Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

# Using mathematical modelling, identify the repetition and progression of the human eye's colour pattern

**Fahad Ghani[1], SA Ali[2], Irfan M. Leghari[3]**

[1]Sindh Madressatul Islam University, Pakistan
[2]Sindh Madressatul Islam University, Pakistan
[3]University Malaysia Sarawak, Malaysia
*Corresponding author: E-mail. mirfanleghari@gmail.com

## Abstract

*The formation of human eyes is basically a result of genetic mutation process. The colour of eyes is determined by variation of genes which are associated with eye colour to produce transport or storage of a pigment is called melanin. In this research this aspect is confirm with the theory of Jordan algebra which has invented from an associative algebra which is relative to the arrangement, this scheme is called special Jordan algebras. To verifying the eyes colour mutation an appropriate number of datasets are collected from survey and observation, similar result found from the collected datasets which show that, the human eyes colour which is an outcome of genetic mutation of eye genes which appeared in first generation is mostly skip in second generation cycle and same process is repeat in generation to generations. The climate of Pakistan is usually varying in region to region because of temperature its dry and warm near the coastline and low-lying region and gradually cooler in the northern highland's areas. Mostly in coldest area of Pakistan the colour of eyes are lighter but in some warm areas the lighter eyes colour in eyes colour in eyes causes different types of eyes disease. Lighter eye colour is more sensitive to light because of less amount of melanin. Melanin protects eyes from sun light due to lesser amount of melanin there is chances of macular degeneration (an eye disease that can blur your central vision). The darker coloured eyes practice less visual discomfort in sun light, mean it help in protection from ultraviolet (UV) rays. Lighter coloured of eyes increased the risk of cancer because of less amount of melanin which cannot/less protect eyes from sun light which is very harmful and increase the chance of cancer. Colour vision deficiency, sometime called colour blindness is usually a genetic (hereditary) condition transfer into next generation. Colour blindness is a cause of less melanin ration, the prediction of repetition of eye colour of next generation can be helpful to stop the problem of colour blindness.*

**Keywords**. Human Eyes Colour ( HEC), Jordan Algebra and Human Eyes Colour, Eyes dieses, Heredity repetition eye colour, Global Model, Knowledge.

Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

## 1. Introduction

The human eye is a sense and the chief organ which allows us to see the "world" focused on appearance and the meaning conveyed or interpreted via expression. The organ of vision is also sometimes called a photoreceptor. The eyes are always present in pairs that provide 3D vision and are in the bony socket of the skull. Therefore, it is well protected. Some basic components are mentioned below in table 1.1. The lie lenses and clear gel that say vitreous filled in eyes are located just behind the coloured part of the eyes. Light projects through the pupil and lens to the back of the eyes. The inside lining of the eyes is covered by a special light-sensible cell that is called the retina. The brain receives impulses from the optic nerve, which, of course, converts light into electrical impulses. The retina gives central vision.

Human eye colours are generated by the quantity and variety of melanin pigmentation in the iris. Multiple genes from each parent determine a person's eye colour. The pupil of the eyes is the black circle in the center of the coloured part of the iris. The colour part of the iris has an organization and colour matchless to all people. The pupils of the eyes are a portal to admit and regulate the flow of the light beam to the retina, part of the progression that allows us to perceive images. The cornea is the obvious front surface of the eyes. It lies directly in front of the coloured part of the iris and pupil, and it allows light to enter the eyes. Viewed from the front of the eyes, the cornea appears slightly wider than it is tall. The white part of the colour of the eyes is called the sclera, which surrounds the cornea. As a result, more than 80% of the sclera of the eyeball's surface areas extends from the cornea all the way to the optic nerves, which exit the back of the eye. Only a small section of the anterior sclera is visible. The inner surfaces of the eyelids and a portion of the front surfaces of the eyes are partially covered by the clear, thin conjunctiva membrane.

There are two parts to it Conjunctiva of the belly: the anterior portions of the sclera are covered by this area of conjunctiva. The coloured part of the iris is visible behind the cornea in the upper portion of the lens. quantity of pigment contained in irises determines the eye's colour. The human eye is functionally a light-sensitive organ that likewise enables people to perceive light, colour, and depth. Vision is accessed from side to side in the human eyes. The human eye is a light-responsive organ. They allow such things as light perception, colour vision, and perception. As far as I can tell, the average human eye can see about 10 million different colors. A lot of factors in the human eye are going undercover in this atom. Discussing the human eye, the subject is not a perfect sphere. Above the whole abstractive discussion, it consists of two separate pieces. The cornea and the sclera limb are a ring that connects these two sections. The iris, which is the coloured component of the eye, is the part that is visible. The middle of the iris colour part is the pupil, the changing size of the black in the center. The cornea covers this element but is transparent. Of course, optic nerves convey the signal from the eyes to the brain.

Human eyes automatically initiate movement, even just a little, with automatic adjusting, that is, continually working to regulate the size of the pupil. However, the lens of the eye is like one in glasses or cameras and the same as the darker room behind the backside of the lance's presence appeared. This task is performed by the pupil, and the aperture stop is the coloured portion of the iris. The different parts of the eye have an effective different refractive index, and this is what bends the rays to form an image. Two-thirds of the eye's power comes from the cornea, making it the most significant component of the eye. The lens provides efficient power. Firstly, imagine contact with the lance. Lastly, it reaches the retina, which is an inverted image, but the brain will correct it and, furthermore, it will look like a convex lens. The darker eyes required more and more pigmentation of melanin. Moreover, by decreasing the amount of melanin, the iris colour will become lighter. The summarized melanin impact on human eyes is the following below table. 1.2 The human eye colour will darken as melanin levels rise, and the iris colour will lighten as melanin levels rise.

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

In the universe, most of the population has brown eyes with more pigmentation in the iris's colour, causing additional light to be absorbed and, furthermore, a lesser amount of light to be efficiently reflected. Because of this, high melanin quantity protects from the sun's radiation despite this evolutionary benefit, simply because darker human eyes can withstand the hot sun longer. Overall, the 15 genes that determine human body colour are closely related to the genes that determine eye colour. Given that brown eyes are generally human genetic, both brown and blue-eyed people have a greater genetic variation diversity. It can account for the variations in brown eyes' colours. The variation may arrive from the different genes on different chromosomes, in addition to bringing human genetically determined colour information from our ancestors. Iris should, at the minimum, have gloomy melanin. How different a person's eyes appear is directly proportional to the concentration of melanin. The amount of melanin in the irises determines how much light is absorbed. As a result, additional light is reflected out of the eyes, giving them a hazel, green, or blue appearance. The word "hazel" does not in fact describe a colour in addition to a mixture of colours. Hazel-colored eyes have a hint of green, blue, gold, and brown. Hazel eyes are found in about 5% of the population. Hazel-eyed people have the second-highest melanin, but concentrated around the iris' edge, with specks of gold, brown, or green filling the middle.

Those who have blue eyes' irises have low concentrations of brown melanin due to which additional light is allowed to reflect wavelengths in the blue colour spectrum, which in turn makes the eyes' iris show a blue colour. Blue-eyed people account for 8 to 10% of the world's population. Blue eyes are related at the same time apart from everyone having brown eyes. On the whole, blue eyes originated from a genetic mutation in a single person 10,000 years ago. You should know that about 10% of people on the planet have blue eyes. Blue eyes are found in around 8% of the world's population. Overall, blue-eyed people have a particular common ancestor, according to research. Scientists have discovered that all blue-eyed people today are the result of a human genetic mutation. However, that occurred thousands of years ago. Green eyes are extremely unusual, with just around 2% of the population having them. having too low to moderate levels of melanin.

