

Data Ownership and Privacy in Personalized AI Models in Assistive Healthcare

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Abstract

The use of personalized artificial intelligence (AI) models in assistive healthcare presents a number of ethical and legal challenges, they are examined in this paper. We look at a number of situations in which AI models have close interactions with persons under care. In particular we are interested in the question of model and data ownership, privacy, and ethical implications. The paper also surveys the existing regulatory environment, including the US Congress's legislative initiatives and the US Federal Trade Commission's examination of AI. Additionally, it covers AI strategies such as modular AI and discusses possible solutions to the issues described. We present an overview of the current outstanding problems and with this work offer a researched and organized contribution for a public discussion of responsible application of AI in this field of healthcare. Our selection of topics is guided by keeping in mind the key stakeholders: technology providers, healthcare or care providers, care beneficiaries and their families.

1 Introduction

The use of artificial intelligence (AI) has caused a major shift in the economy, especially in fields and services where customers interact with AI systems directly. We are particularly interested in learning agents and systems utilized in assistive healthcare. Given that language is the primary means of human communication (for example, information exchange, request assistance, expression of emotions or memories, etc.), our focus is on systems that employ large language models.

The term "assistive healthcare", which is also used to describe assistive technology in the healthcare industry, describes the use of devices and technology to help people manage their age-related or health-related limitations. The goal of assistive healthcare is to enable people to live more independently, take part in social and recreational activities, and pursue their educational and career goals. Because of the aging population in the west, there will likely be a significant demand for workers in a variety of fields, including healthcare, home care, and personal care, some of which AI will be able to fill [McKinsey Global Institute, 2018]. Between 200

and 300 billion USD are predicted to be the financial impact of AI in the healthcare sector between 2020 and 2030, which is similar to the impact in the banking or high-tech industries [McKinsey Global Institute, 2018].

1.1 Definition of the Issue and Facts Concerning the Case

AI models can be very helpful in managing a wide range of ailments, from mental health issues to Alzheimer's disease. They provide tailored care based on the unique needs of each patient. But the personalization of these AI-powered assisted healthcare models raises significant moral and legal questions, especially those related to privacy and ownership.

Think about an AI assistive model developed for Alzheimer's disease treatment. Through continuous interaction with the patient, the model replicates the behavioral traits and cognitive processes of the patient. This model could serve as a poignant posthumous memorial for the family member who passed away because it perfectly captures their unique personality. However, who owns this highly personalized AI model? Are the surviving family members entitled to interact with it when the patient passes away? What are the privacy implications if they do have the right? Are there ways for the person in care to limit or retract, all or some, aspects of knowledge collected while under care.

Comparatively speaking, let's look at an assistive AI model used in pediatric healthcare. This model adjusts to the child's developmental stage and preferred learning style, becoming an essential part of their educational and health care journey. The question of ownership arises once more: Does the AI development industry have rights, or are parents the only ones who can use this model? Privacy is again a concern.

Assistive AI models have the potential to become sensitive information archives in the field of mental health, storing patients' most private wishes, fears, and emotional states. Who is permitted access to this very personal data? How can its ethical and responsible use be guaranteed?

These actual cases highlight how crucial it is to consider the ethical and legal ramifications of ownership and privacy in AI models that support medical care. This case study looks at the regulatory frameworks in place, clarifies these problems, and offers practical solutions. As we continue to unlock AI's potential, it is imperative that we apply it in healthcare in a way that upholds the highest ethical standards, respects indi-

vidual rights, and remains transparent.

1.2 A White-Collar Worker at your Fingertips

Artificial intelligence (AI) in healthcare is not just a sci-fi fantasy; it is becoming a reality. Industry pioneers like Mustafa Suleyman, Sal Khan, and Bill Gates have already expressed visions that are consistent with the advancement of assistive AI models in healthcare.

Mustafa Suleyman, co-founder of DeepMind and CEO of Inflection AI, predicts that “everyone will have their own AI personal assistant within the next five years.” This could be used in the healthcare sector to develop assistive AI agents that serve as a continuous health watchdog. This kind of application could enhance patient safety and care by closely monitoring vital signs and alerting medical professionals in an emergency.

Sal Khan, the founder of Khan Academy, claims that AI can act as a “personal tutor for every student.” This concept could grow into an AI-assisted health educator for the medical field. With its ability to deliver personalized, real-time information on a range of medical conditions, potential therapies, and preventive measures, this AI model may serve as an on-demand medical reference.

Bill Gates advances the conversation by equating access to advanced AI models with “having a white-collar worker” at one’s disposal. This could show up in the healthcare sector as a virtual medical assistant with expertise in both administrative and challenging diagnostic procedures. This kind of assisting AI model could revolutionize healthcare delivery by streamlining workflows and increasing diagnostic accuracy.

