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Theory and Practice of Artificial Intelligence

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Abstract: If you don't understand artificial intelligence, ask yourself because others don't understand it either. There is no generally applicable definition of artificial intelligence. The field is so vast that its actors will always have to develop a more precise definition of their own objectives in their context. Artificial intelligence is broadly defined as the simulation of human intelligence by machines programmed to learn, reason, and solve problems. Therefore, AI encompasses several subfields, including machine learning (ML), deep learning (DL), robots, natural language processing (NLP), and computer vision, etc., each with distinct applications and limitations. And yet, AI can be classified into two main categories: i-Narrowly defined AI (concrete definition of AI) Which is simply defined as an automated algorithm operating on the basis of statistical transition matrices, which allows it to increase the amount of existing information. ii- General AI (broad definition of AI): such as machine learning (ML), deep AI (DAI), image and voice recognition, etc. These broad AI systems that operate according to predefined parameters and lots of input data cannot be generalized beyond their designated functions. We believe that the term AI should be reserved for software capable of increasing the amount of information that is the function of only humans (and much less other creatures) and unitary 4D x-t statistical transition matrices. Note that the connection between artificial intelligence and the 4D x-t unitary space is revealed for the very first time. Some hypothetical AIs with human-like cognitive abilities including reasoning, writing and reading rules, pronunciation, specific tasks such as facial recognition, speech processing, etc. are usually called AI systems, which is not true. These systems operate in classic 3D+t space and obviously cannot increase the amount of existing information and therefore cannot be qualified as artificial intelligence. We can conveniently call these systems storage intelligence systems (SI systems) rather than artificial intelligence systems. On the other hand, concrete and narrow AI in 4D x-t unit space remains a well-defined theoretical and practical construct with many existing examples in physics and mathematics as well as in real daily life.

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I. INTRODUCTION

If you don't understand artificial intelligence, ask yourself because others don't understand it either. There is no generally applicable definition of artificial intelligence [1,2]. The field of artificial intelligence is so vast that its actors will always have to develop a more precise definition of their own objectives in their context.

Artificial intelligence is broadly defined as the imitation or simulation of human intelligence by machines programmed to learn, reason, and solve problems. Therefore, the current definition of AI includes several subfields, including machine learning (ML), deep learning (DL), robotics, natural language processing (NLP), computer vision, etc., each with distinct and individual applications and limitations. And yet, AI can be classified into two main categories: i- Narrowly defined AI (concrete definition of AI) Which is simply defined as an automated algorithm operating on the basis of statistical transition matrices, which allows it to increase the amount of existing information. ii- broad or general definition of AI such as machine learning (ML), deep AI (DAI), robots, image and voice recognition, etc.

These broad AI systems that operate according to predefined parameters and lots of input data cannot be generalized beyond their designated functions.

Furthermore, and most importantly, they cannot increase the amount of existing information. We believe that the term AI should be reserved for software that can increase the amount of information in input data. the increase in the amount of information is the function of humans alone (and much less of other creatures) and the software of well-programmed statistical transition matrices.

Some hypothetical AIs with human-like cognitive abilities including reasoning, writing and reading rules, pronunciation, specific tasks such as facial recognition, speech processing, etc. are currently called AI systems.

And yet, it is clear that these systems cannot increase the amount of existing information and therefore cannot be called artificial intelligence. We can conveniently call these systems storage intelligence systems (SI systems) rather than artificial intelligence systems.

On the other hand, concrete and narrow AI remains a well-defined theoretical and practical construct with many

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existing examples in physics and mathematics as well as in real daily life.

Deep Learning DL and Machine Learning ML, among others, will sooner or later be exploited in the field of stored intelligence SI information systems.

Note that the link between artificial intelligence and 4D x-t unit space is revealed for the very first time. It is natural to expect that the AI's unitary 4D space will contain more information than 3D+t space, in the same way that a 3D geometric space is more informative than a 2D space, etc.

How does AI work and why should its only definition be automated statistical algorithm software? The AI operates in 4D unitary x-t space via the statistical theory of Cairo techniques and the resulting B-transition matrix chains.

Automated statistical programs can only be run through statistical transition chains such as Markov chains and Cairo techniques statistical chains.

The theme of this work is to define and explain the theory and practice of artificial intelligence. This is not an easy task since the field is completely new and we are building foundations and columns from scratch.

