

On the Importance of Being Earnest

The quest to understand, mimic, and even replicate consciousness has obsessed mankind from Thales of Miletus, with the principal of panpsychism, to more contemporary logicians, such as Turing, and his eponymous test. With the advancement of computational technologies, the humble automata which amused circus-goers from the early Renaissance with dancing, music, and other dynamic performances, have evolved into highly capable machines scratching the surface of sentience. The best popularised example of this advancement was demonstrated when DeepBlue, a chess-playing algorithm bested the world champion, Gary Kasparov, in 1997. This defining moment signified the beginning of the replication and the superseding of human intelligence. But compared to the high hopes for what AI might accomplish, such achievements seem trivial, so what lies in store? How might such technology benefit humanity, and what role should naturalists play in its development? To consider these questions it is necessary to consider where the lives of people around the world need improving: The United Nations created, in 2015, a list of 17 Sustainable Development Goals (SDGs), to be achieved by 2030, which fall largely into three categories, social, health, and environmental advancements. Where our current society is deficient will potentially be the area which is most affected by the radical changes which an advancement in AI technologies will bring. But how exactly will these changes occur, and will scientists simply play the role of inventors, and creators of new technologies, or might they exceed these traditional roles, and become stewards of our future?

Social issues are an area which often do not receive consideration with regard to AI, but they are an area which have the potential to benefit the most. Within the broad subcategory of societal aims, devised by the UN, the SDGs further divide into aims to implement equality, peace, and national and individual economic improvements. The greatest asset that AI might provide in all these areas is through extending the reach of the state, by improving communication and management of its citizens. Developing nations with large populations have historically struggled with providing stable governance: the scars of colonialism, the curse of natural resources, and large disparities in wealth throughout such nations have too often led to intractable conflict. More recently the advent of computing has led to increasing centralisation of power, with an additional technological disparity between citizens leading to a deeper chasm developing between urban and rural life. Such divisions reduce the integration of peoples, and can often prove to disrupt fair governance over the totality of a nation. The ability of AI to rapidly gather information whether through virtual or physical means, and ideally to interpret that information, would extend the hand of governance, and would serve to facilitate the implementation of law and order with the power of information. This idea is illustrated best through better management of resources: AI can handle far larger datasets than any human alternative, allowing for more detailed analysis of the state of a nation, allowing better distribution and use of limited resources by optimisation of how and where they might be used. One clear example which may benefit is the education sector: distribution of teaching resources to students demonstrating potential regardless of background could help eliminate inequality in this area, and lead to a future reduction in wealth inequality. AI could potentially identify such students and provide the optimal teaching resources to aid them; potentially resulting in personalised education. One possible

consequence of such power derived from knowledge of one's citizens is the potential for a dictatorial, totalitarian state: Orwellian images are easily conjured. However, the advancement of technologies should not be suppressed, but instead responsibly used, to prevent the compromise of essential liberties. This is where the role of natural scientists is ill-defined, and where their role becomes increasingly important. The advent of the internet has led to an unprecedented democratisation of information, and given a platform to anyone to whom people will listen. This has inevitably led to the politicisation of science and technology. Therefore, scientists themselves must undergo a similar politicisation and take an active role in any political dialogue surrounding their science. Knowledge is the best cure to ignorance, and responsibly applied knowledge is the key to maintaining progressive, peaceful, and uninhibited democracy.

Health and welfare is a more familiar area in which AI has the potential to revolutionise and ameliorate living conditions. At its peak AI offers the ideal of personalised medicine: treatment that is tailored to each individual. Decisions involved in medicine often involve considerations of risk and benefit on a gross scale, aiding the majority, but failing the minority. With the advent of AI, treatment might no longer resemble sweeping brush strokes, but reflect finer details, based on each patient's genetic makeup. The technology required for such progress would require a detailed understanding of genetic information, and the relevant interaction with suggested treatment. To achieve this would require huge amounts of DNA sequencing, and data processing; a task readily achievable by automation. The role of naturalists in achieving this is to reduce numerous drug interactions, cellular activity, and genetic information into code: to convert all this information into calculable data is the goal. Machine learning is the tool of choice for such an undertaking. This complex deconstruction of the human body demands the unification and co-operation of many different fields of science. Increasing knowledge and specialisation of naturalists has led to fractured communications between fields; such an interdisciplinary task demands an interdisciplinary team of scientists to guide its creation. The role of naturalists, particularly with regards to healthcare, is to unite and communicate, to circumvent commercialisation through the form of strict patenting which might prevent the dissemination of life-saving technologies, and instead to create and support institutions which unite and progress many different scientific fields behind a common goal.

The third category of SDGs, the environment, contains aims encompassing sustainable development to energy resources, but it may at first appear somewhat obscure how AI might impact this area. The primary contribution of AI to the maintenance of our planet's environment is perhaps not what it can physically contribute, but how it might limit ourselves. Waste, and mismanaged resources are highly detrimental to the Earth's ecosystem, and reduce the efficiency of any progress. The minimisation of waste, and streamlining of growth is therefore central to any environmental development which might benefit humanity. Artificial intelligence gives the possibility of better predicting demand, and preventing oversupply through careful consideration of fluctuating variables, and identification of systematic patterns. Feats of data analysis thought impossible might soon become mundane through machine learning, allowing for a far better understanding of how the delicate balance of our planet might be maintained, whilst not compromising human innovation and progress.

Through the use of deep learning, the impacts of short-term changes to the environment can be better understood. Following extreme weather events, for example, the reduced number of trees in a forest can be analysed and the effect on the CO₂ concentration predicted; a relevant response to the local ecosystem might be considered. Similarly, better predictions of weather patterns could allow the agricultural industry to optimise crop yields, by using specific pesticides or other measures for plant maintenance depending on conditions. The role of naturalists with regard to this area of development is therefore to act as stewards of the planet, and to enact ethical and sustainable development directives. The planetary impact of research and technology must be considered, and the consequences understood. Scientists must hold the responsibility that ethical development precedes progress for the sake of progress.

Artificial intelligence, and the development of autonomous, logical, computing systems, offer the potential to resolve some of the greatest issues of our time. From resolving social issues, such as war and inequality, to better managing the environment, for example improving food production and efficiency, AI could change the world significantly for the better. The primary role of natural scientists in this valiant effort is therefore to guide this technology. Any new technology has the ability to further divide, whether along lines of wealth or power: AI will have huge consequences: voter targeting in elections is one such area already seen with firms such as Cambridge Analytica using data gathering as a political weapon. AI also has the potential to generate huge wealth through commercialisation, or create devastating military weapons, so it is therefore the role of natural scientists to provide, not only the framework for its development, but foremost its ethical development. This will require the politicisation of scientists to reflect the growing trend in the politicisation of science, the unification of scientists to foster communication, and development in the areas which most need it, and the requirement that ethical research and development is prioritised. The role of the naturalist has never been more important, and required such responsibility: the power which AI will bring to those who wield it demands an equal measure of responsibility. It is paramount that natural scientists embrace the role of stewards of AI, to ensure the safeguarding of our future.

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