Exploratory remarks and discussion on a potential program for interlock even more the mathematics and physics

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Abstract

These remarks are endowed with exploratory argumentation for disrupt further discussion and in favor of the in-depth consolidation of a mathematical and physics identification based on 2 key concepts: 1) finite support and 2) a notion of infinite intrinsic to the usage of the complex numbers. General relativity shows up linked to a kind of a Gelfand representation as an approximation of an analog of a hidden Markov Model. This has deep connections with the Stone–Weierstrass theorem and these discussion are an invitation to the physics community to study the physics x mathematics identification in the case of a holding true multiverse hypothesis. Photon in this setup stands to the analog of kernel/convolution driven solution (in physics jargon: renormalization and in data science: adding layers of convolutional neural networks) for the solution of the called Runge´s phenomenon of the approximation theory and that is deeply related to Noether´s theorem and Karhunen-Loeve transform.   If one reinterpret the   Schrödinger's wave function as the mathematical modeler of   the result of a whitening transformation regarding a given covariance matrix and related random variables, then the evolution related to the collapse of such a Schrödinger's wave function stands to Karhunen-Loeve transform also suggesting a program on unifying fundamental forces. We explanatorily   claim that by this perspective that natural phenomena, as we perceive it in daily basis, and mathematics a share the same logic and set theory as their main/core background all and of them are closely related to endow finite natural/real numbers with a finite support by means of complex numbers and this finite support stands to spacetime in physics.

Keywords: Covariance Matrix, Combinatorics polynomials, Convolution, optimal basis, whitening transformation

Introduction

Let we start by the enunciation of a toy model for a further exploratory discussion and consider an industry focused on the production (P) of the same item I every single day (D): typical n-faces dices. This industry cant produces perfect dices. The bias of the dice produced can be mapped in 2 main dual/antagonist categories: A and B. The production always begins in an event named Big Start with the maximum predominant defect been of type A. As time goes by, in coarse time intervals (T), such production is coarsely adjusted minimizing the frequency of bias A but the increasing frequency of bias type B. In the middle of the day (Md), when virtually the intangible ideal dice (endowed with maximum Information Entropy)
would be produced a fast transition (like a jump discontinuity occurs) and defect B turns to start to predominates over defect A. At the of the day, the frequency of bias A is at its minimum and the frequency of bias B is in its maximum named zero condition Z. The moment that the production ceases is called Big End.
An analogy with mainstream cosmology (mainly) follows like that:

1. P= a Noether´s current
2. D= range in at least one symmetry is preserved and the Noether theorem holds for, mathematically, a solenoidal (divergence-free) vector field. This constraint stands to mathematical themes like the finite support (based on complex numbers) for a finite sequence and group rings.
3. I= Invariant symmetry according to Noether´s theorem framework.
4. Big Start = Big Bang
5. T= Planck time interval that due general relativity stands to a specific universe volume coarse increasing.
6. A= Gravitation related to radiation dominated phase
7. B= Gravitation related to Ghost dark energy dominated late epochs
8. Z= Limiting condition closest possible of 0 Kelvin
9. Big End= Big Rip or the ripping apart of spacetime fabric [3].

Development

The convexity feature intrinsic to Noether current already hints about a duality but another in favor and corroborating argumentation emerges driven/hinted by the graphical representation of a conserved value (related to a given symmetry) against an axis representing time, as a step function that automatically drives

to duality regarding the signal (+/-) of frequencies concerning its representation using the Fourier transform on the frequency dominium. Therefore a conjecture arises to be rigorously mathematically

proofed and that we claim accommodates contrasting gravitational feature (radiation phase x ghost dark energy) features and that consolidates physics and mathematical linkage:

Conjecture: every given Noether´s current stands to a non zero conserved quantity and consequently also stands to a duality in the realm of its frequency dominium (spectral) representation. Automatically boils down to that perhaps what is considered unphysical and just of mathematical importance indeed has a relevant role in natural phenomena. Therefore this toy model/analogy anchored on a duality feature, pervasive in many mathematical branches, suggests that Thermodynamics entropy (TE) relates with the Shannon Entropy (SE) of each kind of dice produced utilizing an accumulative/integral related calculation (along with time flows) that follow like this:

$$TE = K \sum_{t=0}^{t} SE \quad eq.1$$

Where, t = 0 stands to the Big Bang, K= 1 is a constant required for dimensional adjustment. each time interval t stands to a type of dice endowed with a specific and unique set of biased features. Thus the set of bias into a probabilities space is evoked as an archetypal phase/state space representing a Noether´s current. The finite fields theme evoked in item 2) stands to a multiverse approach like suggests the physics' Nobelist Weinberg [1] (2005) that touched the possibilities of the occurrence of another set of constants in another universe that here claim like a subset from mathematics. The B feature fixed at its maximum stands to a kind of attractor suggesting a setup/resolution of an isoperimetric problem (or equivalently: optimal transportation). We claim also that these A features should be interpreted as eigenvalues of the singular value decomposition of a Hankel operator. Contrastingly, B stands to the eigenvalues of the singular values of a dual Toeplitz operator, both of them, related to the Kronecker product. Such Hankel and Toeplitz operator possible encode the concept named cosmological constant but endowed with contrary signals. Such a claim is interlocked with that reported observational hint about a signal change of the cosmological constant [2].In this scenario, an Exchange matrix accommodates the cosmological concept of the Phantom divide.