There are challenges associated with using assistive AI models in the healthcare industry, though. Two ethical and legal issues that require careful handling are data privacy and algorithmic bias. These problems are not just theoretical; they also have real-world implications that could affect the caliber and accessibility of medical care.

2 Three Key Aspects of the Case

2.1 Legal Aspect

Let’s assume you are eager to apply AI to improve patient outcomes and that you work in healthcare. Nonetheless, privacy and data ownership are governed by a complicated web of laws and regulations [Murdoch, 2021].

Public-private partnerships in healthcare AI serve as evidence of the urgent need for strong privacy laws and regulations. Preventing power abuse and making sure patient data is handled with the highest care are the objectives [Murdoch, 2021]. In this AI-driven healthcare environment, data privacy is still a major challenge, particularly when private organizations obtain access to patient data [Murdoch, 2021].

Now for the rules: following them is essential if you want to use assistive AI models in the medical field. The purpose of these guidelines is to protect patient privacy and guarantee moral judgment [Eshwar, 2023]. Using China as an example, certain laws are being pushed for in order to precisely define and classify healthcare information [Wang *et al.*, 2022]. Furthermore, they are advocating for more stringent accountabil-

ity protocols to guarantee that privacy safeguards transcend beyond abstractions [Wang *et al.*, 2022].

Finding the ideal balance is difficult. The potential advantages of AI in healthcare must be evaluated against the rights of individuals to privacy [Wang *et al.*, 2022]. The larger good, business interests, and individual and collective rights must all be carefully balanced [Wang *et al.*, 2022].

HIPAA is considered the gold standard for patient privacy in the United States. There are concerns, though, that HIPAA might not be able to handle the unique challenges AI presents. The GDPR in Europe offers a wider perspective, particularly with regard to data portability rights. Then there are other layers, such as California’s CCPA, the FDA’s Part 11 regulations, and the 21st Century Cures Act.

Globally, the situation is complicated by the existence of various legal frameworks in each of the aforementioned nations—South Korea, Japan, Australia, Canada, and India, for example, the Personal Data Protection Bill of 2019 in India and the PIPEDA in Canada.

International guidelines, like the WHO recommendations and the OECD guidelines, provide a more comprehensive framework than laws alone. With its Code of Ethics for Health Information Professionals, the International Medical Informatics Association has also contributed to the conversation. Legislation pertaining to AI in Europe

Surprisingly, intellectual property laws may be able to protect assistive AI models. We want to raise and open to discussion the following question: who should have access to these models—the *technology provider*, the *patient and relatives* or the *healthcare provider*? All of them? Some of them? None of them?

It’s similar to integrating assistive AI into healthcare to navigate the complex web of legal issues. At this nexus of law and technology, striking the correct balance is essential. To guarantee the ethical and responsible application of AI, all stakeholders need to be informed [Murdoch, 2021; Eshwar, 2023; Wang *et al.*, 2022].

In the following sections we provide more material for this important discussion.

Europe and AI legislation

The foundation for moral and legal issues in assistive AI models for healthcare is the *European Act on Artificial Intelligence (AI Act)*. This Act sheds light on data ownership and privacy in healthcare AI while adhering to EU rights and values. [Amador, 2023] [McLennan and others, 2022].

It’s important to note how the AI Act classifies AI systems according to risk. AI medical models may be deemed high-risk due to their potential impact on patient privacy and healthcare [Pasricha, 2023]. This classification highlights the urgent need for strong ethical standards in healthcare AI with its precise guidelines and emphasis on human touchpoints and data protection [Prakash and others, 2022].

ChatGPT and other generative AI systems are aimless and data-hungry. The Act aligns with the broader call for transparency and accountability in the healthcare industry by requiring that it be evident where training data originates from and how AI-generated content differs from human-produced content [Mittelstadt, 2019] [Dastin and Tong, 2023].

The Act's acknowledgment of regulatory sandboxes highlights how important it is to validate AI models before integrating them into healthcare to make sure they are secure and efficient [Schwalbe and Wahl, 2020].

A Congressional Perspective

A comprehensive legislative framework for artificial intelligence is presently being developed by Congress, a development that will significantly affect the healthcare sector [Abatal and Korchi, 2023]. Charles Schumer, the former majority leader in the Senate, has stressed in remarks the need for legislative action, particularly in regards to the application of AI in medicine. There are plans to establish a National AI Commission, which could act as a crucial watchdog to guarantee that moral principles and privacy laws are adhered to in healthcare AI applications [Amedior, 2023].

Three main concerns that are being discussed in Congress regarding artificial intelligence are of great importance to the healthcare sector:

First of all, a lot of importance is placed on invention preservation. The legislative framework seeks to strike a compromise between advancing technological innovation and safeguarding patient privacy [McLennan and others, 2022]. This is particularly crucial in light of the European Union's stricter laws regarding AI, which some worry could stifle technological progress [TechCrunch, 2023].

