

# **The Ethical Implications of Data Governance in AI-Powered Elder Carebots**

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## 1. Introduction - written by Larissa Pinto

Artificial Intelligence (AI) has seen increasing growth in its application in various fields and sectors, one such field with a significant impact is that of healthcare and elderly care. It has the potential to revolutionize the way that elderly care is delivered. AI and Robotics have helped tackle monotonous work, allowing healthcare workers to have a better focus on their patients and to have a lesser workload. AI systems can learn from data, recognize patterns, and make decisions, which makes them well-suited to help older adults with a variety of tasks and improve their quality of life.

Artificial intelligence (AI) has the potential to greatly improve elderly care by enabling more efficient, effective, and personalized support. Some applications of AI in elderly care include:

- Fall detection: AI can help prevent injuries and ensure timely medical attention by monitoring the movements and activities of elderly individuals, to detect if a fall has occurred.
- Medication management: AI-powered elderly care bots can be used to remind elderly individuals to take their medication and to alert caregivers if a dose is missed. This can help prevent dangerous drug interactions and ensure that individuals are adhering to their treatment plans. For example, AI-powered personal assistants can remind older adults to take their medications, provide information about the medications, and check for interactions.
- Companionship: AI can be used to provide companionship to elderly individuals who may be isolated or lonely. This can be in the form of a virtual assistant that can engage in conversation or a robot that can provide a physical presence.
- Assistive technologies: AI-powered assistive technologies such as elder care robots can help older adults with tasks such as preparing meals, doing laundry, and cleaning, which can help them to continue living in their own homes.
- Safety: AI can be used to monitor the environment and alert caregivers if there are any potential safety hazards, such as a gas leak or a fire.
- Health monitoring: Data Mining along with AI can be used to monitor the health of elderly individuals such as tracking vital signs like blood pressure, heart rate, and oxygen levels or detecting early signs of illness. They can also be used to detect changes in an older adult's condition that might indicate a health problem, such as falls, and alert caregivers if there are any concerning changes.
- Socialization: It can be used to facilitate socialization and engagement for elderly individuals. For example, a Virtual Assistant could help connect an elderly person with their friends and family or facilitate participation in online social activities.

These are just a few examples of how AI can be used in elderly care, but researchers and developers are constantly finding new ways to apply this technology to improve the lives of older adults. By using AI, care providers can gain new insights, automate repetitive tasks and personalize elderly care, it can also improve the efficiency and cost-effectiveness of the services,

The following report details the analysis of the data governance and management issues observed in the applications listed above, in various tools and platforms.

### **1.1. Aims and Objectives**

The aim of this report is to understand and analyze the social, cultural, ethical, moral, environmental, and legal issues associated with the use of AI along with data extraction and governance, and the impact it has on the stakeholders. The report details the evaluation of the effectiveness of these technologies in improving the quality of life of older adults and reducing the burden on human caregivers, understanding how robots affect the physical, emotional, and social well-being of older adults and their caregivers. This report also aims to investigate ethical and social issues related to the use of elder care robots, such as privacy, autonomy, and human interaction. The objectives include understanding public perceptions of these robots and the potential implications of their use, particularly in the context of eldercare, and studying the impact of these robots on human interactions and relationships. The goal is to collate the research done based on the various issues, ethical practices, and benefits of using Artificial Intelligence in care for the elderly.

## **2. Ethical issues and Data Governance - written by Larissa Pinto**

Data mining is the process of collecting, analyzing, and using large datasets to discover patterns and trends. It is a key component of artificial intelligence (AI) and machine learning, as it allows AI systems to learn from data and make predictions or decisions based on that learning.

In the context of AI, data mining can be used to train machine learning algorithms to recognize patterns in data and make decisions based on those patterns. Some of the applications of data mining with AI include fraud detection, customer segmentation, recommendation engines, predictive maintenance, etc. It can help organizations to extract valuable insights from large amounts of data, and to make better-informed decisions based on that data.