Here again, the narrow and rigorous definition of AI can be written as follows:

The algorithm/software belongs to AI if and only if it is based on a chained statistical transition matrix of the Cairo techniques or any other equivalent chain of transition matrices. This narrow, concrete definition of AI would be a safe departure from the current broad and confusing definition.

Other broader AI definitions and terms, such as generative machine learning (ML), deep learning (DL), image processing, robotics, regression solvers, among others, would be transferred to the so-called stored intelligence IS, where they belong, rather than artificial intelligence.

The subject of this paper is the application of the statistical theory of Cairo Techniques (or any other similar transition matrix chain theory) as a fully-fledged theory of artificial intelligence.

This claim has been verified via different algorithms in different fields of classical and quantum physics as well as mathematics since 2020 [3,4].

Cairo's statistical theory of techniques and artificial intelligence is just a successful simulation modeling equivalent to the intelligence of Mother Nature. In other words, AI and Cairo Techniques statistical theory are, in a way, a precise simulation or modeling of mother nature in time-dependent events in a 4D x-t unit space.

➢ *Through the new definition of narrow and concrete AI, we answer four fundamental and still unanswered questions:*

- What are the basic skills of an AI programmer?
- How did artificial intelligence deceive A. Einstein and E. Schrödinger in the phenomena of energy density entanglement?
- Why is science today stuck in a continuous and endless debate on two potential problems, namely the thermodynamics of vacuum and the temperature or thermodynamics of space?
- Was the formation and explosion of the Big Band millions of years ago a fact or, conversely, was there never an explosion forming the Big Bang as claimed by quantum mechanics?

For each of the four problems above, we apply the corresponding AI statistical algorithm, rules and definitions emerging from the statistical theory called Cairo Techniques and its transition matrix B-chains to develop rigorous answers to these four engaging questions.

It is worth mentioning that neither classical physics, nor quantum physics, nor the general theory of relativity can provide satisfactory answers to these four questions. In order not to worry too much about the details of After the introductory rules and hypotheses, let's move directly to the theory and its numerical results.

II. THEORY AND NUMERICAL RESULTS

In this section of Theory and Numerical Results we provide answers to some of the main ambiguities or divergences in classical and quantum physics as well as mathematics in the form of questions and answers.

First, we apply the well-defined statistical transition matrix B in a closed control volume of a physical situation.

There exists a unique statistical transition matrix B for a uniquely defined RO vector which is the key to the required spato-temporal solution [3,4].

The question arises how to find or presuppose the value of the main diagonal inputs RO$\in$ [0,1] which is crucial and represents the core of the AI solution.

The answer is simple and assumes that the RO can be zero, constant or variable and that the nature of the RO vector corresponds to the nature of the physical situation. In other words, the RO vector depends on the spatiotemporal nature of the event.

➢ *What programming languages are suitable for AI algorithms?*

We believe that without these programming languages, artificial intelligence could never exist. At first there was only so-called machine language which gives orders to the computer's control processor via its own machine language.

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The machine language was the only one at the time and extremely hard to use or even understand. Obviously, it was impossible for machine language to perform any type of programming or AI since it performs computer operations one order at a time.

Additionally, machine language resembles Talisman complexes which are almost impossible to understand and memorize. Understanding and memorizing the Japanese and Heroglephic languages together could be much easier.

There is therefore an urgent need for a human-understandable operational language, such as the English language, which functions as an interface or translator between human languages and machine language.

Obviously, the program/algorithm construct in such an operating language must be transformed or translated by the computer operating system into machine language via the so-called compiler in a process called compilation.

The first operating system/computer programming language called Basic appeared in the mid-1960s, followed by the revolutionary operating system known as Windows in the mid-1980s.

Computer programming languages compatible with Windows operating systems (sometimes called Windows versions) are numerous where we list the first three suitable for programming artificial intelligence algorithms/codes, namely,

- Fortran programming language.
- C+, C++ programming language.
- Ready-to-use Python and MATLAB programs.

The first version of Windows interface or operating system called Windows 1.0, which was easy for humans to understand, was released by Microsoft in 1985, as a revolution in the world of computer operations and it was the only one at that time.

Needless to say, it made billions of dollars in its first years, because the price of a single copy of the original Windows software was higher than the price of the computer itself (hardware).

