**1\*INTRODUCTION TO ARTIFICIAL INTELLIGENCE\***

### What is A.I.?

There are numerous definitions of what artificial intelligence is.

We end up with four possible goals:

1. Systems that think like humans (focus on reasoning and human framework)
2. Systems that think rationally (focus on reasoning and a general concept of intelligence)
3. Systems that act like humans (focus on behavior and human framework)
4. Systems that act rationally (focus on behavior and a general concept of intelligence)

### https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcShaa1xLkLAGvArWB3rH9xtdzhcOFuNL8uSuhuuSj-58wZxu1BRhg

Fig1.1: Artificial Intelligence

|  |  |
| --- | --- |
| Artificial Intelligence is the study of human intelligence and actions replicated artificially, such that the resultant bears to its design a reasonable level of rationality. |  |

Artificial intelligence is the search for a way to map intelligence into mechanical hardware and enable a structure into that system to formalize thought.[3]

Artificial Intelligence (AI) is the [intelligence](http://en.wikipedia.org/wiki/Intelligence) of machines and robots and the branch of [computer science](http://en.wikipedia.org/wiki/Computer_science) that aims to create it. AI textbooks define the field as "the study and design of intelligent agents" where an [intelligent agent](http://en.wikipedia.org/wiki/Intelligent_agent) is a system that perceives its environment and takes actions that maximize its chances of success . [John McCarthy](http://en.wikipedia.org/wiki/John_McCarthy_(computer_scientist)), who coined the term in 1955,defines it as "the science and engineering of making intelligent machines.".

Artificial Intelligence is the science of making computer software that reasons about the world around it. Humanoid robots, [Google Goggles](http://www.google.com/mobile/goggles/), [self-driving cars](http://www.pbs.org/wgbh/nova/darpa/), even software that suggests music you might like to hear are all examples of AI.

The central problems of AI include such traits as reasoning, knowledge, planning, learning, communication, [perception](http://en.wikipedia.org/wiki/Perception) and the ability to move and manipulate objects.

General intelligence (or "[strong AI](http://en.wikipedia.org/wiki/Strong_AI)") is still among the field's long term goals. Currently popular approaches include [statistical methods](http://en.wikipedia.org/wiki/Artificial_intelligence#Statistical), [computational intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence#Sub-symbolic) and [traditional symbolic AI](http://en.wikipedia.org/wiki/Artificial_intelligence#Symbolic). There are an enormous number of tools used in AI, including versions of [search and mathematical optimization](http://en.wikipedia.org/wiki/Artificial_intelligence#Search_and_optimization), [logic](http://en.wikipedia.org/wiki/Artificial_intelligence#Logic), [methods based on probability and economics](http://en.wikipedia.org/wiki/Artificial_intelligence#Probabilistic_methods_for_uncertain_reasoning), and many others.[6]

In AI

Think and act like humans

Think and act rationally

* [**Strong AI**](http://en.wikipedia.org/wiki/Strong_AI) = machine-based artificial intelligence that can truly reason and becomes self-aware (sentient), either human-like (thinks and reasons like a human mind) or non-human-like (different form of sentience and reasoning)
* [**Weak AI**](http://en.wikipedia.org/wiki/Weak_AI) = machine-based artificial intelligence that can reason and solve problems in a limited domain. Hence it acts as if it were intelligent in that domain, but would not be truly intelligent or sentient.

**ACloser Look** The goal of research on *artificial intelligence* is to understand the nature of thought and intelligent behavior and to design intelligent systems. A computer is not really intelligent; it just follows directions very quickly.

At the same time, it is the speed and memory of modern computers that allows researchers to manage the huge quantities of data necessary to model human thought and behavior. An intelligent machine would be more flexible than a computer and would engage in the kind of "thinking" that people actually do. An example is vision.

In theory, a network of sensors combined with systems for interpreting the data could produce the kind of pattern recognition that we take for granted as seeing and understanding what we see. In fact, developing software that can recognize subtle differences in objects (such as those we use to recognize human faces) is very difficult.

The recognition of differences that we can perceive without deliberate effort would require massive amounts of data and elaborate guidelines to be recognized by an artificial intelligence system. According to the famous Turing Test, proposed in 1950 by British mathematician and logician Alan Turing, a machine would be considered intelligent if it could convince human observers that another human, rather than a machine, was answering their questions in conversation.[2]

1.1\* ARTIFICIAL INTELLIGENCE IN MEDICAL\*(AIM)

'Medical artificial intelligence is primarily concerned with the construction of AI programs that perform diagnosis and make therapy recommendations. Unlike medical applications based on other programming methods, such as purely statistical and probabilistic methods, medical AI programs are based on symbolic models of disease entities and their relationship to patient factors and clinical manifestations.' A medical clinic can use artificial intelligence systems to organize bed schedules, make a staff rotation, and provide medical information.

AIM systems are by and large intended to support healthcare workers in the normal course of their duties, assisting with tasks that rely on the manipulation of data and knowledge. An AI system could be running within an electronic medical record system,

For example, and alert a clinician when it detects a contraindication to a planned treatment. It could also alert the clinician when it detected patterns in clinical data that suggested significant changes in a patient's condition.

[**Artificial neural networks**](http://en.wikipedia.org/wiki/Artificial_neural_networks)are used as [**clinical decision support systems**](http://en.wikipedia.org/wiki/Clinical_decision_support_system) for [medical diagnosis](http://en.wikipedia.org/wiki/Medical_diagnosis), such as in [Concept Processing](http://en.wikipedia.org/wiki/Concept_Processing) technology in [EMR](http://en.wikipedia.org/wiki/Electronic_medical_record) software.[3]

Other tasks in medicine that can potentially be performed by artificial intelligence include:

* [Computer-aided interpretation of medical images](http://en.wikipedia.org/wiki/Computer-aided_radiologic_interpretation). Such systems help scan digital images, *e.g.* from [computed tomography](http://en.wikipedia.org/wiki/Computed_tomography), for typical appearances and to highlight conspicuous sections, such as possible diseases. A typical application is the detection of a tumor.
* [Heart sound](http://en.wikipedia.org/wiki/Heart_sound) analysis.

Expert or knowledge-based systems are the commonest type of AIM system in routine clinical use. They contain medical knowledge, usually about a very specifically defined task, and are able to reason with data from individual patients to come up with reasoned conclusions. Although there are many variations, the knowledge within an expert system is typically represented in the form of a set of rules.

There are many different types of clinical task to which expert systems can be applied.

**Generating alerts and reminders:-** In so-called real-time situations, an expert system attached to a monitor can warn of changes in a patient's condition. In less acute circumstances, it might scan laboratory test results or drug orders and send reminders or warnings through an e-mail system.

**Diagnostic assistance:-** When a patient's case is complex, rare or the person making the diagnosis is simply inexperienced, an expert system can help come up with likely diagnoses based on patient data.

**Therapy critiquing and planning:-** Systems can either look for inconsistencies, errors and omissions in an existing treatment plan, or can be used to formulate a treatment based upon a patient's specific condition and accepted treatment guidelines.

**Agents for information retrieval:-** Software 'agents' can be sent to search for and retrieve information, for example on the Internet, that is considered relevant to a particular problem. The agent contains knowledge about its user's preferences and needs, and may also need to have medical knowledge to be able to assess the importance and utility of what it finds.