However, in terms of the use of Artificial Intelligence and Data Mining in elderly care applications and Carebots there may be many concerns that arise regarding ethics and data. Privacy is a critical concern since data mining often involves the collection and analysis of large amounts of personal data. In this specific application, the data would entail health reports. It is important to ensure that personal data is collected and used in a way that respects the privacy rights of elderly individuals and complies with relevant laws and regulations. This may include obtaining the consent of individuals before collecting their data, limiting the amount of data collected to what is strictly necessary, and taking steps to secure and protect the data from unauthorized access or misuse (Gallagher, Nåden , Karterud, 2016).

Data mining can be used to extract valuable insights from data, but it can also be used to exploit individuals or organizations. In this case, the data can be used to find out about the household and people surrounding the elderly individual being monitored. This information can be used to commit various crimes.

Another ethical issue is related to accountability. Elder care bots are often operated remotely, and there may be questions about who is responsible in the event of an accident or malfunction. Additionally, there may be questions about the legal responsibility of the manufacturers of these technologies and the providers of the service.

AI-powered systems can have the potential to restrict the autonomy of elderly individuals, for example by limiting their ability to make decisions or by imposing certain behaviors. It is important to ensure that the use of AI in elderly care is designed to support and enhance the autonomy of elderly individuals, rather than restricting it.

Data mining can perpetuate and amplify existing biases if the data being analyzed is itself biased, this can result in unfair or discriminatory treatment of elderly individuals. The bias could be caused due to data, based on the kind of data being fed to the model while training can impact the decision-making outcome. For example, if the training data is predominantly male, the Carebots may be more likely to recognize and respond to male voices or faces, leading to a disadvantage for female users. In some instances, the design of elderly Carebots may itself be biased, leading to unequal treatment of users. For example, an elderly Carebot that is designed to be more responsive to certain types of users (e.g., those who speak a particular language or have certain physical characteristics) may disadvantage other users. Sometimes users of Carebots may have their own biases, which can influence how they interact with the robot and how it responds. For example, a user who is biased against a certain group of people may treat the Carebots differently based on the perceived identity of the user, leading to unequal treatment. It is important to be aware of these potential sources of bias in elder Carebots and to take steps to mitigate them, to ensure that the Carebot is providing fair and equitable treatment to all users. Therefore, it is important to ensure that data is collected and analyzed in a way that minimizes the risk of bias, for example, by ensuring that data sets are diverse and representative.

Individuals may have little control over how their personal data is collected and used in data mining. It is important to ensure that individuals have the right to opt out of data collection and to have their data deleted if they choose. This may include providing clear information about data collection practices and allowing individuals to access and control their personal data. Therefore, it is important to be transparent about the data mining practices being used and the purposes for which the data is being collected and used. This can help to build trust and ensure that individuals are aware of how their data is being used. This may include providing clear and concise information about data collection and use and being open and responsive to questions and concerns about data practices.

One of the ethical issues of switching to elderly Carebots is the potential for AI to replace human caregivers, leading to job loss and reduced social interaction for elderly individuals. It is important to ensure that the use of AI in elderly care is complementary to, rather than a replacement for, human caregivers.

Data governance refers to the policies, procedures, and controls put in place to ensure proper management and protection of data. In the context of AI in elderly care, it is important to have



robust data governance practices in place to ensure that personal data is collected, stored, and used in a way that is ethical and compliant with relevant laws and regulations.

Some key considerations for data governance in AI in elderly care include:

- **Data collection:** It is important to ensure that the collection of personal data from elderly individuals is done with their consent and in a way that is transparent about the purposes for which the data will be used.
- **Data storage:** Personal data should be stored in a secure and confidential manner, with appropriate safeguards in place to prevent unauthorized access or misuse.
- **Data use:** Personal data should only be used for the purposes for which it was collected and with the consent of the individual. It is important to have clear policies in place governing the use of personal data and to ensure that these policies are followed.
- **Data access:** Individuals should have the right to access their personal data and to request that it be corrected or deleted if it is incorrect. It is important to have processes in place to ensure that these requests are handled in a timely and appropriate manner.