Second, the alignment of AI technologies with democratic ideals is becoming increasingly important in legislative discourse [Mittelstadt, 2019]. This is important when it comes to customized AI models in healthcare. The United States aims to ensure that AI applications in healthcare are implemented in an ethical, transparent, and individual-rights-respecting manner [Pasricha, 2023].

The implications of Communications Decency Act Section 230, which presently protects tech companies from lawsuits pertaining to user-generated content, are finally discussed [Prakash and others, 2022]. Whether the content of artificial intelligence models should be shielded from lawsuits is an important question, particularly if those models interact with patients and gather private medical information [Schwalbe and Wahl, 2020].

Ownership, Control, and Trustworthiness in the Age of Mechanistic Interpretability

Prominent figures in the field of artificial intelligence, including Yoshua Bengio, Jeff Hinton, and Sam Altman, have cautioned about the pressing need to amend the law to address the possible issues and dangers associated with unbridled AI development. The AI research community echoes this viewpoint in an open letter that highlights the necessity of legislation that can avert existential risks from AI before they arise [Amedior, 2023].

Examining this complex terrain, Prof. Max Tegmark proposes that physics may provide answers to these legal quandaries, especially when viewed from the perspective of "mechanistic interpretability" [Liu *et al.*, 2023]. Similar to how neuroscience attempts to comprehend the human brain, this approach seeks to comprehend the inner workings of AI systems [McLennan and others, 2022]. However, how does the law fit into this scientific investigation? The ownership

of data and opinions produced by AI holds the key to the solution. Who is the rightful owner of an assistive model if an AI system is continuously retrained by communicating with a patient or student in a way that suits their cognitive styles? According to Pasricha (2023), is it the creator, the user, or both?

Despite its early development, mechanistic interpretability seems to be a promising approach to these legal problems [Liu *et al.*, 2023]. We might be better able to create laws pertaining to data ownership, user privacy, and the proper application of insights produced by AI by breaking down AI systems to comprehend their workings [Prakash and others, 2022]. In order to protect user rights and data privacy, Tegmark addresses the possibility of using formal proof as a legal tool to guarantee that AI systems function as intended [Mittelstadt, 2019].

Furthermore, deriving data from AI "black boxes" may carry substantial legal ramifications, especially with regard to intellectual property rights [TechCrunch, 2022].

2.2 Business/Managerial Aspect

The healthcare industry is changing as a result of artificial intelligence (AI) methods like deep learning, natural language processing, neural networks, and support vector machines [Jiang and others, 2017]. Critical disease areas such as neurology, cardiology, and cancer have found use for these approaches; the diagnosis and treatment of stroke is one prominent example [Jiang and others, 2017]. Though many obstacles prevent AI from being used in healthcare, cutting-edge systems like IBM Watson demonstrate the technology's potential [Jiang and others, 2017].

In the healthcare sector, new business models may result from the evident trend toward a more human-centered approach to personal data [Kemppainen *et al.*, 2022]. This approach has the potential to rethink value generation and capture by empowering individuals over their data. But the potential of AI is outweighed by concerns about data security and the consequences of AI-generated content [Khan *et al.*, 2023].

Businesses such as Segmed are establishing the benchmark for moral data gathering in the corporate world [Segmed, 2023]. Their system provides a means to reconcile privacy concerns with AI model training by standardizing and anonymizing global medical data. Conversely, Syntegra encourages the generation of synthetic data, which addresses various ownership and privacy concerns by producing realistic but non-patient-specific data [Syntegra, 2023].

Awkin focuses on the difficult balancing act between innovative uses of data and privacy concerns in his work with university medical facilities. They analyze patient data using a unique AI-based technique [Owkin, 2023].

Deep Genomics explores the intricacies of RNA biology through its AI Workbench, posing important concerns regarding data ownership and protection [Genomics, 2023].

Through its Benevolent PlatformTM, BenevolentAI leverages AI to interpret the complexity of disease and provides a comprehensive understanding of human biology under all circumstances [BenevolentAI, nd]. Their partnerships with the largest bio-pharmaceutical companies bear witness to their

dedication to using AI to generate ground-breaking medical breakthroughs.

Insitro prefers data-driven forecasts over conventional intuition when it comes to clearly defined objectives [Insitro, nd]. By fusing cutting-edge biological technology with artificial intelligence and prioritizing patient needs and productivity, they hope to transform the field of medication discovery.

The emergence of new companies seeking to bridge the technological and medical development divide further demonstrates the advancement of AI in healthcare. For instance, Arterys achieved significant progress when it was the first business to receive FDA approval for the use of deep learning and cloud computing in a clinical setting [Arterys, nd]. They mostly use imaging tests, such as MRIs and CT scans, to look for indications of malignant growths in the liver or lungs.