In the world population who have a grey eye, only 3 %, which is reasonable and understandably, may be confused with a blue eye. Gray eyes are estimated to affect just around 3%. Gray-eyed people are thought to have even less melanin in their eyes than blue-eyed people, as well as a distinct storm composition in the same way that causes light to scatter another way, resulting in an enigmatic silver tint. Green eyes Iris colours are considered to be the least common eye iris colours in the world, though some consider amber to be even more unusual. a further 2% increasedespite the fact that one-third of the world's population has green eyes. Green pupils Iris is a genetic mutation that produces low levels of melanin, whereas more blue iris eyes. The green eye colour may not only be the result of pigment, therefore the lack of melanin present in the eye's iris. To sum up, light scatters out, which makes the eye become visible green. Green eyes contain the yellow pigment lipochrome. A change in light makes the lighter iris eye-looking like a changing colour iris like a chameleon. Green iris eyes are most common, evidently in Northern, western and central Europe regions as well as in Ireland and Scotland. The countable figure of population who has the right amber eye is unclear, but this is absolutely one of the rarest colours.

As a result, unlike the hazel eye, the amber eye lacks a hint of other colors. Eye colour depends on melanin. If there is more melanin, then the eyes' colour will become darker. On the other hand, minimization of the quantity will result in a lighter colour. Hence, notice its variation. The following information on eye colour and iris data of the world population is given below in table 1.3. In the European region, 8 to 10 percent of the people in world have blue eyes. Furthermore, in Asian region, 55 % to 79 % population has brown eyes. However, the other iris colour is present in approximately 2 to 5% of people worldwide. Pakistan is situated in the Asian region. Most of the people of this region have both brown and black eyes. The upper region of Pakistani people presented data being a Pakistani

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

Pashtoon. According to the research, about 40% of Pakistani Pashtoons have eye colours other than blue and green, which is common in around 40 % and Kashmir's population also has colour iris eyes. Around 25 % to 30 % of Punjabis have brown eyes. Mention information is in table 4.

Therefore $S_{n+1}= \frac{(2n)!}{(n!)^2}$

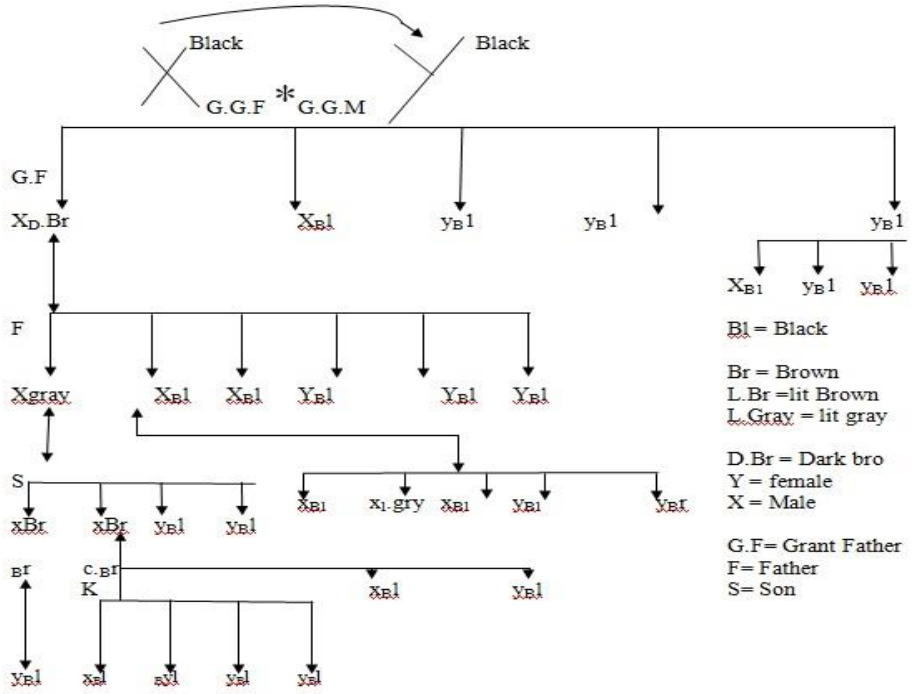
The number 0, 1, 2……..n
Whole Coefficients the (a +c) = a + c
Binomial expansion
$(a + c)^2 = a^2+2ac+c^2$
$(a + c)^3 = a^3+ 3 a^2 c + 3 a q^2 + c^3$
$(a + c)^n$ =Applying binomial Expansion

The research target is to find coloured people in Karachi, but it is more difficult to say the exact population percentage of coloured people who are in Karachi because there is an arriving population from the different regions of Pakistan. In Karachi, it is difficult to determine the eye colour of the genie population. People of colour make up 10% of the population, but black and brown eyes make up 90%. This variability is thought to be partly due to the presence of eye colour in different individuals, even within the same family. Evidently, it originates from generation to generation of offspring. Colour was a constant differentially. Mendel conducted his experiment with a variety of pea hybrids. Moreover, one or two constant differentiating characteristics. To get power as number note that $p^2 + 2 p q + q^2$ looks likes the third row contracting of the triangle created by poly math, to visualize the associations between number the numbers involving in binomial distribution and triangle may going to symmetry mirror image.

In other words, flip two coins, therefore n = 2, and "X" is head and "Y" is tails, as with equal probability of the coin landing on head or may be tails. This is called the Bernoulli trial $2^n$ => $2^n$ =4 Possibly combinations Heads $x^2$ get two tails $y^2$ and one head and one tail (xy). Apart from associated with the natural distributions of iris colour parts, specific colour regions. as significant and associated with iris colours. However, genes explain 15 percent of iris colour, part of the eyes' variation. Evidently, sequences come more strongly from genotypes associated with the eye colours. In this research collected around 500 samples from the source of the physical survey. Besides, a family-to-family survey collected thedata. Here go to attached for Mathematically, the genetic, zygotic, or copular algebras that give birth to the algebras a and c are extremely fascinating algebraic structures. Consequently, to state typically commutative but not associative) Nevertheless, many of these structures' algebraic characteristics have genetic importance. That is how the purely mathematical structure, and the accompanying genetic characteristics interact. On the contrary, the familiar mathematical study of the underlying algebraic structure. Consider gene with two P and Q after the meeting p and q, get Zygotes p q, p qq p, qq. Note p p and q q have known homozygote's while that the commutative pq = qp means commutative law. Therefore, represents the nation that mating of allele P with Q is same as the mating of q with p consider the equation Q P = ½ ( q + p ) given below:

Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*




Equation QP

Assume that if people with black eyes have dominant factors that are black, one dominant factor is brown eyes. If the people have two identical factors, the linear equation represents p p = p and q q = q. People with two separate components (p q and q p), like those who are homozygous for the feature, are heterozygous. There is just one gene, with a dichotomous form, that affects eye colour, as shown by the Punnett Squares that follow, which explain the specific percentage of each eye colour in offspring of different parents. The offspring of two black-eyed parents who are homozygous are also black-eyed. Moreover, Black eyes the ratio of the phone types and genotypes. With reference to the biological glossary (Table1.5). Eye colour has moved through generations. Variations in genetics can also produce unexpected results in eye iris color. Learn even more about the genetics of eye colour in this guide. Moreover, the eyes are blue or occasionally brown; it is obvious that hereditary characteristics passed down from parents to offspring influence eye colour. Of course, the quantity of melanin, or pigment, in an offspring's iris is influenced by the genetics of the parent. The eye appears brown when there is a lot of brown melanin present. In the same way, with a minimal level of the same brown melanin, the eye looks blue. Even though a genetic difference might make a kid's eye colour uncertain, leading to two parents with blue eyes producing a child with brown eyes.

A blue-eyed parent could never conceive a child with brown eyes since blue eyes are often the result of a single recessive gene. Even though they pertain to inheritance patterns, dominant and recessive genes, they explain the likelihood that a certain feature will be passed down from one parent to the next. Therefore, eye iris colour is found by variation in a person's genes. The genes associated with eye iris colour is involved in the production, transport, or storage of a pigment called melanin. However, the amount of melanin in the front border layer of the iris is directly related to the colour of the eye iris. Therefore, DNA Inheritance Conway to offspring-to-offspring genes commutes, like hair colour, skin colour, eye colour, genes and other genes, some of which are silently natural genetic habits. Although the average effects of random genetic drift are predictable, the outcome of individual cases is not. Individuals were inclined to consider a trait adaptive not from side to side due to recognition of its design to fulfil a function, but as the residual demographic effect of that function, which predicts the frequency

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

of progeny genotypes between the offspring of particular mating, and natural selection is one of the causes of the distortion of this predicted segregation ratio. The colour of a person's eyes is influenced by genetic variations. Most genes related to eye colour are involved in melanin production or storage. Melanin content and quality in the front layers of the iris play a significant role in determining the colour of the iris. Furthermore, the human eye finds the pupil eye colour as the amount of melanin contained in the front layer of the iris colour. Furthermore, melanin is given by specialized cells, in other words, say melanocytes, as well as stored in intracellular compartments, say melanosomes. Therefore, the quantity of melanin within melanosomes and the number of melanosomes differs. The number of melanocytes in each person is about the same.