**Image recognition and interpretation:-** Many medical images can now be automatically interpreted, from plane X-rays through to more complex images like angiograms, CT and MRI scans. This is of value in mass-screenings, for example, when the system can flag potentially abnormal images for detailed human attention.

Many of the early efforts to apply artificial intelligence methods to real problems, including medical reasoning, have primarily used rule-based systems . Such programs are typically easy to create, because their knowledge is catalogued in the form of "if ... then..." rules used in chains of deduction to reach a conclusion. In many relatively well-constrained domains rule-based programs have begun to show skilled behavior .

This is true in several narrow domains of medicine as well *,*but most serious clinical problems are so broad and complex that straightforward attempts to chain together larger sets of rules encounter major difficulties. Problems arise principally from the fact that rule-based programs do not embody a model of disease or clinical reasoning. In the absence of such models, the addition of new rules leads to unanticipated interactions between rules and thus to serious degradation of program performance .[2]

Given the difficulties encountered with rule-based systems, more recent efforts to use artificial intelligence in medicine have focused on programs organized around models of disease.

Efforts to develop such programs have led to substantial progress in our understanding of clinical expertise, in the translation of such expertise into cognitive models, and in the conversion of various models into promising experimental programs. Of equal importance, these programs have been steadily improved through the correction of flaws shown by confronting them with various clinical problems.[4]

The simplest version of such programs operates in the following fashion when presented with the chief complaint and when later given additional facts.

1. For each possible disease (diagnosis) determine whether the given findings are to be expected.

2. Score each disease (diagnosis) by counting the number of given findings that would have been expected.

3. Rank-order the possible diseases (diagnoses) according to their scores.

4. Select the highest-ranking hypothesis and ask whether one of the features of that disease, not yet considered, is present or absent.

5. If inquiry has been made about all possible features of the highest-ranked hypothesis, ask about the features of the next best hypothesis.

6. If a new finding is offered, begin again with step 1; otherwise, print out the rank-ordered diagnoses and their respective supportive findings and stop.[5]

**2\*ARTIFICIAL INTELLIGENCE IN EYE EXAMINATION\***

An **eye examination** is a battery of tests performed by an [ophthalmologist](http://en.wikipedia.org/wiki/Ophthalmologist), [optometrist](http://en.wikipedia.org/wiki/Optometrist), assessing [vision](http://en.wikipedia.org/wiki/Visual_perception) and ability to [focus](http://en.wikipedia.org/wiki/Focus_(optics)) on and discern objects, as well as other tests and examinations pertaining to the [eyes](http://en.wikipedia.org/wiki/Human_eye). Health care professionals often recommend that all people should have periodic and thorough eye examinations as part of routine primary care, especially since many [eye diseases](http://en.wikipedia.org/wiki/List_of_eye_diseases_and_disorders) are [asymptomatic](http://en.wikipedia.org/wiki/Symptom#Types).

Eye examinations may detect potentially treatable [blinding](http://en.wikipedia.org/wiki/Blindness) eye diseases, [ocular manifestations of systemic disease](http://en.wikipedia.org/wiki/Ocular_manifestation_of_systemic_disease), or signs of [tumours](http://en.wikipedia.org/wiki/Tumour" \o "Tumour) or other anomalies of the [brain](http://en.wikipedia.org/wiki/Brain).

**Recognise normal and abnormal anatomy-** An **Anomaly-Based** [Intrusion Detection System](http://en.wikipedia.org/wiki/Intrusion-detection_system), is a system for detecting computer intrusions and misuse by monitoring system activity and classifying it as either normal or anomalous. The classification is based on [heuristics](http://en.wikipedia.org/wiki/Heuristics) or rules, rather than patterns or [signatures](http://en.wikipedia.org/wiki/Signature), and attempts to detect any type of misuse that falls out of normal system operation. This is as opposed to signature based systems which can only detect attacks for which a signature has previously been created.

In order to determine what is attack traffic, the system must be taught to recognize normal system activity. This can be accomplished in several ways, most often with [artificial intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence) type techniques. Systems using [neural networks](http://en.wikipedia.org/wiki/Neural_networks) have been used to great effect. Another method is to define what normal usage of the system comprises using a strict mathematical model, and flag any deviation from this as an attack. This is known as strict anomaly detection.

**Systematically examine an eye-**A standard ophthalmic exam is a series of tests done to check your vision and the health of your eyes.

First, you will be asked if you are having any eye or vision problems. You will be asked to describe these problems, how long you have had them, and any factors that have made them better or worse.[3]

Your history of glasses or contact lenses will also be reviewed. The eye doctor will then ask questions about your overall health, including any medications you take and your family's medical history.

Next, the doctor will check your vision ([visual acuity](http://www.nlm.nih.gov/medlineplus/ency/article/003396.htm)) using a Snellen chart.

* You will be asked to read random letters that become smaller line by line as your eyes move down the chart. Newer electronic devices have been developed that check vision in a way similar to a Snellen chart.
* To see if you need glasses, the doctor will place several lenses in front of your eye, one at a time, and ask you when the letters on the Snellen chart become easier to see.

Other parts of the exam include tests to:

* See if you have proper three-dimensional (3D) vision (stereopsis)
* Check your side (peripheral) vision
* Check the eye muscles by asking you to look in different directions at a penlight or other small object
* Examine the pupils with a penlight to see that they respond (constrict) properly to light

To see inside your eye, the doctor looks through a magnifying glass that has a light on the end (an ophthalmoscope). The device allows the doctor to see the [retina](http://www.nlm.nih.gov/medlineplus/ency/article/002291.htm) and nearby blood vessels, back of the eye (fundus), and optic nerve area.

Often, you'll be given eye drops to open up (dilate) your pupils so that the doctor can view the structures in the back of the eye.

Another magnifying device called a [slit lamp](http://www.nlm.nih.gov/medlineplus/ency/article/003880.htm) is used to:

* See the clear surface of the eye (eyelids, cornea, conjunctiva, sclera, and iris)
* Check for [glaucoma](http://www.nlm.nih.gov/medlineplus/ency/article/001620.htm) using a method called [tonometry](http://www.nlm.nih.gov/medlineplus/ency/article/003447.htm)

**Use of systematic approach to examine the eye**

**1. Lids and lashes-**An **eyelash** or simply **lash** is one of the hairs that grow at the edge of the [eyelid](http://en.wikipedia.org/wiki/Eyelid). Eyelashes protect the [eye](http://en.wikipedia.org/wiki/Human_eye) from debris and perform some of the same function as [whiskers](http://en.wikipedia.org/wiki/Vibrissae) do on a [cat](http://en.wikipedia.org/wiki/Cat) or a [mouse](http://en.wikipedia.org/wiki/Mouse) in the sense that they are [sensitive](http://en.wikipedia.org/wiki/Sensitive) to being touched, thus providing a warning that an object (such as an [insect](http://en.wikipedia.org/wiki/Insect) or [dust](http://en.wikipedia.org/wiki/Dust) mite) is near the eye (which is then closed [reflexively](http://en.wikipedia.org/wiki/Reflex_action)).

An **eyelid** is a thin fold of skin that covers and protects the [eye](http://en.wikipedia.org/wiki/Human_eye). With the exception of the [prepuce](http://en.wikipedia.org/wiki/Prepuce) and the [labia minora](http://en.wikipedia.org/wiki/Labia_minora), it has the thinnest skin of the whole body. The [levator palpebrae superioris muscle](http://en.wikipedia.org/wiki/Levator_palpebrae_superioris_muscle" \o "Levator palpebrae superioris muscle) retracts the eyelid to "open" the eye.

