Artificial Intelligence (AI) Revolution in Research: Transforming Data into Discovery

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Introduction

Artificial Intelligence (AI) has emerged as a transformative force in the dominion of research, reshaping the landscape across diverse fields. AI refers to the simulation of human intelligence by a system or a machine. It implies a vast term that encompasses machine learning and deep learning.[1] AI is based on 'intelligence' which refers to cognitive capacity of an individual to plan learn and interpret. Secondly 'techne', a more wide-ranging ability to solve problems using technological objects. Although the intelligence remains the same, measured by intelligence quotient (IQ), it is the change in techne that leads to amplification of intelligence.[2]

Use of AI in healthcare and biomedical sciences is based on development of algorithms. This requires a sound knowledge of programming languages, advanced mathematics and statistics. In healthcare AI cannot be used fairly if these skills are lacking. However visual and no code programming tools are available now which simplify the process. Free data science tools make it easy to use for clinicians, researchers and health journalists.[3]

It is playing a pivotal role in augmenting the capabilities of researchers, offering unprecedented opportunities and insights. One of the primary contributions of AI in research lies in data analysis and interpretation. Machine learning algorithms excel in identifying patterns, correlations, and trends within vast datasets, allowing researchers to derive meaningful conclusions and hypotheses1. In the field of medical research, AI contributes to diagnostic accuracy, drug discovery, and personalized medicine. Generative AI methods can create designs, such as small-molecule drugs and proteins, by analyzing diverse data modalities, including images and sequences.[4]

They can analyze genetic data, predict disease outcomes, and recommend tailored treatment plans. Additionally, AI's ability to process and analyze images has proven invaluable in fields such as radiology and pathology. AI has the potential to dramatically affect nearly all aspects of oncology-from enhancing diagnosis to personalizing treatment and discovering novel anticancer drugs.[5] As we navigate this era of technological innovation, the synergy between AI and research holds immense promise for expanding the boundaries of knowledge and addressing complex challenges across disciplines. In healthcare, AI is even being used to enhance empathetic awareness, communication skills, health coaching; therapeutic interventions, clinical knowledge and healthcare quality assessment.[6]

Despite these advancements, the biggest challenge is regulation of data. Many countries have the regulatory bodies like the European Union has General Data Protection Regulation (GDPR). The AI systems need to be fed with diverse, non-discriminating and fair data. Accountability is one major issue. Keeping the outcomes abreast with social and ethical norms another.[7] Regulatory issues raised by Ganapathy include feeding accurate data initially. Maintaining adequate privacy policy especially protecting disabled and mentally challenged. Although a regulatory body by name of Digital Information In Healthcare Security Act (DISHA) exists, what would be the legal and ethical aspects if a physician decides to nullify the AI decision?[8]

Ethical considerations and the responsible deployment of AI in research are critical. Striking a balance between the potential benefits and ethical implications ensures that AI continues to enhance research endeavors while respecting privacy, bias mitigation, and societal well-being. There is need for curricula development and healthcare professional education, implementation of AI applications to

enhance health and wellbeing of the healthcare workforce. The use of AI reporting guidelines that address potential sources of bias specific to studies involving AI interventions has the potential to improve the quality of AI studies.[9] This will help scientists throughout the scientific process and the central issues that remain despite such advances. Both developers and users of AI tools need a better understanding of such approaches as challenges posed by poor data quality and stewardship remain. Concurrently the question that needs to be answered is, the continuous exposure of healthcare professionals to new technology, upon which they depend for diagnosis and decision making, is it going to diminish the skills of the healthcare workers?[10]

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