More nations will be able to access Ubie's AI-powered healthcare services. It provides a broad range of services that improve the efficiency and accessibility of healthcare, such as AI-powered symptom trackers and SaaS products for hospitals [Newswire, nd].

Cleerly focuses on cardiac imaging and seeks to transform the provision of cardiac care through AI [Cleerly, nd]. In 2022, the business got a sizable funding boost.

Just two of InformAI's distinctive benefits are model optimization and access to large private medical datasets [InformAI, nd]. InformAI has been acknowledged by Forbes for its innovative contribution to healthcare, a significant development in the use of AI to enhance the provision of healthcare.

Harnessing the Power of 'Multiple Selves' in AI for Rapid Adaptation

Because of its possible medical applications, Dr. Jonathan Cohen and his team's research at the Princeton Neuroscience Institute is attracting a lot of interest from the academic and business communities [Hub, 2023]. Their main area of study is a modular artificial intelligence agent that mimics the ability of the human brain to balance opposing goals. This is not just a theoretical project; it has important ramifications for healthcare AI applications.

The group created an artificial intelligence system that deviates from conventional single-agent models by incorporating a large number of smaller agents, or sub-agents, each with distinct objectives and feedback mechanisms [Liu *et al.*, 2023]. The AI can have internal discussions to decide on the best course of action because of the way it is designed. This method mimics the neural networks in the human brain that compete for attention when making decisions [Liu *et al.*, 2023]. In the healthcare industry, where AI systems frequently have to reconcile competing objectives like diagnostic accuracy and patient confidentiality, such a framework is especially helpful [Abatal and Korchi, 2023].

Modular artificial intelligence has outperformed its monolithic counterparts in computer simulations, particularly in the area of simultaneous goal balancing [Liu *et al.*, 2023]. This adaptability is critical in healthcare environments, as AI must manage a multitude of competing ethical, medical, and patient-centered objectives [Amedior, 2023].

Since treatment protocols and medical knowledge are con-

stantly changing in the rapidly changing healthcare sector, modular AI's inherent flexibility is extremely valuable [Schwalbe and Wahl, 2020]. By swiftly adjusting to new clinical guidelines, research findings, or patient data, the modular architecture may enhance patient care [Schwalbe and Wahl, 2020].

It is noteworthy that although the preliminary findings are encouraging, additional empirical investigation is necessary to completely comprehend the possible benefits and constraints of this novel methodology [Liu *et al.*, 2023]. The ethical concerns involved also necessitate a thorough academic investigation, particularly with regard to algorithmic accountability and patient data management [McLennan and others, 2022].

The Inheritance Question

Artificial Intelligence and machine learning-based assisted healthcare models are heavily influenced by the concept of digital inheritance and the ethical management of digital data after death. These models often rely on significant personal data in order to provide tailored healthcare. The data may include lifestyle choices, genetic information, medical histories, and even psychological evaluations. These AI models become digital representations of the patients they assist as personalization increases [Chikhaoui *et al.*, 2022]. This raises concerns about data ownership, privacy, and what to do with the data after a patient passes away.

Particularly relevant is the concept of "data afterlives," as defined by Mackinnon [Mackinnon, 2022]. Assistive healthcare models may continue in some form even after a patient dies, especially if the underlying platform or software is still in use. There are ethical issues with managing and archiving this highly customized data. Should it be deleted to protect the individual's privacy, or could it be anonymized and used for research?

It's crucial to take into account Harbinja's analysis [Harbinja, 2017] regarding the lack of recognition of users' ownership rights over digital goods. This may suggest that, in the context of healthcare, the confidentiality of a deceased patient's medical records may be compromised in the lack of suitable legal safeguards. Sensitive healthcare data makes this a major concern.

As stated by Nakagawa & Orita [Nakagawa and Orita, 2022], maintaining the deceased person's dignity or respecting their wishes requires handling personal data after death. When it comes to healthcare, this can mean complying with a patient's request to have their information deleted in order to protect their privacy or to be used in future research projects.

According to a 2014 survey by Grimm & Chiasson [Grimm and Chiasson, 2014], people do have preferences about what happens to their digital footprints after they pass away, including healthcare data. This demonstrates the need for assistive healthcare models to include ways to allow users to express their preferences for data management after death.

2.3 Ethical Aspect

Artificial intelligence (AI) in healthcare poses numerous ethical and social issues that need to be carefully considered [Pasricha, 2023]. A wide range of topics are covered by

these inquiries, such as openness, possible biases, data security, safety procedures, justice, fairness, and individual liberty [Pasricha, 2023] [Lebcir *et al.*, 2021]. A comprehensive strategy that considers the viewpoints of numerous stakeholders, including patients, healthcare providers, and regulatory agencies, is required to address these issues [Lebcir *et al.*, 2021].

