Rethinking Human and Machine Intelligence under Determinism

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Article

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Abstract: This paper proposes a metaphysical framework for distinguishing between human and machine intelligence. It posits two identical deterministic worlds -- one comprising a human agent and the other a machine agent. These agents exhibit different information processing mechanisms despite their apparent sameness in a causal sense. Providing a conceptual modeling of their difference, this paper resolves what it calls "the vantage point problem" – namely, how to justify an omniscient perspective through which a determinist asserts determinism from within the supposedly deterministic universe.

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Introduction

According to causal determinism, "every event is necessitated by antecedent events and conditions together with the laws of nature" (Hoefer, 2023, Section 0). Apparently, this is an innocuous, reasonable claim held by contemporary thinkers well versed in scientific and philosophical literature. However, what does determinism suggest about the determinist as a being?

Determinism involves envisioning every past/present/future event encapsulated in a static realm. All of this appears frozen/stagnant from a God's-eye viewpoint. However, from this standpoint, her intellectual mind should progress dynamically to render a judgment on the universe. Yet, by asserting determinism, she places herself within the static realm. Let us pursue this more closely through the following formulation.

The determinist refers$_1$ to:

The determinacy of all the events in the universe, including the act of referring$_2$ to the determinacy of all the events.

While referring$_1$ occurs dynamically, referring$_2$ exists within a static realm. Therefore, there is a discrepancy. But this is not the sole issue. In this scenario, the determinist's mind ("M_1") engaged in referring$_1$ targets the mind ("M_2") engaged in referring$_2$. However, M_1 and M_2 are presumed to be the same entity. Then, M_2 should also target M_1, creating an infinite loop where they continue to target each other. It is hard to imagine that this would be her state of mind. Meanwhile, we can imagine that she might belatedly realize that her assertion of determinism was also a predetermined event. However, because this realization occurs temporally after the assertion, the state of mind (akin to M_1) during the realization cannot be identical to the state of mind (akin to M_2) during the assertion. For them to be identical, there would have to be no time lapse between them, which is absurd.

The dilemma would not arise if we assumed that she was examining the universe as an outside observer. However, this is not possible because she is a finite being located within space and time. This leads us to the "the vantage point (VP) problem" – namely, how to justify an omniscient perspective through which she asserts determinism from within the supposedly deterministic universe.

We can be tentatively certain that it applies to the determinist only. For instance, the problem does not apply to the following case.

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A physicist refers$_3$ to:

The influence of gravity, which exerts its sway even on the neuronal activities of her brain required for referring$_4$ to the influence of gravity as well as on all the other objects in the universe.

There is no indication suggesting that referring$_3$ and referring$_4$ exist in a static realm. Additionally, although gravity is one of the essential factors in the act of making the assertion, her mind is not entirely subjugated to gravity. Admittedly, her mind would not be able to exist without her body, which is subject to gravity. Nevertheless, the mind can separate itself from the objects in the universe to which gravity applies. Thus, she can easily engage in referring$_3$ while existing within a gravitational field. Therefore, no VP problem exists in this case.

Now, to address the VP problem, this paper will provide a metaphysical speculation for distinguishing between human and machine intelligence. Specifically, it will discuss two different types of deterministic worlds through a thought experiment. Then, it will provide a plausible model that allows a determinist to validly claim the universe as deterministic while remaining a part of it.

1. Deterministic Knowledge

This paper will use the following key definitions:

(1) **Deterministic knowledge** (D knowledge): A totality of facts associated with all the past, present, and future events in a deterministic world.
(2) **Deterministic world**: A world where events are deterministic. There is metaphysical significance in considering a case of providing D knowledge to a cognitive agent of this world.[1]

Definition (2) introduces a seemingly contradictory idea. If D knowledge were provided to the agent, it suggests that she could gain knowledge about her future. However, if she did attain such knowledge, the D knowledge would no longer be valid. Why? Because it fails to describe one particular event: her attainment of the knowledge. To address this apparent contradiction, this paper will examine reception of D knowledge in a *metaphysical* sense only.[2]

Now let us define two deterministic worlds.