In such approach, one can interpret cosmos volumetric expansion/evolution inferred as a sort of sweep along with these dual eigenvalues (resonating with the concept of Langrangian/ Legendre transform) and accommodates the contrasting phenomena related to a Newtonian/radiation phase like gravity in opposition to dark matter energy/matter driven one. This finite amount of eigenvalues (analog to set level/roots of polynomials or photons in physics) endowed with a notion of order/state (energy) (and therefore time) tracked in a type of path integral´s analog resonates with the loss of mathematical support and the rip apart of the fabric of spacetime as devised mathematically elsewhere[3].

On other hand, the start/setup of this complex number-driven support stands for the called Big Bang. These ideas/heuristics have an in-depth connection with the least action principle that already was related to Entropy elsewhere [4]. All of this suggests that our reality has an analogy with a state/phase space and that maybe the gravitation related A and B have a resemblance to the Hilbert space of quantum mechanics. From the mathematical point of view, the interplay between the tensor product and the Kronecker product (and the tame of base choosing resonate with a notion of time) evoked here, in our interpretation, has resemblance with those of a covariance matrix contrasting with a Principal component analysis. Thus resonating with covariant theory (feature) and the Wick rotation (analytical continuity) follows an equation like with the intention of emphasizing/illustrate that how the dynamical features converge to sort of blow-up, Big Rip or divergence just after an optimal equivalence between both of them. .

$$\lim_{t \to \infty} \frac{M}{E} = \infty \quad eq.2$$

Where M is a system endowed with a Minkowski metric in natural units and endowed with a metric signature (−1, +1, +1, +1) and E (the static counterpart that stands to covariance matrix/hiden Markov model) is a system endowed with a four-dimensional Euclidean metric. This way the role of complex numbers regarding modeling nature is to accommodate (using duality features) a sort of search for an optimized representation in the spirit of the principal component analysis and the Karhunen-Loeve transform (KLT).

Such invocation of Wick rotation (and its relation with statistics mechanics) also brings the well know relation temperature x time relation (eq.3):

$$T = \frac{h_{bar}}{iK_b t} \quad eq.3$$

Following the same spirit eq.3 suggests that temperature is a kind of index that points to how weak/strong is the approximation (eq.1). If one considers the evidence related to efficiency spotted using on wavelets modeling presented elsewhere [5]. We claim that one could interpret (by the lens of statistics) temperature as a measure of how similar a given Brownian branching movement process is in the comparison with a given Random Walk that stands the called quantum Vacuum. This is indeed consistent with the exclusive dependence on the frequency of the called zero-point energy highlighted in the extended version of the Planck law. The key linkage for macroscopic reality is that the general relativity principle stands to the convexity intrinsic to such optimal basis for representation. Such photons x mass interplay [6] drives the optimized representation in this scenario is the essence of the existence of spacetime fabric.
In such a scenario to highlighted convex and dual features (that evoke about A and B regarding gravity) of the Noether current inserted in the framework of General relativity and interlock it with the Dedekind Zeta function possible would: pay off as a research program besides potentially would spot set theory (mathematical logic) as the preferential common background and natural phenomena and ordinary (i.e. daily use number-driven) mathematics. In such scenario Planck constant stands to a regulator and fine structure constant interlocks with the group related concept named residue (as a result of a path integral). In this perspective the Euclidian space E touched in eq-3 encode

Conclusions

These remarks are endowed with exploratory argumentation for disrupt further discussion and in favor of the in-depth consolidation of a mathematical and physics identification based on 2 key concepts: 1) finite support and 2) a notion of infinite intrinsic to the usage of the complex numbers. General relativity shows up linked to a kind of a Gelfand representation as an approximation of an analog of a hidden Markov Model. This has deep connections with the Stone–Weierstrass theorem and this discussion are an invitation to the physics community to study the physics x mathematics identification in the case of a holding true multiverse hypothesis. Photon in this setup stands to the analog of kernel/convolution driven solution (in physics jargon: renormalization and in data science: adding layers of convolutional neural networks) for the solution of the called Runge´s phenomenon of the approximation theory and that is deeply related to Noether´s theorem and Karhunen-Loeve transform. Such rationale also suggests the interpretation of natural numbers as entries of a covariance matrix and this interlocks with the Hilbert-Polya´s conjecture on prime numbers with the Karhunen-Loeve transform also. If one reinterpret the Schrödinger's wave function as the mathematical modeler of the result of a whitening transformation regarding a given covariance matrix and related random variables, then the evolution related to the collapse of such a stands to Karhunen-Loeve transform also suggesting a program on unifying fundamental forces. We prospectivelly claim that by this perspective that natural phenomena, as we perceive it in daily basis, and mathematics a share the same logic and set theory as their main/core background and of them are closely related to endow finite natural/real numbers with a finite support by means of complex numbers and this finite support stands to spacetime in physics.

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Dated 19/01/2021 – First publishing in : http://bit.ly/3bAeyCF
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