An essential component of the ethical conversation around AI is transparency. In order for patients and healthcare providers to comprehend the decision-making process, the algorithms and mechanisms underlying AI should be clear and understandable [Khan *et al.*, 2023]. This kind of openness promotes trust and establishes the foundation for responsibility [Amedior, 2023]. Simultaneously, worries regarding biases in AI systems are significant because they may lead to unjust and distorted results [Pasricha, 2023].

To guarantee justice in healthcare applications, more work needs to be put into identifying and removing these biases [Khan *et al.*, 2023]. According to Khan *et al.* (2023), there are serious worries about data security and potential privacy violations due to the enormous volume of personal health data processed by AI systems [Khan *et al.*, 2023]. Adherence to privacy regulations and the implementation of strong security measures are crucial [Amedior, 2023].

Ethical considerations in healthcare AI encompass matters of accountability and responsibility [Amedior, 2023]. The main goals of AI system design should be to maximize benefits, reduce risks, and improve patient well-being [Amedior, 2023]. Informed consent and the indispensable nature of human interaction are underscored by Amedior (2023) [Amedior, 2023]. Human touch and empathy should always be present, but patients should be well-informed to make wise decisions about the use of AI in their healthcare [Amedior, 2023].

Ethical frameworks and clear guidelines are necessary to navigate this complex ethical terrain [Solanki *et al.*, 2022]. They ought to cover every stage of the AI lifecycle, from gathering data and developing models to deploying them and keeping an eye on them continuously [Solanki *et al.*, 2022]. Furthermore, to guarantee its responsible and ethical use, the social effects of healthcare AI need to be continuously researched [Amedior, 2023].

The moral climate in the medical field Transparency, justice, privacy, responsibility, and accountability are the cornerstones upon which AI is based. It is essential to create explicit ethical guidelines and support continued research in order to guarantee the moral application of AI in healthcare [Solanki *et al.*, 2022].

Consent

Informed consent, a cornerstone of healthcare ethics, ensures that patients are equipped with the information necessary to make autonomous decisions regarding their care [Racine *et al.*, 2019]. But when artificial intelligence enters the picture, things become more complicated.

The response? an honest and transparent discussion. Patients and healthcare providers must be able to communicate openly, as emphasized by Racine *et al.* [Racine *et al.*, 2019]. The goal of data collection, the possible applications of AI, and the security measures put in place to preserve patient pri-

vacancy must all be understood by patients [Racine *et al.*, 2019].

Furthermore, we can ensure that patients actively participate in AI-powered data applications by giving them regular updates and the flexibility to check and modify their consent selections. Healthcare organizations and AI developers must create user-friendly interfaces in addition to instructional materials that explain the complexities of AI models [Racine *et al.*, 2019]. In addition to offering patients greater control, these initiatives promote informed decisions regarding the use of their data in AI systems.

By broadening our perspective, we can see that the advent of innovative privacy solutions is causing a paradigm change in the digital realm toward user-centric data management. But following the rules is only one part of this complicated issue. Robust data security protocols offer users complete control over their data and can enhance the integrity of the product.

This search for control transcends language models. Consider the LAION dataset, which is available to the public and is used by the AI system Stable Diffusion to generate images. The substantial demand for businesses and individuals to remove their photos emphasizes the increasing need for consent-centric AI features.

A transparent framework for AI consent is ideal since it lets users know how their data is being used for AI training and gives them the option to participate or not. Beyond technological advancements, the challenge lies in safeguarding user privacy and autonomy in the quickly approaching AI future.

Bias

Bias in AI models is a significant problem that must be resolved in order to ensure fairness and equity in healthcare. When AI algorithms unintentionally reinforce the biases in the data they are trained on, unfair results may result [Sweeney, 2013]. Online ad distribution is one area where bias in AI models has been proven. Sweeney (2013) found that different people responded differently to online ads. According to the study, ads were shown differently depending on racial and cultural characteristics. For example, Sweeney found that people whose names were linked to specific racial or ethnic groups were more likely to receive targeted advertisements. This implies that biased and unfair results were produced by the AI algorithms used to display advertisements [Sweeney, 2013].

In the healthcare sector, biased AI models have the potential to be extremely dangerous. If an AI model is based on biased data, it could, for example, generate predictions that are unjust or erroneous for particular groups of people when used to detect conditions. Disparities in health outcomes and access to suitable therapies could arise from this [Sweeney, 2013]. Reducing bias in AI models requires resolving the problems that cause bias in the training data. Making sure the training set is representative, varied, and free of discriminatory patterns is necessary to achieve this. Furthermore, it's imperative to routinely check AI models for bias and to address any found biases [Sweeney, 2013].