(1) An original world like ours that comprises a human agent.
(2) A simulated world that replicates every aspect of the original world and comprises a machine agent emulating the human agent in a causal manner.[3]

According to Schwartz (2012), determinism is the view "that [possible] worlds cannot be the same up to a point and then diverge" (p. 216). However, in our thought experiment, it *is* possible that the deterministic worlds (1) and (2) are computationally identical up to a particular point and then diverge when D knowledge is provided to them. If one contends that the human mind cannot be fully reduced to an algorithm, it becomes necessary to assume that such a divergence is possible.

This paper will use concepts of computationalism to describe information processing. According to Beraldo-de-Araújio, the essence of computation is "symbolic manipulation" and concerns "mapping function between two sets of symbols" (Polak & Krzanowski, 2019, p. 6). The human agent's symbolic manipulation, for instance, may take place through neural activities in the brain. Meanwhile, the machine agent relies on processing machine-readable symbols. By slightly changing Beraldo-de-Araújio's definitions, this paper defines computation as follows.

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[1] Vihvelin (2023) proposes "[leaving] open the metaphysical possibility of time travel to the past" (Abstract). This concept is philosophically worth considering, even though it is unlikely to materialize in reality. Note that her proposal implicitly involves the idea of providing D knowledge to an agent in the past.

[2] We assume that the cognitive agent receives only a "small breadth" of D knowledge that is associated with the agent. The entirety of D knowledge would be too immense to be processed by any agent.

[3] Müller (2014) indicates that two different physical processes P_1 and P_2 can perform the same computation C (p. 9). Similarly, the original and simulated worlds are computationally the same but ultimately different.

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(a) A process is a function P: I → O such that its domain I is a set whose elements are called input *events* and its co-domain O is a set whose elements are called output *events*, while both I and O are subsets of a physical world. For all x∈I, y = P(x) (y∈O) is a corresponding output event.
(b) A computer is a function C: S → T from a set of input *symbols* S to a set of output *symbols* T, such that C($\bar{x}$) is outputted by computing $\bar{x}$. ($\bar{x}$ is a symbolic representation of x.) A process P: I → O is computational if P is generated by a computer C.

In the simulated world, we suppose that the mind is a "classical von Neumann computer" and that "its representation-bearers [are] data structures" (Frankish & Ramsey, 2012, pp. 31-32).[4] This world is intentionally designed to avoid being based on a "connectionist" model.[5] Specifically, it may not be feasible for the connectionist model to accurately emulate the human agent due to its highly stochastic nature.[6] Such a feature might hinder accurate realization of a scripted scenario. Although the classical model may be much less sophisticated, it can at least robustly emulate human behaviors in hindsight if all the relevant information is available.

1.1. Type 1

If the D knowledge specific to the simulated world is provided to its agent, the agent would process reception of the D knowledge simply as one of the existing potential input events. This world is governed by a predefined type of D knowledge (i.e., Type 1) that *dictates* how things should occur.

See the following mappings.

$I = \{x_1, x_2, \ldots, x_n\}$
$O = \{y_1, y_2, \ldots, y_n\}$

Since this world is deterministic, only one of the input events from x_1 to x_n is bound to occur. Nevertheless, in order to enhance the "realness" of the simulated world, the above sets have been configured to include a reasonably finite number of input-output pairs other than the actual pair. These are included as conditional cases in Type-1 D knowledge. Now suppose that reception of D knowledge occurs immediately before a particular event in the input event set does. Then:

$x_D = x_k$ (x_D is reduced to x_k.) $1 \leq k \leq n$
x_D = Reception of D knowledge
$y_D = y_k$
y_D = Response to reception of D knowledge

To illustrate the triviality of the simulated world, let us consider a hypothetical scenario involving a clinical psychologist named "Millicent" (or simply "Millie"). She loves coffee but often hesitates whether to drink it. One morning, she decides to have a coffee anyway while watching a seminar video on a tablet device. The following *event* mappings are established for her in atomic-sentential form:

x_1 = The seminar tires me.
x_2 = The coffee does not convince me of insomnia.
x_3 = The coffee convinces me of insomnia.
y_1 = I stop watching.
y_2 = I keep drinking.
y_3 = I stop drinking.