### **3. An overview of current and emerging ethical guidelines, frameworks, principles, and legislation - written by Ansa Baby**

#### **3.1. Current and emerging ethical guidelines**

When discussing the ethical implications of AI, it is often assumed that the conversation centres on negative or problematic outcomes. While it is important to address the potential negative consequences of AI, it is also important to recognize the many potential benefits of the technology. For example, AI has the potential to increase efficiency and productivity, leading to economic benefits and improved quality of life for individuals. However, this may also raise ethical questions about the distribution of wealth and the role of society in redistributing it in a fair and just manner. These values and assumptions should be made explicit as we consider the ethical considerations of AI.

The CEO of Microsoft says "AI has the potential to transform our world in remarkable ways, but we must develop and implement it in an ethical, responsible manner. We must ensure that AI is not only highly advanced technology but also aligned with human values and the greater good." (Nadella, S, 2018: online)

There are several current and emerging ethical guidelines in data governance that organizations should be aware of. These include:

##### **3.1.1. Privacy**

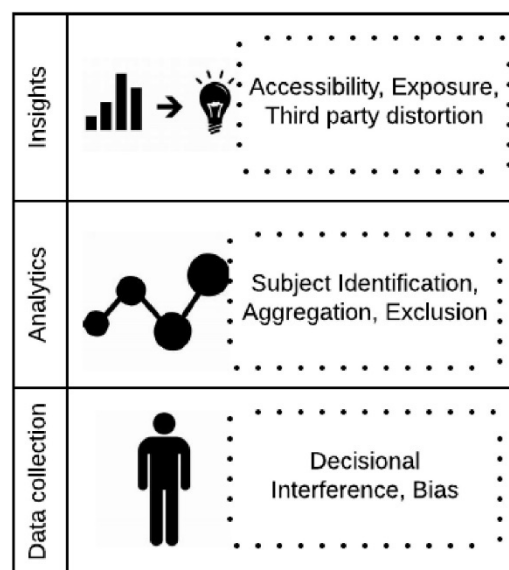
AI often involves the collection and processing of substantial amounts of personal data, making privacy an important ethical concern. It is necessary to ensure that individuals' data is protected not only from a legal perspective but also to uphold individuals' rights and autonomy.

There are several ways in which the privacy of individuals' data can be compromised in the context of AI. For example:

**Data acquisition:** AI systems frequently require vast amounts of information to function optimally, and this data is often obtained from individuals through various channels such as web tracking, wearable technology, and social media platforms. Individuals should be aware of the methods in which their data is being acquired and have the option to control the data that is obtained about them.

**Data preservation and protection:** Once data is acquired, it is crucial to guarantee that it is protected securely and that suitable measures are in place to prevent unauthorized access or misuse.

**Data utilization and distribution:** It is also essential to consider the ways in which data is utilized and distributed and to ensure that it is only used for the intended purposes for which it was obtained. This necessitates clear and transparent guidelines for data utilization and distribution, as well as mechanisms for individuals to manage their data and limit its utilization.



**Figure 1 – Data Privacy**

Fig 2 shows the definition of privacy in data analytics involved in three aspects: data collection, analytics, and insights. (VictorChang,2021)

### 3.1.2. Fairness

Fairness is an ethical principle that is concerned with treating all people equally and avoiding discrimination. It is especially important when data and algorithms are being used to make decisions that can affect people's lives, such as hiring, lending, and sentencing. To ensure fairness, it is important to:

- Use diverse data that accurately represents the population being studied.
- Check for and address any biases present in the data and algorithms.
- Explain the decision-making process clearly, including the use of data and algorithms.

Involve a wide range of stakeholders, including those who may be affected by the decisions, in the process.