We all know that the first commercial competition was the Android version, 1.0, released in 2008 and slowly progressing until this operating system was developed by Google on an annual schedule since at least 2011.

In general, there are many programming languages compatible with different versions of the Widows operating system and most suitable for AI algorithms. Choosing one of them depends on the taste of the programmer. The following is a simple algorithm/program in Fortran language:

➢ *Construct a Program in Fortran Language that Solves Numerically the following Problems:*

- Find the numerical values of y=x^2 for x=19,19.5,20,20.5
- Find the numerical value of the division z=y/x, when y=118.432 and x=117.431
- Find the roots (solution) of the quadratic equation ax^2+bx+c =0 when a=2, b=5, c=3.
- Note that the two roots R1 and R2 of the quadratic equation are complex numbers in general (in the form x + Iy).
- Complex numbers are mathematical tools used to find the solution of some algebraic equations such as x + y =2 and x. y =6.

➢ *The Solution to the above Problem is:*

Input to CPU

```
!gfortran, gcc version 5.4.0 20160609
Program MORAD10
Dimension Total(30)
Double Precision Bc(30),Cc(30)
Dimension X1(4),Y1(4)
Complex R1,R2,R3,R4

Print*, " . . . . . Cairo Techniques . . . Program/Algorith . . .
Code 10 . . . ."
Print*,
Print*, " . . . . . . . . .Problem 1 Solved . . . . . . . . ."
Print*,
Do 1,I=1,4
X1(I)=19.0+0.5 * (I-1)
Y1(I)=X1(I)**2
Print*,"X=",X1(I),"Y=",Y1(I)
1 Continue
Print*,
Print*, " . . . . . . . Division Z= Y/X . Where Y= 118.432 And
X=117.431. . . . . . . . ."
Print*,
Z=118.432/117.431
Print*,  ". . Z=",Z
Print*,
Print*, " . . . . . . . Solution Of Quadratic Equation. . . . . . . .
."
Print*, " . . . . . . . . .A X^2 + B X + C = 0. . . . . . . . . ."
A=2.
B=5.
C=3.

R1=(-B + Sqrt(B*B-4.*A*C))/2.
R2=(-B - Sqrt(B*B-4.*A*C))/2.
R3= R1+R2
R4= R1*R2
Print*,"Roots Of Quadratic Equation"," . . . . R1=",R1," . . . ..
R2=",R2
Print*,
100 Continue
return
end
```

The CPU output (numerical results) is:

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. . . . . CAIRO TECHNIQUES. . . PROGRAM/ALGORITH . . . CODE 10. . . .

. . . . .problem 1 solved. . . . .
X= 19.0000000 Y= 361.000000
X= 19.5000000 Y= 380.250000
X= 20.000000 Y= 400.000000
X= 20.500000 Y= 420.250000
. . . . DIVISION Z= Y/X. Where Y= 118.432 AND X=117.431. . . . .

. . Z= 1.00852418

. . . . SOLUTION OF THE QUADRATIC EQUATION. . . . .
. . . . a X^2 + b X + C = 0. . . . .
ROOTS OF THE QUADRATIC EQUATION . . . .
R1= (-2.00000000,0.00000000)
R2= (-3.00000000,0.00000000)

Note that this program/algorithm of problem 1 is only an algebraic mathematical calculation but not an artificial intelligence program since it does not apply statistical chains such as Markov chains or B matrix chains. There is no AI here to create information that didn't exist or wasn't seen before.

➢ *What is the Fundamental Difference Between Solving Problems the Traditional Way And Solving Them With AI?*

For any given problem, there are too many different solutions and too many different approaches or workflow diagrams. The basic classification of these approaches can be seen as falling into only two distinct categories [5,6]:

- The traditional method where the solution results from processing the input document data via the intelligence of the human brain (shown in Figure 1), which is costly and time-consuming.
- New AI artificial intelligence techniques (shown in Figure 2) which is more powerful, cheaper and less time consuming

