**Why the Artificial intelligence act hardly alleviates concerns**

**Hint: Research & Development is explicitly exempted from the AI act**

Proud and happy faces within the EU as [a preliminary agreement](https://www.consilium.europa.eu/en/press/press-releases/2023/12/09/artificial-intelligence-act-council-and-parliament-strike-a-deal-on-the-first-worldwide-rules-for-ai/) has been reached on the regulation of AI within the European Union. Under the banner of the 'AI act,' the agreement focuses particularly on European values related to democracy, the rule of law, privacy, and human rights. However, for now, the AI act mainly concerns content on social media and unhindered access through the largest digital (internet)platforms.

Undoubtedly a milestone for policymakers and bureaucrats. However, the AI act seems to primarily address concerns related to influences of social media and accessible internet. Regulation of social media, unhindered internet access, and the integration of AI within them are legitimate concerns, but one might question aloud whether the AI act adds anything substantial to the recently introduced Digital Services Act (DSA) and Digital Markets Act (DMA)?

Research & Development (research & innovation) is, to my increasing amazement, however explicitly exempted from the AI act. While this is precisely an area where the application of AI could potentially spiral out of control in the near future. I want to try to make this plausible based on potential developments within bio-engineering.

**Do AI and bio-engineering contribute to the Fermi paradox?**

As often seems to be the case, policymakers appear barely capable of looking beyond the immediately apparent societal developments. This is despite the fact that the threats and dangers posed by AI could potentially manifest on an unimaginably larger scale than mundane issues surrounding social media and unrestricted internet access. In this way, they might even serve as a potential explanation for the Fermi paradox.

The Fermi paradox is the paradox in which the high statistical probability of the existence of intelligent extraterrestrial life starkly contrasts with the lack of evidence for it ([Source: Wikipedia](https://en.wikipedia.org/wiki/Fermi_paradox)). One potential explanation for the Fermi paradox is that all intelligent life eventually self-destructs due to its own actions.

In that light, we urgently need to discuss bio-engineering: the application of complex knowledge related to the origin and sustenance of all life on Earth. Bio-engineering actively involves itself with the intricate molecular machinery that enables all forms of life: DNA, RNA, amino acids, and proteins.

Agro-engineering, for example, is a part of this field, focusing particularly on pesticides, resistance, and genetic manipulation within agriculture and animal husbandry. Research into medicinal applications, resistance, and genetic manipulation within bacteriology, mycology (fungi), virology, and botany (plants) is naturally also integral to bio-engineering.

**The intrinsic building blocks of life explained**

I will try to guide you through my argument without requiring you to know all the details regarding the molecular machinery of life. In essence, the machinery of life can be simplified to those simple plastic shapes that children are supposed to push through the right holes. Yes, really, that's how simple it is in essence.

DNA, RNA, amino acids, and proteins actually operate on a molecular scale in virtually the same way. They literally serve as chemical and physical templates for each other's construction and functions. Due to their complex spatial structures and the way their chains fold, they catalyze other compounds and structures. Over the course of evolution, a complex system of encoding genetic information (DNA and RNA) and building molecular cell structures (RNA, amino acids, and proteins) has emerged from these molecular templates. This allows the entire molecular machinery to endlessly replicate itself. This forms the basis of all life as we know it.

Bacteria, viruses, fungi, plants, and multicellular animals interact with each other in unimaginable ways. Although they may appear as entirely separate worlds at first glance, there are still gene exchanges between different life forms on an evolutionary scale. This phenomenon is referred to as horizontal gene transfer. The consequence is that all life forms on Earth fundamentally still use more or less the same coding of genetic information and construction of protein structures. While there are certainly differences between species, the underlying mechanisms through which organisms manifest themselves are essentially similar or barely different.

**The inevitable deployment of AI leads to an accumulation of knowledge**

Meanwhile, a substantial amount of scientific knowledge has been amassed. Knowledge about how genetic information encodes for structural information. Knowledge about how structural information ultimately converts into fatty acids, proteins, enzymes, and organisms. Organisms, namely, are largely composed of fatty acids, proteins, and enzymes. The greatest challenge here is that the intrinsic functionality (i.e., the template function) of complex proteins and their enzymes is particularly difficult to map. The intrinsic functionality of as-yet-unknown complex proteins and their enzymes is possibly even harder to predict. This is closely tied to the spatial structures of proteins and the as-yet-unpredictable ways in which their chains can fold.

