Wandering Towards a Goal

HOW CAN MINDLESS MATHEMATICAL LAWS GIVE RISE TO AIMS AND INTENTION?

"If you want to make God laugh, tell him about your plans."

Woody Allen

1.1 DEFINITION OF INTENTION FROM THE SEARCH ENGINE PERSPECTIVE

We could call a data interpretation process in the brain, "intention". It is unlikely that we need to present the "intention" as an active force similar to the pattern of activity that underlies walking or running. The perceived world is perhaps, an associative chain of weights that measure the importance of sensory perceptions or memories. The "weight" is the same word as the one that defines the strength of a particular synaptic connection between the neurons. Whether a few interlinked neurons or many neurons matter is beyond the scope of a five-sentence theory.

The design of modern search engines relies on the concept of "user intent". This is a particular layer in the search query interpretation (query understanding). [1] You might be familiar with the internet pages that contain the requested keyword, but not in the desired context. These are considered the wrong or useless search results. An on-topic page completes the user query. We know only three types of user intent: navigational, informational, and the action intent that demands an action by a device usually.

The diversity of the results is valuable when the search engine has several interpretations of the query. Additionally, in the broad informational query, the user may actually appreciate a diverse set of results. In that case, the user and the search engine can begin a new kind of mutual appreciation. They will exchange their digital genes and continue to learn from each other.

1.2 NEURAL NETWORKS ARE MATH

A layered network of interconnected conceptual neurons is sufficient to define any mathematical function. [2] You can see a neural network as a set of cables that connect the input and the output sides.

This set can define a mathematical function such as the number multiplication. It is a handy thing to know if you hate math or if you cannot solve any math problems because it puts things into perspective.

The mathematics is very long, especially near the end, to paraphrase Woody Allen on infinity. [4] Throughout the science, math encompasses the variety of unsolvable differential equations. It tackles the quantum field theory but remains an innocent mechanical toy. What you see at school is mostly a selection of proven math. You would not want to see your kids ruined by an unsorted mathematical closet in which you can sum up divergent series and perform other tricks. [12]

Functions are equivalent (or "symmetrical") to the brain's neural networks. Brain features a diverse set of functions. Perhaps it is noteworthy that the particular functions represent the solution to a particular differential equation. One could ask about the differential equation for which the brain is the solution. However, the great differential equation in question has been in the making during the entire span of the human species and it would probably turn out to be unsolvable.

On the frontlines of physics are the mathematical approximations. If we win the game of approximations, we can expect to have the same mathematical procedure for most hard problems. On the other hand, we could have a single great computer to solve most problems. We should represent the physical processes of various kinds that become too complicated to compute, with the same simple math repeatedly. If a process is computationally expensive, not even nature will produce an answer in that way.

1.3 CHAOS THEORY IS SIMPLE MATH

For those who have not been around to catch up with the progressive views on the complexity of nature, here is the source of all creation concisely.

If you iterate an equation in a computer, you can spawn the varied number landscapes. A simple deterministic equation can produce a constant, periodic or chaotic series of numbers, depending on the value of a parameter in the equation.

The chaotic series may be sensitive to the smallest decimals of the numbers in the iteration cycle, but the infinitely small decimals do not exist on a computer. The iterated equation mines for the non-existent resource such as the computer memory, and eventually returns zeros. The chaotic number sequences are random, but they repeat themselves if you restart the iteration and they die out in the end.

Any number of paragraphs – or visuals – on the chaos theory is pleasing to our senses because the chaos represents a good source of the natural-looking scenery made with remarkable simplicity in a computer.

A simple rule can produce all sorts of behaviors such as the lively motion of an organism, or the fluctuation of the number of fish. These observations are perceived as an assurance that the simple rules or laws of nature indeed possess the nature itself as their product. You do not need anything more to get something more. Education also comes with the promise of giving you the basics only, which are sufficient to produce any behaviors and where the unknowns grow to the random extent.

Some of the numbers that we find in nature reflect the degrees of freedom in which a particle can move or simply, they reflect the particle position written as a number. The numbers in the iteration cycle

mentioned above, with many small decimals, can represent the positions of the planets. Because the law of nature perhaps magnifies the importance of the smallest decimals (the details of particle position), the law does not produce any precisely calculable future. A small degree of ignorance will eventually be magnified into the large blurry unknown that fits under the hat of the certain statistic.

Consider the similarity that the detailed description of nature has with the difficulty of having enough memory inside your computer. The universe itself could run out of the chaotic series as the sources of randomness or novelty if it reaches its finiteness and thus the limit of creation. It sounds like a theoretical musing, but it may concern the nature of information as a physical phenomenon.