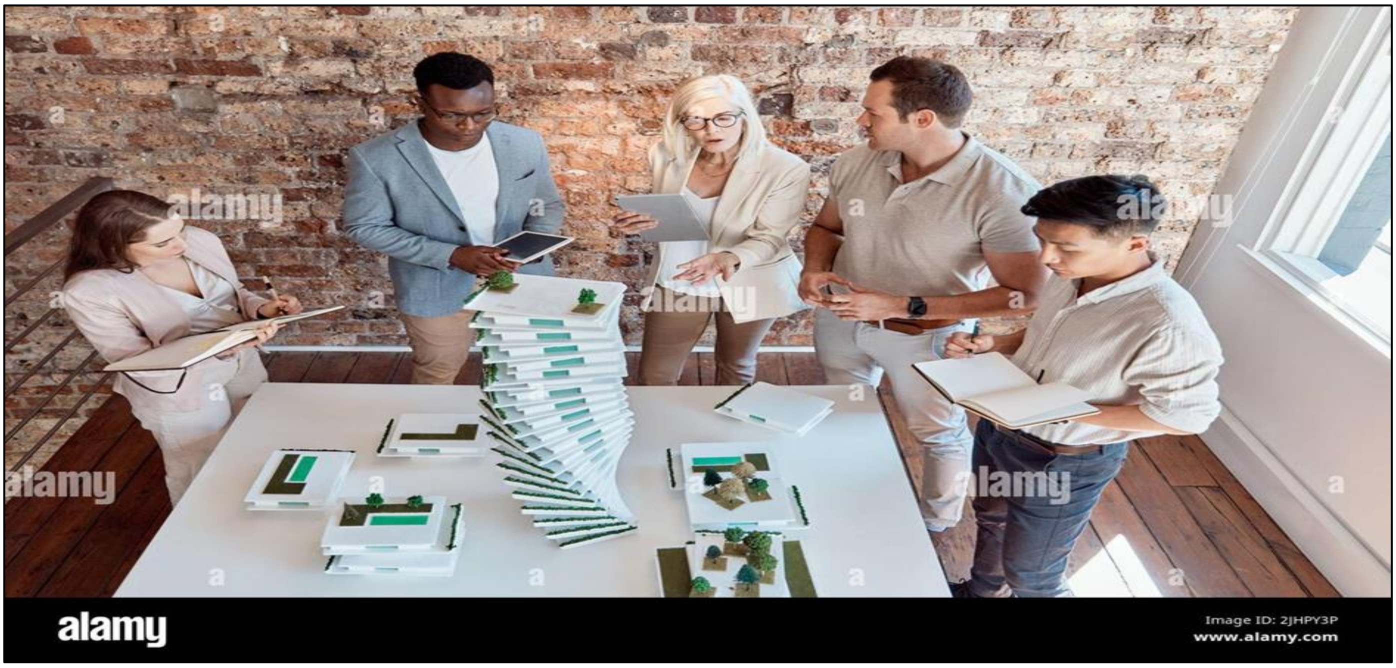

Fig 1 Processing of Document Input Data Via Human Brain Intelligence.