**2. Conjunctiva-** The **conjunctiva** lies the inside of the [eyelids](http://en.wikipedia.org/wiki/Eyelid) and covers the [sclera](http://en.wikipedia.org/wiki/Sclera) (white part of the [eye](http://en.wikipedia.org/wiki/Human_eye)). The conjunctiva helps lubricate the [eye](http://en.wikipedia.org/wiki/Human_eye) by producing [mucus](http://en.wikipedia.org/wiki/Mucus) and [tears](http://en.wikipedia.org/wiki/Tears), although a smaller volume of [tears](http://en.wikipedia.org/wiki/Tears) than the [lacrimal gland](http://en.wikipedia.org/wiki/Lacrimal_gland" \o "Lacrimal gland).It also contributes to [immune surveillance](http://en.wikipedia.org/wiki/Immune_system) and helps to prevent the entrance of [microbes](http://en.wikipedia.org/wiki/Microbes) into the eye.

**3. Cornea-**The **cornea** is the [transparent](http://en.wikipedia.org/wiki/Transparency_(optics)) front part of the [eye](http://en.wikipedia.org/wiki/Human_eye) that covers the [iris](http://en.wikipedia.org/wiki/Iris_(anatomy)), [pupil](http://en.wikipedia.org/wiki/Pupil), and [anterior chamber](http://en.wikipedia.org/wiki/Anterior_chamber_of_eyeball). The cornea, with the anterior chamber and [lens](http://en.wikipedia.org/wiki/Lens_(anatomy)), [refracts](http://en.wikipedia.org/wiki/Refraction) light, with the cornea accounting for approximately two-thirds of the eye's total [optical power](http://en.wikipedia.org/wiki/Optical_power).

**4. Anterior chamber-** The **anterior chamber** ([AC](http://en.wikipedia.org/wiki/Optometric_Abbreviations#AC)) is the fluid-filled space inside the [eye](http://en.wikipedia.org/wiki/Human_eye) between the [iris](http://en.wikipedia.org/wiki/Iris_(anatomy)) and the [cornea](http://en.wikipedia.org/wiki/Cornea)'s innermost surface, the [endothelium](http://en.wikipedia.org/wiki/Endothelium). [Aqueous humor](http://en.wikipedia.org/wiki/Aqueous_humor) is the fluid that fills the anterior chamber. [Hyphema](http://en.wikipedia.org/wiki/Hyphema" \o "Hyphema) and [glaucoma](http://en.wikipedia.org/wiki/Glaucoma) are two main pathologies in this area.

**5. Iris and pupil-** The **pupil** is a hole located in the center of the [iris](http://en.wikipedia.org/wiki/Iris_(anatomy)) of the [eye](http://en.wikipedia.org/wiki/Human_eye) that allows light to enter the[re retina](http://en.wikipedia.org/wiki/Retina)

The **iris** (plural: **irides** or **irises**) is a thin, circular structure in the [eye](http://en.wikipedia.org/wiki/Human_eye), responsible for controlling the diameter and size of the [pupil](http://en.wikipedia.org/wiki/Pupil) and thus the amount of light reaching the[re retina](http://en.wikipedia.org/wiki/Retina). The color of the iris is often referred to as "[eye color](http://en.wikipedia.org/wiki/Eye_color)."

**6. Lens and posterior chamber-** The **posterior chamber** is a narrow space behind the peripheral part of the [iris](http://en.wikipedia.org/wiki/Iris_(anatomy)), and in front of the [suspensory ligament of the lens](http://en.wikipedia.org/wiki/Suspensory_ligament_of_the_lens" \o "Suspensory ligament of the lens) and the [ciliary processes](http://en.wikipedia.org/wiki/Ciliary_processes" \o "Ciliary processes). The Posterior Chamber consists of small space directly posterior to the iris but anterior to the lens. The posterior chamber should not be confused with the vitreous chamber.[6]

2.1\* EYE DISEASES\*

The [World Health Organization](http://en.wikipedia.org/wiki/World_Health_Organization) publishes a classification of known diseases and injuries, the [International Statistical Classification of Diseases and Related Health Problems](http://en.wikipedia.org/wiki/International_Statistical_Classification_of_Diseases_and_Related_Health_Problems)

[Glaucoma](http://www.sciencedaily.com/articles/g/glaucoma.htm) — Glaucoma is a group of diseases of the optic nerve involving loss of retinal ganglion cells in a characteristic pattern of optic neuropathy.Although raised intraocular pressure is a significant risk factor for developing glaucoma, there is no set threshold for intraocular pressure that causes glaucoma

[Vitreous humour](http://www.sciencedaily.com/articles/v/vitreous_humour.htm) — Vitreous humour or Vitreous humor is the clear aqueous solution that fills the space between the lens and the retina of the vertebrate eyeball.

[Astigmatism (eye)](http://www.sciencedaily.com/articles/a/astigmatism_(eye).htm) — In ophthalmology, astigmatism is a refraction error of the eye in which there is a difference in degree of refraction in different meridians.

[Visual acuity](http://www.sciencedaily.com/articles/v/visual_acuity.htm) — Visual acuity (VA) is acuteness or clearness of vision, especially form vision, which is dependent on the sharpness of the retinal focus within the eye, the sensitivity of the nervous elements

[**Scleritis**](http://en.wikipedia.org/wiki/Scleritis) — a painful inflammation of the [sclera](http://en.wikipedia.org/wiki/Sclera)

[**Keratitis**](http://en.wikipedia.org/wiki/Keratitis) — inflammation of the [cornea](http://en.wikipedia.org/wiki/Cornea)

[**Corneal ulcer**](http://en.wikipedia.org/wiki/Corneal_ulcer)**/**[**Corneal abrasion**](http://en.wikipedia.org/wiki/Corneal_abrasion) — loss of the surface [epithelial layer](http://en.wikipedia.org/wiki/Epithelium) of the eye's cornea

[**Snow blindness**](http://en.wikipedia.org/wiki/Snow_blindness)**/**[**Arc eye**](http://en.wikipedia.org/wiki/Arc_eye) — a painful condition caused by exposure of unprotected eyes to bright light

[**Fuchs' dystrophy**](http://en.wikipedia.org/wiki/Fuchs%27_dystrophy) — cloudy morning vision

[**Keratoconus**](http://en.wikipedia.org/wiki/Keratoconus) — the cornea thins and changes shape to be more like a cone than a parabole

[**Keratoconjunctivitis sicca**](http://en.wikipedia.org/wiki/Keratoconjunctivitis_sicca)— dry eyes

[**Iritis**](http://en.wikipedia.org/wiki/Iritis) — inflammation of the [iris](http://en.wikipedia.org/wiki/Iris_(anatomy))

[**Uveitis**](http://en.wikipedia.org/wiki/Uveitis) — inflammatory process involving the interior of the eye; [Sympathetic ophthalmia](http://en.wikipedia.org/wiki/Sympathetic_ophthalmia) is a subset.

