

ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN ICT AND SUSTAINABLE DEVELOPMENT

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Abstract

In recent years, modern technology introduced Artificial Intelligence (AI) and rapid advancement in AI has been implemented in several fields. Multiple sectors are accepting AI techniques including businesses, corporates, and governments. AI is enhanced machine intelligence increasing the exposure to deep learning in robotics. It has enabled capabilities of machines and robotics that extend the economic growth and efficacy of machines as compared to humans. Various beneficial practices in the AI revolution have challenged sustainability. On the other hand, information and communication technology (ICT) using cloud-based tools are enhanced to access valuable data through AI. The research is purposed for studying the concept of AI and its use in ICT. It includes enhancements in the manufacturing, assembling, and commercial industries. The concept of AI is implemented in robots to deliver reliable information and assemble products with the use of software technology. Since computer programs are a crucial part of AI that access information through computing, software creation, and data transmission. The paper focuses on AI technologies with machine learning, natural language generation, speech recognition techniques, and biometric identification in robotics and their impact on sustainability. Emerging AI technology has a greater impact on global sustainability since AI has replaced humans with machines due to the benefits of time, accuracy, and efficiency. The study explains the significance of AI in ICT gaining popularity due to economic and productive growth in various sectors like healthcare, automotive, etc. The researcher considers the negative impact of AI on social, economic, and environmental changes with increasing performance of organizations.

Keywords: *Artificial Intelligence, role of AI, machine learning, ICT, sustainable development, impact of AI*

Role Of Artificial Intelligence (Ai) In ICT And Sustainable Development

Artificial intelligence (AI) is transforming a growing number of industries. For example, AI is projected to have a short- and long-term impact on global productivity, equality [1] and environmental consequences [2], and a variety of other domains. The reported possible consequences of AI on sustainable development are both good [3] and negative [4].

AI, including machine learning, language processing, and deep learning, is set to significantly disrupt the information and communications technology (ICT) sectors by boosting the effectiveness of apps, communications, content, and digital commerce. Because interfaces and efficiency permit previously inexplicable involvement, AI will also encourage new business models and open up entirely new business options. As ICT and digitisation support a wide range of business operations, spanning supply chains, sales and marketing, product, service, and support models, many additional vertical sectors will be altered. [5] Artificial intelligence (AI) can help support and improve the accessibility of information and communication technologies (ICTs). In a progressively media-heavy world where authors and developers don't appreciate the necessity of alternate formats that meet user preferences, more solutions to automate accessibility activities are needed

In the era of Industry 4.0, AI has risen to prominence, with the goal of transforming IT infrastructure into intelligent systems that restore the IT industry's significance. Considering that information technology involves computers, software, and data transfer networks, AI can play a critical role in this domain. Today, AI has become a distinguishing character for emerging technology and application across several sectors. Data collection, storage, analysis, and assessment techniques are

focused on communicating the best result in terms of information. Because they operate more closely on established knowledge and facts, AI systems are thought to be brighter than information systems. Artificial intelligence (AI) is viewed as a technology that has the potential to help reduce global health disparities [6]. "The mimicking of human cognition by computers" [7, 8] is characterised as "reasoning, learning, sensory understanding, adaptability and interaction." Because the majority of AI-based healthcare applications are developed and realized in high-income countries, their adoption in LMICs is relatively new [6]. However, the critical necessity of health care services in resource-constrained nations, as well as recent breakthroughs in the AI area, hint to dramatic changes in the near future [6, 9]. Despite the fact that Africa bears 25% of the global disease burden and has only 3% of the world's health care personnel [10], the region is predicted to have over 700 million smartphone connectivity by 2020 [11].

Artificial Intelligence's Impact on Innovation, Infrastructure development and Industries

Infrastructure and innovation investments are crucial aspects of economic development and growth. Over half of the world's population is anticipated to live in urban areas, making infrastructural advancement in mass transportation and renewable energy extremely important [12]. The rapid rise of new sectors, information and communication technologies (ICT), and artificial intelligence (AI) in cities is also crucial. Another hard truth is that over 4 billion people lack internet connection, with over 90% of these individuals living in poor countries [13]. The only way to close the digital gap is to ensure huge infrastructural development, increased access to relevant information, and the promotion of AI-powered innovation and entrepreneurship [13].

