Could AI replace Human Scientists?

Since the beginning of the 'Technological Age' in the late 20th century, machines and ground-breaking technologies have been developed, refined and integrated into our lives. Technology has significantly improved our quality of life over 50 years, but we will soon enter the next phase of this Technological Age - Automation. By 2030, it's suggested that 800 million (roughly 16%) of jobs worldwide would be lost due to Automation. The majority of the jobs lost would be in the primary and secondary sectors of employment, however, the employees in the tertiary and quaternary sectors – the majority of whom pursue various careers in STEM – will face a new threat: Artificial Intelligence.

Artificial Intelligence occurs in machines which have been developed to work and react to certain situations like a human. This means AI would be able to: recognise speech, accurately simulate models, detect patterns, efficiently utilize previous knowledge to unfamiliar situations, learn from mistakes, and problem solve. Currently, the AI we have are 'Weak' or 'Narrow' AI meaning they are less intelligent and well-rounded than humans, typically having a very narrow or niche set of skills. While the introduction of AI in Science is inevitable, it will be more beneficial in some areas of Science.

In order to assess the impact that AI will have in Science we need to divide STEM careers into two groups. The first group includes jobs which involve the application of science on a social level. Scientists in this specific area would have more contact with the public or other living organisms. These types of jobs include Biological Sciences, Social Sciences or Medical Science.

The second group include jobs which primarily involve research, application of pure scientific theories and innovation. These jobs include Engineering and Research and Development. By considering the impacts of AI on both groups, we can create a more precise idea of how AI will shape the future of Science.

In Science careers which heavily impact the public, AI can be very beneficial albeit with significant drawbacks. For example, in Medical Science AI could be utilized in various ways to improve patient care. AI can help in patient diagnosis and improve patients' understanding of their diagnosis. AI can be given data or results from blood tests or various other diagnostic procedures and analyse this data and come up with a list of possible diagnoses and their relative probability of being the cause of the patient's symptoms. This role perfectly suits AI due to their nature and the way in which they function. AI ultimately work like regular machines: an input — data — is put into a machine which then processes the input using various algorithms — a set of rules for various procedures — and then the machine produces an output — a diagnosis. The benefit of AI in this regard is its ability to learn from previous mistakes and the work of other humans. This is known as 'Machine Learning.' This can be through Unsupervised Learning, where the AI changes its algorithms based on its own conclusions and experiences or through Supervised Learning (like Backpropagation) where AI detect differences between their output and the desired output and adjust their calculations to achieve the same outcome. Moreover, AI can be used to accurately model or simulate the diagnosis which would be useful to patients. It provides a clear, visual model of what is happening in their body which

will allow families to make more informed decisions. This shows the application of AI in Science that deals with other living organisms could be extremely beneficial.

However, AI has a critical flaw: it is incapable of fully interpreting and understanding human emotion. Arguably, this may be beneficial - AI will be able to make the most logical and theoretically beneficial decisions without being swayed by emotions. However, in any science career in which people are involved, AI will never be able to perform the tasks of human scientists. This is because AI cannot fully perceive and therefore interpret the ways in which humans communicate. Communication has always been complicated and there are many factors and ways of expressing ourselves like: verbal communication; non-verbal communication; emotional awareness; body language; situational context; intonation and personal idiolects.

As humans we grew up developing our communication skills and consequently have become well-trained communicators and active listeners. However, AI overlook many of these essential clues and may miss vital information or may even be misled by the humans they interact with. This point is again illustrated in Medical Sciences. If an AI were to completely replace humans and interact with patients, they wouldn't be capable of acquiring enough information for a proper diagnosis. An AI may miss key signals a patient displays: overlooking the body language showing a patient is hurt; considering a mentally ill person recovered if they can't detect the sorrowful tone in their voice or failing to pick up on lies that patients tell which would have provided further insight into their condition. This shows that while AI can perform many of the tasks, to an even more precise degree, AI alone cannot enhance this sector of science.

AI can prove far more useful in research-heavy areas of science. As previously discussed, AI run much like machines – with an input, series of algorithms and an output – but on a much more complicated level. This allows them to be far more efficient than human researchers. For example, in chemical research, human researchers can program a set of rules (such as the rules
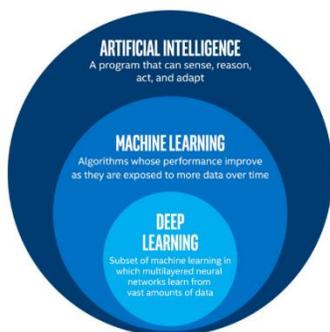
for naming chemicals or the rules for predicting how substances react) in the AI along with the exceptions to these rules. Subsequently, the AI produces predictions of its own, simulates reactions and predicts their outcomes and even change its own algorithm concurring with any anomalies or recent findings. AI can perform these complex and time-consuming tasks in a matter of seconds, and this allows the whole process of research and development to be sped up significantly.

Just as before, AI has limitations. Developing AI and allowing it to learn requires extensive knowledge of the subject and with few exceptions or occurrences that cannot be explained. While this is valid for chemical and biological sciences, certain areas of physics and relatively unfamiliar areas do not have enough logic or data for AI to work from. AI work based off previous information and their outputs are based on patterns-spotting and logic. However, with recent research and breakthroughs, scientists must think outside of the box, come up with new ideas and innovate - all of which an AI cannot do unless taught to do so by humans. In addition, in order to maintain and confirm AI's findings, you will always need someone of higher intelligence to comprehend or correct the AI. While this is seemingly straightforward to do, an AI's algorithm (often referred to as 'Blackbox') is extremely complicated and can be extremely hard for humans to follow. Therefore, human researchers would still be necessary for breakthroughs and research to continue.

Ultimately, we must all accept a technological age is upon us. Automation and the introduction of AI into science are already taking place but they could never replace human scientists. AI are extremely sophisticated and are able to perform many tasks more efficiently and to a better standard than most human scientists, but AI alone cannot lead us into the future. When AI may struggle to find a logical solution to an unfamiliar problem, it would be up to humans to make that breakthrough. Where AI find it hard to interpret other living organisms, we can do it instead. Where AI lack, humans excel and the key to greater scientific development in the future is creating AI to *aid* us. Not *replace* us.