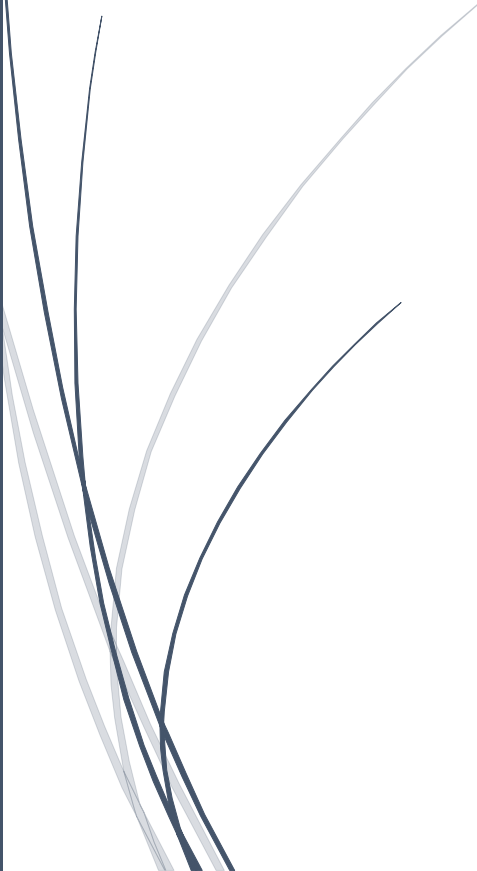8/12/2023

Artificial Intelligence Development

Social Impact Within Industries

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Artificial Intelligence (AI) is an ever-evolving force that has the potential to revolutionize a multitude of industries, including healthcare, manufacturing, cybersecurity, retail, and even the world. It offers opportunities for optimization, automation, and enhanced decision-making processes. However, it also raises significant ethical concerns and safety risks that require careful consideration. This paper aims to explore AI's impact on various industries, its promise, and the associated ethical issues that need to be addressed. Because of the immense power and potential harm that can be done, I want to bring awareness to the need for regulations and ethical standards to ensure the safe integration of AI into society.

Many do not realize the scale of technological advancement when it comes to AI in the modern world. In comparison to technological revolutions in the past AI is no different. "Artificial intelligence (AI) has been described as the fourth industrial revolution following the first "steam engine revolution", the second "electrical revolution", and the third "digital revolution" (Zhang & Zhang, 2023) The tool of AI is a very important advancement in history having the potential to change the world. Although AI's ability to collect and analyze vast amounts of data about human tendencies and patterns raises substantial ethical concerns. The question arises: how is this data collected, and how is it used? The implications of data-driven decision-making and its potential consequences are significant. But first, we must understand what AI is, and how it works with its infinite complexities.

Artificial Intelligence (AI) involves the creation of computer systems capable of performing tasks that traditionally require human intelligence, such as learning, reasoning, and problem-solving. AI can be categorized into two forms, the first being Narrow AI, which would be designed for specific tasks like virtual personal assistants or image recognition. Secondly there is General AI, which would possess broad cognitive abilities like humans. There are

Artificial Neural Networks (ANN) which would simulate the neurons in the human brain. Although many AI systems today are powered by machine learning, a subset of AI focuses on algorithms that learn from data. The process involves collecting extensive datasets, training the model to recognize patterns, developing algorithms, and testing the model's performance on new data. While AI continues to advance, ethical considerations surrounding issues like bias and accountability are crucial aspects of its development and deployment.

AI's ability to collect and analyze vast amounts of health data raises significant ethical concerns in the healthcare sector, there is a lack of concern for the importance of human responsibility in AI. I want to emphasize that human developers in most scenarios ultimately control what data is collected and stored, highlighting the need for regulations targeting data quality, algorithm transparency, and risk management. The healthcare sector is explored as a critical area where AI's potential benefits in disease detection must be carefully weighed because of the sensitivity of the information involved.

The integration of AI in healthcare is indeed transformative, with the ability to detect diseases at a much higher rate than traditional methods. For instance, artificial intelligence algorithms have proven to be valuable tools for pediatricians, as reported by the European Journal of Pediatric Dermatology. AI helps with accurate and early diagnosis of diseases, especially rare conditions. It supports decision-making by providing evidence-based recommendations and streamlines routine tasks, allowing pediatricians to focus more on patient care. AI contributes to personalized medicine, tailoring treatment plans based on individual health profiles. It enhances the analysis of medical imaging and enables remote monitoring of pediatric patients. Additionally, AI keeps pediatricians updated with the latest medical research. With no doubt in my mind, AI is a transformative tool that aids pediatricians in improving

diagnoses, treatment plans, and overall patient management. Many industries are being radically transformed; another example would be the modernization of the livestock industry.