Another severe issue arising from a lack of adequate infrastructure is that only 30% of agricultural goods in poor nations are processed industrially, compared to 98 percent in high-income countries [12]. AI is transforming the global economy, with improvements in AI expected to add almost \$13 trillion to world economic output by 2030. The world market for transportation-related AI technologies totaled \$1.2 to 1.4 billion in 2017 and is expected to expand to 3.1 and 3.5 billion by 2023, representing a 12 to 14.5 percent increase from 2017 to 2023 [12]. Many AI solutions can be applied to different sectors to improve infrastructure, allowing these sectors to get closer to achieving SDG goals. According to the World Bank, AI applications in the transportation industry go beyond autonomous cars and can tackle a variety of problems connected to driver and pedestrian safety. According to research, the use of AI in driverless vehicles might help cut traffic accidents by 90% in certain wealthy countries by 2050. AI applications may be used to upgrade the effectiveness of public transport systems all around the world. AI is also important for environmental preservation. For example, in the transportation sector, AI technology may minimize the number of unproductive journeys on water and on the road by optimising routes to enhance fuel economy and reduce greenhouse gas emissions.

Leveraging AI for education

Poverty is frequently related with a family's failure to obtain a formal education. According to the World Bank, around 39% of the world's poorest people do not have access to formal education. The expense of education and the capacity of higher education institutions are the only factors that prevent many families from obtaining an education. Many organizations have a limit on how many individuals they can hold [14]. AI can help raise the educational levels of disadvantaged children using a variety of means, including customised learning strategies that use computer algorithms to stimulate engagement with the learner, as well as developing a curriculum that is tailored to each learner's requirements. It is extremely probable to detect each learner's particular learning needs using AI and to meet these demands utilising various learning approaches. In some unusual cases, smart chat boards are employed as instructors to help students from low-income regions overcome the financial barrier to education, therefore addressing access difficulties while also addressing inequality. According to research, technologies connected to Industry 4.0 assisted tremendously

during the COVID-19 social distancing, allowing learners to continue their education even during the lockdown. [15] In this approach, AI may greatly assist in achieving the objective of high-quality education. This also allows for inclusive and egalitarian education, as well as the creation and promotion of lifelong sustainable learning opportunities for everybody [12].

Digital Financial Accessibility and AI

Digital financial inclusion is considered as a means of reaching out to financially inactive families, or those who are unable to access formal financial services tailored to their requirements [16]. Youth, women and the poor, particularly those living in rural regions, are barred from the official financial industry. Traditional methods of eliminating poverty and increasing shared prosperity are being disrupted by artificial intelligence (AI), which is altering the expense of access to goods and services. It is altering the way information is acquired, things are manufactured, and people interact. It has been shown that governments in developing markets are beginning to employ basic AI to address crucial development concerns, particularly in the delivery of financial services to the unserved population. AI is driving innovation in financial services by relying on non-traditional data such as call records, mobile money transaction data, text messages, and address books, thanks to better data processing and a large rise in credit availability. Furthermore, AI is making the finance sector more inexpensive by automating credit scoring, which was previously a human-intensive procedure in conventional financial institutions. The potential of digital finance to employ information and communication technology (ICT) to increase the scope and usage of financial services by the poor and those who are barred from the formal financial system is critical [16]. Financial inclusion became digital with the introduction of ICT and AI, allowing groups of disadvantaged individuals to access financing [17]. Customers may also utilise AI to trade in irregular tiny sums to help them manage their inconsistent revenues [16,18]. Another benefit of electronic financial services is that they serve to mitigate risks of theft, loss and other economic crime associated with cash transactions. [16,19].

AI's Implications for Information Technology

Business has become smart and much more effective as a result of innovative technology. Artificial Intelligence is being used by the IT sector to resolve and prevent high-severity crimes. Traditional IT processes may be revolutionised using AI's machine learning and deep learning capabilities, making them more smart, time-saving, and efficient. Quality assurance, service management, and process automation are the primary domains where AI has shown to be a successful tool.