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[4] A representation-bearer is a means through which an object being represented is thought/perceived by an agent. See Frankish & Ramsey (2012, p. 9).

[5] Connectionism suggests that "individual neurons do not transmit large amounts of symbolic information" and that "they compute by being appropriately connected to large numbers of similar units" (Feldman & Ballard, 1982, p. 208).

[6] Testing whether a connectionist-based AI could think like humans may require a different approach like Schneider's (2019) ACT test (p. 54). Or we can imagine testing the AI by feeding it with a history of its replica as a certain kind of "D knowledge."

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Recall that only one particular such as x_1 has been configured to actually occur. However, assume that specific descriptions in the D knowledge could be provided to her immediately before x_1 happens. Suppose that her tablet displays not only the above mappings but also a short history of her activities in the morning and the events to unfold throughout the day. How would she respond?

From a human agent's perspective, there must be a distinct mental representation corresponding to the event of "I see the descriptions." However, Millie's processing mechanism would only be able to interpret the sight of the display as one of $\bar{x}_1$ to $\bar{x}_3$. Recall that Millie's mind follows the classical computer model whose representation-bearers are data structures. Since she is only a machine agent, a bit structure corresponding to her symbolic representation of the event would most probably be translated to a particular bit structure corresponding to one of $\bar{x}_1$ to $\bar{x}_3$. Suppose that it is interpreted as $\bar{x}_3$. Then, her processing mechanism would output $\bar{y}_3$, which should be accompanied by y_3. In other words, she would probably stop drinking her coffee upon receiving the D knowledge. This result is not surprising because only the predefined sets of inputs/outputs were configured for the simulated world.

1.2. Type 2

If the D knowledge specific to the original world were provided to its agent, the agent would process reception of the D knowledge as a unique input event. But what justifies this characterization of the world?

Recall from the paper's first footnote that contemporary metaphysicians (e.g., Vihvelin (2023)) accept a metaphysical possibility of time travel to the past. Time travel would not simply suggest displacement of one's body. It would also mean that the time traveler could bring some of the accumulated knowledge about the world to the past. In this case, it would be hard to imagine that an agent in the past would show only a robot-like reaction to the knowledge of her future. Similarly, if the original world's agent received D knowledge, it is reasonable to expect that she would provide a non-trivial response to it.

Then how would the D knowledge of the original world differ from that of its simulated counterpart? To begin with, let us first assume an as-of-yet-unnamed type of determinism. Under this determinism, causality may not necessarily definitively determine the events *with respect to* the agent's perspective.[7] Although this "unnamed" determinism may seem odd, eternalism can provide a deterministic picture of the events. What is eternalism, then? According to Thyssen (2020), it is a view that "all events in the history of the Universe are *equally real* -- regardless of whether we judge them past, present, or future" (p. 6). Further, "[w]hether past, present or future, all events 'lie frozen' in the four-dimensional block, much like the scenes from a movie are fixed on the film roll."

Accordingly, adopting eternalism, we can conceive of a D knowledge (i.e., Type 2) that only *reflects* every physical event across time without including counterfactual cases. If one were to see the events of the world like fixed scenes on a film roll across time, she might be able to extrapolate, to a certain extent, counterfactual cases associated with those events. However, the scenes themselves do not include such information.