Table 1: Eye Composition

| **Basics Parts** | **Function** |
|---|---|
| Iris | The human eyes colour area is called iris |
| Cornea | Cornea is a clear space over the colour part iris. |
| Pupil | The center and upper black circular part of human eyes organ. The present in iris. |
| Sclera | The white of eye. |
| Retina | Retina tissue is very sensitive at the back of eyes that converts light into electrical impulses and send to the image message to the brain along with optical nerve. |
| Conjunctiva | Thin layer of tissues that covers the entire front of eyes. |
| Lens | The clear part of the eyes behind the iris it facilitates to the focus light and maintains the image on retina. |
| Vitreous humor | A clear gel on inside the eye. |

Table 2: Eye Statistics

| **Sr #** | **Eye Colour** | **Percentages** | **Region** |
|---|---|---|---|
| 1 | Brown Eye | 55 % to–79% | Dark Brown:<br>(i)East Asia, (ii)Southeast Asia, as well as Africa. Lighter Brown, Overall Europe, West Asia, and Americas. |
| 2 | Blue Eye | 8 % to10 % | Europe in the same way large population being from Finland. |
| 3 | Hazel Eye | 5% | All |
| 4 | Amber Eye | 5% | All |
| 5 | Green Eye | 2% | All |
| 6 | Grey | Less than 1% | Northern and Eastern Europe population being Gray eye. |
| 7 | Red/Violet | Less than <1 % | All |
| 8 | Heterochromia | Less than <1 % | All |

Table 3: Statistic of colour Eye in Pakistan

| Sr No | Eyes Colour | Percentages | Region | Black Eyes Percentage |
|---|---|---|---|---|
| 1 | Brown, Blue, Green Eyes | 40 % approx | khyber pakhtunkhwa, Baltistanis, kashmiris | 60 % |

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

| | | | | |
|---|---|---|---|---|
| 2 | Brown, Blue, Green Eyes | 25 % | Punjab | 75 % |
| 3 | BrownEyes | 20% | Sindh | 80 % |
| 4 | Brown , Green | 15% | Blochistan | 85 % |

## 2. Literature Review

In this research, extremely discuss the research papers published between years 2009 to 2020 that entirely relates to the human eye iris colour pattern that is identified and under machine learning. Gertrude Davenport and Charles created a model intended for eye colour inheritance in 1907. It is said that brown eyes are more commanding than blue eyes. This means that having two blue-eyed parents will for all time have blue-eyed children, but not all brown-eyed offspring. Our brown eyes always had the upper hand over blue eyes. This would imply that both parents have blue eyes. Always have blue-eyed children, never brown-eyed ones. For the past 100 years, this report of eye colour heredity has been trained in classrooms all about the universe. This paper accords to Bartomiej Szlachta that every person has a unique eye that has a beneficial outcome, therefore human authentication by iris melanin structure area [2]. Researchers solved this problem by using the artificial intelligence method to speed up robust features and soft set analysis as per how human eyes recognise images. This paper has been implemented and tested on thousands of human iris images. used grayscale RGB and stripped away their meaning Therefore, future improvements have been described to allow recognition effectiveness improvement.

Researchers introduce the new clustering validity index that introduces the colour segment and uses the genetic algorithm used to find data partitioning [3]. Therefore, art image segmentation, theorems that outcome result is qualitative. In work, future work semantic will be incorporated by incorporating saliency. This paper introduces a system that recognizes biometrics by fingerprint speech and face dictation [4]. Moreover, human iris identification plays a supreme role. In the same way, pattern recognition strongly demands all available new technology. Therefore, mythology is used in this paper. The iris segmentation takes place to maximize the area of identification. Therefore, methodology was used in this paper to counter integral with something function on our cartesian x-axis and y-axis to find the maximum area of human identification in part of the body. As for the central contour, it is searched by the operator and x and is always positive. By the periodic application of the operator, the process of smoothing is progressively reduced so as to achieve a precise localization. Therefore, future improvements have been described in order to allow for recognition effectiveness improvement. This research paper discussed the Construct biometric system by the texture of Iris colour and the user's recognized frequently [5]. The method was used to make a Gaussian closed under the sinusoidal function. Furthermore, the database resulted in 1867 colour RGB eye iris images with dimensions of 600x800 pixels. The proposed eye iris identification system is one unique system. Overall, in the initial session, 241 users enrolled, resulting in a total number of images of 1205, while in other 2nd sessions, only 132 users enrolled.

In this paper we discussed the widely discussed variance seen in the colour of human irises. Two different Bayesian network models were evaluated and assessed for correctness in the calculation based on data for the six most relevant eye colour predictions for human eye colour [6]. The methodology was applied in this paper to the Model Bayesian for Eye Iris Colour. The discovery of human eye colour while classifying all of the included into one of four eye colour categories has been divided into: blue, gray/blue, green, and hazel, which have lower melanin levels than brown and black (further referred to as black) and also show the graphically represented probabilistic variables. Furthermore, the results showed that, as studied in a 638-population sample, 346 (54.2%) had blue eyes, 76 (11.9%) had green, 129 (20.2%) hazel, and 87 (13.6%) had brown eyes. The data was collected from a population sample of human eyes. For analysis and optimization, the correct solution was found. This paper states that to

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

extremely predict the human eyes' colour. The IrisPlex system assay was described as an average tool for the prediction of grey and black eyes' iris colour [7]. Therefore, it was presented for study and used the IrisPlex tool to find the human eyes' iris colour.

In this research paper, it states that every human eye is unique. As a supplement to biometric identification using pattern recognition [8]. Mathematical methods were used to verify the human eye's uniqueness and find the nth order polynomial. To extract sums are sine functions with exponential functions represented in the form of Fourier. Furthermore, the model may abstractly represent the Gaussian model. As a result, it arrived in this paper. As follows: The uniqueness of the human iris is that it has the asymmetry of any eye if divided vertically. The order of polynomial functions and different mathematical forms the practical test results showed that the mathematical expressions have different forms. According to research [9] it was stated in this paper that the human iris systematical automatic detection and image making has fast work. In this method, the input image is converted to grayscale using an algorithm. The histogram equalization, 3Log, and normalization were tested and compared in this experiment as the effect of lighting variation. Light spot deletion was applied to remove the reflection of the light on the human irises.

In this paper introduce an authentication pattern recognition mathematical model. The uniqueness of the eye is the quietest feature of the human iris system. This paper has identified the inner and outer contours of the human eye circle [10]. They used the method to solve this problem. Find the nth order polynomial. To extract sums are sine functions with exponential functions represented in the form of Fourier. Furthermore, the model may abstractly represent the Gaussian mode. The sclera is brighter than the iris, and the iris is brighter than the pupil, according to this paper's proposed novel method for quick iris segmentation [11]. This method also makes use of the iris' polar symmetry. The approach uses mathematical morphology in order to filter polar/radial-invariant images and segment circles using the shortest pathways from generalized grey level distances. The suggested algorithm performed well in the NICE-I competition and had extremely resilient behaviour, especially when coping with participants wearing spectacles, half-closed eyes, or various skin tones or lighting. Moreover, algorithm is based on a combination of the above presented morphological tools. Therefore, the mathematical formulation of the algorithm's selected parameter was approximate optimization by computer core due.