### **3.1.3. Transparency**

Transparency in data and decision-making involves making information available and accessible to those interested in it and being open about the processes and explanations behind the decisions being made. This can include making data and algorithms available for review, being transparent about the decision-making process, providing explanations for decisions, and seeking input and feedback from stakeholders. The goal of transparency is to ensure that the decisions being made using data and algorithms are fair, accountable, and trustworthy, and to allow for the identification of any potential biases or issues with the process. This includes providing clear and concise privacy policies and giving individuals the ability to opt-out of data collection or request that their data be deleted.

### **3.1.4. Security**

Protecting data from unauthorized access, use, or disclosure. This includes implementing strong security measures such as encryption and regularly updating systems to address vulnerabilities. In the context of ethical guidelines for data, security is an important consideration because it helps to protect the confidentiality, integrity, and availability of data. There are several ways to ensure the security of data, including:

- Access controls: Implementing access controls helps to ensure that only authorized individuals can access data.
- Encryption: Encrypting data helps to protect it from unauthorized access, even if it is intercepted or stolen.
- Data backup: Regularly backing up data helps to ensure that it can be recovered in the event of a data loss event, such as a cyber-attack or hardware failure.
- Data disposal: Properly disposing of data, such as by securely deleting or destroying it, helps to prevent unauthorized access to the data.
- Training: Providing training to employees on data security best practices helps to ensure that they understand the importance of protecting data and how to do so.

By implementing these measures and others, organizations can help to ensure the security of their data and protect it from unauthorized access or misuse.

### **3.1.5. Accountability**

Accountability in data ethics refers to the concept that individuals and organizations should be held responsible for their actions related to data. This includes being accountable for the accuracy and reliability of the data they collect and use, as well as for protecting the privacy and security of the data. Ensuring accountability can involve setting clear policies and procedures, implementing oversight and review mechanisms, providing training on data responsibilities, and establishing consequences for non-compliance. These measures help to ensure that organizations and individuals take their data-related responsibilities seriously and protect against misuse or abuse of data.

### **3.1.6. Safety**

Ensuring that AI systems are safe and do not pose a risk to individuals or society. The safety of individual data refers to the protection of individuals from harm that may result from the collection, use, or disclosure of data. This can include physical harm and harm to an individual's reputation,

financial well-being, or other aspects of their life. To ensure the safety of individual data, organizations can take measures such as protecting the privacy and security of data, obtaining informed consent, conducting risk assessments, and being transparent about their data practices.

### **3.2. Frameworks**

According to Liu et al. (2016), big data can be prone to errors due to three factors: inauthentic data collection, information incompleteness, and representativeness issues. This demands the need for ethical frameworks.

Governments and the wider public sector can use data responsibly and appropriately by following the Data Ethics Framework. Public servants gain a better understanding of ethical considerations, incorporate them into their projects, and are encouraged to innovate responsibly. Data practitioners (statisticians, analysts, and data scientists), policymakers, operational staff, and those providing information based on data are the target audience of this guidance. (Govt of UK,2020)

#### **3.2.1. The ethical principles of the Association for Computing Machinery (ACM)**

The ACM (Association for Computing Machinery) has developed a set of ethical principles that outline the responsibilities of computer scientists and professionals working with data and AI. These principles include respect for privacy, confidentiality, and security; integrity and accuracy; and accountability. The ACM is a professional association for computer scientists and professionals working in computing. It has developed ethical principles that outline the responsibilities of its members when working with data and AI. These principles include respect for privacy, confidentiality, and security; integrity and accuracy; and accountability.

#### **3.2.2. The Control Objectives for Information and related Technology**

COBIT is a framework and set of best practices for managing information and technology, including a set of guidelines and practices for managing data assets, including guidelines for data quality, data protection, and data governance.