1.4 CONSTANTS OF NATURE

The laws of conservation offer a perspective on the constants of nature that we cannot erase. These range from the old-fashioned conservation of energy, mass, or electric charge, to the conservation of quantum information (qubits). A constant also implies the number of protons in the universe or the speed of light. You might have guessed that I do not know all that a constant may imply. All the matter in the universe is the same and uniform wherever you look, hence the constancy in nature.

Quantum information is a thing, similar to the seesaw. You can teleport it, but you cannot make copies of it or erase it. The states of particles such as the individual polarizations of photons carry the quantum bits of information. In accordance with the agreed language system in which the reading and writing are performed, you can establish a series of qubits that carries any message. The election speeches one should hope are not perpetual. [8]

You cannot change a particle's state without engaging another particle's state. You can perform the change of state as the exchange, in general. One might call this notion a "relative information". The exchange is reminiscent of a seesaw-like switch that conserves the amount of information in the universe. [5]

If you keep N entangled qubits in a super-cooled computer memory of the future, you can store 2^N bits of information. [9] This number tends to become huge so that at around 300 qubits it becomes bigger than the number of protons in the universe. Mutual correlations between the fully entangled states of particles contain the largest amount of information any system can hold. The correlations exist between something that the entangled particles are doing inherently. Favorable to our imagination could be the inherent spin of an electron, which has the EM field interaction with the spins of other electrons. [10]

In a way, a quantum particle is spread out over space and time. Some have portrayed the quantumness of a particle with the image of a particle that rides on top of a wave on a vibrated fluid. [13] However, a more suitable image could be that of a particle free from any disturbances, to the extent of being "disconnected" from the knowledge of spacetime.

Entangled quantum particles are ignorant about the classical spacetime that we distinguish by distances and times, in which all the local physical events unwind in an orderly manner. Entanglement disregards the causal ordering such as the one given by distance, the obstacles and the speed of light as the limiting factor.

Imagine the entangled particles as a single object that can stretch in spacetime, an object or "ensemble" that remains whole. The occurrence of entanglement that stretches across the dimension of time in peculiar ways, engages the entangled states of various particles. There, the entanglement resembles a state that can be passed on like a virus between the particles.

Entanglement can be regarded as an undefined state of a particle, except that the possible definitive states are known (or not). We can pretend that the particle that has two possible states is in both states at once. A series of particles that can be used as qubits in the earlier example, chips away that magic by revealing a correlated superposition of states, where a particle can be by some percent in one state and in the other at once. The quantumness is popping up in the statistics of the series of particles. [6]

The view on this phenomenon may be flakey, but the entanglement is leading in the polls against the spacetime as a more powerful concept. When the entangled particles maintain their correlation beyond the confines of distance or time, they remain without any interaction with the environment. Briefly, one could glimpse the entanglement as an informational network that could tell us how to construct the spacetime.

A newcomer will probably wish to know what the entanglement does anyway and whether everything will become cheaper once we begin to use the entanglement. I must not tell you the popular answer under any circumstances. The entanglement does not transmit any data end-to-end via the ensemble of entangled particles. The ordeal of the entangled particles is a private affair that ends with the collapse of the entanglement into a set of random but correlated states.

1.5 A THINKING BODY

Ordinary matter carries information and computes, in general. The computation traces the exchange of particle states and the patterns in which the states appear. A static canvas such as the computer memory is in tune with this theoretical insight. The biological matter builds or demolishes its structure made of organic molecules. The idea of computation exist there as well, but to account for the information, we need to trace the large biomolecules. Other ideas of information and computation in the biological organism are concerned with the spreading of electro-chemical signals such as the action potentials.

Biological information is disappearing in many ways each day, as in cell death, but a wider picture of the positive survival rate remains. Life persists throughout the lossy multiplication in the universe in which the fundamental bits of information cannot be made or destroyed. Even worse, the lossy multiplication causes the appearance of tumors, which again multiply. An average human cell may not be able to multiply more than fifty times, but the species continues to procreate.

One might compare the information conservation with the universe at a constant heat level. If it contains the constant amount of energy, you would expect the temperature of the universe to remain constant in the short term.

Living beings are different kinds of systems since their fuel supplies allow the thermal or other metabolic regulation (such as the modulation of each chemical reaction in the living cell with a chemical compound).

An elementary life-like feature is a process of rebuilding the life from scratch each time the individual is at his or her conception.

A high degree of computation may be discerned with the higher temperature of the "thinking body". [7] I suspect that a novel, bureaucratically established sense of consciousness could be the ability to estimate one's own degree of consciousness. If we can sense the brain activity that accounts for the consciousness in the units of energy, by the number of mental events per second, and by the number of perceived details in an image, we can roughly estimate how well we process information. I dream to describe another kind of "heat" as the single parameter for the subjective, yet the usable degree of consciousness.