Together with refractive errors, [red eye](http://en.wikipedia.org/wiki/Red_eye) (non-traumatic inflammation of the external eye) is the most frequent ophthalmic reason for visiting family medicine doctors, pediatricians or ophthalmologists. Despite this fact, surprisingly few studies have focused on how red eye is being diagnosed, treated and followed up by those groups of physicians. Also,comparatively few groups of physicians in the world deal specifically with this issue.[2]

2.2\* CORNEA\*

The **cornea** is the [transparent](http://en.wikipedia.org/wiki/Transparency_(optics)) front part of the [eye](http://en.wikipedia.org/wiki/Human_eye) that covers the [iris](http://en.wikipedia.org/wiki/Iris_(anatomy)), [pupil](http://en.wikipedia.org/wiki/Pupil), and [anterior chamber](http://en.wikipedia.org/wiki/Anterior_chamber_of_eyeball). The cornea, with the anterior chamber and [lens](http://en.wikipedia.org/wiki/Lens_(anatomy)), [refracts](http://en.wikipedia.org/wiki/Refraction) light, with the cornea accounting for approximately two-thirds of the eye's total [optical power](http://en.wikipedia.org/wiki/Optical_power).

 In humans, the refractive power of the cornea is approximately 43 [dioptres](http://en.wikipedia.org/wiki/Dioptre" \o "Dioptre). While the cornea contributes most of the eye's focusing power, its focus is fixed. The [curvature](http://en.wikipedia.org/wiki/Curvature) of the lens, on the other hand, can be adjusted to "tune" the focus depending upon the object's distance.

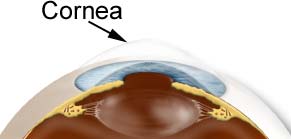
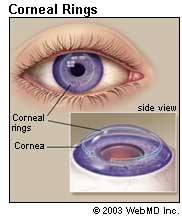


Fig2.1: Image Of Cornea

If your cornea becomes damaged through disease, infection, or injury, the resulting [scars](http://www.medicinenet.com/script/main/art.asp?articlekey=43240) can interfere with vision by blocking or distorting light as it enters the eye.

The cornea is the clear, protective outer layer of the eye. Along with the sclera (white of the eye), it serves as a barrier against dirt, germs, and other particles that can harm the eye's delicate components. The cornea is also capable of filtering out some amounts of the sun's ultraviolet light.

The cornea also plays a key role in vision. As light enters the eye, it is refracted, or bent, by the outside shape of the cornea. The curvature of this outer layer helps determine how well your eye can focus on objects close-up and far away.[4]

There are three main layers of the cornea:

**Epithelium:** The most superficial layer of the cornea, the epithelium stops outside matter from entering the eye. This layer of the cornea also absorbs oxygen and nutrients from tears.

**Stroma:** The stroma is the largest layer of the cornea and is found behind the epithelium. It is made up mostly of water and proteins that give it an elastic but solid form.

**Endothelium:** The endothelium is a single layer of cells located between the stroma and the aqueous humor - the clear fluid found in the front and rear chambers of the eye. The endothelium works as a pump, expelling excess water as it is absorbed into the stroma. Without this specialized function, the stroma could become water logged, hazy and opaque in appearance, also reducing vision.

The term "corneal disease" refers to a variety of conditions that affect mainly the cornea. These include infections, degenerations, and many other disorders of the cornea that may arise mostly as a result of heredity.

2.3\*CORNEAL TOPOGRAPHY IN AI \*

**Corneal topography**, also known as **photokeratoscopy** or **videokeratography**, is a [non-invasive](http://en.wikipedia.org/wiki/Non-invasive_(medical)) [medical imaging](http://en.wikipedia.org/wiki/Medical_imaging) technique for mapping the surface curvature of the [cornea](http://en.wikipedia.org/wiki/Cornea), the outer structure of the [eye](http://en.wikipedia.org/wiki/Human_eye). Since the cornea is normally responsible for some 70% of the eye's [refractive power](http://en.wikipedia.org/wiki/Refractive_power),its topography is of critical importance in determining the quality of [vision](http://en.wikipedia.org/wiki/Visual_perception).

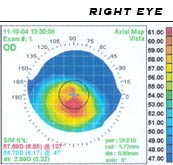


Fig2.2: Analysis Of Right Eye

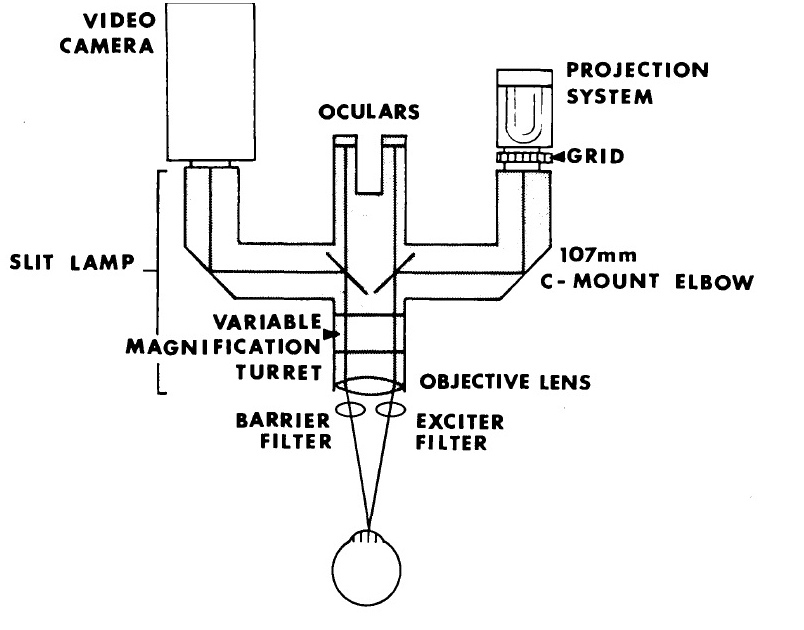


Fig2.3:Corneal Topography

The optical system consists of a Zeiss stereo photo slit lamp which has been modified to be both a camera and projection system. This modification requires that two cine elbows be mounted on the beam splitter. Attached to one of these elbows is a black and white video camera and to the other elbow a coaxial illuminator/flash normally used with the slit system but modified so that the illumination and flash project through a Ronchi ruling mounted at the focus of the optical system.

When acquiring rasterstereographic images of the cornea, the operator focuses the slit lamp in the same manner as when taking photographs. The illumination required for focusing is provided from the illuminator/flash unit through the cine elbow, beam splitter, and internal slit lamp microscope optics and is projected onto the cornea. When the system is in focus, the operator triggers the flash, which follows the same optical pathway. The flash provides sufficient light intensity to acquire an image of the grid on the corneal surface. Because the cornea is a transparent nondiffusing surface, the projected grid is not visible unless a diffusing material is used to provide a surface on which an image can be visualized.[1]

Computerized corneal topography (also known as computer assisted corneal topography, computer assisted keratography, or videokeratography) is a computer- assisted diagnostic technique in which a special instrument projects a series of light rings on the cornea, creating a color-coded map of the corneal surface as well as a cross-section profile.  This test is used for the detection of subtle corneal surface irregularities and astigmatism as an alternative to manual keratometry.[3]

**3\* GLAUCOMA\***

Glaucoma refers to a group of eye conditions that lead to damage to the optic nerve.This nerve carries visual information from the eye to the brain.

Glaucoma is the second most common cause of blindness in the United States.