#### **3.2.3. The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems**

This initiative has developed a set of ethical guidelines for the development and use of AI and autonomous systems. These guidelines cover topics such as transparency, accountability, and non-discrimination. This initiative is run by the Institute of Electrical and Electronics Engineers (IEEE), a professional association for electrical and computer engineers. It has developed a set of ethical guidelines for the development and use of AI and autonomous systems. These guidelines cover topics such as transparency, accountability, and non-discrimination. (IEEE,2022)

#### **3.2.4. The Data Ethics Canvas**

This is a tool developed by the Digital Innovation and Public Policy Lab at the University of Ottawa that helps organizations consider the ethical implications of their data-related activities. It covers topics such as privacy, consent, and transparency. This is a tool developed by the Digital Innovation and Public Policy Lab at the University of Ottawa. It is designed to help organizations consider the ethical implications of their data-related activities. It covers topics such as privacy, consent, and transparency, and provides a structured way for organizations to think about these issues and make ethical decisions.

### **3.2.5. The Open Data Institute (ODI)**

The ODI Data Governance Framework provides principles and practices for managing data assets responsibly and transparently, including guidelines for data management, data protection, and data access.

### **3.2.6. The ISO/IEC 27001:2013**

ISO is an internationally recognized framework for an information security management system, which includes guidelines for data classification, data protection, and data governance.

### **3.2.7. The Data Governance Institute (DGI)**

The DGI Data Governance Framework is a set of best practices for managing data assets to align with an organization's business objectives and strategies. It includes guidelines for data management, data protection, and data governance, as well as principles for data quality and data security.

## **3.3. Principles**

In the context of data governance and mining, principles refer to the guiding values and beliefs that shape an organization's approach to managing and using data. These principles can be used to help make decisions about how to manage data in an ethical and responsible manner

### **3.3.1. Standardized Data management policies Rules and Regulations**

Standardized rules and regulations are an important aspect of data ethical principles because they help to ensure that data is collected, used, and shared responsibly and transparently. These rules and regulations should be clear, consistent, and applicable to all parts of the organization. They should also be regularly reviewed and updated as necessary to reflect changes in the organization of external regulations.

To ensure the success of a data governance process, it is necessary to have clear and standardized rules and regulations in place to protect the data and ensure compliance with external regulations, such as the GDPR (refer to section 3.2.1). These guidelines should cover all aspects of data usage and should be set up by the data governance council and enforced by the data steward(s). Having these rules in place helps ensure that the organization's data is used responsibly and compliantly. (Eolit Services, 2018)

### **3.3.2. Data Stewardship**

Data stewardship is the practice of managing and protecting data assets responsibly and ethically. In the context of data ethical principles, data stewardship involves taking steps to ensure that data is collected, used, and shared in a way that is transparent, accountable and respects the rights and interests of all stakeholders. (Eolit Services, 2018)

Some key aspects of data stewardship in the context of data ethical principles include:

- Ensuring that data is collected and used consistently with the organization's mission and values.
- Establishing clear policies and procedures for how data is managed and used and enforcing those policies consistently.

- Protecting the privacy and security of data and taking steps to prevent unauthorized access or misuse of data.
- Being transparent about how data is collected, used, and shared, and making sure that stakeholders are aware of and understand these practices.

Ensuring that data is used fairly and respects the diversity of the population being studied.

### **3.3.3. Data Quality Standards**

Data quality refers to the accuracy, completeness, reliability, and relevance of data. Ensuring data quality is an important aspect of data ethics because it ensures that data is being used in a responsible and trustworthy manner. (Eolit Services, 2018)

Several principles can help to guide the establishment of data quality standards:

- Data accuracy: Data should be correct and reflect the true state of affairs.
- Data Completeness: Data should be complete and cover all relevant aspects of the subject under consideration.
- Data reliability: Data should be reliable and consistent over time.
- Data relevance: Data should be relevant and related to the purpose for which it is being collected and used.
- Data transparency: The methods and processes used to collect, store, and use data should be transparent and open to scrutiny.

