

**Abstract:** Somewhat surprisingly, several formulas of quantum physics – the physics of micro-world – provide a good first approximation to many social phenomena, in particular, to many economic phenomena, phenomena which are very far from micro-physics. In this paper, we provide three possible explanations for this surprising fact. First, we show that several formulas from quantum physics actually provide a good first-approximation description for many phenomena in general, not only to the phenomena of micro-physics. Second, we show that some quantum formulas represent the fastest way to compute nonlinear dependencies and thus, naturally appear when we look for easily computable models; in this aspect, there is a very strong similarity between quantum techniques and neural networks. Third, due to numerous practical applications of micro-phenomena, many problems related to quantum equations have been solved; so, when we use quantum techniques to describe social phenomena, we can utilize the numerous existing solutions – which would not have been the case if we use other nonlinear techniques for which not many solutions are known. All this provides an explanation of why quantum techniques work reasonably well in economics. However, of course, economics is different from quantum world, quantum equations only provide a first approximation to economic situations. In this paper, we use the ideas behind our explanations to speculate on what should be the next – not-exactly-quantum – approximation to social and economic phenomena.

### SAT1-A3

#### **How the Pavement's Lifetime Depends on the Stress Level: An Explanation of the Empirical Formula**

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**Abstract:** We show that natural invariance ideas explain the empirical dependence on the pavement's lifetime on the stress level and on the dry density.

### SAT1-A4

#### **Freedom of Will, Physics, and Human Intelligence: An Idea**

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**Abstract:** Among the main fundamental challenges related to physics and human intelligence are: How can we reconcile the free will with the deterministic character of physical equations? What is the physical meaning of extra spatial dimensions needed to make quantum physics consistent? and Why are we often smarter than brain-simulating neural networks? In this paper, we show that while each of these challenges is difficult to resolve on its own, it may be possible to resolve all three of them if we consider them together. The proposed possible solution is that human reasoning uses the extra spatial dimensions. This may sound weird, but in this paper, we explain that this solution is much more natural than how it sounds at first glance.

**SAT1 – A5**

### **Why Normalized Difference Vegetation Index (NDVI)?**

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**Abstract:** Plants play a very important role in ecological systems – they transform CO<sub>2</sub> into oxygen. It is therefore very important to be able to estimate the overall amount of live green vegetation in a given area. The most efficient way to provide such a global analysis is to use remote sensing, i.e., multi-spectral photos taken from satellites, drones, planes, etc. At present, one of the most efficient ways to detect, based on remote sensing data, how much live green vegetation an area contains is to compute the value of the normalized difference vegetation index (NDVI). In this paper, we provide a theoretical explanation of why this particular index is efficient.

**SAT1-B1**

### **Binary Image Classification Using Convolutional Neural Network for V2V Communication Systems**

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