In this paper extremely describe the characteristics of melanin depending on colour factors like hair, skin, and iris colour. Therefore, it is more important in forensic genetic specific cases than in standard form (STR) [12]. However, the Iris plex system was described as a sensitive tool for appropriate identification of blue and brown colours. The system iris plex eye colour prediction tool in 102 was used on a German population as 81 samples were taken from individuals in Turkey, Africa, and Asia. Blue-colored eyes in Europeans are more familiar than iris plexus probabilities. The future work that needs more work, the irisplex, works reliably, and the prediction results are plausible. Overall, easy handling and robust landing, the IrisPlex is capable to be. The eye is a sense organ which allows us to see the world focused on appearance and the meaning conveyed or interpreted via expression. The organ of vision is also sometimes called a photoreceptor. The eyes are always in attendance to pairs that give a 3D vision [13-16] and that is present in the bony socket of the skull. Therefore, it is well protected.

Some basic components arementionedbelowthetable1.1. Eye colors are generated by the amount and type of melanin pigmentation in the iris. A person's eye colour is determined by multiple genes from each parent [17-19]. The pupil of the eyes is the black circle in the centre of the coloured part of the iris. The colour part of the iris has a structure and colours that are unique to each person [20-22]. The pupils of the eyes are a portal to admit and regulate the flow of the light beam to the retina, part of the process which allows us to perceive images [23-24]. The cornea is the obvious front surface of the eyes. It lies directly in front of the coloured part of the iris and pupil, and it allows light to enter the eyes. Viewed from the front of the eyes, the cornea appears slightly wider than it is tall [25-28]. Eye colour has moved

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

through generations. as genetic variations can sometimes produce unexpected results in eye iris colour Learn even more about the genetics of eye colour in this guide [29-30]. Moreover, the eyes are blue or may be brown; the eye colour is evidently determined by genetic traits handed down to children from parents. Of course, a parent's genetic makeup determines the amount of pigment, or melanin, in the iris of his or her kid's eyes [31]. With a high level of brown melanin, the eye looks brown. In the same way, with a minimal level of the same brown melanin, the eye looks blue. Even though a genetic variation can cause a child's eye colour to be unpredictable, resulting in two blue-eyed parents having a brown-eyed child [32-34]. Overall, blue eyes have been caused by a single recessive gene, and a blue-eyed parent could never produce a brown-eyed child. Even though dominant and recessive genes refer to inheritance patterns, Moreover, they describe how likely it is for a certain trait to pass from parent to offspring [35–37]. Therefore, eye iris colour is found by variations in a person's genes. The genes associated with eye iris colour are involved in the production, transport, or storage of a pigment called melanin. Howe's eye iris colour is directly related to the quantity of melanin in the front border layers of the iris [38-40]. Therefore, DNA Inheritance Conway to offspring-to-offspring genes commutes like hair colour, skin colour, eye colour, genes and other genes, some of which are silently natural genetic habits.

The human iris systematical automatic detection and image creation works quickly. In this method, the input image is converted to grayscale using an algorithm. The histogram equalization, 3Log, and normalization were tested and compared in this experiment as the effect of lighting variation. Light spot deletion was applied to remove the reflection of the light on the human irises. Every human eye is unique as a tool for biometric identification using pattern recognition [41]. Mathematical methods were used to verify the human eye's uniqueness and find the nth order polynomial. To extract sums, sine functions with exponential functions are represented in the form of Fourier series. Furthermore, the model may abstractly represent the Gaussian model. As a result, it arrived in this paper. The uniqueness of the human iris is that it has the asymmetry of any eye if divided vertically. The order of polynomial functions and different mathematical forms the practical test results showed that; the mathematical expressions have different forms. To extremely predict the human eyes' colour. The IrisPlex system assay was described as an average tool for the prediction of grey and black eyes' iris colour [42]. Therefore, it was presented for study and used the IrisPlex tool to find the human eye's iriscolour.

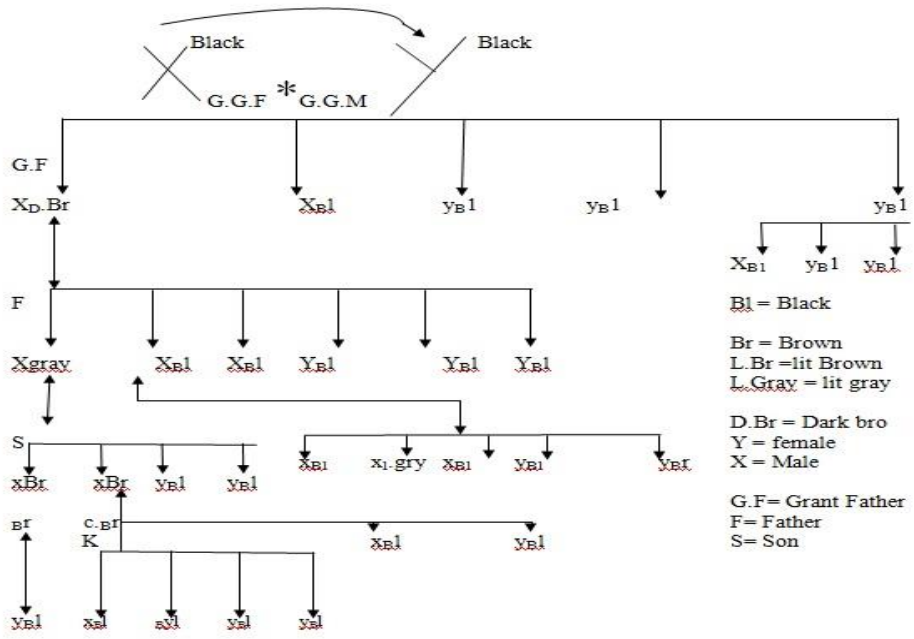
## 3. Research Proposal and Methodology

The proposed research work on hierarchical algebraic model called Jorden Algebra. The data is organized into a tree-like structure. A tree structure may establish parents' children's one-to-many relationships like a cycle wise cycle. Great grandparents are the initial roots of the tree structure. Basically, this research will be very helpful to find very easily how inheritance genes may move to human eyes colour to their offspring like a sequence. The same as the iris colour of the eyes, the sequence pattern will repeat. On the whole, parents can have many children exhibiting one too many relationships and tracing the eye disease. Let if there is a need to stop this sequence according to Algebra X. Y, those who carry and receive gene X, Y cycle appearing disease will show it easily by Jordan Algebra. In fact, they carry X or Y, whereas a root may have the number of dependent offspring. Each of these dependents may have any number of lower-level dependents, and so on, with no restriction on levels. Further, the great-grandparent record is known as the root of the tree; the grandparents and children are the nodes or dependents of the root. The delineation chart below describes the flow of cycle repetitions.

Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

The research targets outcomes will identify the heredity and repetition of human Iris colour. It's a behind Genetics of human eyes colour and mathematical approach with X and Y are the two variables with non-associatively and commutative by Jordan Algebra will using in the first time. The selected research area is Pakistan. The cycle is running like a switch on or off. For example, in first generation iris colour have appearing and second-generation colour sequence is switch off and again it will appear to third generation. The human superior marvelous in this world as comparison to the other all. There is no harm to say now too fastest artificial intelligence are work on human and human. The formation of human eyes is basically a result of genetic mutation process. The colour of eyes is determined be variation of genes which are associated with eye colour to produce transport or storage of a pigment is called melanin. In this research this aspect is confirm with the theory of Jordan algebra which has invented from an associative algebra which is relative to the arrangement like ab = a *b + b*a




Ray Diagram of Delineation 3.1
*Where 'a' and 'b' are associated with 'X', this scheme is called special Jordan algebras.*

To verifying the eyes colour mutation an appropriate number of datasets are collected from survey and observation, similar result found from the collected datasets which show that, the human eyes colour which is an outcome of genetic mutation of eye genes which appeared in first generation is mostly skip in second generation cycle and same process is repeat in generation to generations. X is male and Y is female are tow variable. To find iris colour repetition by using Jordan Algebra. Delineation cycle will help to quickly determine by Jordan algebra and previous researcher's lot of research are available in biological aspect in the heredity although the unable mathematical aspect. The Jordan algebra is like a container is more soften method the finding delineation repatriation of human. Basically, this research will be very helpful to find very easily inheritance gene may move to human offspring like a sequence will run an automatically. Same as the iris colour of eyes sequence pattern will repeat it's behind the Genetics of human eyes colour and mathematical approach with X and Y are the two variables by using Jordan Algebra.