Glaucoma is an eye disease in which the optic nerve is damaged in a characteristic pattern. This can permanently damage vision in the affected eye(s) and lead to blindness if left untreated. It is normally associated with increased fluid pressure in the eye ([aqueous humour](http://en.wikipedia.org/wiki/Aqueous_humour)).The term "[ocular hypertension](http://en.wikipedia.org/wiki/Ocular_hypertension)" is used for people with consistently raised [intraocular pressure](http://en.wikipedia.org/wiki/Intraocular_pressure) (IOP) without any associated optic nerve damage. Conversely, the term 'normal tension' or 'low tension' glaucoma is used for those with optic nerve damage and associated visual field loss, but normal or low IOP.[7]

The nerve damage involves loss of [retinal ganglion cells](http://en.wikipedia.org/wiki/Retinal_ganglion_cell) in a characteristic pattern. The many different subtypes of glaucoma can all be considered to be a type of [optic neuropathy](http://en.wikipedia.org/wiki/Optic_neuropathy). Raised intraocular pressure (above 21 mmHg or 2.8 kPa) is the most important and only modifiable risk factor for glaucoma. However, some may have high [eye](http://en.wikipedia.org/wiki/Human_eye) pressure for years and never develop damage, while others can develop nerve damage at a relatively low pressure. Untreated glaucoma can lead to permanent damage of the [optic nerve](http://en.wikipedia.org/wiki/Optic_nerve) and resultant [visual field](http://en.wikipedia.org/wiki/Visual_field) loss, which over time can progress to [blindness](http://en.wikipedia.org/wiki/Blindness).

Glaucoma is a condition that causes damage to your eye's optic nerve and gets worse over time. It's often associated with a buildup of pressure inside the eye. Glaucoma tends to be inherited and may not show up until later in life.

The increased pressure, called intraocular pressure, can damage the optic nerve, which transmits images to the brain. If damage to the optic nerve from high eye pressure continues, glaucoma will cause permanent loss of vision. Without treatment, glaucoma can cause total permanent blindness within a few years.[1]

Because most people with glaucoma have no early symptoms or pain from this increased pressure, it is important to see your eye doctor regularly so that glaucoma can be diagnosed and treated before long-term visual loss occurs.

Glaucoma can be roughly divided into two main categories, "open-angle" and "closed-angle" (or "angle closure") glaucoma. The angle refers to the area between the iris and cornea, through which fluid must flow to escape via the trabecular meshwork. Closed-angle glaucoma can appear suddenly and is often painful; visual loss can progress quickly, but the discomfort often leads patients to seek medical attention before permanent damage occurs. Open-angle, chronic glaucoma tends to progress at a slower rate and patients may not notice they have lost vision until the disease has progressed significantly.

Glaucoma has been called the "silent thief of sight" because the loss of vision often occurs gradually over a long period of time, and symptoms only occur when the disease is quite advanced. Once lost, vision cannot normally be recovered, so treatment is aimed at preventing further loss. Worldwide, glaucoma is the second-leading cause of blindness after [cataracts](http://en.wikipedia.org/wiki/Cataracts" \o "Cataracts).It is also the leading cause of blindness among African Americans. Glaucoma affects one in 200 people aged 50 and younger, and one in 10 over the age of eighty. If the condition is detected early enough, it is possible to arrest the development or slow the progression with medical and surgical means. Screening for glaucoma in the general population is however unsupported by the evidence.

The goal of currently available [glaucoma](http://en.wikipedia.org/wiki/Glaucoma) therapy is to preserve visual function by lowering [intraocular pressure](http://en.wikipedia.org/wiki/Intraocular_pressure) (IOP) below a level that is likely to produce further damage to the nerve. The treatment regimen that achieves this goal with the lowest risk, fewest adverse effects, and least disruption of the patient's life, taking into account the cost implications of treatment, should be the one employed.[1]

# Glaucoma Types

The most common type of [**glaucoma**](http://glaucoma.emedtv.com/glaucoma/glaucoma.html) is called [**open angle glaucoma**](http://glaucoma.emedtv.com/open-angle-glaucoma/open-angle-glaucoma.html). Also known as chronic glaucoma or primary open angle glaucoma, this condition mainly affects those over the age of 35. People usually have no symptoms at first but may gradually experience narrowed vision or blindness.[6]

Glaucoma comes in many other forms, including:

Open-Angle Glaucoma

Open-angle glaucoma, the most common form of glaucoma, accounting for at least 90% of all glaucoma cases:

* Is caused by the slow clogging of the drainage canals, resulting in increased eye pressure
* Has a wide and open angle between the iris and cornea
* Develops slowly and is a lifelong condition
* Has symptoms and damage that are not noticed.

“Open-angle” means that the angle where the iris meets the cornea is as wide and open as it should be. Open-angle glaucoma is also called primary or chronic glaucoma. It is the most common type of glaucoma, affecting about three million Americans.

### Angle-Closure Glaucoma Angle-closure glaucoma, a less common form of glaucoma:

* Is caused by blocked drainage canals, resulting in a sudden rise in intraocular pressure
* Has a closed or narrow angle between the iris and cornea
* Develops very quickly
* Has symptoms and damage that are usually very noticeable
* Demands immediate medical attention.

It is also called acute glaucoma or narrow-angle glaucoma. Unlike open-angle glaucoma, angle-closure glaucoma is a result of the angle between the iris and cornea closing.

### Normal-Tension Glaucoma (NTG)

Also called low-tension or normal-pressure glaucoma. In normal-tension glaucoma the optic nerve is damaged even though the eye pressure is not very high. We still don't know why some people’s optic nerves are damaged even though they have almost normal pressure levels.

### Congenital Glaucoma

This type of glaucoma occurs in babies when there is incorrect or incomplete development of the eye's drainage canals during the prenatal period. This is a rare condition that may be inherited. When uncomplicated, microsurgery can often correct the structural defects. Other cases are treated with medication and surgery.[2]

3.1\*DIFFERENCE BETWEEN NORMAL & GLAUCOMATOUS\*

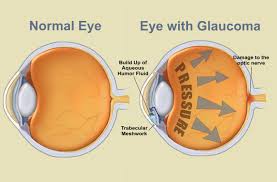
****

Fig3.1:Analysis of Noramal Eye to Glaucoma

3.2\*GLAUCOMA SYMPTOMS\*

The most common types of glaucoma — primary open-angle glaucoma and angle-closure glaucoma — have completely different symptoms.

Primary open-angle glaucoma signs and symptoms include:

* Gradual loss of peripheral vision, usually in both eyes
* Tunnel vision in the advanced stages
* Eye pain
* Nausea and vomiting (accompanying the severe eye pain)
* Sudden onset of visual disturbance, often in low light
* Blurred vision
* Halos around lights
* Reddening of the eye[5]

3.3\*TREATMENTS AVAILABLE IN AI\*

The goal of treatment is to reduce eye pressure. Treatment depends on the type of glaucoma that you have.

If you have open-angle glaucoma, you will probably be given eye drops. You may need more than one type. Most people can be treated successfully with eye drops. Most of the eye drops used today have fewer side effects than those used in the past. You may also be given pills to lower pressure in the eye.

Other treatments may involve:

* Laser therapy called an iridotomy
* Eye surgery if other treatments do not work

Acute angle-closure attack is a medical emergency. Blindness will occur in a few days if it is not treated. If you have angle-closure glaucoma, you will receive:

* Eye drops
* Medicines to lower eye pressure, given by mouth and through a vein (by IV)

Some people also need an emergency operation, called an iridotomy. This procedure uses a laser to open a new pathway in the colored part of the eye. This relieves pressure and prevents another attack.

