A Ophthalmology Study on Eye Glaucoma and Retina Applied in AI and Deep Learning Techniques

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A OPHTHALMOLOGY STUDY ON EYE GLAUCOMA AND RETINA APPLIED IN AI AND DEEP LEARNING TECHNIQUES

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ABSTRACT: Artificial intelligence based on deep learning has huge global interest in current times. Deep Learning has been widely affiliated in image and speech recognition and also natural language processing, but it is beginning of healthcare. In ophthalmology, Deep learning has applied in photographs fundus, optical coherence tomography and vision sectors. Accomplishes safety in classifying the detection performance on diabetic retinopathy, age-related macular degeneration. Deep learning may be used in concurrence with telemedicine as possible to diagnose and monitor major eye diseases for patients in primary care. There are also prospective challenges with Deep learning application in ophthalmology, including clinical and technical challenges, explain ability of the algorithm results, medico legal issues, and physician and patient acceptance of the AI "black-box" algorithms. Deep learning could probably revolutionize how ophthalmology is practiced in the future. Hence this review provides a Deep Learning systems described for ophthalmic conditions, and fundamental functions.

Keywords: Artificial intelligence (AI), Deep learning, Ophthalmology.

I.INTRODUCTION

Artificial intelligence is the fourth age of resources in mankind's history. Deep learning is art of machine learning techniques in huge global interest in current times. Deep Learning represents learning methods with multiple levels of abstraction to process input data without the need for manual feature engineering, automatically recognizing the complicated structures in high-dimensional data through projecting onto a lower dimensional manifold. Compared with adhering techniques, Deep learning has significantly higher accuracies in many domains, including natural language processing, vision of computers and voice recognition. Techniques of AI-based retinal analyses are vary and divergent widely in their applicability, interpretability and reliability in different datasets and diseases. Machine driven AI-based systems have currently been validated for screening of Diabetic retinopathy. The overall potential of ML/DL includes screening, diagnostic grading as well as guidance of therapy with automated detection of disease activity, frequency, quantification of therapeutic effects and identification of relevant targets for hardback therapeutic approaches. Prediction and prognostic conclusions further expand the potential benefit of AI in retina which will enable personalized and empower the ophthalmologist health care in large scale management. Ophthalmologist will provide high quality diagnosis and successfully deals with the complexity of 21st century ophthalmology.

## II.DEFINING THE BASIC PRINCIPLES OF AI, ML, NN,DL

2.1 Artificial Intelligence

Outlined as "Speculation and growth of computing systems will perform tasks as general rule requiring human intelligence, such as vision and speech recognition, decision-making, and translation between the languages." Artificial Intelligence is the science of applying computer algorithms to replicate intelligent human-like behavior.

2.2 Machine Learning

Elucidate as "The volume of a computer to learn from the occurrence that is to modify its processing on the support of newly acquired information." In Machine Learning, the algorithms learn on own by test and error, without being directly programmed the treads to do a task.

Deign of artificial intelligence
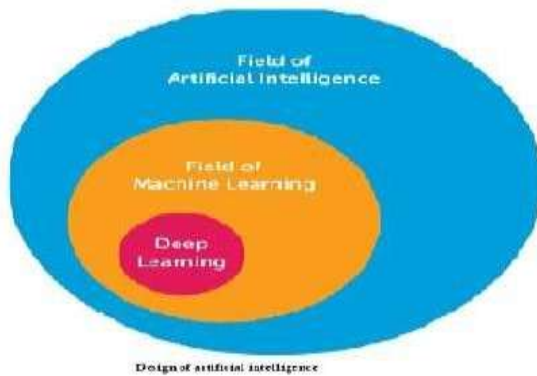
2.3 Neural Network

Defined as "A computer system modeled on the human brain and nervous system." The software is built as a network of neurons communicating with each other with multiple inputs modifying the output, and often has a feedback loop for learning.

