Question: Can AI understand and curb the pandemic?

This is our second year struggling against one of humanity's biggest adversary yet – the Covid-19 pandemic. Amidst the loss of countless lives to the virus, the countless tears shed on the frontlines, and countless calls for more pragmatic action, many wonder if the rising development of artificial intelligence (AI) would help us forge the path to victory against this virus. However, is AI really capable of fully understanding and curbing the pandemic? Or rather, would an AI have done better than us in the face of Covid-19?

First and foremost, the term 'AI' is often misused, so to clarify we define AI as a simulation of human intelligence through machine learning based on a certain set of rules, with a goal to achieve [1]. The establishment of these two basic elements is necessary whether it be in supervised or unsupervised learning. Even for the well-known AlphaGo-Zero that exceeded its predecessors with no relevant data input, the game rules and definition of victory were necessary for it to 'learn'[2].

Returning to the context of Covid-19, for AI to influence the situation on a large scale, its involvement in government decisions is doubtlessly of paramount importance. Nevertheless, many hurdles remain in incorporating it into that level of decision making. To illustrate, we can divide the problem into three parts, the first being the epidemiological analysis and countermeasures, the second being the economic impact and actions to be taken, the third being the ethics and social issues involved. Regarding the first two, it is possible to present current and historical data in numbers or machine comprehensible patterns, therefore understanding the pandemic in this sense and predicting probable outcomes following certain actions is, in theory, completely within the capabilities of an AI. Coming to the third part, however, we arrive at a very abstract territory, one that is very human. The propaganda that may follow, the people's reaction to strict policies, and the harsh reality of working on the frontline – these are essential elements to truly understanding the pandemic, yet certainly cannot be presented as numbers.

Diving deeper into this argument, let us examine the problem through the aforementioned conditions necessary for AI to function: set rules of the 'world' and a well-defined goal. 'Rules' can be constructed either by directly declaring rigid principles, or through the input of relevant data in the hopes that the AI would discover certain inner logic on its own. The former is unrealistic, as predicting human actions and reactions require comprehension of the emotions that drives them. However, as pointed out by Frijda, multiple possible behaviours can arise following one given emotion-relevant event[3]. Since the relationship between feelings and action is not a functional mapping, establishing an adequate ruleset remains beyond our reach. As for the latter, namely supervised training with existing datasets, we would hypothetically need to input the entire history of a country to simulate the development of societal beliefs, political influence, and public emotions in a way that can help the AI weigh decisions. Besides the difficulties in establishing 'rules', further problems arise in the clarification of a goal. Even if values can be assigned to freedom, life, rights, and other abstract factors, how do we set a priority, when achieving one can threaten another? This is again undeterminable as our priorities are often not clear cut: the importance of each varies across cultures and individuals, and even humans fail to decide which holds the greatest weight.

Following this thread of logic, it is clear that AI will be incapable of grasping the rather contradictory human nature despite its excellence in data analysis. Some may argue that this quality is precisely what makes AI an unbiased observer that can provide us with truly objective perspectives of the situation. However, what if

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[1] Patrick Winston, the Ford professor of artificial intelligence and computer science at MIT, defines AI as algorithms enabled by constraints, exposed by representations that support models targeted at loops that tie thinking, perception and action together.
https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-1-introduction-and-scope/

[2] AlphaGo Zero was not given any knowledge on the game other than its basic rules, but managed to surpass AlphaGo Lee in 3 days and AlphaGo Master in 21.
https://www.nature.com/articles/nature24270.epdf?author_access_token=VJXbVjaSHxFoctQQ4p2k4tRgN0jAjWel9jnR3ZoTv0PVW4gB86EEpGqTRDtpIz-2rmo8-KG06gqVobU5NSCFeHILHcVFUeMsbvwS-lxjqQGg98faovwjxeTUgZAUMnRQ

[3] Frijda points out that many different behaviors can manifest subsequent to a given emotion-relevant event.
https://www.frontiersin.org/articles/10.3389/fpsyg.2011.00346/fullc

the problem we are facing lies not in the deficiency of knowledge or understanding, but rather, in human nature? There will always be some who would go against rules and regulations, there will always be some who refuse to listen to the science, there will always be some who put profit before lives. Is this because they do not know of the consequences though? Rarely is this the case. Furthermore, countries like New Zealand, Taiwan, Singapore have successfully brought the virus under control with our current technology and knowledge of the pandemic. It is obvious then, that the struggle with implementing effective policies stem from a thoroughly human problem – one that cannot be solved even by the most futuristic AI, even beyond the Turing point[4]. Rather, it is one that should be addressed through communication, empathy and unity.

That said, we must remember many aspects of the issue can benefit from this technology. For instance, utilizing AI to help monitor and care for patients can minimize the workload of frontline medical workers. The use of deep learning could help study and perhaps even predict the mutation of the virus[5]. Not to mention the endless possibilities of using AI in retail and other services to reduce the need of essential workers risking their lives – identifying those violating Covid regulations, handling basic customer interactions like locating items, recommending products and so forth.

In short, fully understanding the pandemic and the problems surrounding it is undoubtedly beyond the ability of AI. Therefore, it is quite impossible for AI, on its own, to curb the entire issue. In fact, the solutions an AI might come up with may very well be less satisfactory than our current efforts, due to the lack of consideration for the human aspects of this crisis. Admittedly, the infinite possible applications of AI will certainly help in curbing the pandemic and accelerating our eventual recovery. Ultimately though, our persisting struggle against this adversary is the result of human action, and inaction. The answer to our prayers is not an ultimate AI, for the power we hold in our hands is more than sufficient, and it is up to us to realize it – the solution might be as simple as that.

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[4] "The critical point – the Turing point – will come when machine learning overtakes natural variety" - The Master Algorithm by Pedro Domingos, Chapter 10, under Evolution, part 2. This refers to a point of time when the bottleneck of natural learning – the speed of human development, will be removed. Even with a strong AI with such capabilities however, it would not be the panacea to the ignorance, foolishness and arrogance that is, at a fundamental level, the root of all human conflicts.

[5] A machine learning algorithm for natural language processing is being used to predict mutations that may lead to viral escape, with three unsupervised language models for influenza A hemagglutinin, HIV-1 envelope glycoprotein and SARS-CoV-2 spike glycoprotein. This study is important because viral escape can impede effectiveness of a vaccine. https://science.sciencemag.org/content/371/6526/284