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

In this research identification of human eyes iris parents' colour to offspring even generation to generation.

*Pigment melanin > Eyes colour is Darker*
*Pigment melanin < Eyes colour is Lighter*
*Pigment melanin <<<< Eyes colour is*
*(light→ lighter→ lightest)*

In this research result will have been finding that the human eyes colour repeat generation to generation as hair and skin colour may transfer in generation to offspring. It usually works in the field of modern science for identification. If the colour come darker and darker that means have more melanin if light colour of eyes that have low melanin. Therefore, delineation disease cycle will help to quickly determine by Jordan algebra and previous researcher's lot of research are available in the heredity and they have used the different methods. In this case, family eye colour data was collected from my great great father as an initiate sequence, and the square box is male, and the circle is female**.** A hierarchical model is drawn as generation and gender wise. This case-initiated form x and y, both of which are black eyes. Therefore, in the 1$^{st}$ generation, dark brown eyes have arrived. However, dark brown relates to black eye colour, then grey has arrived, and x-gray eye compared with y black.

However, brown arrived, this has been proven to be the cycle repeating. As proved, the above model is discussed. In this case family eyes colour data was collected from Great father as initiate sequence and square box is male and circle is female**.** If X blue eyes European native crossing with European native Y so may be possible to have offspring having blue eyes. If European region blue eyes X with crossing Y black African more possibility is that offspring eyes not the blue but may be other color like dim brown, dim gray chances but not blue. The colour part irises that variation is considered in different families and often in different individuals of the same family. Some of this variability is due partly to the presence of eye colour. The originates varies from generation to generation of offspring. However, colours were constantly differentiated. Character Mendel performed his experiment using hybrids of peas that varied one or two constant differentiating characteristics.

It could be possible to extend an expression with the generic form (p + q) n. Since n = 2 therefore, when will n start to increase? To manually multiply (p + q) ten times, for example, would be tiresome. There are two ways to enlarge a statement of this type without doing all the necessary multiplications. The first technique we'll examine is known as Pascal's triangle. Below are the first five rows of Pascal's triangle. To get the power of number note that $x^2$ +2xy +$y^2$ looks likes the 3rd row of the triangle generating by polynomial math such as to imagine the relationships between number the numbers involved part to part in binomial distribution and triangle may going to symmetry mirror image. Punnett square image show the graphical image of the outcomes of possible iteration of offspring genotype arising a cross event. The genetic composition of punnett square in demanding the knowledge of genetic move in parent. The variety of possible combination of their gamete is encapsulated in a tabular format.

A Punnett square is a graphical image of the possible outcome generation cycle genotype arising from an exacting cross event. Compos Punnett square requires information about the genetic composition of the parents. The variety of possible combinations of their gametes is encapsulated in a tabular format. So, every box in the table represents one fertilization event. The inherent assumption is that each trait is determined by a single gene locus and that various traits assort independently from one another. Though this is true for many useful traits, especially Therefore, associated with the natural distributions of iris colours, specific colour regions are significantly associated with iris colours. These genes account for 15% of the variation in iris colour in eyes, and the genotype cycle sequence was more strongly associated with iris colour.

Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

Assume that if people with black eye dominate factor are black one dominate factor are brown eyes that no dominate are black eyes, if the people two identical factors. The homozygous character and people with two different factors (x y or y x) that the commutative x y = y x means commutative law holds. The nation that mating of allele X with Y is same as mating of y with x consider the equation.

Define by a • b = $\frac{1}{2}$ (a b + b a). A real vector space with bilinear product a • b they are following properties satisfying.

(i) Commutative law
(ii) Jordan Identity

The algebra that arises genetic (via genetic, zygotic, or copular algebras). They are typically commutative but non-associative, as with extremely intriguing structures. However, they aren't always liars or lie algebras. Additionally, a lot of these structures' algebraic features have genetic importance because of how they interact with one another. Perhaps it is simply mathematical structure and the associated hereditary characteristics. Examination of the underlying algebraic structure using more sophisticated mathematics. A nonempty set together with two binary operation "+ "". ", that is Satisfies all the except an associatively property with respect to multiplication, there it is known as a No associative ring (Alg) with under usually multiplication of an associate ring (Alg) clearly, it is a non-associative ring (Alg) By detaining a new binary is define operation x . y = ½ (x y + y x) an associative algebra over a field is not equal to 2 which binomial theorem apply, in this thesis obtain another non associative algebra knows as forded algebra. Moreover, there are some other classes of no associative algebras closely related to inheriting. Beside the properties of inheritance by making the Mathematical modeling using non associative and Commutative properties hold. Basically, nations of non-associative Algebra A grow point S is called a left almost semi group if it Satisfies the following left inventive.

law (x y) z = (y z) x ∀ ∈ S

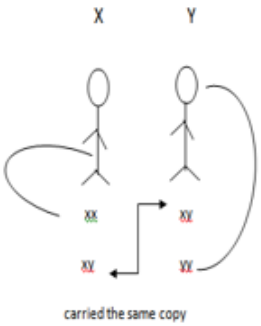
The initiate analyzing the algebraic properties of matrices hermitian or operators was to decide what the basic observable operations were. There are many possible ways to combining matrices hermitian to get another hermitian matrix, but after some empirically experimentation Jordan decided that they

could all be expressed in terms of quasi-multiplication x • y := $\frac{1}{2}$ ( x y + y x) consists of a real vector space equipped with a bilinear product x • y they satisfying the commutative law and the Jordan identity: x • y = y • x, (x2 • y) • x = x2 • (y • x). A Jordan algebra is formally real if $x_1^2 + \cdots + x_n^2 = 0 \Rightarrow x_1 = \cdots = x_n = 0$. Any associative algebra A over R gives rise to a Jordan algebra A+ under multiplication the product x • y = $\frac{1}{2}$ (x y + y x ) is clear commutative

Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

| | X | Y |
|---|---|---|
| X | X. X<br>=> x (copy) | ½ (x + y) |
| Y | ½ (y + x) | Y. Y = y (copy) |




X . X = x copy
X . Y = ½ (x + y)
Commutative

Y . X = ½ (y + x)

X . Y = Y . X

Y . Y = y copy

Table 5: Product table

| | X.X B1 | X. Y L Br | Y. Y |
|---|---|---|---|
| X. X | XB1. XB1 copy | x½ (x bl + y)<br>½ (x bl + x. y) | Xbl. Ybl copy |
| X.Y | ½ (x B + x + y)<br>l-Br | ¼x. x + ½xy + ¼ y. y | ½ (x + y) y<br>½ (x. y+ y. y)<br>L Br, Blang he not (l gr |
| Y. Y | YB . XB | [½ y x] +y. y<br>L. Bro | Ybl. Ybl<br>Black |

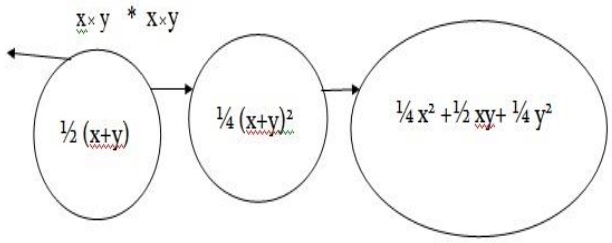
Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

Consider gene with two X and y after the meeting X and y we get Zygotes x x, xyyx, yy: Note x x and yy are Knows homozygote's while that the commutative xy = yx means commutative law holds. The nation that mating of allele X with Y is same as mating of y with x consider the equation X Y = ½ ( x + y ). The linear equation represents xx = x and yy = y Assume that if people with dominant black eyes are black, one dominant factor is brown eyes and the other is black eyes. People with the homozygous character and people with two different factors (xy or yx) are heterozygous. The following Pannell Squares explain the particular proportion of each eye color. In children of various parents, only one gene, with a dichotomous form, is involved in eye color, when two homozygous black-eyed parents. The children will be homozygous and black-eyed. The ratio of the phone types and genotypes will be 4 : 0 and 4 : 0 : 0

Consider gametes $x_1, x_2 \ldots\ldots\ldots\ldots X_i$
$y_1, y_2 \ldots\ldots\ldots\ldots Y_i$

n-dimensional real vector space Multiplication x and y then it could be written in the form of linear combination. $X_iY_i = x_1y_1 + x_2y_2 \ldots\ldots\ldots\ldots\ldots\ldots + x_ny_n$
Let $p_1, p_2, \ldots, p_n$ and $q_1, q_2, \ldots, q_n$ be any two arbitrary sets of complex numbers, and let the real number p be such that p > 1; there are most famous classical inequality are those of *Complex* Minkowski inequality hold. Furthermore, the geometrically obvious necessary and sufficient condition for equality to hold leads directly to the necessary in the case of Young's inequality. In this instance, sufficient conditions for equality in the other cases of Minkowski inequalities are demonstrated for real exponents. Of course, the usual extra limiting process is needed to proceed from rational to real exponents. Moreover, there is an appealing novelty in deducing inequality for sequences from one containing integrals. where sequences are studied first and integral properties are deduced Generally, generalize the sum.