AI models need to be simple and understandable in order to eradicate bias. It is easier to recognize and understand biases when the decision-making process of AI models is clarified. This offers a chance to fix model flaws and enables

the holding of individuals accountable [Sweeney, 2013]. It is also advised to include individuals from a variety of racial, ethnic, and socioeconomic backgrounds in the development and testing of AI models in order to aid in the discovery and correction of biases. Prejudices are less likely to persist this way, and it guarantees that the viewpoints and experiences of underrepresented groups are taken into account [Sweeney, 2013].

Care for an Aging Population

Humanoid robots have become increasingly common in the care of the elderly to assist and support them in many aspects of their daily lives [Jung *et al.*, 2022]. These human-like robots are employed in diverse contexts, ranging from daily life to geriatric healthcare [Jung *et al.*, 2022]. The effectiveness, potential benefits, and challenges of deploying humanoid robots in the care of the elderly have been the subject of numerous studies.

A comprehensive study investigated the use of humanoid robots in elder care and aimed to determine the advantages and disadvantages from the caretaker's point of view [Andtfolk *et al.*, 2021a]. The review states that humanoid robots have several uses, including companionship, help with everyday tasks, and mental health treatments [Andtfolk *et al.*, 2021a]. Benefits mentioned by older adults included increased social engagement, better mood, and increased cognitive stimulation [Andtfolk *et al.*, 2021a]. But there are also disadvantages, such as privacy concerns and the need for technical support [Andtfolk *et al.*, 2021a].

Some research has been done on specific aspects of the use of humanoid robots in elder care. For example, a study examined the degree to which older individuals with cognitive impairments were stimulated to interact with a humanoid social robot [Tulsulkar *et al.*, 2021]. According to the findings, the residents of the assisted living facility accepted the robot well and felt it was a helpful tool for communication [Tulsulkar *et al.*, 2021].

Research has also been done on how elderly people view humanoid robots. A study examined the degree of trust older adults felt in social robots, especially when the robot admitted its mistakes and offered an apology [Giorgi *et al.*, 2022]. The study found that various older adults reacted differently to the robot, highlighting the need for additional research to understand how people, particularly older people, would respond to these robots in sensitive circumstances [Giorgi *et al.*, 2022].

Research has also examined perspectives on the use of humanoid robots in medical settings. A cross-sectional study was conducted to find out what healthcare professionals thought about the use of humanoid robots in hospital settings [Andtfolk *et al.*, 2021b]. The study found that while using humanoid robots, healthcare providers had concerns about patient safety and privacy. This emphasizes how important it is to address these issues as these robots are implemented in healthcare settings [Andtfolk *et al.*, 2021b].

3 Conclusion

Let's take a moment to appreciate the breadth of the technology that surrounds us. We now understand that artificial

intelligence in healthcare involves more than just data and algorithms after navigating its tangled web. At issue in this [Chikhaoui *et al.*, 2022] are societal norms, medical ethics, and the course of patient care in the future.

In addition to being a tool for organizing patient data and aiding in diagnosis, AI in healthcare also serves as a mirror reflecting our complex moral and ethical dilemmas [Mittelstadt, 2019]. These AI systems are intelligent agents that can "understand" a patient's medical history, adapt to changing health needs, and initiate crucial discussions about who owns personal health data [Jiang and others, 2017]. They are more than just code. This change sparks excitement and worries at the same time. Artificial intelligence's potential in healthcare is expanding more quickly than our current legal and ethical frameworks [Prakash and others, 2022]. This growth at an exponential rate highlights how urgent and challenging it is to responsibly integrate AI into healthcare. It's like attempting to keep up with an ambulance that is traveling at high speed.

This is where things get a lot more complicated. AI in healthcare is self-transforming rather than just growing itself [Pasricha, 2023]. Instead of just tweaking algorithms, a fundamental shift in the way healthcare is provided, recorded, and even conceived of is required [McLennan and others, 2022]. This is the main point of contention. How do you handle something that is unpredictable both during its evolution and during its changes? Healthcare professionals and ethicists are at odds over this issue [Solanki *et al.*, 2022].

What ought to we do now? There isn't a comprehensive response. Legislators, healthcare providers, tech companies, and yes, even average citizens are all involved in this collaborative effort [Dwivedi and others, 2021]. Establishing governance frameworks, fostering public discourse, and establishing ethical norms are all necessary [Amedior, 2023]. Recall how movies like "An Inconvenient Truth" aided in raising public awareness of climate change? Similar tipping points are required for AI in healthcare [Schwalbe and Wahl, 2020].

Let's resolve to approach this shift with the care and knowledge that it requires as we stand on this threshold, gazing out over the vast field of AI-driven healthcare [Stypińska and Franke, 2023]. We are all invested in that future because the use of AI in healthcare will ultimately determine people's welfare [Abatal and Korchi, 2023].