Applications of AI are likely to bring about a true revolution in this domain. With the help of AI systems, researchers can proceed much more targetedly when it comes to unraveling the intrinsic functionality of complex proteins and their enzymes. Until at some point, AI systems will also be capable of predicting the intrinsic functionality of as-yet-unknown complex proteins and their enzymes.

Of course, complex proteins also adhere to certain universal chemical and physical rules. Rules that AI should excel at unraveling. Thus far, conventional science has only made a few scratches on the formidable amount of implicitly contained knowledge within the molecular machinery of our cells.

**Taking a threshold for AI accuracy into account within bio-engineering**

The moment AI is deemed capable of predicting the intrinsic functionality (i.e., the template function) of unknown complex proteins and enzymes with more than a few percent probability is likely also the moment when this technology could become a potential threat to humanity. Imagine that with 5% accuracy, AI is already correct in 1 out of 20 situations. Furthermore, the AI system will probably develop exponentially from that point onward.

With sufficient predictive power regarding the molecular machinery of life, it becomes possible to eventually develop (i.e., to programm) bacteria, viruses, fungi, and enzymes that can either heal or, conversely, inflict serious damage to life. With the ultimate knowledge of the coding of genetic and structural information, life in all its aspects can be controlled or, on the contrary, be destroyed. The primary safeguard at this moment is that no one has a complete overview or understanding of all the genetic and structural information at the cellular level that makes organisms living entities. Full knowledge of the molecular machinery of life could turn out to be the ultimate 'Pandora's Box.'

**The ultimate 'Pandora's Box' is slowly coming into view**

Scientists have a general understanding of how organisms function at the cellular level but lack the detailed genetic and structural connections among the seemingly endless array of interrelated factors. To unravel these, one would need to perform literally endless calculations, while AI is likely to offer much more in the short term. This is based on the much more efficient neural network approach characteristic of AI, as opposed to the straightforward reasoning based on strict physical formulas (mathematics). AI, relying on discrepancies, accurate feedback, and endless iterations, is likely capable of elucidating previously unformulated genetic and structural connections at a staggering speed and high accuracy. Whether it's within this decade or at least the next, it seems increasingly feasible.

You can use this knowledge for the greater good, à la Star Trek, by effectively treating all diseases and hereditary conditions. Alternatively, you can misuse this knowledge by (re)programming bacteria, viruses, fungi, and enzymes that can make species, populations, races, genders, or individuals - in specific subregions or not - severely ill and partially or even completely eradicate them.

For instance, you could program bacteria, viruses, fungi, and enzymes that specifically cause harm to carriers of certain variants or alleles of a gene. In theory, this could be directed towards a cross-section of residents from specific geographic, demographic, or ethnic regions. How society-threatening do you want it to be on our overpopulated and volatile earth?

**Genetically programming bacteria, viruses, fungi, and enzymes**

I presume you don't need an overactive imagination to envision what could happen if such knowledge and technology fall into the wrong hands. On our overpopulated and volatile earth, any life-threatening technology that can be deployed relatively anonymously poses an immense security risk. I want to emphasize, however, that I am solely referring to AI systems coordinated and managed by humans. By no means am I discussing non-existent autonomous AI systems.

The likely primary reason that nuclear weapons haven't led to our total destruction so far is that you cannot deploy them anonymously. The concept of mutual destruction is what has thus far deterred us from using nuclear weapons on a global scale. However, what would prevent someone from spreading a targeted infection if they can vaccinate themselves, their loved ones, their ethnic group, or their fellow citizens effectively, or otherwise shield them from infection?

With the awe-inspiring and alarming prospect of genetically programming bacteria, viruses, fungi, and enzymes, one could, in principle, operate relatively anonymously. Anonymous biological warfare and the commission of unimaginable acts of terror could eventually become a reality due to such deployment of AI. This might be the strongest argument for the proposition that intelligent life, in accordance with the Fermi paradox, ultimately self-destructs.

**Can the AI act prevent such a potential disaster scenario?**

The AI act should, therefore, explicitly include bio-engineering as a focus area. A panel of prominent bio-engineering scientists within AI should continuously monitor whether the deployment of AI within bio-engineering in the near future might exceed certain safety thresholds. If so, safeguards should be promptly established to prevent the explicit and unsupervised application of such technologies.

What we can do against dubious regimes that will eventually acquire such technology is, however, much more complex. By that time, bio-engineering can undoubtedly be applied for both positive and negative purposes. Therefore, taking early action at the EU level to develop generic forms of antibiotics, antifungals, antiviral agents, and universal vaccines seems to be the only way to stay ahead of the Fermi paradox. Otherwise, it might be over for humanity as you and I know it at some point!

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