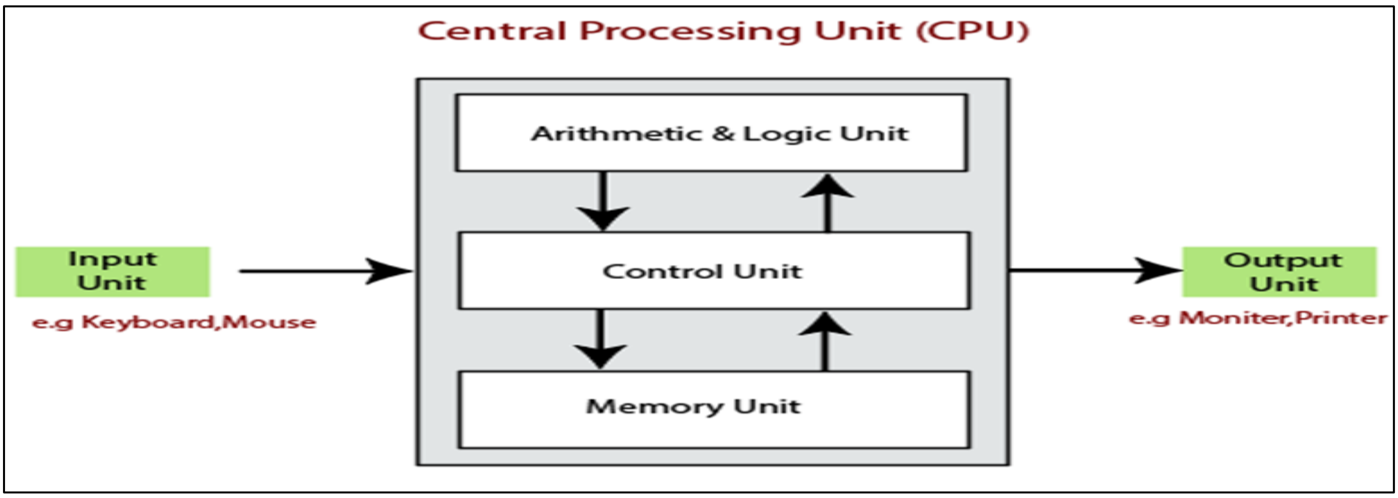

Fig 2 Input Data and Output Data Processed from Input to Output by Intelligent Algorithm Through Computer Processor.

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➢ *What are the Basic Prerequisite Skills of a Future AI Programmer?*

- First of all, we emphasize that any student or graduate who chooses to work and specialize in the field of AI programming must be one of the best and possess special talents. By one of the best we mean high intelligence and activity in addition to excellent scientific knowledge and understanding of the universal laws of physics [5,6].
- A beginner AI programmer can improve his abilities in the field of artificial intelligence with more knowledge about statistical transition chains such as Markov and B-matrix chains.
- An advanced AI programmer can improve his or her abilities in the field of artificial intelligence by attempting to apply AI algorithms/programs to test the correctness of well-known theories of classical and quantum physics as well as mathematics.
- He must master the laws and universal theories of classical physics. These classic theories were introduced in the 20th century by the greatest scientists of the time and had never been tested theoretically before [7,8,9]. We believe that all universal laws are statistical in nature and therefore can be tested via newly discovered statistical AI.

➢ Is It Possible to Calculate Finite Numerical Integration Via AI Statistical Matrix Mechanics?

Here it is not necessary to use FDM or any similar numerical calculation method [1,2,10]. Single, double or triple finite statistical integration for 1D, 2D, 3D space is not complicated but a bit cautious.

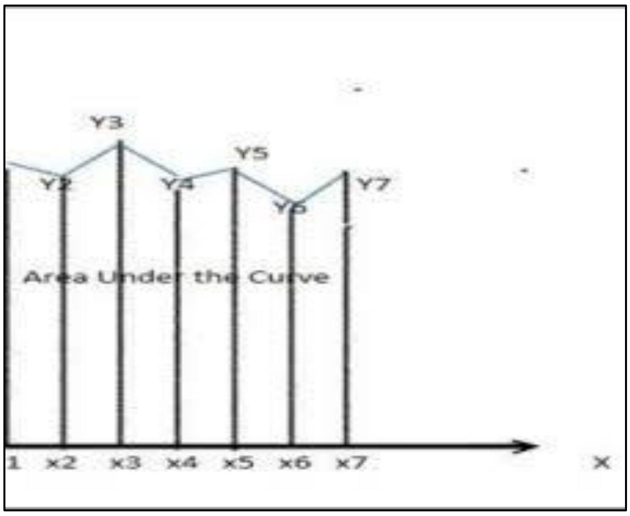

Fig 3 1D finite numerical integration for 7 free nodes with equal steps h.

The starting point is to discretize the space considered into n equidistant free nodes as shown in Fig 3 then to calculate the stationary transfer matrix D nxn given by the following expression [1,2,10],

Dnxn=1/(I-Bnxn)-I

For a sufficiently large number of iterations N.

Where B is the well-defined nxn statistical transition matrix in 1D with RO=0.

The resulting statistical finite integration formula

I = ∫ from x1 to x7 of y dx

is expressed by the numerical formula,

I = ∑over 7 nodes SW_i . Y_i

Where SW_i is the statistical weight at point i.

Note that ∑ SWi for any number of free nodes n is equal to 1 by definition.

The statistical integration formula for n = 7 nodes ,

I = 6h/77 (6.Y1 +11.Y2 + 14.Y3+15.Y4 +14.Y5 + 11.Y6 + 6.Y7). . ..(1)

And the statistical integration formula for 11 nodes gives:

I=10 h/ 145*[6.191+ 10.715 +13.862 +15.921 17.056+17.4344025 + . . +. . .] . . (2)

Equations 1,2 are the equivalence of 1D Simpson's rule for 7 and 11 nodes respectively.