2.4 Deep Learning

Deep learning is "A class of machine learning algorithms" that utilizes multiple layers to consistently extract higher level features from the raw input. For example, in image processing, lower layers might identify edges, while higher layers might identify the concepts relevant to a human such as digits, letters, and faces. It is an advanced level of neural network.

III. AI TECHNOLOGY IN GLAUCOMA

Glaucoma is a condition where it raises intraocular pressure may result in damage to the optic nerve. Glaucoma is a major cause of blindness. Macular degeneration – it is condition which destroys sharpness. Retinal detachment - the retina is pulled away from the back of the eye. Retinoblastoma - cancer of the retina, common in young children. Macular pucker – it is scar tissue on the macula. Macular hole - a small break in the macula that usually happens to people over 60 years of age.


a.Glucoma   b.Cataract
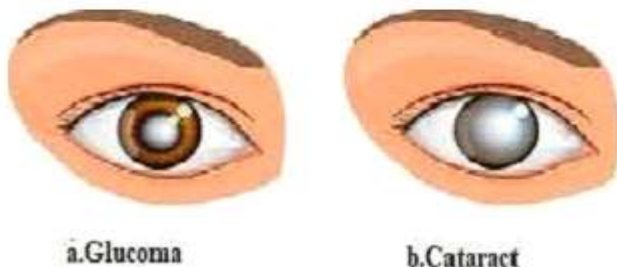
Artificial Intelligence is well-suited to extract useful information from all this data. Such a comprehensive glaucoma AI is not yet ready to the best of my knowledge, but I predict that it wouldn't take long for this to be developed. That would indeed be a game changer in the fight against this "It silently steals the eye sight". Meanwhile, there has been huge progress in the use of AI for evaluation of individual parameters and some combinations. There has been success in the diagnostic and prognostics aspects. Glaucoma is an eye disease that is often associated with elevated intraocular pressure in which damage to the (optic) nerve can lead to vision loss and blindness and cause irreversible blindness. Glaucoma generally has no symptoms in the course beginning, at the time it can only be diagnosed by regular eye examinations. By screening the frequency based age and current risk factors.

Intraocular pressure increases when either too much fluid is produced in the eye or the drainage or outflow channels (trabecular meshwork) of the eye become blocked.

The two kinds of glaucoma are open angle glaucoma which has many variants and is a long duration (chronic) condition and angle closure glaucoma which may be either a sudden (acute) condition or a chronic disease. Many types of painless tests which determine the intraocular pressure, the status of the optic nerve and drainage angle, and visual type are used to diagnose the presence of glaucoma and monitor its progression. Glaucoma is usually treated with eye drops, although laser treatment and surgery can also be used. Most cases can be controlled with these treatments, by preventing further loss of vision. Early diagnosis and treatment is the key to preserve the sight in people with glaucoma.

IV. AI TECHNOLOGY IN RETINA

To acknowledge and interpret AI-based diagnostic results, the retina expert needs to become aware of the enormous spectrum of machine learning techniques that will be the bases of clinical management decisions. Diagnostic decisions of the pre-AI era were based on commonly accepted pathological clinical features and definitions of health versus diseased retina such as in the Early Treatment Diabetic Retinopathy study (ETDRS) or Age-Related Eye Disease Study (AREDS) scores. AI techniques are also based on characteristic Discrimination. The sensitivity and accuracy features as healthy pathological proceeds on a subclinical base for biomarkers not seen ophthalmological. Hence, AI represents a major paradigm shift in retinal diagnosis which is unlike any previous approach. The community has to understand the rules and risks of the various methods to properly use the machine-based outcomes in their daily management decisions and be aware of their security. Otherwise, retinology will become dependent on a "black box," with all its essential threat and errors are detached from authentication-based medicine.

