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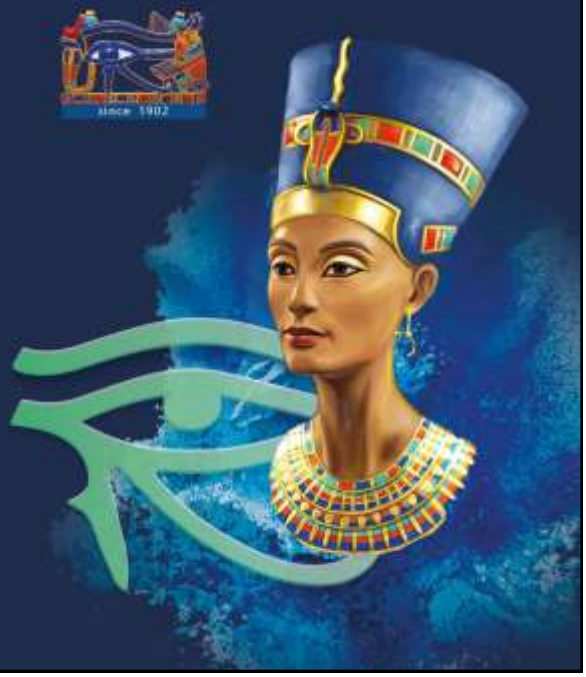

PAPILLAEDMA AND ARTIFICIAL INTELLIGENCE

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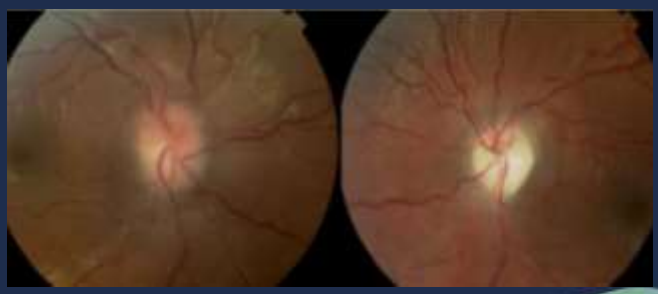
- Direct ophthalmoscopy is usually avoided or poorly Performed by general physicians and nonophthalmologist.
- The findings on ophthalmoscopy influence diagnostic strategy and treatment options

- Failure to detect papilledema and its cause can lead to neurologic dysfunction, permanent vision loss, or even death



On the other hand, a false diagnosis of papilledema can lead to unnecessary expensive, and invasive investigations

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In one study conducted in an emergency department 8.5% of patients presenting with headache had abnormal findings on fundus photographs.

However, these photographs need to be interpreted by physicians on-site at the time of photography or sent through teleophthalmology platforms

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- Fundus examination is needed in a variety of clinical settings.

neurological clinics

emergency departments

urgent care centers

pediatric clinics

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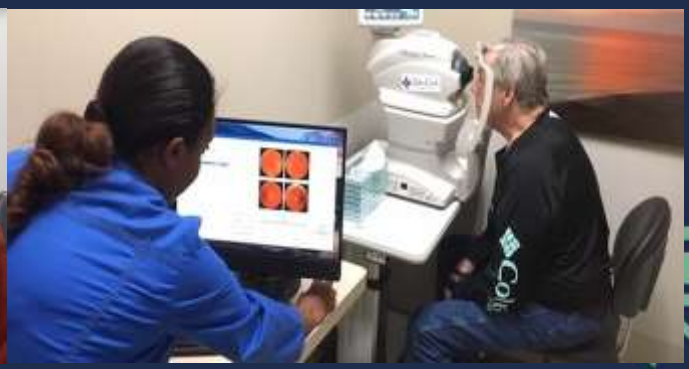
Artificial intelligence

Artificial intelligence (AI) enables a technical system of human-like behavior that consists of

- receiving,
- interpreting,
- learning from data before achieving a particular goal.
- make more accurate diagnoses in a shorter amount of time.

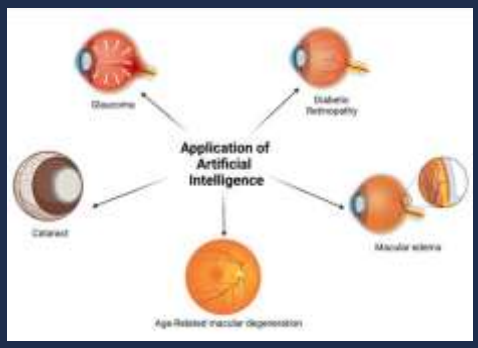
COVID 19 and AI

- The COVID-19 pandemic only accelerated the implementation of AI-powered telehealth into clinical practice to minimize infection
- .