The exploration of biometric methods in animal identification is relevant to the non-invasive nature. Emphasizing the use of AI and computer vision-based technologies in international biometric recognition systems for animals. Various machine learning processes used in biometric identification are detailed, providing insights into the technological advancements driving the field. Biometrics, as a non-invasive method of animal identification, has seen international adoption, utilizing AI and computer technologies. These contactless systems, based on machine learning processes, contribute to the accurate identification and verification of animals, showcasing the potential of AI in diverse domains beyond human-centric industries. AI's potential benefits extend beyond increased productivity. In modern livestock farming, AI contributes to better management and health monitoring through biometric identification and temperature measurement. The integration of agents, sensors, and cloud connections helps identify problems, monitor diseases, and improve animal welfare. Additionally, the use of artificial neural networks and robotics promotes sustainable and efficient operations in dairy farms.

The benefits of AI are very prominent in a multitude industries, some being improved productivity, streamlined processes, and enhanced decision-making. However, I also want to acknowledge the ethical and moral issues raised by AI. Expanding on the potential harms, including lack of transparency, privacy concerns, bias, security threats, economic inequality, improper diagnosis, and over-dependence on AI systems. Balancing these considerations is crucial for the responsible integration of AI into society.

For instance, the ScienceDirect article on breast cancer diagnosis outlines how AI algorithms, particularly those employing deep learning, can autonomously classify and cluster data. This innovative approach allows algorithms to recognize patterns in data without explicit programming, providing a promising avenue for early and accurate detection of diseases. Although this automatic data collection can be a massive ethical challenge just like the technical challenges to develop this technology. "…by anticipating future directions for AI in breast cancer care. Stakeholders in healthcare AI should acknowledge that their enterprise is an ethical, legal, and social challenge, not just a technical challenge." (Carter et al., 2020) One of the many advancements in AI techniques is for breast cancer diagnosis, due to the use of machine learning, deep learning, and neural networks. It's on the concept of 'new AI,' characterized by its ability to independently classify and cluster data through exposure to training data. The ethical considerations in medical AI need to be explored further, emphasizing the alignment with established bioethical principles, such as respect for autonomy, privacy, security, and justice. I want to discuss the ethical expectations with the development of AI models in the medical field.

Full transparency is key, the patient or individual deserves to know when their data is being collected, where it's being used, and how the AI algorithm is using and implementing the learned data. Consent is and should be necessary if their data is going to be implemented into a machine learning algorithm. It's important data scientists and healthcare professionals follow all rules of ethical responsibility which are "patients have the right to be informed of their diagnoses, health status, treatment process, therapeutic success, test results, costs, health insurance share or other medical information, and any consent should be specific per purpose, be freely given, and unambiguous."(Farhud & Zokaei, 2021) These guidelines promote data transparency which is crucial to retain any sort of integrity and trust. AI has tremendous potential

and has been a hot topic in recent years. Many people are starting to realize AI's role in the future with great promise but can cause many issues if not managed correctly. A key point in my reason for research is to bring awareness to not just the tremendous promise but to raise awareness for the need for ethical considerations before implementation into society. One of the reasons is that there is an obvious bias in the media regarding the future and development of AI.

The media bias when it comes to the coverage of AI is overwhelmingly positive. The bias becomes observable when the media tends to only cover the transformative power and innovative aspects that AI has to offer. At the same time downplays the moral, ethical, and social implications that arise with the implementation into society. There are countless positive narratives or articles covering potential and tremendous power that can be considered dangerous. The BMC Medical Informatics and Decision-Making Institute was one of the first to examine AI and its view in the media, and they found that coverage is overwhelmingly positive. AI has been portrayed as a social advancement and very few articles ever mention the ethical, legal, and social implications. "…This represents an opportunity, especially for specialist health journalists, to provide the public with deeper analysis of the ethical, legal, and social implications of screening and diagnostic AI, and to do so now before these technologies become firmly embedded in everyday healthcare delivery." (Frost & Carter, 2020) This is incredibly important because an overly positive bias can contribute to the underestimation of challenges and ethical considerations associated with AI development. It is crucial for media consumers to critically evaluate the information presented, seek diverse perspectives, and be aware of the potential for bias to form a more balanced and informed understanding of the impact of AI on society. Showing skepticism to something as powerful as AI is completely reasonable and it's obvious in the media there is not much of it. AI has the power to revolutionize the world in the future and

we already have seen some adoption of AI and how it's been implemented in several industries. Furthermore, there is not just bias in the media, AI can have an algorithmic bias as well which can put any patient at risk jeopardizing their future.