On the other hand, for the case of finite 3D numerical integration,

W= ∭ U(x,y,z) dx dy dz

on the domain of the 3D cube illustrated in figure 4 we arrive at :

The SW statistical weights for the 27 free nodes in Figure 1 are as follows [11]:

0.712175906 0.966820836 0.7094255090.977245331 1.28672469 0.9668208360.740758121 0.977245331 0.7121759060.971432269 1.28263426 0.9653068781.31396687 1.68382823 1.28263426 1.189383151.31396687 0.9714322690.709893465 0.959949672 0.7071430680.970374167 1.24996960 0.9599493740.738475680 0.970374167 0.709893465 . . . (3)

This means that the finite digital triple integral W of any arbitrary function f(x,y,z) on the cubic domain V of side length L is given by[10,11],

W= L^4/27 *(f1.SW1+f2.SW2+. . . +f27.SW27) . . .(4)

In other words equation 4 writes as,

W= L^4/27 *(f1. 0.712175906 + f2. 0.959949672+. . . +f27. 0.709893465) . . .(5)

Following equation 5, the volume of any hypercube of length L follows from equation 5 assuming f(x,y,z) identically equal to 1. Therefore, the volume of any hypercube is equal to L^4. If we look at Wikipedia, we find that this suggests that the volume of a four-dimensional hypercube(tesseract) of side length "a" is 8 a^4.On the other hand, B matrix chains predict the volume of a four-dimensional hypercube with side length "a" (tesseract) as simply a^4.

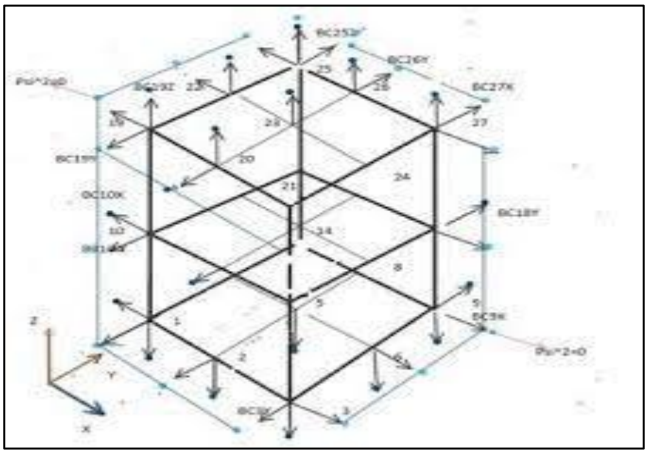

Fig 4 A 3D Cube with 27 Equidistant Free Nodes and 27 Boundary Conditions.

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It is worth mentioning that the numerical results of equations 1,2,3 are more accurate than those obtained from the trapezoidal rule and those obtained from Sympson's rule.

Also note that the artificial method of Lagrange multipliers or any other statistical assumption is not required. Lagrange multipliers Is it just a classic statistical mathematical trick that we can do without!

This clearly shows that the numerical statistical method of artificial intelligence using B matrix chains in 4D unit space is more complete than classical 3D+time mathematical calculations. Also note that this statistical numerical integration program/algorithm (Q/A 4):

- is a real artificial intelligence program since it works in unitary 4D x-t space and applies the statistical transition chains of matrix B.
- It increases the amount of existing information.

➤ *How did entanglement deceive A. Einstein and E. Schrödinger?*

Two important points are that the AI B-matrix statistical chain predicts that energy entanglement exists in both quantum and classical physics on an equal footing and that energy entanglement has a maximum signal speed or flux transfer rate equal to the speed of light C (no infinite speed or spooky action at a distance) [11,12,13,14].

- *The Two Giant Scientists Missed the Above Two Points.*

It is worth mentioning that many of our respectable contributors and readers frequently ask us how do you judge and correct the scientific work of the giants A. Einstein and E. Schrödinger? Does this mean you are smarter than both of them?

The answer is that we use the AI of the statistical chains of matrix B and it is this AI that is smarter than Einstein and Schrödinger and not the author himself.

In 2022, the author measured the half-time of the free cooling curve t1/2 in the middle of an Egyptian aluminum cube with a side of 10 cm and a similar Russian carbon steel cube (Fig.4). He found t1/2 equal to 45 seconds and 100 seconds respectively.