Previous use of AI in ophthalmology

- diabetic retinopathy
- glaucomatous optic neuropathy
- age-related macular degeneration
- retinopathy of prematurity



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AI in papilledema

- As an alternative to trained neuro-ophthalmologists to detect papilledema.
- AI may offer a solution for fast, automated, and accurate interpretation of ONH appearance and potentially, underlying diagnoses.

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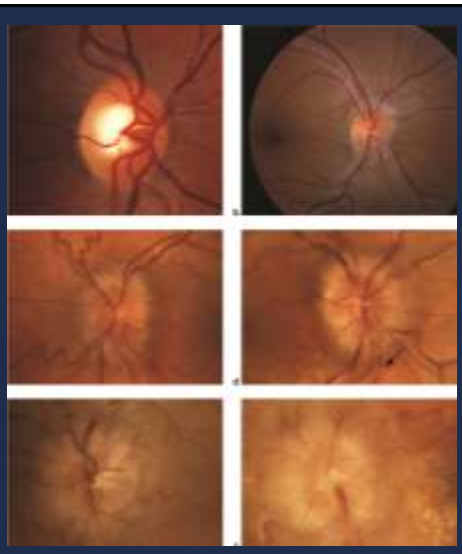
Papilledema versus normal Disc



Akbar et al 2017 developed an automated system to detect papilledema from healthy ONHs and grade its severity (mild vs severe) using 160 retrospectively collected fundus photographs. Four classes of features (textural, color, disc obscuration, and vascular) were extracted from ONH photographs and subsequently processed through support vector machine classifier and radial basis function kernel.

This system yielded accuracies of 92.9% and 97.9% for the detection and grading of papilledema, respectively.

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The Brain and Optic Nerve Study with Artificial Intelligence (BONSAI)

The Brain and Optic Nerve Study with Artificial Intelligence (BONSAI) consortium prompted in 2019 a large collaborative effort across 24 ophthalmology centers in 15 countries, leading to the development of a deep learning system (DLS) able to classify papilledema and other ONH abnormalities.

The DLS,was trained to classify ONHs into 3 classes: normal, papilledem and other ONH abnormalities, using a dataset of 14,341 retrospectively collected mydriatic fundus photographs from 6779 patients of various ethnicities from 19 centers worldwide.

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(BONSAI)

- Fundus photographs were classified into three groups

- normal optic disk
- disk with papilledema due to proven intracranial hypertension
- disk with other abnormalities, such as anterior ischemic optic neuropathies, optic-disk drusen, optic atrophy, and congenital optic-nerve abnormalities.

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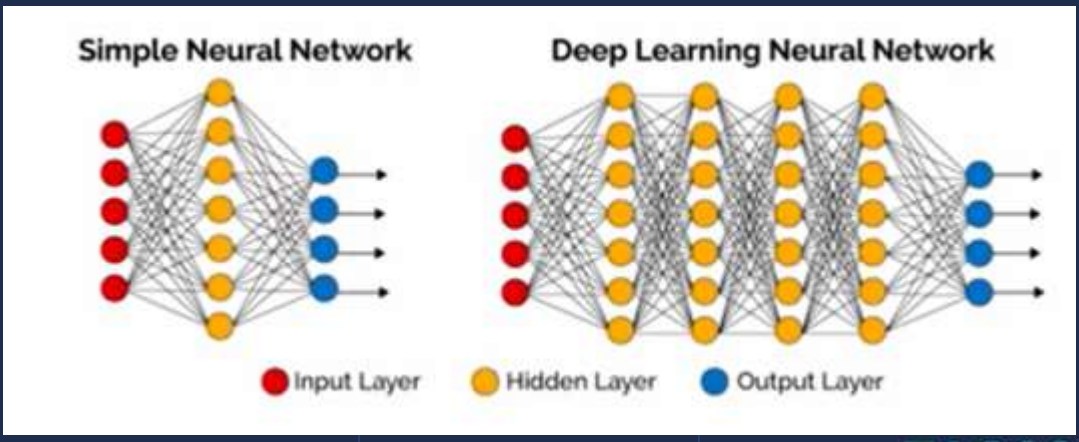
Teaching the deep learning system machine to recognize normal and various optic nerve pathologies



Diagnostic output

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(BONSAI)

- The deep learning system for the detection of papilledema were assessed in a separate testing data set comprising 1,505 photographs from 5 countries (i.e. Thailand, Denmark, Germany, Iran and USA).
- four expert neuro-ophthalmologists not involved in the original analyses reviewed these images, and agreed with the deep learning system

The nursing staff would be in charge of preparing the patient by dilating his pupils. Then, they would take photographs of the fundus and then upload it to the computer and have them analyzed.