Meanwhile, we see that metaphysical *emergence* of a new output upon receiving D knowledge is necessary, since the agent's processing mechanism follows causality. However, the *content* of the new output may be deterministic or non-deterministic. How so? Although the eternalist model can provide a deterministic view of *this* world, it cannot do the same of the *metaphysical* realm beyond. Therefore, whether the output's content is deterministic/non-deterministic only remains a question.

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[7] Regarding a universal proposition that "[a]lways, given an A, a B follows," Steward (2022) cites Anscombe, who suggests that our inability to "describe the absence of circumstances in which an A would not cause a B" challenges identification of causation with necessitation (p. 9). In other words, it is possible that "A" causes "B" but it is not necessary for "B" to follow. Nevertheless, this possibility does not justify the "conclusion that determinism is certainly false" (p. 12).

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1.3. Type 3

Now let us embrace causal determinism to the fullest -- beyond this world to the metaphysical realm. Then, we can entertain the idea that its agent's decision-making processes are strictly deterministic in a metaphysical as well as physical sense. In contrast to Section 1.2, the agent should generate a new output with *deterministic* content if she were to receive D knowledge of Type 2. Moreover, this situation should generate a new version of D knowledge (namely, D') that describes her reception of existing D knowledge. Then, the agent should produce another new output with regard to D'. This should generate another new version of D knowledge (namely, D''). To facilitate comprehension of this somewhat complex scenario, let us go back to the Millie story. With regard to the Millie of the original world, D' knowledge might state as follows:

"Millie responds to D knowledge. She says, "Am I living in a Matrix?"

D'' knowledge might state:

"Millie responds to D' knowledge. She says, 'I might need to take some medication to calm my caffeine-induced paranoia. Or maybe this world that I'm living in was monstrously rigged, and I must somehow survive by figuring out how I first reacted to… I don't know, but it seems like this situation that I'm in happened already once before, and I must figure out whatever this evil gadget had said in the first place. Let me think… Whatever action I take right now, was that also predetermined?'"

See the following mappings:[8]

$I = \{x_1, x_2, \ldots, x_n, (x_{n+1}), (x_{n+2}), \ldots\}$

$O = \{y_1, y_2, \ldots, y_n, (y_{n+1}), (y_{n+2}), \ldots\}$

$x_D = x_{n+1}$ $\quad y_D = y_{n+1}$

$x_{D'} = x_{n+2}$ $\quad y_{D'} = y_{n+2}$

The above mappings may develop indefinitely.[9] All these potentially infinite counterfactual cases are included in Type 3.[10] Further, we can say that this type of knowledge *is generated by* an inherent configuration of the world.[11]

For instance, Tegmark (2008) argues that "our universe could *be simulated by* quite a short computer program" (p. 18) (emphasis added). Based on the idea that "our universe *is* mathematics" (p. 1), he maintains that its realization only requires storage of "all the 4-dimensional data" (p. 18). Specifically, the 4-dimensional data include all the "[encoded] properties of the mathematical structure that is our universe" (p.18). If his argument is true, we would not need D knowledge (consisting of linguistic descriptions) to simulate a universe. Rather, D knowledge would be a byproduct of the mathematical structure.

2. The Vantage Point Problem

This section explores how the VP problem can be addressed through the use of D knowledge. Let us first look into two cases where this problem has not been appropriately addressed.

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[8] (x_{n+1}), (x_{n+2}), (y_{n+1}), and (y_{n+2}) are enclosed in their parentheses to highlight that they are unique counterfactual cases associated with D knowledge.

[9] Similarly, Sterelny (1990) notes that the "ability to think about the world as it is and as it might be, to think indefinitely many and indefinitely complex thoughts" may be a "necessary condition on having intentional states" (p. 29).

[10] When considering the infinite counterfactual cases, we see that no predefined type of D knowledge (i.e., Type 1) can simulate a world genuinely resembling the original world.

[11] This configuration may be beyond our reach as demonstrated through the Kantian antinomies (Kant, 1998, pp. 470-495).