When we venture further into the realm of AI in healthcare, an alarming ethical concern has emerged which is algorithm bias. This phenomenon reflects the potential for AI algorithms to exhibit discriminatory patterns, disproportionately affecting certain demographic groups. The ethical implications of bias in healthcare raise crucial questions about fairness, transparency, and the overall impact on patient outcomes. Because some algorithms inherit human bias which would be written by a developer. An example of this is "...either an unintentional behavior or a specific design under the trade-off of interests, and social bias can be unintentionally reflected or purposefully embedded in the system design by designers to produce output results unfavorable to the disadvantaged people" (Zhang & Zhang, 2023) Which adds on top of a bias that is reinforced by the deep learning algorithm models for AI in datasets. Algorithmic or data-induced bias in healthcare occurs when machine learning models inadvertently learn and perpetuate existing disparities in the data on which they are trained. The bias may stem from historical inequalities, systemic prejudices, or underrepresentation of certain groups in the training datasets, manifesting in various forms such as racial, gender, socioeconomic, or geographic disparities. These biases can lead to unequal access to medical resources, misdiagnoses, or inappropriate treatment recommendations. "For example, if the algorithm is developed with training data that primarily involves Westerners, it may be less accurate in diagnosing Asian people. Similarly, intelligent TCM expert systems based on big data of sutra prescriptions of TCM, and a large number of local Chinese samples may not be fully applicable to Westerners. Second, deep learning is a typical "black box", it is opaque and uninterpretable, which makes the

biases difficult to detect. These biases may be continuously replicated and amplified in algorithm and lead to biased prediction results, which may cause discriminatory treatment of certain people in medical care and even lead to medical safety accidents" (Zhang & Zhang, 2023) This shows how AI can diagnose patients based on biased training data like lack of diversity in data through inadequate validation and testing. Showing the ethical and social implications of AI within the healthcare industry, which can result in an improper diagnosis. Addressing this issue requires transparent AI development, diverse representation in datasets, and continuous monitoring and updating of algorithms to ensure ongoing fairness. Striking a balance between innovation and ethical considerations is crucial to harness the full potential of AI in healthcare while being aware of unintended consequences and disparities, necessitating concerted efforts from developers, healthcare practitioners, policymakers, and the public to create a future where AI enhances healthcare quality rather than perpetuate inequalities. Although the deep learning models can be impossible to interpret for healthcare professionals, these biases are impossible to spot.

Many healthcare professionals do not understand how AI works, yet they are using the tool to diagnose patients, which is scary to think about. If healthcare professionals, including doctors and nurses, are not adequately informed about how AI systems make decisions, there is an increased risk of relying on inaccurate or biased information mentioned above. This lack of understanding and transparency can jeopardize patient safety, as medical decisions may be based on flawed or misunderstood AI recommendations. The National Library of Medicine of Biotechnology Information mentions how a diagnosis can be made with no understanding of how the AI arrived at that conclusion. "Perhaps the most difficult issue to address given today's technologies is transparency. Many AI algorithms – particularly deep learning algorithms used

for image analysis – are virtually impossible to interpret or explain. If a patient is informed that an image has led to a diagnosis of cancer, he or she will likely want to know why. Deep learning algorithms, and even physicians who are familiar with their operation, may be unable to explain." (Davenport & Kalakota, 2019) Some healthcare professionals depend on AI to make a diagnosis without an understanding of how the deep learning model concludes the diagnosis. Raising significant ethical challenges that should be considered because they put patients at risk because bias exists. Leading to an improper diagnosis based on a biased deep-learning model which is hidden and uninterpretable. Making lack of transparency a given due to the opacity of the deep learning model.

