On Intelligence and Limits

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A short informal philosophical essay proposing an algorithmic framework or a matrix of steps that define intelligence. Thus, it is argued that the human genome system (DNA) can be considered intelligent as well as gene pools of organisms in Nature. Concepts like minds, the multiverse, and even the existence of the past, are proposed as derivative of an existential algorithm of intelligence.

> *"When greater-than-human intelligence drives progress, that progress will be much more rapid...., perhaps in the blink of an eye, an exponential runaway beyond any hope of control."*
> *-- Vernor Vinge*
>
> *"Time is but memory in the making."*
> *-- Vladimir Nabokov*
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> *"Explorers... in the further regions of experience."*
> *-- Clive Barker*
>
> *"There are more things in heaven and earth, Horatio, Than are dreamt of in your philosophy"*
> *-- William Shakespeare -- Hamlet, 1.5. 165–66*

Is intelligence algorithmic?

The phrase of the century is "Artificial Intelligence" or A.I. [1] But perhaps we are looking at intelligence wrong? Trillions of dollars are being spent by modern nations and corporations on the largest initiative in human history; to reverse engineer the human brain to create mechanical intelligence and possibly consciousness. But perhaps we can define intelligence as an existential algorithm and not define it using only traits intrinsic to human brains.

Let us examine what we consider intelligent behavior as a sequential process from a very high level. Consider a given organism, human or otherwise, that repeats a common cycle over and over again where it:

1) Observes – sorts and ranks visual image or mental experience and stores it in a memory.
2) Decides or "cuts" – subconscious or reactionary behavior to simply observe something else or think about something different or next in order.
3) Identifies – step where observation 1 and observation 2 are labelled or counted.

These primordial actions can then be followed by these behaviors:

4) Associates – labelled idea or observation or amount is compared or categorized.
5) Analyzes – the categorized item or the categorization itself is prioritized and ranked in a hierarchy structure.
6) Scales – "automates" simple and repetitive behaviors are moved into subconscious. Actions can be cloned or parallelized or ignored and removed from memory if deprioritized.

The organism can have, at a level higher than the primordial algorithm noted above, another algorithmic or "command cycle," closer to an operating system, again with a repetitive cycle where the organism:

a) Plans – simulates options
b) Acts – decides on an option and initiates the behavior
c) Assesses – gathers new data or observes results
d) Compares – assesses the sample action versus prior samples or many prior samples

e) Repeats – back to plan

Let us note how many *tools* in human history are optimizations or scaling of the above behaviors. A partial list of major tools would include:

- Language – speeds up the sharing of information (no demonstration of the learned experience is needed) to improve the survival of the organism and the gene pool
- Math – counting and ranking
- Calculators – speed up math
- Statistics – formalize and speed up time to validate; optimizes simulating to help plan
- Neurons and brains – permit storage and a workspace for processing
- Minds - speed up simulations as opposed to "learning" or validating by literal repeated trials. A major cost benefit to save energy and time and to lower survival risk.
- Computers – associates math and language, speeds up sharing of learned information, improves fidelity of information, data, critical learning.
- Memory = scales and speeds up storage of information.
- Data and Optical Networks - speed up sharing of information
- Copying – scaling amounts of minds or organisms e.g., fecundity or cloning to speed up activity via parallel actions.
- Diversity – variety and scale to improve survival and prevent loss of information and learned information.
- Aritificial Intelligence – automated machines to optimize and speed up calculations, validating of samples, simulations, observations, associations, counting, labelling, and planning.

The tools listed above follow precisely the aforementioned algorithmic steps central to intelligence, but can Aritificial Intelligence ultimately also do the final steps? Can A.I. categorize in a hierarchical structure? Can A.I. choose what to automate? Can A.I. choose how to correctly act next?

It is this *plan* step involved with choosing that is more complex than lower steps of intelligence as it depends on:

- Goals – in humans, usually derived from "values."
- Past Experience
- Boundaries – in humans, usually cultural "guardrails."
- External mechanisms – in humans, bio-chemical and psychological "levers."