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(1) Tegmark[12] (2008) asserts that "[t]here exists an external physical reality completely independent of us humans" and that "[o]ur external physical reality is a mathematical structure (p. 1). However, despite presenting convincing arguments, he still fails to address the VP problem. In footnote 3 on p. 5, he notices the problem of how a mathematician should derive, through (i) a mathematical structure alone, (ii) an empirical domain and (iii) "a set of correspondence rules which link parts of the mathematical structure with parts of the empirical domain." He hints at a possibility of achieving this by introducing a "car" analogy. Specifically, "given an abstract but complete description of a car (essentially the locations of its atoms)," "someone" that wants "practical use of this car" might "be able to figure out how the car works and write her own manual" by "carefully examining the original description." Put simply:

"Someone" → Mathematician
Car → Universe
Description of the car → Mathematical structure of the universe
Practical use of the car → Empirical domain of the universe
Knowledge of how the car works → Correspondence rules linking the mathematical structure with the empirical domain

While the mathematician is a part of the universe, that "someone" is not a part of the car. Therefore, the car analogy fails. The analogy would have been more accurate if the "someone" had a complete description of *both* herself and the car.[13] Tegmark's case is one instance illustrating a common mistake made by scientists as well as philosophers – namely, the confusion that arises from the VP problem.

(2) Dennett (2003) notes that "confusion [over determinism] arises when one tries to maintain two perspectives on the universe at once" (p. 93). One perspective is the "God's eye" perspective, and the other is the "engaged perspective of an agent within the universe." His description of the former perspective coincides with the Parmenidean view of the universe. He adds that "[f]rom the timeless God's-eye perspective nothing ever changes," as "the whole history of the universe is laid out 'at once.'" Dennett appears to give equal weight to both perspectives but cautions against assuming them at the same time. He does not provide a philosophical scheme where both perspectives can coexist. Specifically, he does not reveal how it is possible for the agent within the universe to assert determinism from a provisional God's-eye perspective.

The above two cases illustrate the ongoing struggle of scientists and philosophers to reconcile the discrepancy between a human agent asserting determinism and the universe. It is believed that this paper has resolved this issue to a certain extent. Unlike machines, humans are capable of emergently processing even "otherworldly but comprehensible" knowledge (i.e., D knowledge).[14] Since D knowledge is an entirety of verbal descriptions encompassing the universe, it is inherently inaccessible. Therefore, it can be considered to exist in an "otherworldly" realm. Nevertheless, it is deemed "comprehensible" from a human agent's perspective. This is evidenced by its capacity to provide a non-trivial response to it. This suggests that the human agent could potentially view the universe from a vantage point situated in a realm beyond the universe. However, for machine intelligence, D knowledge is neither "otherworldly" nor "comprehensible." In fact, there is no type of information at all that can be genuinely comprehended by machines. This is illustrated through the triviality of a response it might generate with regard to D knowledge in Section 2.1.

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[12] Tegmark is a determinist. He supports Einstein's dictum that "God does not play dice" (p. 10).

[13] Even if she had all the information regarding her mind/body as well as the car from a materialistic viewpoint, she might still fail to explain how her bodily composition gives rise to consciousness. Even a complete mathematical formulation of the neural correlates of consciousness may not fully elucidate its nature. Such an "epistemological limitation" may be a necessary condition for consciousness, as "the transcendental standpoint is in a sense irreducible, for one cannot look 'objectively' at oneself" (Žižek, 2012, p. 239).

[14] Simply speaking, we could show a non-trivial response to the knowledge of our future if we were to receive it.

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Further, the same level of triviality could be said to be exhibited by a hypothetical agent whose declaration of determinism should be assumed to be qualitatively inseparable, in a pancomputational[15] sense, from all the other events of the world. Specifically, in a world without any distinction between the two (i.e., espousal of determinism and the other physical phenomena), the agent (possibly a machine one) would have no motivation to assume a higher "vantage point." Roughly speaking, in such a world, no scholarly debate on determinism would have any meaning. If our universe is to be depicted differently from that world, a determinist's declaration of determinism should by necessity stand out by acquiring metaphysical significance. This is achieved by granting a privileged status to the determinist regardless of the truthfulness of her argument. She can be granted such a status because of her inherent capacity to comprehend D knowledge.