Why does the deep learning model raise ethical concerns? This is because of the lack of transparency, which can be split into three distinct reasons. The first reason is algorithms are meant to be hidden and they are trade secrets that companies want to hide. Secondly, very few people understand the complexity of these algorithms and how they work. The third is that some algorithms themselves are just totally incomprehensible for humans in general, in short, we don't know why they learn the way they do based on datasets. "The first two types of opacity can be improved by establishing better regulation and education. The third type of opacity is inherent to machine learning and is also known as the algorithmic "black box", meaning that its inputs and outputs are visible and understandable, but the process from input to output cannot be explained or understood" (Zhang & Zhang, 2023) AI image diagnosis is being used to make health recommendations with no way to explain the recommendation. Addressing these ethical concerns involves developing transparent and interpretable machine learning models, implementing privacy measures, actively working to identify and mitigate biases, and

establishing clear frameworks for accountability and regulatory compliance in healthcare AI applications.

There are many reasons why AI needs to be carefully implemented and managed because of ethical and safety concerns. Before AI is firmly established in society and used in healthcare operations, regulations, and ethical guidelines need to be established. This is to protect patient safety and privacy which AI has rapidly threatened in recent years with little awareness raised. Transparency is being disregarded which can damage the reputation, trust, and integrity of the healthcare industry. Bias is prevalent in many ways within these algorithms, being the developer's own internal bias and the disparities used in the dataset that the AI used to train its model. There is also bias in the media, where ethical concerns are being overlooked because of the overwhelmingly positive coverage of AI's promise for the future. This is dangerous for a multitude of reasons but if we continue to undermine the ethical concerns of AI our privacy is at great risk. The lack of urgency to develop a solution is a part of the problem, although there are a few steps that can be taken.

The first step is securing and strengthening how the data is managed. AI uses databases to self-learn so securing and properly collecting data without disparities will result in a reduction of bias. "Many countries have incorporated quality management of training data and data trainers into their regulatory frameworks to ensure data quality. For example, China's *Deep Learning Assisted Decision-Making Medical Device Software Approval Points* require quality control of training data and should ensure diversity of data sources, with data collected from multiple medical institutions at different geographic and hierarchical levels whenever possible" (Zhang & Zhang, 2023) Because data and algorithms are the foundation of AI development and deep learning models it should be managed with proper security measures and diversity. All with the

result of reducing algorithmic bias to prevent undesirable health outcomes. The next step would be to ensure that the data is properly used in a transparent algorithm.

Transparency establishes trust, integrity, and ethical decisions and holds accountability. Algorithm transparency would consist of disclosing source code, elements, input data, and output results. However, transparency has not been established in black box algorithms that are just too complex to even be interpreted. This shows that regulations and guidelines need to be placed to ensure that there is a safe environment in the healthcare industry. There needs to be a clear understanding of how AI comes to certain conclusions so it can be explained to the patient. There have been some steps taken to combat the lack of transparency. "GDPR (General Data Protection Regulations) requires algorithms to have interpretability, and data subjects can take intervention and require interpretation of the relevant data when they are not satisfied with automated decisions" (Zhang & Zhang, 2023) This is a way to focus more efforts on developing interpretable machine learning models that can be explained to the patient. Researchers can align the powerful tool of AI with ethical and regulation standards to ensure patient privacy and safety. Others will argue that the algorithm does not need to be explained for it to be transparent and used which jeopardizes the patient's safety. It's important to design following morals and ethics, not after the product has already been developed and tested.

In conclusion, while Artificial Intelligence promises revolutionary advancements across industries, it raises significant ethical concerns. The opaque nature of AI algorithms, especially in complex deep learning models, shows the lack of transparency, accountability, and potential biases that are formed in the datasets. The media's overwhelmingly positive bias towards AI also contributes to a lack of awareness about ethical implications that I wanted to bring attention to. To properly implement AI in the healthcare sector fully it requires strict regulations and ethical

standards to be set in stone before any advancements are made. Transparency in algorithms, secure data management, and addressing biases are just some of the steps that need to be addressed. Healthcare professionals' lack of understanding of AI's decision-making processes further complicates ethical challenges. It is important to prioritize ethical responsibility, patient consent, and privacy in AI development. To ensure a safe and responsible integration of AI into society, collaborative efforts are needed from developers, healthcare practitioners, policymakers, and the public. By actively addressing ethical concerns and prioritizing transparency, we can harness AI's potential while maintaining respected privacy and security in an increasingly AI-driven world.

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