We would like to emphasize the importance of a balance between the interests of providers of technology and care and care recipients and their families. The current state of the art in intelligent learning systems and explainable AI is not near the level where technology needs from all three groups are fully met. Very specifically as it pertains to data and technology ownership. This work should also be viewed as a call to the AI community to perform more research and experimentation in this particular domain. Lastly this balance should also reflect itself in the regulatory environment. Experts in the field can no longer ignore or postpone reacting to the increased interest from the public and legislature to issues related to AI, data ownership and privacy.

References

- [Abatal and Korchi, 2023] A. Abatal and A. Korchi. Transforming healthcare systems with artificial intelligence: revolutionizing efficiency, quality, and patient care, 2023. <https://doi.org/10.21203/rs.3.rs-3175341/v1>.
- [Amedior, 2023] N. Amedior. Ethical implications of artificial intelligence in the healthcare sector. *Advances in Multidisciplinary and Scientific Research Journal Publication*, 2023. <https://doi.org/10.22624/aims-accrabespoke2023p1>.
- [Andtfolk *et al.*, 2021a] M. Andtfolk, L. Nyholm, H. Eide, and L. Fagerström. Humanoid robots in the care of older persons: a scoping review. *Assistive Technology*, 34(5):518–526, 2021.
- [Andtfolk *et al.*, 2021b] M. Andtfolk, L. Nyholm, H. Eide, A. Rauhala, and L. Fagerström. Attitudes toward the use of humanoid robots in healthcare—a cross-sectional study. *Ai & Society*, 37(4):1739–1748, 2021.
- [Arterys, nd] Arterys. Arterys. Online, n.d. <https://www.arterys.com>.
- [BenevolentAI, nd] BenevolentAI. Benevolentai. Online, n.d. <https://www.benevolent.com>.
- [Chikhaoui *et al.*, 2022] E. Chikhaoui, A. Alajmi, and S. Marie-Sainte. Artificial intelligence applications in healthcare sector: ethical and legal challenges. *Emerging Science Journal*, 6(4):717–738, 2022.
- [Cleverly, nd] Cleverly. Cleverly. Online, n.d. <https://cleverlyhealth.com>.
- [Dastin and Tong, 2023] J. Dastin and A. Tong. Openai rolls out ‘incognito mode’ on chatgpt. Reuters, 2023. <https://www.reuters.com/technology/openai-rolls-out-incognito-mode-chatgpt-2023-04-25/>.
- [Dwivedi and others, 2021] Y. Dwivedi *et al.* Artificial intelligence (ai): multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, 2021.
- [Eshwar, 2023] M. Eshwar. Exploring the potential of artificial intelligence in healthcare: possibilities and challenges. *International Scientific Journal of Engineering and Management*, 2023. <https://doi.org/10.55041/isjem00408>.
- [Genomics, 2023] Deep Genomics. Deep genomics: The discovery platform for genetic medicine. Online, 2023. <https://www.deepgenomics.com/>.
- [Giorgi *et al.*, 2022] I. Giorgi, F. Tiroto, O. Hagen, F. Aider, M. Gianni, M. Palomino, and G. Masala. Friendly but faulty: a pilot study on the perceived trust of older adults in a social robot. *IEEE Access*, 10:92084–92096, 2022.
- [Grimm and Chiasson, 2014] C. Grimm and S. Chiasson. Survey on the fate of digital footprints after death, 2014. <https://doi.org/10.14722/usec.2014.23049>.
- [Harbinja, 2017] E. Harbinja. Post-mortem privacy 2.0: theory, law, and technology. *International Review of Law Computers & Technology*, 31(1):26–42, 2017.
- [Hub, 2023] Singularity Hub. Ai agents with ‘multiple selves’ learn to adapt quickly in a changing world. Online, 2023. <https://singularityhub.com/2023/07/11/ai-agents-with-multiple-selves-can-rapidly-adapt-to-a-changing-world/>.
- [InformAI, nd] InformAI. Informai. Online, n.d. <https://www.informai.com>.
- [Insitro, nd] Insitro. Insitro. Online, n.d. <https://www.insitro.com>.
- [Jiang and others, 2017] F. Jiang *et al.* Artificial intelligence in healthcare: past, present and future. *Stroke and Vascular Neurology*, 2(4):230–243, 2017.
- [Jung *et al.*, 2022] S. Jung, S. Ahn, J. Ha, and S. Bahn. A study on the effectiveness of it application education for older adults by interaction method of humanoid robots. *International Journal of Environmental Research and Public Health*, 19(17):10988, 2022.
- [Kemppainen *et al.*, 2022] L. Kemppainen, M. Pikkarainen, T. Koivumäki, and Y. Xu. Drivers for platform business model innovation: individuals in control over their personal data. *Journal of Innovation Management*, 10(3):46–74, 2022.
- [Khan *et al.*, 2023] B. Khan, H. Fatima, A. Qureshi, S. Kumar, A. Hanan, J. Hussain, and S. Abdullah. Drawbacks of artificial intelligence and their potential solutions in the healthcare sector. *Biomedical Materials and Devices*, 2023.
- [Lebcir *et al.*, 2021] R. Lebcir, I. Vlaev, R. Atun, and M. Cubric. Stakeholders’ views on the organizational factors affecting application of artificial intelligence in healthcare: a scoping review protocol. *BMJ Open*, 11(3):e044074, 2021.
- [Liu *et al.*, 2023] Z. Liu, E. Gan, and M. Tegmark. Seeing is believing: Brain-inspired modular training for mechanistic interpretability. arXiv preprint arXiv:2305.08746, 2023. <https://arxiv.org/abs/2305.08746>.
- [Mackinnon, 2022] K. Mackinnon. Critical care for the early web: ethical digital methods for archived youth data. *Journal of Information Communication and Ethics in Society*, 20(3):349–361, 2022.
- [McKinsey Global Institute, 2018] McKinsey Global Institute. Assessing the economic impact of artificial intelligence. ITU Trends, Issue Paper No.1, September 2018. <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/misr2018.aspx>.
- [McLennan and others, 2022] S. McLennan *et al.* Embedded ethics: a proposal for integrating ethics into the development of medical ai. *BMC Medical Ethics*, 23(1), 2022.
- [Mittelstadt, 2019] B. Mittelstadt. Principles alone cannot guarantee ethical ai. *Nature Machine Intelligence*, 1(11):501–507, 2019.
- [Murdoch, 2021] B. Murdoch. Privacy and artificial intelligence: challenges for protecting health information in a new era. *BMC Medical Ethics*, 22(1), 2021.