Finally, note that this peculiar dynamic between the determinist's philosophical mind and the universe can be best described through a dialectic circle in Maybee (2020, Section 1). Before the determinist decides on the determinacy of the events of the universe, these events must first be placed within her scope of thought. In other words, they should become the objects of her speculative investigation. Then, as she declares determinism, she realizes that the entire process (from her investigation up to the declaration) is also part of the deterministic scenario. Subsequently, she concludes from a transient God's-eye perspective that every time she declares determinism, this would have also been predetermined.

The above process continues,[16] thereby generating the dialectic circle.[17] It expands as the determinist's mind and the objects/events of the universe continue to encircle each other in an alternating manner. As this dialectic circle continues to grow, "the opposition or antithesis between the subjective and objective disappears" (Maybee, 2020, Section 3). As it matures into a stage of Absolute Spirit, the philosophical mind targeting itself through a deterministic outlook on the universe would achieve total identity with itself.

Conclusions

Deterministic knowledge:

- Type 1
  - Dictates the world.
  - Includes finite conditional cases.
- Type 2
  - Reflects the world.
  - Includes no counterfactual cases.
- Type 3
  - Is generated by the world.
  - Includes infinite counterfactual cases.

Based on the above scheme, this paper has sought to distinguish human from machine intelligence by allowing for determinism. Additionally, it addressed how to justify the omniscient perspective required for a determinist to assert determinism despite being placed within the universe.

However, this paper may face several challenges from readers.

First, one might point out that the paper relies only on metaphysical speculation and lacks empirical support. However, many philosophical ideas are inherently speculative, aiming to look beyond the realm of empirical science. Despite their purely speculative nature, they can meaningfully

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[15] According to pancomputationalism, "everything is a computing system" and "minds are computing systems too" (Piccinini, 2007, p. 95).

[16] This type of infinite progression is believed to be a central feature of philosophy, as seen in Kripke's "Kripkenstein," Derrida's "différance," Sheffer's logocentric predicament, the liar paradox, Lao Tzu's Taoism, and so on.

[17] This type of circle provides a more nuanced illustration than the image of "eye" of the "metaphysical subject" encapsulated within "the field of sight" in Wittgenstein (1922, p. 75), as well as a different image that one may newly draw by placing the eye outside the field of sight.

influence the empirical world. For instance, this paper's framework can be taken as a normative model for human vs. machine intelligence. Under this model, we can consider measuring a level of enhancement in a connectionist-based AI by studying its response to a history of its replica provided as a certain kind of "D knowledge."

Second, one might argue that the VP problem is not really a problem. She may have no difficulty accepting the idea that a determinist can describe the universe from a viewpoint situated within the universe. She can conveniently appeal to the causality principle to support determinism. However, causality itself does not tell us very much about her status as an intellectual being. If she conflates herself with mindless machines in accordance with pancomputationalism, her concern for the truth of determinism becomes insignificant. Philosophical truths are dead issues to mechanical beings. What this paper has done is illustrate a subtle difference between human and machine intelligence by assuming that both adhere to causality.

Finally, one could assert that this paper's main idea totally collapses if determinism is wrong. Indeed, if the universe is indeterministic, the VP problem is no longer a problem. It naturally vanishes since indeterminism would suggest that the philosophical investigator of the universe is in the process of discovering how the universe is unfolding. But would the distinction between human and machine intelligence still hold? One way of postulating their difference could be to argue as follows in a counterfactual manner. If a human agent in the past received our knowledge of her history (which would be regarded as a form of future knowledge for her), she would generate a non-trivial response to it. However, a machine agent would not be able to.

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