ophthalmology, it is primarily the use of machine learning that has been documented - in reading fundus images, IOL calculations and auxiliary screening for diagnosis.

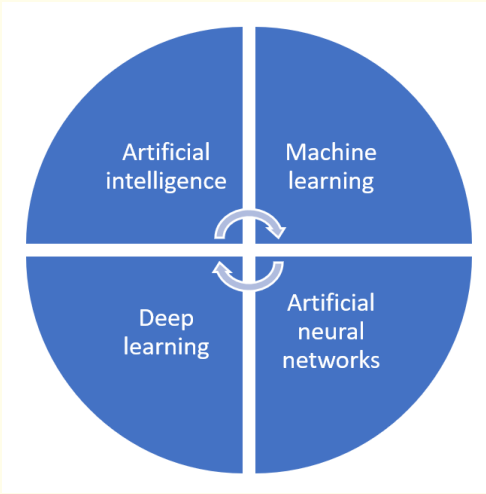

Figure 1: Layers of artificial intelligence.

Based on present application of artificial intelligence, machine learning helps not only identify the presence or absence of features that are indicative of the disease, but also the severity of the disease. Most documentation regarding artificial intelligence applied in ophthalmology concerns image identification of proliferative and non-proliferative diabetic retinopathy, age related macular de-

generation and retinopathy of prematurity with work done in identifying glaucoma and cataract as well. In this article, we'll be honing in on retinopathy of prematurity in particular - a leading cause of blindness in children [2].

Retinopathy of prematurity (ROP) is a vasoproliferative disorder affecting the retinae of premature infants with low birthweights. Retinopathy of prematurity (ROP) is quickly becoming an epidemic in the developing world, with a prevalence of 7.7% of severe ROP in Pakistan*. Although most ROP settles without significant visual sequelae, up to 5% of ROP will require timely treatment to avoid permanent visual loss. Proper checkups, screenings and follow-ups are necessary to ensure that the afflicted patient is treated efficiently.

Screening examinations have traditionally been carried out by a trained ophthalmologist using a binocular indirect ophthalmoscope. However, access to ROP screening is limited due to the need for highly specialized personnel and the time-consuming nature of its clinical practice, as well as significant associated medicolegal risk [3].

Modern modalities of ROP screening utilize digital retinal imaging and remote diagnosis via telemedicine by specialized clinicians, which have improved both access to screening and objectivity in diagnosis.

Machine learning methods in diagnosing retinopathy of premature have aided in evaluating vascular changes and categorize the disease into separate categories based on their features - it has been able to determine the zone or stage the disease is in, its category as well as the progression of the disease. Deep learning has been employed in recent advancements made in artificial intelligence [4]; it produces an ROP vascular severity score and rates the degree of the plus disease while determining regions where there has been natural formation of blood vessels (neovascularization) [5].

The use of computer-assisted image analysis for plus disease diagnosis in ROP has also been documented, which along with algorithms such as ROPtool and VesselMap analyses the extent of tortuosity and venule width recorded to determine the category and zone of the disease*. These methods have had fair success, being praised for its promising results demonstrating the high level of specificity and sensitivity that is a feature of this procedure. Reports say that the level of accuracy has gone as high as 95% - quite comparable to the accuracy of diagnosis made by experts in the matter*.

With an already significant lack of accessibility to doctors, as well as reluctance from both doctors and patients to expose themselves in this era of pandemic, employing a form of artificial intelligence technology could be a step towards procuring proper treatment in a safer way.

Across the world, the concept of telemedicine - taking care of patients remotely via modern technology - has gained popularity as a preferred method by both doctors and patients for consulting doctors as opposed to being physically present with each other [6]. Pakistan, especially, is an ideal setting for enhancing the use of telemedicine as it would yield beneficial for the rural majority who live at a significant distance from major tertiary care hospitals that are within the cities, helping patients save both time and money in getting access to this essential facility. Although many barriers would have to be crossed in making this a more effective way of practicing medicine, the potential to not only increase use of telemedicine but incorporate artificial intelligence with it is real. In the United States, the FDA has announced interest in incorporating AI with telemedicine in the post-covid world where it would be used in guidance-system technologies to better facilitate remote healthcare.

As with any other new technology in health-care, AI too should be subject to regulatory approvals relying on clinical trials and evidence-based improvements in clinical outcomes in the intended population.

Bibliography

1. Amisha Paras Malik., *et al.* "Overview of artificial intelligence in Medicine". *Family Medicine Primary Care* (2019): 2328-233.

2. Brritini A Scruggs., *et al.* "Artificial intelligence in retinopathy of prematurity diagnosis". *Translational Vision Science and Technology* (2020).

3. Clare Gilbert., *et al.* "Artificial intelligence for ROP screening and to assess quality of care-progress and challenges". *Pediatrics* (2021).

4. Danial S W Ting., *et al.* "Deep learning for retinopathy of prematurity screening". *BMJ of Ophthalmology* (2018).

5. Gensure Rebekah H and Chiang Michael F. "Artificial intelligence for retinopathy of prematurity". *Current Opinion in Ophthalmology (*2020): 312-317.

6. Ji Peng., *et al.* "Digital technology telemedicine and artificial intelligence in ophthalmology: A global perspective". *Progress in Retina Eye* (2020).