All the definitions of energy lie in the chemists' notion of the atomic bonds. The fictitious heat parameter would capture the frequency of events pertaining to the energy transitions seen in atoms and their bonds. The energy levels are sketchy when perceived without the quantum mechanical description, but the spectral analysis of the light emission and absorption produces the signatures of the energy transitions between the energy levels. An electron jumping between the atomic orbital energy levels implicates the production or absorption of a particular color of light.

The molecule of ATP (GTP) serves as the unit of biological fuel, where its conversion into ADP (GDP) represents a jump from the higher energy level to the lower energy level. Once dragged into the body from the food, the atoms found in the GTP molecule serve the occasional purpose of recharging a membrane receptor or recharging the entire neuron as a small battery.

An intelligent, capacitive membrane surrounds the neuron, which operates as an ion storage device. The GTP molecule has a single energy transition downwards, but these tiny steps account for the aspects of perception and thinking. Opening and closing of the ion gates along the membrane surface correlate with the signal propagation and consciousness. The decoding of the conscious signal remains fuzzy. This carries the danger to the further scientific development.

The self-estimated measures of consciousness perhaps favor the ascribed scientific picture, but our perceptions engage another branch of science, namely the thermodynamics.

The feverishly high energies may not have any value for the computation. The delicate and meaningful structure such as neuronal activity or the local connectedness of the neurons could be lost at a high temperature. A lower value of the fictitious heat parameter could be correlated with the increased microscopic order. The neural network would then mine for the resource of this type to satisfy the frequency and resolution of the computation. The change towards the ordered state marks the biological condition exempted from the negative implications of the computational chaos. One would expect to do more alongside the desynchronized chaos present in the neuronal firing across the neural networks.

It looks as though every single measurement of the electrical signals from the brain demonstrates chaos. A commonplace EEG device may be by far too crude on the scale of time to measure the events in the brain. The events are temporally encoded into episodes of firing at certain frequencies. These denote the small, meaningful signals such as the sensory inputs at the constant amplitude. As a digital machine, very limited and slow, prone to errors and noisy, the brain still strikes many as the top computer in this galaxy.

One view on the brain emphasizes its ability to respond immediately to any sensory input. As such, it recognizes the content fast, possibly by utilizing the parallel processing of information. The trained neural networks come in the form of the systems of specialized regions. Certain regions contain the

image pixels while other regions act as the associative areas that bundle the large sets of data from different modalities together, such as the visual and the auditory experiences.

The information undergoes the processing multiple times in multiple ways, where the first feedback response to stimuli crudely indicates the presence of the mind. Roughly, two inhibitory feedback links exist per single feedforward (outgoing) excitatory link that begins at the sensory cortex.

Evolution has perhaps awarded the skeptical view on any convoluted topic, which makes the evidence-based arguments a requirement. In this large-scale example, the negative feedback slows the adoption of information. Such feedback mechanisms are a type of control mechanism.

Philosophical investigations into the nature of consciousness put the person's self-image in the center of the person's mental realm. People are usually capable of thinking about themselves and about their own thinking, which makes the argument cyclic or recursive. In addition, we can find the recursive processing of information in the hierarchical neural networks, at different scales.

However beautiful this image may be, I keep recalling an evil citation from the textbook on the control systems. If we have a control system that has a feedback, then we are not going to be able to understand it, analyze it, or predict its behavior without resorting to the formal methods of analysis, it claims.

As for the manner of describing the biological information, the information writing and reading are processes starved for energy or perhaps, wasteful to a certain extent. The energy requirements of the information flow make the flow schematic more complex. Only recently, the description of biological information gained traction in the field of thermodynamics. Clearly, a stubborn rule of nature is being born. [11] In contrast, the attempts to see the single photons or the entanglement with the human eyes seem trivial. [14]

1.6 COLORS AND CATEGORIES

In a surge of computer intelligence research, elements of the so-called "deep learning" are becoming more accessible to the public. We can describe the method of image interpretation in a deep, multi-layered neural network, as a telescope. [3]

Astronomers use an optical telescope to study the stars. Usually, not a single star except the Sun can be seen through a telescope. Stars are too small for us to observe their surface, so they remain point-like objects. The relevant data comes from the analysis of their light spectrum, obtained by letting the light pass through a glass prism or diffraction grating.

The spectrum is associated with the energetically excited atoms radiating the timeless light. Because it moves at the speed of light and has no mass, the light experiences its entire existence at once, without ever knowing about the passage of time. Yet, we could describe the light as a wave whose phase (state) can be known at each moment. Its frequency is observed as a color.