Congenital glaucoma is almost always treated with surgery. This is done using general anesthesia. This means the patient is asleep and feels no pain.

If you have secondary glaucoma, treatment of the underlying disease may help your symptoms go away. Other treatments may be needed.

* A complete eye exam is needed to diagnose glaucoma. You may be given eye drop to widen (dilate) your pupil.
* Photographs or laser scanning images of the inside of the eye (optic nerve imaging)
* **Tonometry** –IOP(**Intraocular pressure** is the fluid [pressure](http://en.wikipedia.org/wiki/Pressure) inside the [eye](http://en.wikipedia.org/wiki/Human_eye))
* **Gonioscopy**
* **Slit lamp examination**
* **Visual acuity**
* **Visual field measurement[3]**

**4\*AI IN GLAUCOMA DETECTION****\***

In an attempt to classify the eyes as normal or glaucomatous analysis strategies involves-

Analysis of input parameter from different instruments LDF or ANN

Now classify the eyes as normal or glaucomatous based on input parameter from different instruments using ANN MLP with back propagated learning

Different tools in the diagnosis of Glaucoma by an automatic classification system were explained based on ANN.

I contribute the inclusion of Artificial Intelligence and neuronal networks in the diverse systems of clinical exploration and autoperimetry and laser polarimetry, [1]

Artificial neural networks have been trained on different optic nerve head imaging analyzer parameters to classify eyes as glaucomatous or healthy in accordance with confocal scanning laser ophthalmoscopy

In the present work an analysis of 106 eyes, inaccordance with the stage of glaucomatous illness was used to develop an ANN.

**STEP 1:-**

Multilayer Perceptron was provided with the Levenberg-Marquardt method.

**STEP 2:-**

The learning was carried out with half of the data and with the training function of gradient descent momentum Backpropagation and was checked by the diagnosis of a Glaucoma expert ophthalmologist.

A correct classification of each eye in the corresponding stage of Glaucoma has been achieved.

Specificity and sensitivity are 100%.

Optical coherence tomography (OCT) is a novel technique that allows cross-sectional imaging of the anterior and posterior eye. OCT has a resolution of approximately 10 microns, with extremely high sensitivity. OCT is analogous to computed tomography, which uses x-rays, magnetic resonance imaging, which uses spin resonance, or B-scan ultrasound, which uses sound waves, but OCT uses only light to derive its image.[6]

OCT is a noncontact, noninvasive system by which[**retinal**](http://europepmc.org/abstract/MED/10150863/?whatizit_url_Chemicals=http://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI%3A15035)substructure may be analyzed in vivo. OCT is useful in the evaluation of[**retinal**](http://europepmc.org/abstract/MED/10150863/?whatizit_url_Chemicals=http://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI%3A15035)pathologies and[**glaucoma**](http://europepmc.org/abstract/MED/10150863/?whatizit_url_Species=http://www.ncbi.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=5882&lvl=0). In[**retinal disease**](http://europepmc.org/abstract/MED/10150863/?whatizit_url=http://europepmc.org/search/?page=1&query=%22retinal%20disease%22), entities such as[**macular holes**](http://europepmc.org/abstract/MED/10150863/?whatizit_url=http://europepmc.org/search/?page=1&query=%22macular%20holes%22),[**macular edema**](http://europepmc.org/abstract/MED/10150863/?whatizit_url=http://europepmc.org/search/?page=1&query=%22macular%20edema%22),[**central serous chorioretinopathy**](http://europepmc.org/abstract/MED/10150863/?whatizit_url=http://europepmc.org/search/?page=1&query=%22central%20serous%20chorioretinopathy%22),[**retinal vascular occlusion**](http://europepmc.org/abstract/MED/10150863/?whatizit_url=http://europepmc.org/search/?page=1&query=%22retinal%20vascular%20occlusion%22)and other factors have been examined. Separation between the posterior vitreous and retina, or lack thereof, are seen and quantitated. In[**glaucoma**](http://europepmc.org/abstract/MED/10150863/?whatizit_url_Species=http://www.ncbi.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=5882&lvl=0), [**retinal**](http://europepmc.org/abstract/MED/10150863/?whatizit_url_Chemicals=http://www.ebi.ac.uk/chebi/searchId.do?chebiId=CHEBI%3A15035)nerve fiber layer (NFL) thickness is measured at standardized locations around the optic nerve head. A circular scan produces a cylindrical cross-section of the retina, from which the NFL can be analyzed. In addition, radial scans through the optic nerve head are used to evaluate cupping and juxtapapillary NFL thickness.

OCT, a new imaging technology by which the anterior and posterior segment are seen in cross-section, may permit the early diagnosis of[**glaucoma**](http://europepmc.org/abstract/MED/10150863/?whatizit_url_Species=http://www.ncbi.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=5882&lvl=0), and the early detection of glaucomatous progression.[4]

4.1\*BLOCK DIAGRAM\*

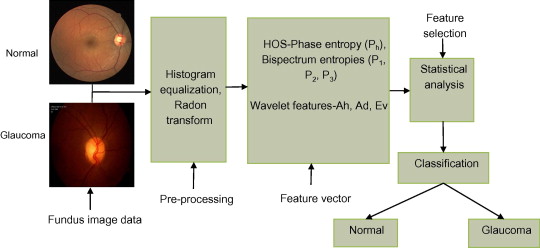
****

Fig4.1: Diagnosis of normal and glaucomatous eye

4.2\* METHODS IN AI FOR GLUACOMA DETECTION\*

ANN-

The backpropagation learning algorithm in a year that can be considered the cornerstone of the ANNs recent history. ANN models have been extensively studied and applied in recent years in the hope of reaching human performance in different fields, including, for instance, automatic speech recognition, image processing, and biomedical applications.

Actually, neuro computing is blossoming almost daily in both theoretical and practical approaches. ANNs are generally more robust and outperform other computational tools in solving problems such as: classification, clustering, modeling, forecasting, optimization and association.

There are several models of neural nets according to their relevant features: topology, type of learning algorithm, degree of learning supervision, and so on. Classical ANN models are: Hopfield networks, Carpenter-Grossberg networks (Adaptative resonance theory), Kohonen networks (self-organizing feature maps), and backpropagation multilayer perceptron networks.

ANNs are empirical models in nature, however they obtain accurate and robust solutions for more or less precisely formulated problems and for complex phenomena that are only understood through experimental data.[6]

**Multilayer Perceptron Network are:**   
(i) It is an adaptative method which permits the carrying out of non-linear statistics;   
(ii) Fitting is made by a gradient method using the training data;   
(iii)A multilayer perceptron with three layers with step transference functions can solve any problem with arbitrary decision regions;   
(iv)Noise in the patterns, the same as in the statistical fitting, does not impede their classification;   
(v)Training of the connection weights must be very great;   
(vi)Backpropagation algorithm usually finds the global minimum of the error function.

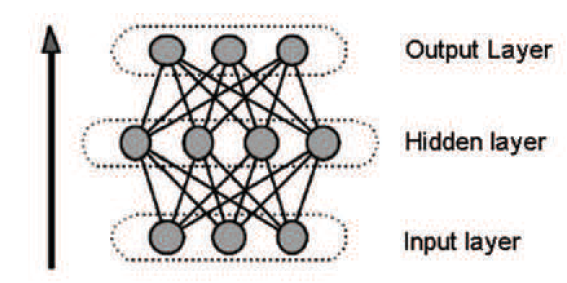
****

Fig4.2:Feedforward Neural Networks

These layers contain hidden units or nodes which obtain their input from the previous layer and output their results to the next layer, to both of which they are fully-connected. Nodes within each layer are not connected and have the same transfer function.