Retina
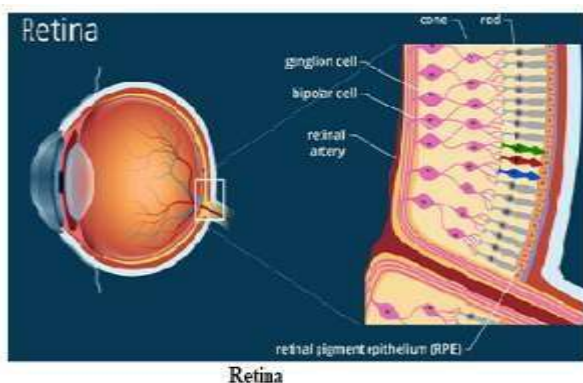
V.FUNDAMENTAL PROPOSITIONS AND ROLES IN EYES

Eyes are sensitive and major components in human body. Eyes are windows to outside world that gives image in colorful format. Eyes are most valuable organ which processes the image of objects.

Eye may interpret in size, shape, color and objects in distance in 3-Dimesional Picture of visible objects. Human eyes are also called as sophiscated cameras which take pictures in seconds and process the brain as Message. Eyes are able to play three vital roles adjust, capture and transform into a chemical code that only the brain can decipher. Each structure of the eye works according with the next – refracting, constricting, dilating and chemically reacting to convert patterns of light. The simplest „eyes", known as eye-spots, are present in some unicellular organisms. The much complexes optical systems tare found in 96% of animal species, however they are able to Protective light from the environment and regulates its intensity through a diaphragm and focus it using an adjustable lens to form a pattern of light.
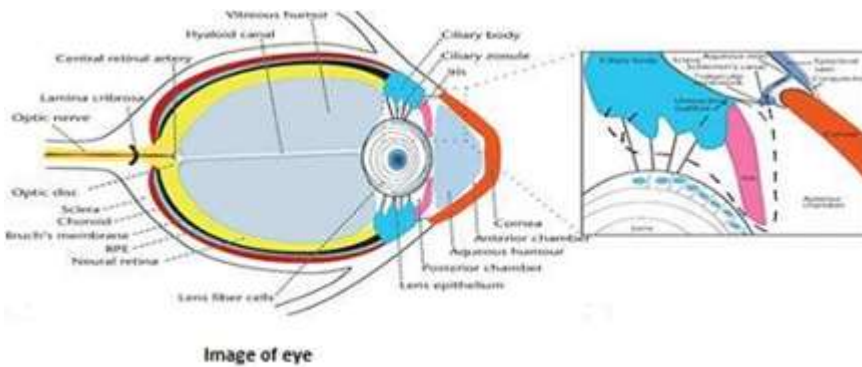
Image of eye

5.1. Eyestrain- Tiredness in eye . It is underlying diseases causes due to prolonged screen time, inadequacy of sleep, intense fatigue and computer vision syndrome**.**


Eye strain

5.2. Refractive Errors- some refractive errors mentioned below

 a) Near-Sightedness [myopia]-a condition in which close by objects appear clearly but not the far distance objects.

 b) Far-sightedness [hyperopia] - a condition in which far distance objects appear clearly but not the close by objects.[Presbyopia]- constant loss of eye sight natural part of aging, presbyopia is noticeable in mid age 40-65.

 c) Distorted vision- ordinary objects looks wavy and bent incorrectly.

 d)Uncorrected refractive error- is a preventable cause of visual impairment which affect.

 e) Astigmatism –it is general imperfection in eye curvature the surface forepart or the lens inside the eye is curved differently.
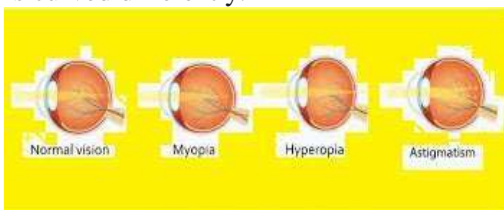
Refractive Errors