The atoms emit their specific light signature as colors. Further, atoms that obstruct the light also have their specific signatures called the absorption lines in the spectrum. Although, the light color is shifting depending on the motion of the star and the gravitational curvature. For instance, a very massive star

could shift the spectrum towards the red end. We can imagine a clock running more slowly in a strong gravitational field, emitting the elongated waves of red light.

The image interpretation technique uses the image elements such as pixels and each pixel is a star with the specific color spectrum. In a particular color system, there are red, green and blue colors only, but this may not be the only color system that a computer can use. Another element that you could associate with the pixel is its surroundings.

This is reminiscent of the holographic filming, where the ordinary photographic film records the laser light interference. All the objects under the spotlight reflect the laser light towards the film. Portions of the film are receiving the original laser light and the reflected light that carries the information from the entire scene. The pixel neighborhood matters, except that the computer eye has yet to look at it, record it in a layer of the neural network and make a judgment about it.

Specifically, the pixel could belong to the group of horizontal, vertical or diagonal lines. In addition, it could sit on a black-to-white or white-to-black area edge, depending on how you approach it. The pixel group is a quality that we can describe with a number, just like the color, and associate it with the pixel. The computer can next, group the larger elements of the image such as the lines together. In the ultimate layer, the neural network contains the number data reminiscent of images. We call them the abstract categories such as cats, dogs, musical instruments or astronauts.

The trick is to build the neural network by training it on a set of solved, tagged images. The arbitrary initial associations of pixels in the first neural network layer, with the lines, areas and abstract groups in the higher layers are weakened or strengthened throughout the training. This strength or weight is a number that defines the local connectivity of one neuron to another. If the association of the pixel or an object with the higher-ranking object category is meaningful, the weights are ready for use in the image reading applications.

An input image needs to enter on one side of the neural telescope network and exit on the correct output where it meets the appropriate word such as the "dog". The neural network is just a file on your computer with the number tables that define the neuronal connections by weight. The network stores a huge amount of experience from the training set of labeled images. We can interpret it as a very large mathematical equation with perhaps, a hundred and fifty million parameters. Although we are all equations, you cannot directly program in such equation by writing all the parameters in advance.

1.7 Remember the Seal

Imagine a seal strolling down the beach on its belly, over the small, round pebbles, each of which is unnoticeably different in color. Each pebble is a seed in the seal's perception: the chaotic computation in the neural network ingests the pebble stimulus. The seal can interpret a pebble as the source of stimulation and build its representation in the brain. As a slight inconvenience perhaps, each pebble inspires the animal to advance a bit. Besides the static solution, we can expect that the motive force will reflect the underlying stimuli dynamically by adjusting the periodicities of neuronal excitations as the animal is walking over the pebbles.

The quantum entanglement seems to have very little with the biomolecules or the neural networks, because the biomolecules are warm and interacting with everything else. The seal's biochemistry remains a considerable modeling challenge even without some of the quantumness mentioned earlier. The biochemistry represents the big data and some of the basic data about the big molecules is slightly off. The question is not whether this is the case of huge ignorance.

I wonder if there exists any novel fundamental principle of nature left in the biological organisms that the scientists have not spotted thus far. I invite the interested parties to invest in the interpretation of the brain signals and in the analysis of human experiences. We could find the arguments that portray the brain as a computer, as a physics laboratory, and as an environmental scanning device and find the new compass for the civilized seal.

References

[1] http://nlp.stanford.edu/IR-book/html/htmledition/user-query-needs-1.html

[2] http://neuralnetworksanddeeplearning.com/chap4.html

[3] https://karpathy.github.io/2015/10/25/selfie

[4] http://thinkexist.com/quotation/eternity_is_really_long-especially_near_the/168473.html

[5] https://www.edge.org/response-detail/27074

[6] https://www.quantamagazine.org/20160119-time-entanglement

[7] https://arxiv.org/abs/quant-ph/9908043

[8] https://media.ccc.de/v/32c3-7305-quantum_cryptography

[9] p. 514, ch. 16.2 Quantum information processing, "Quantum Mechanics - A Paradigms Approach", David H. McIntyre, Oregon State University, Copyright © 2012 Pearson Education, Inc.

[10] https://www.youtube.com/watch?v=v1_-LsQLwkA&index=4&list=PLkahZjV5wKe_dajngssVLffaCh2gbq55_

[11] http://www.mdpi.com/1099-4300/18/4/138/htm

[12] https://youtu.be/VvqeJkT3uyo?t=30m

[13] https://www.youtube.com/watch?v=WIyTZDHuarQ

[14] https://www.technologyreview.com/s/600827/the-experiment-that-will-allow-humans-to-see-quantum-entanglement/