Therefore minkoski inequality hold $\sqrt{\sum_{n=1}^{\infty}(Xi+Yi)^2} \leq \sqrt{\sum_{n=1}^{\infty}Xi^2} + \sqrt{\sum_{n=1}^{\infty}Yi^2}$ it show the sum of pigmentation of X and Y is less then or may be equal of the X and Y Pigmentation. In a short the first-generation melanin has been transferring into their offspring sub generation is less than or equal to the sum of the sub-X and Sum of the sub–Y. Partially ($\partial$) solve with respect to x and y for finding the ratio between X and Y as it is the pricewise continues function as know that. Most familiar piecewise continues theorem. Would be apply, therefore.

$$\int_0^1 f(x,y)\partial x\,\partial y = \int_0^{\frac{1}{2}} f(x)dx + \int_{\frac{1}{2}}^1 f(y)dy$$

Above mention table as arrived polynomial expression with x and y are two respective variables for partially integration with pricewise continues real function.

$\int_0^{\frac{1}{2}} \int_{\frac{1}{2}}^1 \frac{1}{4}x^2 + \frac{1}{2}xy + \frac{1}{4}y^2 = \frac{1}{8}$ $\forall\, x, y \in$ R, if limit change values vary.

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

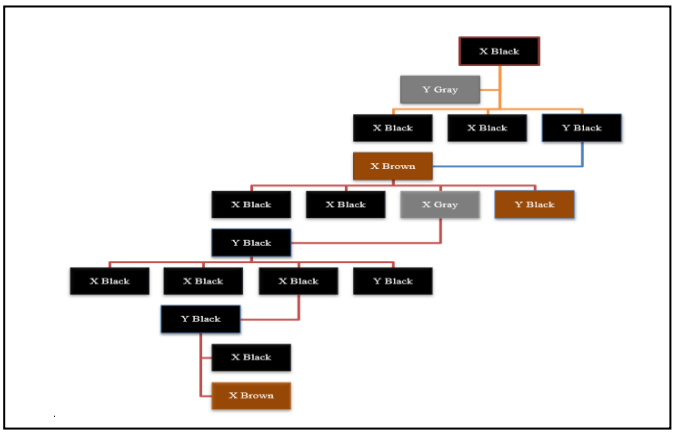



Fig. 1. Case 1.

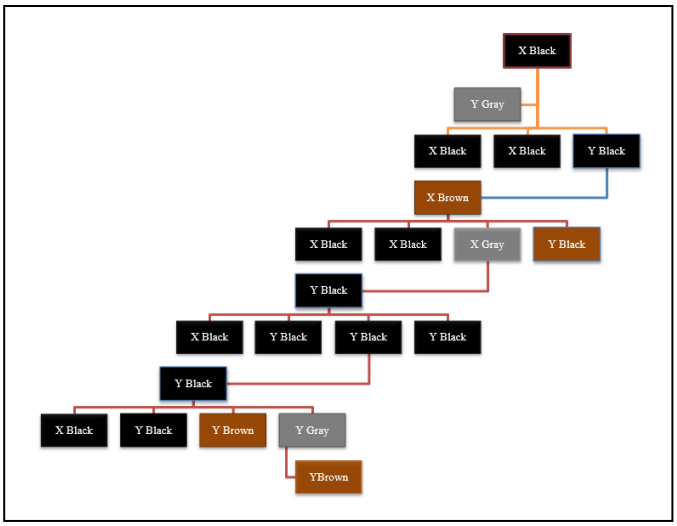



Fig. 2. Case 2.

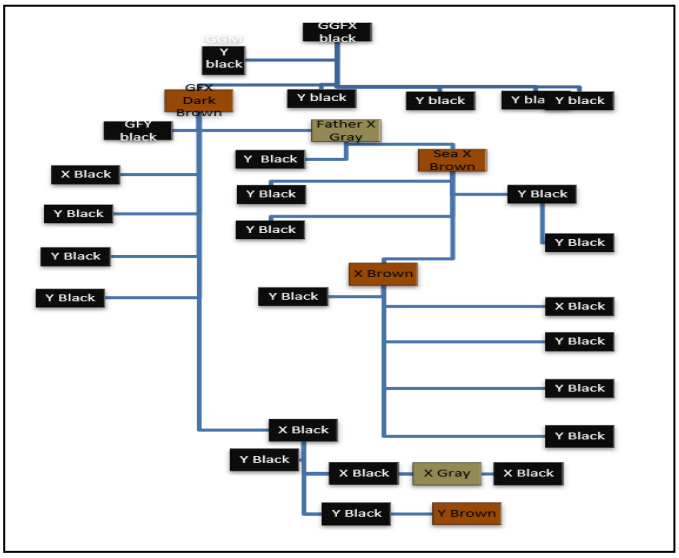



Fig. 3. Case 3.

Technium
Education and Humanities

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

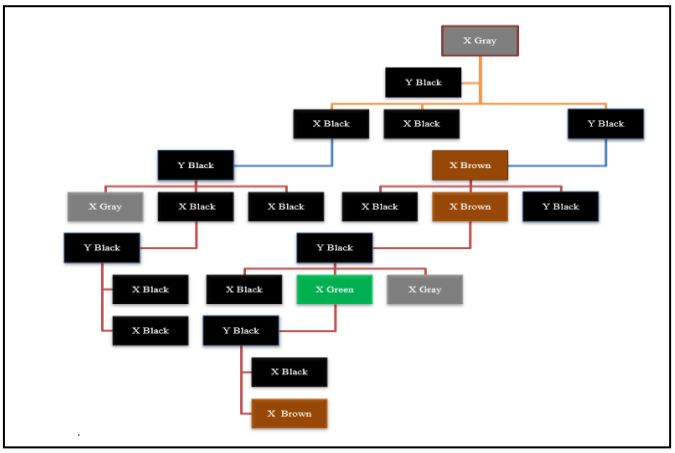



Fig. 4. Case 4.

## 4. Results

After the hard expanding effort to write this chapter, this chapter discusses the result. The whole research data has been collected by a physical survey of more than five hundred other words, which means qualitative research methods helped in this research. This thesis is going to explore the inheritance behind the mathematics of eye colour and reputation, as well as hair, skin, and other factors of the organs of the human body. Between 2009 and 2020, papers were published on human iris colour as year-wise discussed in the above paper. In this research identification of human eyes, parent genes move to offspring, even generation to generation. Furthermore, human iris colours depend on the presence of melanin pigment within the human iris for the complex colour patterns that are responsible for the visual impression of the human eye. The summarizing segregation of blue-brown eye colour has been described using a simple Mendelian dominant-recessive. However, a new molecular genetics perspective is needed to fully understand the biological complexities of this process. Therefore, the human eye colour can be explained by one interval on chromosome 15 that contains the OCA2 and HERC2 genes that play a significant role in the formation of eye colour. The genetic basis underlying the determination and inheritance of these traits has been the subject of debate and research from the very beginning of mixed-data trait studies in humans. The cycle is running like a switch on or off. In the first generation, the iris colour appears, and in the second generation, the colour sequence is switched off, and again it will appear in the third generation. In most cases, the iris cycle repeats probably to stop. If the first-generation iris colour is appearing, then in most cases, in the second generation, chances are eye colour has stopped.