Note that t1/2 is the half-time of the free-cooling curve (BC = 0 and S = 0) or the time elapsed for the temperature T to drop to half of its initial value (T=1/2 T (0))

The matrix chain technique B predicts (in 4D unit space) that the speed of the entanglement signal C as [12], C=t1/2 *log 2 * L^2/ α. . . . (6)

Where, t1/2 is half the time or the time in seconds elapsed for the median temperature to fall to half its value at t=0. log 2 = 0.693

In equation 6, a cube of side 10 cm means L^2 = 1.0 E-2 m^2. The thermal diffusivity α can be found from thermal tables. Again, for aluminum cube t1/2 found experimentally at 45 seconds and α found from the thematic tables is equal to 1.18 E-5 m^2 / sec.

We obtain, C = 2.9 E 8 m/s, which almost matches the speed of the EMW in a vacuum. Likewise, for the steel cube, by replacing the numerical values of t1/2 = 100s and that of thermal diffusivity of steel α found in the thermal tables of α (steel) = 2.7 E-5 m^2 /s, we obtain: C = 2.9 E 8 m/s, which again corresponds to the speed of the EMW in a vacuum.

The two independent experiments on aluminum and steel give the same value for C = 2.9 E8 m/s. This clearly shows that entanglement exists in classical physics in the same way as in quantum physics and has a finite maximum flow velocity of C=3E8.

Now, if that is the case, the question is how does the solution to the thermal diffusion equation in 4D unit space relate to the speed of light C? The answer is simple: Mother Nature operates and signals entanglement in classical physics as well as quantum physics at speed C_{emw}.

➤ *Was the Formation and Explosion of the Big Band Millions of Years Ago a Fact or, Conversely, Was There Never an Explosion Forming the Big Bang as Claimed by Quantum Mechanics?*

The solution to the classical and quantum physics does not allow for a singularity responsible for the explosion of the Big Bang or the formation of a black hole. This may be why the Big Bang explosion is denied by quantum mechanics enthusiasts.

Before the Big Bang, there existed infinite free space and time that constituted a unitary, four-dimensional void. The formation and explosion of the Bang can be explained via the artificial intelligence theory of Cairo techniques combined with short-range weak and strong forces, as shown in Fig.5,6 [14].

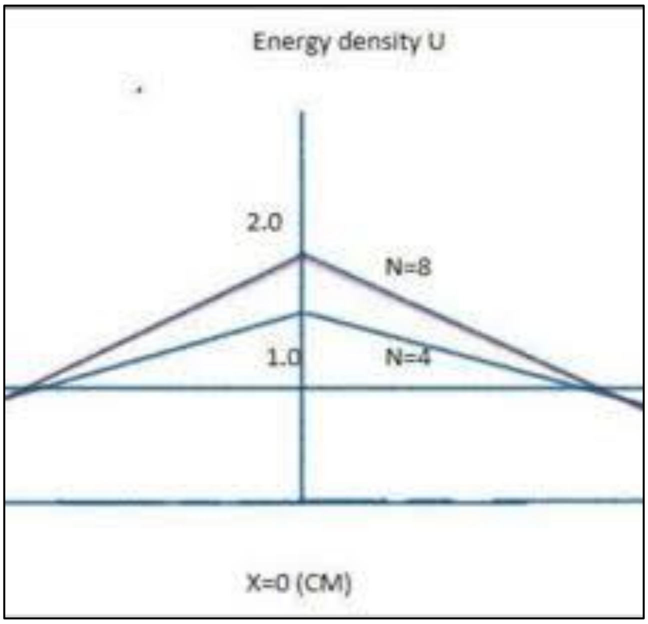

Fig 5 Occurrence and Duration of the Big Bang Over Millions or Billions of Years - Early stages.

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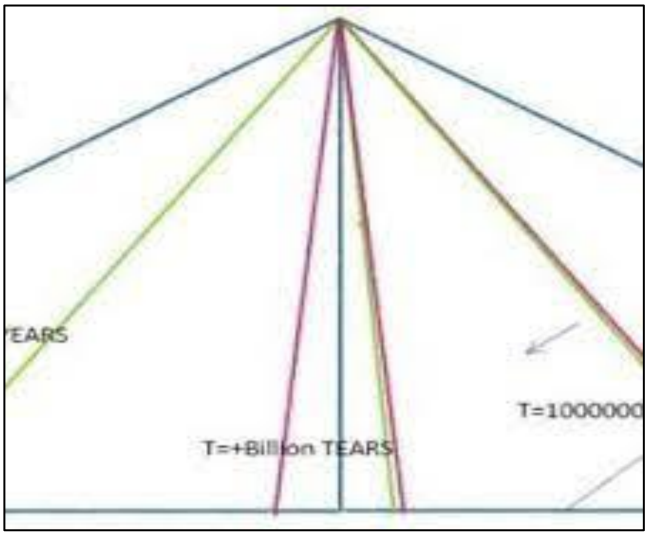