### **3.3.4. Accountability / Responsibility**

Accountability must be a central aspect of any successful data governance process. Without someone taking ownership of the data governance efforts, the process will lack direction and be ineffective. To ensure that all parts of the organization are held accountable, it is recommended to set up a data governance council made up of representatives from all departments, including executive leadership. This council should be responsible for creating and enforcing data procedures and policies across the organization. Having representatives from all parts of the organization involved helps to prevent the perception that data governance is solely the responsibility of the IT department and helps to ensure that it is seen as a concern for the entire organization. (Eolit Services, 2018)

### **3.3.5. Ethical considerations**

Ethical considerations in data refer to the moral principles and values that should guide the collection, use, and sharing of data. These considerations are often reflected in ethical principles, which are guidelines or rules that help to ensure that data is collected, used, and shared responsibly and ethically. Some examples of ethical principles that may be relevant to data include privacy, security, fairness, transparency, and accountability. These principles help to ensure that data is collected and used in a way that respects the rights and interests of individuals, and that it is not used to harm or exploit them. These are elaborately explained in the ethical guidelines section (refer to section 3.1).

### **3.3.6. Explainability**

Explainability, also known as transparency or interpretability, is an ethical principle that refers to the idea that the decision-making processes and methods used by algorithms and other data-driven

systems should be able to be understood and explained to those who are affected by them. This principle helps to make sure that these systems are transparent and can be held accountable for their actions, and it is an important aspect of responsible data practices. To ensure explainability, organizations can use explainable algorithms or set up processes for explaining the decisions made by their data-driven systems to those who are affected by them.

### **3.3.7. Inclusivity**

Inclusivity in data refers to the idea that data collection, use, and sharing should be inclusive of all individuals and groups, regardless of their characteristics or identities. This includes ensuring that data practices do not discriminate against or exclude any groups and that they are fair and fair for all individuals.

Ensuring inclusivity in data practices is important for several reasons. First, it helps to ensure that data is representative of the diverse populations it aims to serve. If certain groups are excluded from data collection or analysis, the data may be biased or skewed, which can lead to inaccurate or unreliable results.

Second, inclusivity helps to ensure that data-driven decisions are fair and unbiased. When data is used to make decisions that affect individuals or communities, it is important to ensure that it stands for all relevant groups and is not biased towards any group. This helps to ensure that these decisions are fair and unbiased and that they do not unfairly disadvantage any group.

There are several ways in which organizations can promote inclusivity in their data practices. This can include actively seeking out and including data from underrepresented groups, implementing processes to find and mitigate biases in data, and ensuring that their data collection and use are transparent and accountable. By taking these steps, organizations can ensure that their data practices are inclusive and fair for all individuals

## **3.4. Legislation**

### **3.4.1. The General Data Protection Regulation (GDPR)**

The DPA (Data Protection Act) 2018 and UK GDPR (General Data Protection Regulation), and the EU GDPR require organizations to implement “appropriate technical and organizational measures” to secure the personal data they process. The European Data Protection Regulation, which took effect on May 25th, 2018, is a set of laws that apply to all member states of the European Union and are designed to standardize data privacy regulations across Europe. (GDPR-info, 2016)

The GDPR sets out several principles that organizations must follow when processing personal data. These include the principles of lawfulness, fairness, transparency, purpose limitation, data minimization, accuracy, and storage limitation. (GDPR-info, 2016)

GDPR applies to all organizations that process the personal data of EU citizens, regardless of their location. It sets out specific requirements for the collection, use, and storage of personal data, including the need to obtain explicit consent from individuals for the processing of their data, the

right of individuals to access and rectify their data, and the obligation of organizations to protect personal data from unauthorized access or misuse. (GDPR-info, 2016)

### **3.4.2. The California Consumer Privacy Act (CCPA)**

The CCPA is a California law that gives consumers in the state the right to request that businesses disclose what personal information they have collected about them, and request that it be deleted. It also requires businesses to provide a link on their website's homepage that allows consumers to opt-out of the sale of their personal information. CCPA applies to businesses in California that have gross revenue over \$25 million or buy, sell, or share personal information of at least 50,000 consumers, households, or devices. It allows the California attorney general to enforce the law and imposes fines for non-compliance.