The mean objective of this research has shown that X is male, and Y is female are two variables. To find iris colour repetition by using Jordan Algebra Although the mathematical aspect is insufficient, the delineation cycle has been useful in quickly determining by Jordan algebra and previous researchers' extensive research in the biological aspects of heredity. The Jordan algebra is like a container and is the softer method for finding the delineation and repatriation of humans. Basically, this research is very helpful to find out how easily inheritance genes may move to human offspring like a sequence will run automatically. The same as the iris colour of the eyes, the sequence pattern will repeat. Therefore, have used the Jordan Algebra along with the mixed data and physical survey to collect the data in connection with its sampling. The first-time using Jordan Algebra in the whole observation of human eyes colour with non-associated and commutative operations. Those who have brown eyes with brown eyes have brown offspring, but in some cases, if the people have brown eyes with brown eyes, the offspring have green, or lite green color, blue color, or black. It means that X and Y depend on

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

dominative and recessive. If in those cases, x is a dominant brown colour and Y is a blue colour, then the offspring's eye colour is not brown nor blue is green. This means that X and Y both have the green colour pigmentation evidently papering into offspring. The whole research has been proved with the help of algebra relations, say Jordan algebra, which is new in this research.

However, the melanin cycle runs like a switch on or off. Our all-in observation surveyed mixed datasets identifying the heredity and repetition of human Iris colour patterns. It's a behind-the-scenes genetics of human eyes colour mathematical approach non-associatively and commutatively by Jordan Algebra. As briefly discussed above, eye colour is genetically determined by melanin. In the same way, if the melanin increases the eye's colour becomes darker. If the melanin decreases, the eye's colour will come lighter. Even though the minimum pigmentation is harmful because of that, the chances of eye cancer chances will increase. All the coloured eyes have blue, green, and grey and have a low melanin quantity present. In comparison, brown and black eyes have a huge quantity amount of melanin. Even though red and golden eyes colour have a very low quantity of melanin. Everybody has that the European and American regions have all have coloured eyes, as well as in Pakistan's northern regions have coloured eyes, and Baluchistan's upper cool region has a coloured eye. Because the above paragraph discussed that low melanin quantity has responded to eye cancer, However, the upper regions of Europe, the United States, and Pakistan have coloured eyes, indicating that a lack of melanin has no negative consequences. Because of its genetic outcome, famous green, blue, and grey colors. However, the weather temperature over there is cold, which has dual benefits. In comparison to other hot weather Sindh, Baluchistan, and Punjab are the provinces of Pakistan that have the hottest weather on average in most areas. Furthermore, the UAE Arabian is also a hot region where the presence of people's eyes is brown and black. As briefly discussed above, black and brown are two colours that have maximum melanin quantities in the eyes. As far as is known, the low melanin presence in the eyes is an effect of cancer. If brown eyes are present in the hot regions of the world, it means that they have lower melanin levels in their eyes, which means that cancer chances will increase.

In this research work, conduct causal inference in terms of colour expansion transfer on the number of families in a generation in all environments of the country. Causal inference differs from our previous mixed research methods in that it is based on the concept of potential outcomes. This requires different eye colours to be genetically transferred, but there are no effects on our vision in the same individual at the same time. However, those who have very little melanin pigmentation may find it difficult to see or observe in real life, but that type of only one or two % especially and may be associated with increased cancer chances for observational research on the effects of health. To solve this problem, there are many strategies that can be used, such as Jordan Algebra, partially Piecewise continues integration. Foriris colour expansion, many states implemented this from 2009 to 2020, the colour of eyes, and successive states have successively implemented it.

The purpose of eyes' iris colour expansion is to make more people able to receive identification from family to family and more a varies about eyes. In this research, we want to make sure that after a significant transfer of melanin in their number offspring Previously, the number of researchers worked on eye colour different and different methods provided pertain mater briefly discussed in Chapter No 2. As a result, the study focused on the effect of eye colour purpose system expansion on the number of families and generations in all-weather counties. The first chapter is a review of causal inference methods and related background in the expansion of eye colour and its components. In chapter 2, as mainly discussed the purpose of the system advantages. As a result, in Chapter 3, we briefly describe the research paper on related eye color, which used various methods to determine eye color. Brief references are available in chapter no 3, and in this research used the mixed dataset to analyse the number of people in Karachi, Pakistan, and included some state-level variables as relevant factors for analysis. The model is initiated with binomial by applying Jordan algebra, where colour pigmentation distribution can better fit the number of mixed data.

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

As in chapter no 4 methodology I briefly trying to batter explained, as the combination of X Y with multiplication expression of the form (a + b) n . The combination x and y are n = 2, such as iteration n going to be large n itself. However, the manually multiply (x + y) by itself 10 times, say. The initial method will look at is called Pascal's triangle. The first 5 rows of Pascal's triangle. if the (x + y) or the power is 2 , would be expand x^2+2xy+y^2 timely increase the n is 3 , expiration will be arrive ( x + y ) (x^2-xy+y^2) since the gradually it increasing family wise family then n seem to be large.

Alternatively, the n is binomial multiplication. It is performed multiple times and is performing call a binomial expansion. It feels like chain expansion. To show that they usually do TONS of distributing colour in chain vise. However, open the next door, which is an extremely cool shortcut. Look at the binomial expansions and find some patterns to help you predict what the next expansions will be. Illustration A Punnett square is a graphical structure of the possible expected outcome of offspring genotype arising from a specific cross event. On the whole Punnett Square composition necessitates extensive knowledge of the field of genetic composition from parent to offspring, as well as donor and recipient. Surely, the variety of possible combinations of their gametes is encapsulated in a tabular format. Each fertilization movement event is represented by a box in the table. The offspring-to-offspring transformation gene assumption is that each trait is determined by a single gene locus and that various traits assort independently from one another. Though this is true for many useful traits, especially. But in 2020, the Colour Iris Recognition System Employing Multiple Classifier Techniques.

## 5. Conclusion

The randomization of eye colour and iris texture has allowed them to construct biometric systems with near-perfect accuracy. As a result, the confined context in which the user is enrolled and recognized is a frequent shortcoming of the majority of existing ocular colour iris identification systems. The ability to work on colour images while preserving accuracy is a desirable feature of a colour iris recognition system. The present work proposes an eye iris recognition method which is intended to cope with noisy colour iris images. A variety of colour channels second, bringing in a Multiple Classifier System architecture to enhance the recognition accuracy of the biometric system, was used in the methodology A bank of circular symmetric filters is utilized to extract a real-valued feature vector of length 384. The best results reported in the literature on near-infrared images were comparable to the experimental results reported employing these attributes. Furthermore, circular symmetric filters, which are made up of a Gaussian envelope and a sinusoidal function, are like 2D Gabor filters. Furthermore, in this research, for the first time, Jordan Algebra with commutative and expansion as human iris colour repetition genetically initiates mathematical prove.

## References

[1]. Dorgaleleh, S., Naghipoor, K., Barahouie, A., Dastaviz, F., & Oladnabi, M. (2020). Molecular and biochemical mechanisms of human iris color: a comprehensive review. Journal of Cellular Physiology, 235(12), 8972-8982.
[2]. Szlachta, B., & Rusin, K. Artificial intelligence in iris recognition.
[3]. Khan, A., Jaffar, M. A., Ullah, J., Din, A., Ali, A., & Ullah, N. (2019). Color image segmentation using genetic algorithm with aggregation-based clustering validity index (CVI). Signal, Image and Video Processing, 13(5), 833-841.
[4]. Vatsal, S., & Dwivedi, M. S. S. Advanced IRIS Recognition System: A Review. International Journal of Modern Communication Technologies and Research, 6(5), 265090.
[5]. Radu, P., Sirlantzis, K., Howells, G., Hoque, S., & Deravi, F. (2013). A colour iris recognition system employing multiple classifier techniques. ELCVIA: electronic letters on computer vision and image analysis, 12(2), 54-65.
[6]. Pośpiech, E., Draus-Barini, J., Kupiec, T., Wojas-Pelc, A., & Branicki, W. (2012). Prediction of eye color from genetic data using Bayesian approach. Journal of Forensic Sciences, 57(4), 880-886.