Human and manual procedures can no longer match the network's innovation, development, complexity, and change. AI is the next step in the automation process. Business operations that are smarter, more mindful, and more contextual. AI-driven automation would make it simple for IT organisations to automate a variety of operational procedures, cut expenses, and eliminate human labour. IT process automation may help to simplify a variety of IT operations by replacing recurring manual chores and business operations with automated solutions in a variety of settings.[20]

In the digitalization and innovative use of technology by industries to optimize and address critical industries, new technical advances have been made. Artificial intelligence (AI) is at the heart of all technological applications across all sectors, with ICT at the top of the list. Integration of IT and AI technology has decreased the strain on developers while increasing efficiency, quality assurance, and productivity.

AI and information technology (IT) are evolving at the quickest rate. AI also revitalises old concepts to improve IT systems for more efficient operations. AI is the first stage in the IT industry's transformation to smart systems in order to scale up IT capabilities. Automation and optimization are the main AI functions in IT. A few AI applications in IT are listed below. [20]

a. Data and Information security:

An IT system maintains sensitive data about the general public, the government, corporate and public organisations, and so on. The creation and building of a secure information system is a top priority for an information system. The AI system may handle these issues by creating a smart system that swiftly detects risks and infractions and offers safeguards and solutions to security-related issues. [5]

b. Creating more effective information systems:

Any system must be constructed on the foundation of efficient and bug-free code. Artificial intelligence (AI) systems boost productivity. An AI system employs a variety of algorithms to help programmers write better code or fix software bugs. The AI system offers a set of developer algorithms that are pre-designed to reduce development time by detecting and eliminating software problems based on their performance.

c. Automation of Processes:

An AI system with deep integration attempts automating the backend operation in order to save time and money. During tasks, an AI-programmed algorithm eventually learns from its mistakes and improves the code to operate better.

Artificial intelligence and societal outcomes

AI-based technologies have the potential to help many outcomes in the societal context. For example, AI might help the availability of adequate, health, water, and energy services to the public in SDG 1 on no poverty, SDG 4 on excellent education, SDG 6 on clean water and sanitation, SDG 11 on sustainable cities and SDG 7 on affordable and clean energy. It may also promote low-carbon systems by assisting in the development of a circular economy and smart cities that make effective use of resources. [21]. For instance, AI can allow smart and low-carbon cities by bringing together a variety of interconnected technologies such as electric autonomous cars and smart appliances to enable demand response in the power sector [21]. The Society group has fewer objectives that can be negatively influenced by AI than the ones that can be positively impacted. However, these must be taken into account. Many of these have to do with how AI-enabled technical advancements may be deployed in nations with varying cultural values and affluence. Advanced AI research and product creation may need vast computational resources only accessible through supercomputers. These facilities use a lot of energy and have a big carbon footprint¹⁵. According to some projections, the total power consumption for information and communications technologies (ICTs) might reach 20% of global electricity demand by 2030, up from 1% today¹⁵. Green ICT technology development is so critical [22]. More effective cooling solutions for data centres, increased energy efficiency, and the use of renewable energy in ICTs will all help to limit the growth of power demand [23]. Human expertise must be embedded in the construction of AI models, in conjunction to more effective and renewable-energy-based data centres. The accessible knowledge provided in the system does not need to be learned through data-intensive training, which may greatly minimise the related energy usage. Although AI-enabled technology has the potential to accelerate the implementation of the 2030 Agenda, it may also exacerbate inequities.

AI and its impact on environment

Artificial intelligence and the environment depicts the last set of SDGs, those relating to the environment. Climate action, life below water, and life on land are the three SDGs in this category (SDGs 13, 14, and 15). It was found that there are 25 targets for the Environment category where AI might be a game changer. The ability to analyse large-scale linked datasets and devise coordinated activities targeted at environmental preservation might be one of AI's benefits. In the case of SDG 13 on climate action, there is indication that AI breakthroughs will aid in comprehending climate change and predicting its potential consequences. Low-carbon energy systems with strong integration of renewable and energy efficiency will benefit from AI, which are all required to mitigate climate change [24]. AI may also be utilised to assist enhance ecological health. AI can help reach objective 14.1, which calls for preventing and considerably reducing all types of maritime

pollution, by using algorithms to detect potential oil spills [25]. Target 15.3, for example, asks for fighting desertification and rehabilitating damaged land and soil. According to a study neural networks and objective-oriented approaches may be utilised to enhance the categorization of plant cover types on the basis of satellite pictures, allowing for the processing of enormous volumes of data in a short amount of time. [26] These AI approaches can assist in identifying desertification patterns over broad regions, which is useful information for environmental planning, judgement, and administration to avoid additional desertification, or they can assist in identifying desertification trends over small areas. However, as previously stated, high energy requirements for AI applications may jeopardise attempts to fulfil SDG 13 on climate action, particularly if non-carbon-neutral sources of energy are utilised. Furthermore, despite the numerous instances as to how AI is increasingly being used to promote biodiversity surveillance and conservation [27], it is possible that greater availability to AI-related environmental information might lead to resource overexploitation, albeit such abuse has not been well documented.