The strength of the multilayer perceptron originates from the use of non-linear sigmoidal functions in the nodes. If the nodes were linear elements, then monolayer networks with appropriately selected weights could repeat the calculations carried out by a multilayer network[4]

**The backpropagation algorithm**

The high performance usually achieved with this backpropagation algorithm is rather surprising if we take into account the fact that the gradient method, of which the backpropagation training algorithm is a generalization, can find a local minimum of the error function instead of the desired global minimum. Some ideas for improving performance and reducing the appearance of local minimums are, for example, the addition of new nodes in

the hidden layers, the lowering of the gain term used for the adaptation of weights and, above all, the initial training with a different set of random weights.[2]

**5\*HOW ACTUAL PROCESS WORKS\***

* **MLP with back propagated learning method based ANN for glaucoma detection was tested using EasyNN-pluse s/w simulator**
* **The modeled ANN had 114 input nodes corresponding to each parameter from the tests conducted:**
* **The ANN model had 3 hidden layers: [1]**

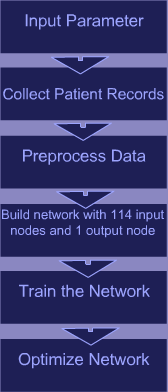
****

Fig5.1:Scanning Of ANN Model

5.1\*ANN(ARTIFICIAL NEURAL NETWORK) DEFINITION\*

An **artificial neural network**, often just called a **neural network**, is a [mathematical model](http://en.wikipedia.org/wiki/Mathematical_model) inspired by [biological neural networks](http://en.wikipedia.org/wiki/Biological_neural_network). A neural network consists of an interconnected group of [artificial neurons](http://en.wikipedia.org/wiki/Artificial_neuron), and it processes information using a [connectionist](http://en.wikipedia.org/wiki/Connectionism) approach to [computation](http://en.wikipedia.org/wiki/Computation). In most cases a neural network is an [adaptive system](http://en.wikipedia.org/wiki/Adaptive_system) that changes its structure during a learning phase. Neural networks are used to model complex relationships between inputs and outputs or to [find patterns](http://en.wikipedia.org/wiki/Pattern_recognition) in data.[3]

The word network in the term 'artificial neural network' refers to the inter–connections between the neurons in the different layers of each system. An example system has three layers. The first layer has input neurons, which send data via synapses to the second layer of neurons, and then via more synapses to the third layer of output neurons. More complex systems will have more layers of neurons with some having increased layers of input neurons and output neurons. The synapses store parameters called "weights" that manipulate the data in the calculations.

An ANN is typically defined by three types of parameters:

1. The interconnection pattern between different layers of neurons
2. The learning process for updating the weights of the interconnections
3. The activation function that converts a neuron's weighted input to its output activation.

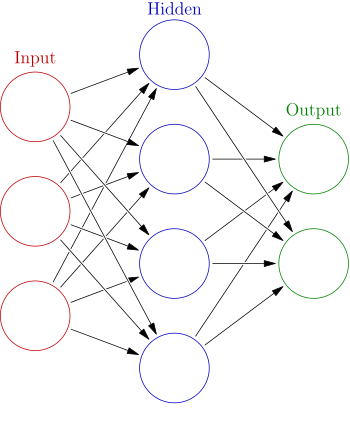
****

Fig5.2: Structure Of Layers

Artificial Neural Networks consist of a number of **units** which are mini calculation devices. They take in **real-valued** input from multiple other nodes and they produce a single real valued output. By real-valued input and output we mean real numbers which are able to take any decimal value. The architecture of ANNs is as follows: [5]

1. A set of **input units** which take in information about the example to be **propagated** through the network. By propagation, we mean that the information from the input will be passed through the network and an output produced. The set of input units forms what is known as the **input layer**.
2. A set of **hidden units** which take input from the input layer. The hidden units collectively form the **hidden layer**. For simplicity, we assume that each unit in the input layer is connected to each unit of the hidden layer, but this isn't necessarily the case. A **weighted sum** of the output from the input units forms the input to every hidden unit. Note that the number of hidden units is usually smaller than the number of input units.
3. A set of **output units** which, in learning tasks, dictate the category assigned to an example propagated through the network. The output units form the **output layer**. Again, for simplicity, we assume that each unit in the hidden layer is connected to each unit in the output layer. A weighted sum of the output from the hidden units forms the input to every output unit.

**6\*ANN AS A TOOL\***

For the diagnosis of Glaucoma, we propose a system of Artificial Intelligence that employs ANNs and integrates, jointly, the analysis of the nerve fibers of the retina from the study with scanning laser polarimetry (NFAII;GDx), perimetry and clinical data. The present work shows an analysis of 106 eyes of 53 patients, in accordance with the stage of glaucomatous illness in which each eye was found.

The groups defined include stage 0,which corresponds to normal eyes;

stage 1, for ocular hypertension;

stage 2, for early Glaucoma;

stage 3, for established Glaucoma;

stage 4, for advanced Glaucoma and

stage 5, for terminal Glaucoma.

The developed ANN is a 16–30–1 multilayer perceptron provided with the Levenberg-Marquardt

Method[2]

To classify the eyes in groups, besides studying IOP (Goldmann tonometry) and the ophthalmoscopic study of the optic disc by means of biometry using Volk aspheric lens autoperimetry has been used for the analysis

of the visual field and laser polarimetry for the measurement of the thickness of the layer of retinal nerve fibers using the NFA-II, GDX fiber analyser.A classification into different groups was performed taking into account each eye of each patient separately.

• **Stage 0 (normal eye)**: Within this group were included patients whose IOP was lower than 21 mmHg and there was no effect on papilla nor the visual field nor of the parameters of the analyzer of the RNFL.

• **Stage 1 (ocular hypertension)**: Formed by all the eyes that only presented an IOP equal to or greater than 21mmHg and both the exploration and the functional tests and the analysis of the RNFL were within normality.

• **Stage 2 (early Glaucoma)**: They were eyes that presented an altered IOP and some of the following diagnostic data: effect on the papilla, incipient alteration of the visual field, decrease in the number of retinal nerve fibers.342 The Mystery of Glaucoma

• **Stage 3 (established Glaucoma)**: Those eyes had IOP equal to or greater than 21 mmHg with involvement of the papilla, from moderate to significant alteration of the visual field as well as alteration of the RNFL analyzer parameters.

• **Stage 4 (advanced Glaucoma)**: Those eyes that presented an IOP superior to 21 mmHg and an important effect, ophthalmoscopically demonstrable, on the papilla, an important alteration of the visual field and a significant alteration of the parameters of the analyzer of RNFL.

• **Stage 5 (terminal Glaucoma)**: If as well as the alterations in the IOP (equal to or greater than 21mmHg) there was papilla excavation with atrophy, the visual field with alterations proper to the terminal stage and alteration of the parameters of the analysis of the RNFL.

Table 1 shows a basic descriptive statistic by stage of the illness for the variables of study:Chamber, IOP, Papilla and Mean. These qualitative and quantitative variables are taken from the history and from the visual field of the individual. The intervals of confidence of the mean have been considered with a coefficient of confidence of 95%.