The CCPA applies to "personal information," which is defined broadly to include any information that identifies, relates to, describes, is capable of being associated with, or could be linked, directly or indirectly, with a particular consumer or household. This includes information such as names, addresses, email addresses, phone numbers, and IP addresses, as well as other types of information such as biometric data, geolocation data, and information about consumers' preferences, behaviours, and interactions with businesses. (CA leginfo legislature,2018)

### **3.4.3. The Health Insurance Portability and Accountability Act (HIPAA)**

The Health Insurance Portability and Accountability Act (HIPAA) is a U.S. federal law that was enacted in 1996 to protect the privacy and security of "protected health information" (PHI). PHI is any information about an individual's health or healthcare created, received, used, or disclosed while providing healthcare services or conducting healthcare operations. HIPAA sets out rules for the use and disclosure of PHI by "covered entities" (such as healthcare providers, health plans, and healthcare clearinghouses) and their "business associates" (such as billing companies and other entities that manage PHI on behalf of covered entities).

HIPAA includes two main sets of rules: the Privacy Rule and the Security Rule. The Privacy Rule sets out standards for the use and disclosure of PHI by covered entities and gives individuals the right to access and request corrections to their PHI. The Security Rule sets out standards for protecting the confidentiality, integrity, and availability of electronic PHI (ePHI). It requires covered entities to implement administrative, physical, and technical safeguards to protect ePHI from unauthorized access, use, or disclosure.

HIPAA also includes provisions to enforce compliance with the Privacy and Security Rules. It gives individuals the right to file a complaint if they believe their PHI has been used or disclosed improperly and allows the U.S.

### **3.4.4. The Payment Card Industry Data Security Standard (PCI DSS)**

The Payment Card Industry Data Security Standard (PCI DSS) is a set of security standards designed to ensure that all companies that accept, process, store, or transmit credit card information maintain a secure environment. It was created by major credit card companies (Visa, MasterCard, American Express, Discover, and JCB) to reduce the risk of credit card fraud and to protect



sensitive customer information. The standard applies to any organization, regardless of size or number of transactions, which accepts credit card payments.

To meet PCI DSS requirements, companies must implement several security measures, including:

- Protecting cardholder data: Cardholder data must be encrypted and securely stored.
- Maintaining a secure network: Companies must implement firewalls and other security measures to protect their networks.
- Protecting against malware: Companies must have measures in place to prevent and detect malware attacks.

Regularly testing and monitoring networks: Companies must regularly test their networks to ensure that they are secure and must have processes in place to monitor for any potential security breaches.

### **3.4.5. The Children's Online Privacy Protection Act (COPPA)**

COPPA is a US law that aims to protect the privacy of children under 13 years old on the internet. It requires online service providers to get parental consent before collecting, using, or disclosing the personal information of children, and to provide clear information about their data collection practices in a privacy policy. COPPA also allows parents to review, delete, and/or consent to the collection of their child's personal information and requires companies to implement measures to protect the security of children's personal information. The law applies to a variety of online services, including social media, gaming sites, and mobile apps, and is enforced by the Federal Trade Commission (FTC).

### **3.4.6. The Human Rights Act**

This is a UK law that gives individuals the right to respect their private and family life, home, and correspondence. It has been interpreted by courts to include the right to privacy and can be used to challenge the processing of personal data that is intrusive or disproportionate. The Information Technology Act: This is an Indian law that sets out rules for the collection, use, and storage of personal data in the context of electronic transactions. It gives individuals the right to access and request corrections to their data and sets out rules for the handling and protection of personal data by organizations.

### **3.4.7. ePrivacy Directive (ePD)**

The EU directive on electronic communications privacy applies to the handling of personal data in the context of electronic communication. It includes rules for the use of cookies, marketing emails, and other electronic marketing methods, and grants individuals the right to object to the processing of their data for marketing purposes.

### **3.4.8. The National Information Technology Development Agency Act**

It is a law in Nigeria that establishes the National Information Technology Development Agency (NITDA). The agency is responsible for regulating the use of information technology in Nigeria, including the development and promotion of the information technology industry in the country.

The act includes provisions on data protection and the use of personal data. It requires companies to obtain the consent of individuals before collecting, using, or disclosing their data, and to act appropriately to protect the security of personal data.