Potential risks and threat associated with Artificial Intelligence

Another significant disadvantage of AI-based advances is that they have been typically dependent on the requirements and values of the countries in which AI is created. If AI and big data are employed in areas where ethical inspection, transparency, and democratic oversight are missing, AI might encourage nationalism, hatred of minorities, and skew election results [28]. The phrase "big nudging" has evolved to describe the use of big data and artificial intelligence (AI) to exploit psychological flaws in order to influence actions, posing issues such as harming societal cohesion, democratic values, and sometimes even human rights [29]. Recently, AI has been used to produce citizens' scores that are used to regulate social behavior [30]. This sort of rating is a clear illustration of the harm to human rights posed by AI abuse, and one of the most serious issues is individuals' lack of knowledge about the types of data collected and the implications for their life. It's also worth noting that AI technology isn't dispersed equitably. Another significant deficiency of AI in the perspective of SDG 5 on gender equality is the lack of study on the possible influence of technologies like smart algorithms, picture recognition, and reinforcement learning on discriminating against women and minorities. Another major concern is the lack of gender, racial, and cultural diversity in the AI workforce, in addition to the lack of variety in datasets. One of the fundamental elements promoting creativity and societal resilience is diversity, which will become increasingly important in a society affected by AI development [24]. Decentralization, or the use of AI technology tailored to the cultural backdrop and specific demands of different locations, also promotes societal resilience.

AAI has the propensity to jeopardise the attainment of a number of SDG-related applications in the economy and society. First, employment may be lost, albeit the actual effect may not be adverse [31] based on different research. This issue manifests itself in unequal access to AI computer resources, which might exacerbate inequalities. Additionally, AI algorithms have the potential to polarise society and exacerbate discrimination [32]. These may be seen in data-driven strategies for dealing with the COVID-19 pandemic [33] and, more particularly, contact-tracing smartphone apps [34], where proper handling is critical to minimise discrimination and polarisation. It's worth noting that divided and unequal communities can have significant implications for peace and stability. It is critical to emphasise that AI has the potential to have a significant impact on global energy demand. By 2030, the entire power consumption for information and communications technology (ICT) might reach up to 20% of global electricity, up from 1% now [3].

Individuals, governments, and technology are three actors interacting with each other and with the environment. As a result, the rate of technological development is so rapid that individuals and governments are significantly behind. As a result, substantial research gaps must be addressed in order to handle the shift to an AI-based civilization. Furthermore, our findings have shown

infrastructures' substantial vulnerability. To reap the benefits of AI's vast potential, significant work is required to narrow the gap in transparency, security, and ethical norms. [35]

Conclusion

For the future of AI, we've reached a critical juncture. To build a society in which AI constructively contributes to the fulfilment of all of the SDGs, a global, science-driven discussion to define agreed values and regulations among cultures and nations is required. The existing alternatives for developing a sustainable-development-friendly Artificial Intelligence by 2030 have the potential to deliver advantages that go well beyond the SDGs in our century. AI is boosting education through a variety of means, including adaptive learning strategies that use computer algorithms to stimulate engagement with the learner, as well as a number of other prominent evidence of development in the industry. AI is also facilitating vast infrastructural development, expanding access to relevant information, and encouraging innovation and entrepreneurship. Another area where AI is making a significant impact is in improving the certainty and dependability of infrastructures such as the transportation sector, which allows for economic development and growth because infrastructure and innovation are crucial aspects of economic development and growth. For AI practitioners, existing research on the impacts of AI suggests that understanding the potential positives and negatives of an AI application across societal, environmental, and economic outcomes is more important than simply understanding what could be the effects of an AI application inside its field. There is a need to promote cross-disciplinary dialogue and cooperation in order to get insights that will help expedite inclusive, responsible, ethical, and relevant AI applications for long-term development.

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