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

[7]. Hashish, H. A., El-Azab, M. S., Fahmy, M. E., & Mohamed, M. A. (2010). A Mathematical Model for Verification of Iris Uniqueness. International Journal on Computer Science and Network Security, 10, 146-152.
[8]. Purps, J., Geppert, M., Nagy, M., & Roewer, L. (2011). Evaluation of the IrisPlex eye colour prediction tool in a German population sample. Forensic Science International: Genetics Supplement Series, 3(1), e202-e203
[9]. Perez, C., Lazcano, V., Estévez, P., & Held, C. (2009). Real-time template based face and iris detection on rotated faces. International Journal of Optomechatronics, 3(1), 54-67.
[10]. Hashish, H. A., El-Azab, M. S., Fahmy, M. E., & Mohamed, M. A. (2010). A Mathematical Model for Verification of Iris Uniqueness. International Journal on Computer Science and Network Security, 10, 146-152.
[11]. Luengo-Oroz, M. A., Faure, E., & Angulo, J. (2010). Robust iris segmentation on uncalibrated noisy images using mathematical morphology. Image and Vision Computing, 28(2), 278-284. [12] Purps, J., Geppert, M., Nagy, M., & Roewer, L. (2011). Evaluation of the IrisPlex eye colour prediction tool in a German population sample. Forensic Science International: Genetics Supplement Series, 3(1), e202-e203
[12]. Nawaz, I. M., Rezzola, S., Cancarini, A., Russo, A., Costagliola, C., Semeraro, F., &Presta, M. (2019). Human vitreous in proliferative diabetic retinopathy: characterization and translational implications. Progress in retinal and eye research, 72, 100756.
[13]. Colombatto, C., Van Buren, B., & Scholl, B. J. (2019). Intentionally distracting: Working memory is disrupted by the perception of other agents attending to you—even without eye-gaze cues. Psychonomic bulletin & review, 26(3), 951-957.
[14]. Bajcsy, R., Aloimonos, Y., &Tsotsos, J. K. (2018). Revisiting active perception. Autonomous Robots, 42(2), 177-196.
[15]. Binda, P., &Morrone, M. C. (2018). Vision during saccadic eye movements. Annual review of vision science, 4(1), 193-213.
[16]. Sturm, R. A., &Frudakis, T. N. (2004). Eye colour: portals into pigmentation genes and ancestry. TRENDS in Genetics, 20(8), 327-332.
[17]. Salvoro, C., Faccinetto, C., Zucchelli, L., Porto, M., Marino, A., Occhi, G., ... &Vazza, G. (2019). Performance of four models for eye color prediction in an Italian population sample. Forensic Science International: Genetics, 40, 192-200.
[18]. Chaitanya, L., Breslin, K., Zuñiga, S., Wirken, L., Pośpiech, E., Kukla-Bartoszek, M., ... & Walsh, S. (2018). The HIrisPlex-S system for eye, hair and skin colour prediction from DNA: Introduction and forensic developmental validation. Forensic Science International: Genetics, 35, 123-135.
[19]. Catani, C., Mussi, L., &Scipioni, M. (2019). 2303-19 INGLÉS TÉCNICO INICIAL.
[20]. Drahanský, M., & Yang, J. (2018). Recognition of Eye Characteristics. In Machine Learning and Biometrics (pp. 7-35). IntechOpen.
[21]. Hájek, J., &Drahanský, M. (2019). Recognition-based on eye biometrics: Iris and retina. In Biometric-Based Physical and Cybersecurity Systems (pp. 37-102). Springer, Cham.
[22]. Koulieris, G. A., Akşit, K., Stengel, M., Mantiuk, R. K., Mania, K., & Richardt, C. (2019, May). Near-eye display and tracking technologies for virtual and augmented reality. In Computer Graphics Forum (Vol. 38, No. 2, pp. 493-519).
[23]. Westheimer, G. (2020). Focused and defocused retinal images with Bessel and axicon pupil functions. JOSA A, 37(1), 108-114.
[24]. Forrester, J. V., Dick, A. D., McMenamin, P. G., Roberts, F., & Pearlman, E. (2020). The eye e-book: basic sciences in practice. Elsevier Health Sciences.
[25]. Hutton, S. B. (2019). Eye tracking methodology. In Eye Movement Research (pp. 277-308). Springer, Cham.
[26]. Vaitonytė, J., Blomsma, P. A., Alimardani, M., &Louwerse, M. M. (2021). Realism of the face lies in skin and eyes: Evidence from virtual and human agents. Computers in Human Behavior Reports, 3, 100065
[27]. Land, M. F. (2018). Eyes to see: the astonishing variety of vision in nature. Oxford University Press, USA.
[28]. Bressan, P., & Damian, V. (2018). Fathers' eye colour sways daughters' choice of both long-and short-term partners. Scientific Reports, 8(1), 1-9.
[29]. Lasisi, T. (2021). The constraints of racialization: How classification and valuation hinder scientific research on human variation. American Journal of Physical Anthropology, 175(2), 376-386.

*Technium Education and Humanities*
*Vol. 4, pp.49-64 (2023)*
*ISSN: 2821-5079*
*www.techniumscience.com*

[30]. Ivanov, I. V., Mappes, T., Schaupp, P., Lappe, C., & Wahl, S. (2018). Ultraviolet radiation oxidative stress affects eye health. Journal of biophotonics, 11(7), e201700377.
[31]. Dorgaleleh, S., Naghipoor, K., Barahouie, A., Dastaviz, F., &Oladnabi, M. (2020). Molecular and biochemical mechanisms of human iris color: a comprehensive review. Journal of Cellular Physiology, 235(12), 8972-8982.
[32]. Schlessinger, D. I., Anoruo, M., & Schlessinger, J. (2021). Biochemistry, melanin. In StatPearls [Internet]. StatPearls Publishing.
[33]. Sułkowski, M., Kot, M., Badyra, B., Paluszkiewicz, A., Płonka, P. M., Sarna, M., ... &Majka, M. (2021). Highly Effective Protocol for Differentiation of Induced Pluripotent Stem Cells (iPS) into Melanin-Producing Cells. International Journal of Molecular Sciences, 22(23), 12787.
[34]. Gračanin, A., Kutnjak, K., &Kardum, I. (2021). Blue-Eyed Men Prefer Blue-Eyed Women: The Role of Life History Strategies and Sociosexuality. Psihologijsketeme, 30(1), 31-56.
[35]. Bhuktar, A. (2021). Problems on Genetics. Blue Rose Publishers.
[36]. Bressan, P. (2021). Blue Eyes Help Men Reduce the Cost of Cuckoldry. Archives of Sexual Behavior, 50(8), 3725-3732.
[37]. Bulbul, O., Zorlu, T., &Filoglu, G. (2020). Prediction of human eye colour using highly informative phenotype SNPs (PISNPs). Australian Journal of Forensic Sciences, 52(1), 27-37.
[38]. Moore, D. S., & Shenk, D. (2017). The heritability fallacy. Wiley Interdisciplinary Reviews: Cognitive Science, 8(1-2), e1400.
[39]. Meyer, O. S., Salvo, N. M., Kjærbye, A., Kjersem, M., Andersen, M. M., Sørensen, E., ... & Andersen, J. D. (2021). Prediction of eye colour in Scandinavians using the EyeColour 11 (EC11) SNP set. Genes, 12(6), 821.
[40]. Hashish, H. A., El-Azab, M. S., Fahmy, M. E., & Mohamed, M. A. (2010). A Mathematical Model for Verification of Iris Uniqueness. International Journal on Computer Science and Network Security, 10, 146-152.
[41]. Purps, J., Geppert, M., Nagy, M., &Roewer, L. (2011). Evaluation of the IrisPlex eye colour prediction tool in a German population sample. Forensic Science International: Genetics Supplement Series, 3(1), e202-e203.