PROS

It has 95% accuracy in its diagnoses and therefore a better treatment will be given to patients

CONS

It should be affordable for all countries and patients

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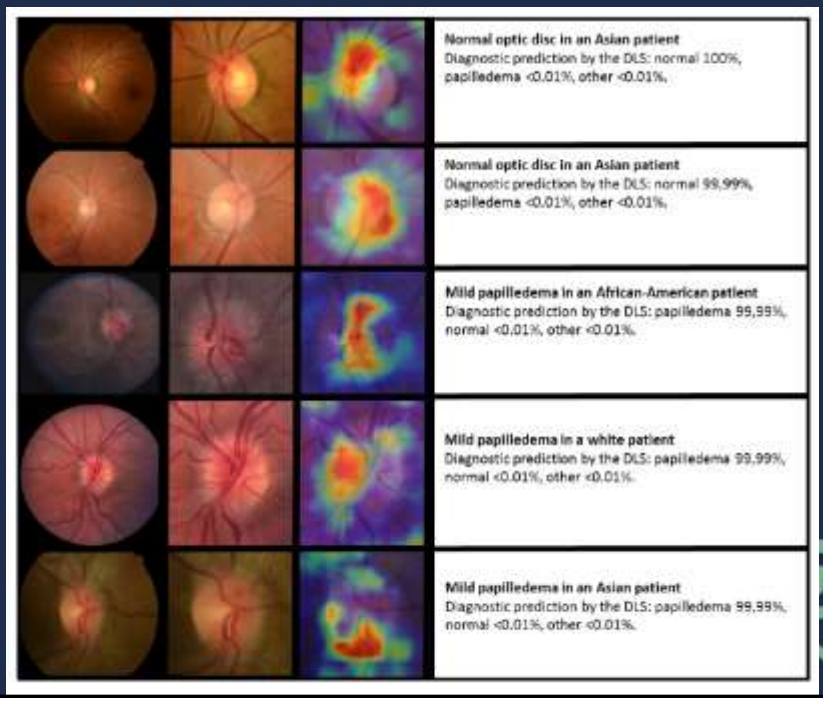
fundus photographs will be non-analysable by the deep learning system

major artefacts

unfocused image

eyelash artefacts

- normal optic disk
- disk with papilledema
- disk with other abnormalities



- normal optic disk
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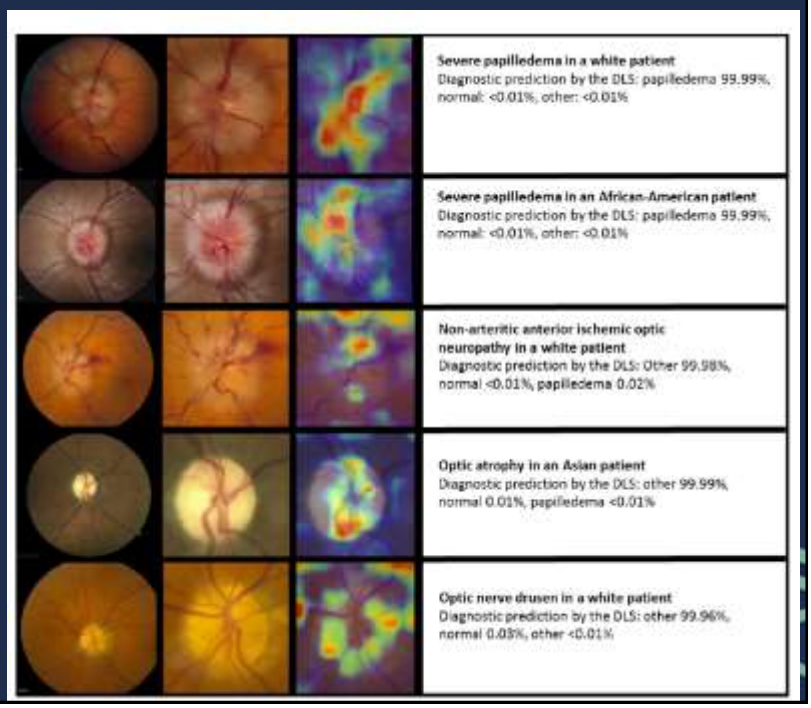

So The future will be

- long-distance clinical investigations/self-investigations (eg, VF testing applications, phone-based imaging, handheld imaging devices) to promote tele-neuro-ophthalmology as a viable health care delivery system.

2023

In conclusion, artificial intelligence to detect papilledema of ocular fundus photographs is improving its development, providing better photographic quality and processing speed, these applications completely change the way of diagnosing and treating the disease, benefiting patients to timely treatment.

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THANK
YOU!
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