5.3. Dry eye syndrome – This is frequent problem that occurs when tears are not able to produce sufficient lubrication in the eyes. Tears are not sufficient for wavering reasons. Dry eyes provokes when eyes are not producing insufficient tears and poor quality of tears.
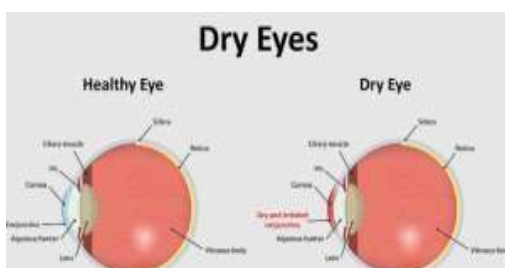
Health condition such as

a) **Conjunctiviti**s-contamination of conjunctiva outer membrane of eyelid, inner eyelid and coves white part of eyeball.

b)**Blepharitis**- an inflammation on eyelids which effects eyelashes and producing tears which causes dry, stickiness in eyelids
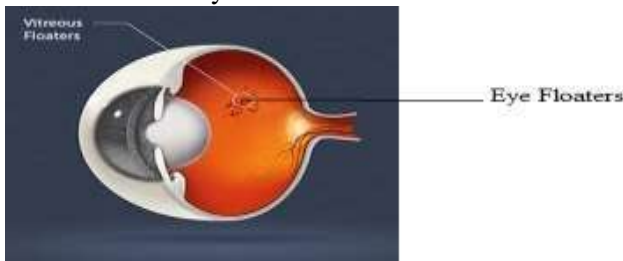
5.4. Night Blindness – Loss of vision in low light called as nyctalopia. Night blindness occurs with **vitamin A deficiency.**
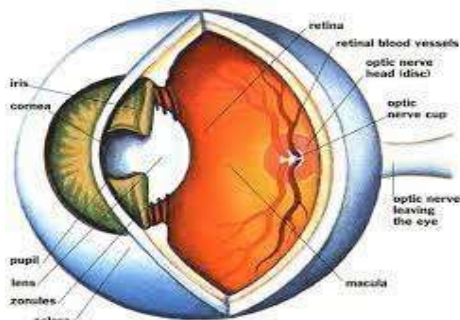
5.5. Amblyopia - abate eyes due to abnormal visual growth. It decreases vision in one eye due to vision development disorder.
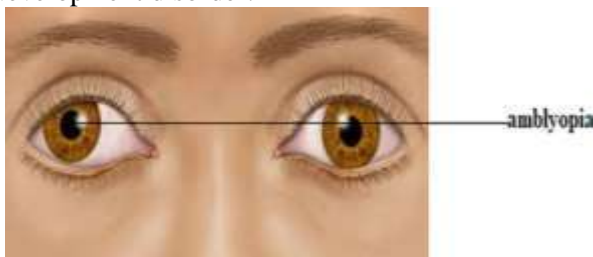
5.6. Eye Floaters - Spots in the vision which likes grey/white specks strings, rings, cobwebs floaters drifts across the eyes.

5.7. Retina disorders - Retinal disorder affects all the essential tissues that affect the eyes and causes blindness. Retina is a layer of tissue located in back of eye it senses light and send pictorial representation to brain. The centre of nerve tissue known as macula provides sharp and central vision required for reading.

5.7.1. Cataract: A cataract is form of clouding in clear lens and growth of protein eye lens cataract develops slowly.

VII. CONCLUSION

Hence this paper concludes, Glaucoma and retina condition signifies a challenging spectrum of disease. Our understanding of path physiology glaucoma remains incomplete. However, clear that new outcomes witnessed in field of medical technology laser and incision surgery, and optic nerve/retinal layer imaging have changed practice and surgical patterns. In order to make it possible for all human

Being is to maintain their productivity in the face of changes in vision which typically occur with age, it will be necessary for scientists, manufacturers, and employers to pursue some general goals. The aging of the human eye involves a series of changes in vision performance that can be readily detected in the healthy adult and Reduces visual functioning. Future research analysis will be developed with depth criterion of eye impairments.

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