Fig 6 Well Developed Formation and Explosion of the Big Bang Over Millions or Billions of Years.

III. CONCLUSION

There is only one narrow and concrete definition of artificial intelligence. AI is defined as software that uses chains of statistical transition matrices B (or any other equivalent chain of transition matrices) in a 4-dimensional unitary x-t space and is capable of increasing the amount of existing information. The theory and practice of artificial intelligence are those of the statistical theory of transition matrix chain techniques. Other definitions called broad definitions such as machine learning, deep learning, robotics, image and voice processing and/or recognition, etc. are not AI in the true sense but rather belong to SI storage intelligence.

We explain the basic prerequisite skills of a future AI programmer and how he can improve his abilities in the field of artificial intelligence programming. We use Cairo Theory of Techniques AI and its B-matrix chains to solve time-dependent PDEs and numerically evaluate 1D, 2D, and 3D finite integrals.

We also test the correctness of the well-known theory of entanglement in classical and quantum mechanics and its explanation introduced by the giants A. Einstein and E. Schrödinger more than a century ago.

The numerical results are stunning because they show that the well-established theories of relativity and quantum mechanics are incomplete, partially true and contain inherent flaws.Finally, it should be noted that the purpose of this Q/A is not to underestimate the great achievements of the brilliant Einstein, Schrödinger, among others, but to address the major flaws in their theories, if any. The author uses his own double precision algorithm [15,16,17]. Python or MATLAB library is not required.

REFERENCES

[1]. 1-I. Abbas, Fundamentals of artificial intelligence, ResearchGate, IJISRT review, Feb 2025.
[2]. 2-I. Abbas, Theory and Practice of Artificial Intelligence, ResearchGate, January 2025.
[3]. 3-I. Abbas, A numerical statistical solution for Laplace and Poisson PDE, ResearchGate, International Journal of Innovative Science and Research Technology, October2020.
[4]. 4- I. Abbas , A rigorous reform of mathematics and physics, ResearchGate, IJISRT review, January 2025
[5]. 5-I. Abbas, A three-dimensional classification of humans - A more tolerant world, ResearchGate, IJISRT journal, January 2025.
[6]. 6-Search Wikipedia and Google.
[7]. 7- Search Wikipedia and Google. May 19, 2024
[8]. 8-I. Abbas, Useless Mathematics, ResearchGate, IJISRT journal, Sep 2024.
[9]. 9-I. Abbas, Useless quantum mechanics-The complex and untold story, ResearchGate, International Journal of Innovative Science and Research Technology, November 2024.
[10]. 10- I. Abbas, Effective unconventional approach to statistical differentiation and statistical integration, November 2022.
[11]. 11- I. Abbas, Theory and practice of control volumes - Detailed Analysis, ResearchGate, International Journal of Innovative Science and Research Technology, Jan 2025.
[12]. 12-I. Abbas, A statistical derivation for Einstein's relativity, ResearchGate, IJISRT journal, January 2025
[13]. 13- I. Abbas, ResearchGate Q/A, Jan & Feb 2025.
[14]. 14- I. Abbas, Quantum Buzzle, Vacuum Dynamics and the Big Bang, ResearchGate, International Journal of Innovative Science and Research Technology, June 2024.
[15]. 15-I. Abbas, How to transform B-Matrix chains into Markov chains and vice versa, ResearchGate, IJISRT review, December 2020.
[16]. 16-I.M. Abbas et al, A critical analysis of the propagation mechanisms of ionizing waves in the event of a breakdown, I Abbas, Bayle, Journal of Physics D: Applied Physics13 (6),8-
[17]. 17-I.M. Abbas et al, IEEE.1996, Pseudo spark - discharge, Plasma Science Transactions 24(3):1106 - 1119, DOI:10.1109/27.