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APPLICATIONS OF MATHEMATICS IN REAL LIFE

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Abstract – A brief summary of the applications of mathematics in real life is provided in the review paper. It supports advancements in telephony, transportation, building, banking, the internet, entertainment, graphics, and medicine. Humans used mathematics to develop robotics and artificial intelligence, analyse data, and navigate satellites.

Keywords : *Cartography , search engine , image compression, probability , thermodynamics, statistics.*

INTRODUCTION

In today's school and college curriculum the focus is mainly on how to solve numerical problems in Mathematics rather than the applications. There is a wide gap between the school taught concepts and applying in real life. This paper will shed light on th aspect of real life applications of Mathematics.

DISCUSSION

A) Weather Prediction

The weather is a phenomenally complex system due to the interaction of billions of molecules. Even with the vast network of weather station satellites and the largest supercomputers on the planet, weather forecasting is extremely difficult due to this.

The Navier Stokes equations are a set of rules that must be followed by fluids like the atmosphere.Unfortunately, we are unaware of a direct solution to these equations, one of the most difficult mathematical puzzles to be solved and a contender for the $1 million Millennium Prize.Instead, supercomputers divide the entire atmosphere into millions of blocks, each approximately one cubic kilometer in size, in order to produce a high-resolution forecast.

B) Cartography

It is challenging to depict our spherical, three-dimensional Earth on a flat, two-dimensional map. We must always slightly stretch or compress specific regions of the world. But math may be useful! Making maps is the subject of cartography. The difficulty of depicting the Earth in 2D space has been attempted through a wide variety of map projections.

C) Glaciers melting

One of the biggest problems facing humanity this century will be climate change Particularly noteworthy is the melting of the polar icecaps, which has a significant effect on global sea level and temperature.

Alas, information about the condition of the entire ice shield or the mechanisms causing its melting is scarce from satellite photographs taken from above. Statistics and probability can be used to analyse environmental data, such as the thickness and composition of ice.

Scientists can better comprehend the interactions between wind, sea ice, ocean currents, and heat transport by utilising sophisticated mathematical models that combine differential equations and thermodynamics.

D) Search Engines

Every day, billions of people utilise the internet. One of the reasons is how simple it is to find information rapidly on the internet, for instance when utilising search engines like Google.
The entirety of the internet is represented by Google in a massive matrix in order to identify the most helpful websites and display them at the top. The matrix contains information about the connections between the different websites, and you may utilise graph theory and linear algebra probability to identify the most popular websites.
Numerous other Google services, such as Maps, Gmail's spam filtering, Android's voice recognition, the compression of YouTube videos, the detection of faces in photos, and text translation, all involve mathematics.

E) Language Recognition

The challenge of speech recognition is intriguing. There are specific vocabulary, grammar rules, and pronunciations for each language. People use languages differently even within one another. Computers are capable of hearing. To determine what the sounds signify, they employ sophisticated statistical models.
Take the English word "potato," which has three syllables. This kind of tree displays the statistical likelihoods that the speaker's pronunciation will occur. According to the three, there is a 60% likelihood that the first syllable will sound like "Poh," and a 40% chance that it would sound like "Pah."
The more syllables a phrase has, the more complicated the probabilities become. For instance, a computer might pick up on the following: r eh k ao g n ay z s p iy ch. The calculator evaluates this based on typical English sound combinations.
Speech recognition software will soon have 60,000 words available. This implies that there are 216 trillion possible combinations for a three-word statemen

F) Crowd management

Large crowds at sporting events, concerts, festivals, or religious gatherings pose a threat in and of itself. There have been innumerable instances of fatal catastrophes in the past, and it is very challenging to anticipate crowd behaviour in these situations.
Every human's movement is reliant on the movements of everyone in their immediate vicinity. Similar to how the velocity of air and water molecules is influenced by the motion of nearby molecules fluid mechanics
It may be possible to decrease the likelihood of accidents in the future by using mathematics and computer simulations to analyse the complex behaviour of crowd dynamics. This will only be possible if we can comprehend how local changes in human behaviour and architectural design affect the crowd as a whole.

G) .Optimization of traffic

Systems for transportation are created by transportation engineers. They employ data analysis to find traffic flow issues. One of the intriguing phenomena they research is phantom traffic congestion.
Generally, rush hour, major events, construction, or crashes cause traffic bottlenecks. We anticipate being able to pinpoint the cause of traffic congestion. On occasion, there are no apparent causes for traffic delays. According to the data, phantom traffic bottlenecks can stretch up to 100 kilometres and happen at a speed of 15-20 km/h. Roadways may attempt to stop this occurrence by gradually lowering the posted speed limit in congested regions. This raises the flow rate to a level that is more desirable.

H) Image Compression

With the introduction of the Eastman Kodak PetaPixel camera, digital photography was born. Even photographs from five years ago don't appear the same as they do now. Poorer quality images are frequently referred to as "pixilated." This appearance is actually a result of digital image compression. Although the underlying arithmetic is challenging, the concept is straightforward.

Image compression solves the issue that an image contains far too much data to be stored in its entirety. If there isn't enough storage and the photographs aren't changed in any way, they will appear evenly pixilated and possibly have odd colours. The most vital portions of the image, those that the eye is drawn to, are preserved via image compression algorithms. The components that don't important as much for visual perception are changed.

I) Music playing

Music shuffle looks like a pretty straightforward problem, right? Play any song you choose at random. After the song is finished, choose and play a random tune. This can be modelled using probability.

Consider taking a marble out of a bag, noting its color, and then replacing it. In essence, this is what happens when random music is shuffled. This suggests that you might select the same marble (music track) as you did in the past. or, if not twice, before you've heard every song on the album.

In fact, when music shuffling first appeared on the market, this is essentially how it operated. People commented that the song selection didn't feel random because some songs were played more frequently than others. Then, engineers created patterns that make music that has been jumbled appear random. However, this indicates that music shuffle is not completely random.

J) Skate Park Planning

Skating requires movement. Speed can be a deciding element in how well a technique is executed. Pushing off the ground is how skaters increase their speed. Speed can be increased by using the skate park.

The slope of the surface can have a significant impact on the ride. Speed, for instance, may be provided by a slope. Bowls are a unique type of sloping design. The skater's speed is influenced by the bowl's simple harmonic motion. A shallow bowl generates less speed. It is better suited to skaters who are new or nervous. It's possible that these bowls don't always move fast enough to create big air. Bowls with a high curvature offer increased speed over shorter distances. Bowls are often included in skaters' routes prior to high-speed stunts. When they are in the air, skaters move according to the laws of projectile motion. When designing fun rides for skateboarders, park designers take into account all speed requirements.

K) Cosmetic Surgery

After an illness or damage, plastic surgeons repair various body components. To graft onto tissue in another section of the body, surgeons take healthy tissue from one area of the body. Getting the blood vessels to integrate is challenging when shifting tissue around in this way.

When the healthy tissue contains a specific number of blood vessels, the likelihood of success rises. And a specified percentage of these blood vessels have a diameter above a set level. Up until recently, before beginning surgery, surgeons had to determine whether the healthy tissue met the requirements of a blood vessel. Mathematicians developed a method for simulating the diameters and clusters of blood vessels in various tissues. Differential equations are used in the models. This aids in locating quality donor tissue before the surgery procedure is begun.

CONCLUSION:

As we have seen in the above examples, there are many more instances where Mathematics is applied to real life. Life without practical mathematical approach is not imaginable. The paper gives an insight to the beauty of Mathematics, rightly coined the Queen of Sciences.

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