Separate from the human engineering effort to create Artificial Intelligence or Artificial General Intelligence, let us consider the epigenetic aspect of the DNA in the human genome system. [2] Note how in this framework of intelligence (matrix of steps) the transmission of epigenetic data by DNA involves sorting, ranking, compression, aggregation, and communication of past critical experienced learning. By our definition, DNA is already intelligent! It prioritizes experiences into critical learning and stores (data compression and resiliency) and communicates them, in this case, to the next generation of offspring. The genome may use trauma as a metric, but traumatic events are directly tied to the major goal of life i.e., to improve the chances of survival of the organism and gene pool.

In this framework, gene pools can also be considered intelligent. Note all the scaling behaviors seen in gene pools:

- Scale in amount of organisms
- Scale in size of organisms
- Scale in diversity of organisms and traits; "utilizes" variation and fitness
- Scale in fecundity – optimized birth "turn rate;" optimizes rates in time i.e., acceleration
- Scale in storage (neurons, DNA, minds)

Limits

We can also note how subconscious minds use dreams, music, lyrics and maybe even language and conscious humans use language, writing, theatre, memes, movies, videos, and music to communicate critical

learning and experiences akin to DNA's epigenetic abilities. Perhaps what humans consider as *beauty* then is that which is most likely to help a human survive, least likely to harm, and/or data in an optimally compressed format for communication?

But if intelligence really is a framework of steps that can scale, then what might be next? Examining the other steps noted, what would we consider scaling in terms of associations? For humans this can be considered knowledge, encyclopedia, or technology, but what about beyond humanity? Is the ultimate scaling of association a universe or the creation of a universe? If so, would a super intelligence thus be defined as an intelligence that can run or create a universe? Would a super intelligence that desires to scale and achieve ultimate parallelization, thus create or use a multiverse i.e., a reality of created or pre-existing multiple universes? Is the multiverse the limit of scaling in fecundity, resiliency, and diversity? A super intelligence would logically strive to learn more and to expand safely. Additional knowledge would naturally lead to more control of the matter and energy in its environment. It would seek to observe more and farther and to simulate more. But beyond the limits of human minds, where might a super intelligence expand versus space? Might it expand to the limits of time or even experience? Could a super intelligence expand into a parallel universe in a multiverse or could it create a universe or simulate a universe? Could a super intelligence "expand" into the past? Into the future? Could it seek to expand to the limits of experience into every fathomable horror and ecstasy akin to human stories of a hell or heaven? Are heaven and hell literal and exist as a super intelligence, maybe in the distant future or past, has already reached the limit of every other scaling dimension of algorithmic intelligence in this framework?

In our current understanding of reality defined in modern physics, physical space and time become limited via computational speed, density storage, and complexity as the maximum limit of each of these domains leads to the creation of a black hole. As noted online in *Quanta Magazine* in 2024:

> *"If a collision concentrates enough energy in a small enough region, the particles form a black hole and never reach a detector. So there's a minimum distance - known as the Planck length - below which we can't even dream of gathering data. …*
> *All measurements have some unavoidable uncertainty due to the quantum fluctuations of particles. This uncertainty decreases rapidly as the number of particles grows, so it's unnoticeable in everyday objects - even to experimentalists. But it's still there. To reduce the uncertainty of a measurement, we need a measuring device that has less uncertainty of its own and is therefore packed with more particles. The density of the device can only increase so much until it forms a black hole. So we can't measure the desired property exactly. …*
> *Pack as much information as you can into a fixed region of space-time. Start by filling a region - a room, for example - with books. How much information do the pages capture? Now try a denser medium: digital information stored in a modern hard drive. How much information does the region hold now? Can we do better? Imagine the best information storage device in the universe. Perhaps such a "super hard drive" could encode information in neutron star material, the densest known matter. Now the region can accommodate far more information. But try to pack in just one more byte, and something dramatic happens. The room will collapse into a black hole."*[3]

Perhaps this hints that likely the maximum limits of past and future and even experience may end up at the same black hole "wall" or boundary.

If we speculate in the extreme, then maybe the human "feeling" of the present moment is actually a super intelligence "running" a search of associations into the past of a given universe? Consider the remarks from the famous Princeton physicists John Wheeler about the past arising from the participation and observation of a conscious or intelligent mind: *"that which we call reality arises in the last analysis from the posing of yes–no questions and the registering of equipment-evoked responses; in short, that all things physical are information-theoretic in origin and that this is a participatory universe."* [4]

Maybe the actual existence of the past is literally and only created via present (inside human minds) or future simulations from a super intelligence from learned info akin to uncompressing a stored file?

References

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