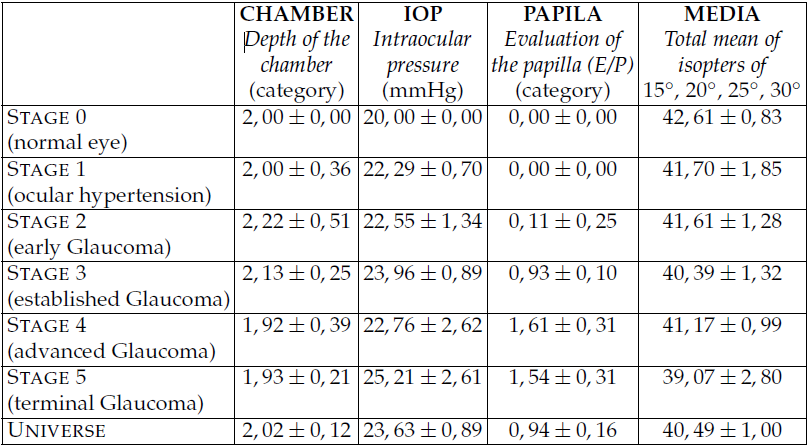


Fig6.1: Table Of Glaucome Analysis

6.1\*ANN VARIABLES\*

* **The definition of the 16 variables of input of the neuronal network consists of:**
* **AGE-** Age of the patient.
* **CHAMBER:-** Depth of the anterior chamber of the ocular globe.
* **IOP:-Intraocular pressure:-** expressed in millimetres of mercury.
* **OPTIC DISC:-** Cup-to-disc ratio. If the result was less than 0.4, 0 was assigned; if between 0.4–0.5, 1 was assigned; if between 0.5–0.6, 2 was assigned and if between 0.7–0.9, 3 was assigned.
* **FIXATION:-** Fixation losses by the patient from all those performed during the

autoperimetry testing of visual field examination.

* **NS, TS, NI, TI- superior nasal, superior temporal, inferior nasal and inferior temporal quadrant**
* **MEAN:-** Mean of all the values of the visual field.
* **NORMAL DEVIATION SUPERIOR, INFERIOR, TEMPORAL, NASAL**
* **NUMBER**
* **MEAN THICKNESS**
* **PAPILLA**

6.2\*DIAGNOSIS OF GLUACOMA WITH ANN\*

The used ANN is a multilayer perceptron with backpropagation with a hidden layer provided with the Levenberg-Marquardt method. The input layer consists of 16 neurons, the hidden layer has 30 neurons and the output layer is a single neuron. The single neuron output layer with a logistic transfer function provided the network output: glaucomatous stage of the eye.

The implementation of the ANN model has been carried out by means of the scientific computation platform Matlab, using the toolbox of Neural Networks.

Once the model had been defined, half the data were randomly employed to train the ANN. The learning was carried out with half of the data and with the training function of gradient descent w/momentum backpropagation and was checked by the diagnosis of an ophthalmologist, expert in glaucoma.[3]

The model of neuronal network has been evaluated from the other half of the data. A 100% correct classification of each eye in the corresponding stage of glaucoma has been achieved.

Therefore, the specificity and sensitivity are 100%. With regard to the variable IOP, the unaffected patients take a constant value. There is a significant difference between the group of patients without illness and those affected regarding the variable IOP (p=0,001),

The unaffected and ocular hypertense patients, which is to say, belonging to groups 0 and 1 do not present variation in the variable of relation excavation/papilla. There is a significant difference between the groups of subjects without illness and those affected with regard to the variable PAPILLA (p=0,004) Regarding the variable of mean, which represents the perimetric functional capacity and corresponds to the mean of all the values obtained from the visual field by autoperimetry there is a significant difference between the group of subjects without illness and the affected patients with respect to the mean variable (p=0,022).[5]

**7\*Limitations\***

Key findings and comments included:

* Patients worried about going blind and how effective their medication was. And they felt powerless when their intraocular pressure became high and impossible to manage.
* They also worried about their families developing glaucoma.
* The internet, reading material and radio health programs were popular sources of information on glaucoma, but they often provided contradictory information and patients questioned their credibility. Internet information was often too complex to understand and hard to read with declining vision.[3]
* Peer support was very important as it gave the patients a sense of belonging. There was a lot of confusion among patients about how to administer their eye drops. Most did it incorrectly and were upset that they had not been shown the right way to do it.
* Others felt that they did not have enough information about the pros and cons of important treatment, such as laser eye surgery.
* Most found comfort in their religion and felt it helped them to cope better. Religion played a greater role when people suffered sudden pain, such as when their intraocular pressure became very high.[6]
* Patients and their families had found practical ways to cope with daily tasks, such as improving lighting.
* Managing their condition was a way of maintaining their independence and not being a burden to their family. Loss of independence was associated with feelings of helplessness, guilt and fear of going blind. [1]

**8\*ADVATAGES AND DISADVATAGES\***

## Flexibility

* Artificial neural networks have the ability to generalize and learn. They acquire knowledge from their surroundings by adapting to internal and external parameters. The network learns from examples and adapts to situations based on its findings.[5]

**Non-Linearity**

* A computational neuron can produce a linear or a non-linear answer. A non-linear artificial network is made by the interconnection of non-linear neurons. Non-linear systems have inputs that are not proportional to the outputs. This function allows the network to efficiently acquire knowledge through learning.

## Greater Fault Tolerance

* An artificial neuron network is capable of greater fault tolerance than a traditional network. The network is able to regenerate a fault in any of its components without the loss of stored data.[5] **Adaptive Learning**
* An artificial neuron network is based around the concept of abstract learning. Three learning paradigms function to equip the network for adaptive learning. These are reinforcement learning, unsupervised learning and supervised learning. Neuron networks can be trained via specialized algorithms including non-parametric methods, expectation maximization, simulated annealing and evolutionary methods.They are constantly accepting and replacing previously learned information, keeping their repository of problem solving techniques updated.[2]
* **Disadvantages**
* The neural networks need training to operate.
* The architecture of a neural network is different from the architecture of microprocessor therefore needs to be emulated.

**9\*Conclusion\***

* We have studied,
  + Corneal details
  + Glaucoma symptoms & treatment
  + AI in glaucoma diagnosis
  + MLP & backpropagation algorithm for layers detection
  + ANN for glaucoma stages detection

**10\*REFERENCES\***

1.Automatic Glaucoma Diagnosis from Fundus Image J. Liu, F. S. Yin, D.W.K. Wong, Z. Zhang, N.M. Tan, C. Y. Cheung, M. Baskaran, T. Aung and T.Y.Wong

2. http://cdn.intechopen.com

3.<http://new-glaucoma-treatments.com/glaucoma-prevention-treatment-2/>

4.<http://en.wikipedia.org/wiki/Eye_examination>

5.http://www.aci.health.nsw.gov.au/\_\_data/assets/pdf\_file/0010/154963/eem\_education\_session2.pdf

6.A SOFT-BACK PROPAGATION ALGORITHM FOR TRAINING NEURAL NETWROKS M.I. EL ADAWY, M. E. ABOUGWAFA, H.A. KESHK and M. M. EL TAYEB Department of Electronics and Comm~tatlonsF, d t y o f Engineering, Helwsn Univedty, Hehvan, Calm, Egypt.