- [Nakagawa and Orita, 2022] H. Nakagawa and A. Orita. Using deceased people's personal data. *Ai & Society*, 2022.
- [Newswire, nd] PR Newswire. Ubie, japanese healthtech startup. Online, n.d. <https://www.prnewswire.com>.
- [Owkin, 2023] Owkin. Owkin: Transforming discovery in healthcare with ai and federated learning. Online, 2023. <https://owkin.com/>.
- [Pasricha, 2023] S. Pasricha. Ai ethics in smart healthcare. *IEEE Consumer Electronics Magazine*, 12(4):12–20, 2023.
- [Prakash and others, 2022] S. Prakash et al. Ethical conundrums in the application of artificial intelligence (ai) in healthcare—a scoping review of reviews. *Journal of Personalized Medicine*, 12(11):1914, 2022.
- [Racine et al., 2019] E. Racine, W. Boehlen, and M. Sample. Healthcare uses of artificial intelligence: challenges and opportunities for growth. *Healthcare Management Forum*, 32(5):272–275, 2019.
- [Schwalbe and Wahl, 2020] N. Schwalbe and B. Wahl. Artificial intelligence and the future of global health. *The Lancet*, 395(10236):1579–1586, 2020.
- [Segmed, 2023] Segmed. The fastest way to acquire medical data online. Online, 2023. <https://www.segmed.ai/>.
- [Solanki et al., 2022] P. Solanki, J. Grundy, and W. Husain. Operationalizing ethics in artificial intelligence for healthcare: a framework for ai developers. *Ai and Ethics*, 3(1):223–240, 2022.
- [Stypińska and Franke, 2023] J. Stypińska and A. Franke. Ai revolution in healthcare and medicine and the (re-)emergence of inequalities and disadvantages for ageing population. *Frontiers in Sociology*, 7, 2023.
- [Sweeney, 2013] L. Sweeney. Discrimination in online ad delivery. *Queue*, 11(3):10–29, 2013.
- [Syntegra, 2023] Syntegra. Transforming healthcare with synthetic data. Online, 2023. <https://www.syntegra.io/>.
- [TechCrunch, 2022] TechCrunch. Image-generating ai can copy and paste from training data, raising ip concerns, 2022. <https://techcrunch.com/2022/10/07/image-generating-ai-can-copy-and-paste-from-training-data-raising-ip-concerns/>.
- [TechCrunch, 2023] TechCrunch. Meta confirms ai 'off-switch' coming to facebook and instagram in europe, 2023. <https://techcrunch.com/2023/08/22/meta-confirms-ai-off-switch-incoming-to-facebook-instagram-in-europe/>.
- [Tulsulkar et al., 2021] G. Tulsulkar, N. Mishra, N. Thalmann, H. Lim, M. Lee, and S. Cheng. Can a humanoid social robot stimulate the interactivity of cognitively impaired elderly? a thorough study based on computer vision methods. *The Visual Computer*, 37(12):3019–3038, 2021.
- [Wang et al., 2022] C. Wang, J. Zhang, N. Lassi, and X. Zhang. Privacy protection in using artificial intelligence for healthcare: Chinese regulation from a comparative perspective. *Healthcare*, 10(10):1878, 2022.