### **3.4.9. The Privacy and Electronic Communications Regulations (PECR)**

This is a UK regulation that applies to electronic communications and marketing. It sets out rules for the use of cookies, the sending of marketing emails, and the use of other electronic marketing techniques, and gives individuals the right to object to the processing of their data for marketing purposes.

There are various acts and bills related to data governance and ethics enacted worldwide. These laws are often specific to a particular country and are designed to regulate the collection, use, and disclosure of personal data in that country.

**The Right to Information Act:** This Indian law gives individuals the right to access information held by public authorities, including personal data. It can be used by individuals to request access to their data or to challenge the processing of their data by public authorities.

**The Indian Penal Code:** This law includes provisions related to unauthorized access to or misuse of personal data. It can be used to prosecute individuals or organizations that engage in such activities.

**The Privacy Act:** This Canadian federal law applies to the personal information of individuals collected, used, or shown by federal government institutions. It sets out rules for the handling of personal information and gives individuals the right to access and request corrections on their personal information.

**The Australian Privacy Act:** This federal law in Australia applies to organizations that handle personal information. It sets out rules for the collection, use, and disclosure of personal information and gives individuals the right to access and request corrections to their personal information.

**The Japan Act on the Protection of Personal Information:** This Japanese law, which went into effect in 2005, sets out rules for the collection, use, and disclosure of personal information by organizations and gives individuals the right to access and request corrections to their personal information.

**The Korean Personal Information Protection Act:** This South Korean law, which went into effect in 2011, sets out rules for the collection, use, and disclosure of personal information by organizations and gives individuals the right to access and request corrections to their personal information.

#### **4. “Carebots” - Automated care for the elderly - written by Jesty Sebastian**

##### **4.1. The global care crisis for our ageing populace**

Ageing of the global population is an unavoidable tendency. According to United Nations, over 950 million people in the world are over 60 today and 62% of these people live in developing countries. This number will cross two billion by 2050, twice what it is today. Almost four hundred million of those people will be over eighty. In the US, this number is expected to be around 100 million by 2060, which is double roughly 50 million today. The case of the United Kingdom is no different. By 2050 the number of people above 85 will double to 2.6 million in England (World Population Prospects, UN, 2022).

The ageing population is a result of increased life expectancy and dramatically decreased fertility rates. Over the last 50 years, life expectancy at birth has increased by almost 20 years. Before the 1900s the average life expectancy was estimated at thirty years. Industrial, technological, and medical breakthroughs helped in diagnosing illness, preventing diseases, and providing effective treatment. So, now the average life expectancy globally is 72 years. On the contrary, there is a noticeable decline in the fertility rate. Today the average woman has less than two children whereas it was five in the mid-1960. Developed countries particularly have the lowest fertility rate all over the world. Specifically, Europe has the lowest fertility rate at 1.6. (Why our world is ageing, Forbes, 2018)

The ageing of the world's population poses a variety of difficulties for global healthcare systems. Age-related illnesses including diabetes, heart disease, and Alzheimer's disease are more likely to develop as people live longer and may need continuing medical care and assistance. This may overburden healthcare systems and make it challenging for elderly patients to get the care they require. Additionally, a lot of elderly individuals need help with everyday tasks like washing, clothing, and managing medications, which can be difficult for family members and carers who could also be caring for children or other dependents. To assist in meeting the care requirements of the ageing population, more resources and assistance are required.

##### **4.2. Inadequacy of human care providers**

As the global population ages, it is getting harder for the healthcare system to provide proper care for the ageing population. Among the significant medical conditions that might manifest in old age are chronic obstructive pulmonary disease, diabetes, depression, dementia, hearing loss, cataracts, refractive errors, back and neck discomfort, and osteoarthritis. As people age, they are more likely to develop such conditions. Consequently, a thorough public health response must consider the various needs and experiences of the aged (Aging and Health, WHO, 2022). Because of the ageing population, there will be a huge rise in the demand for care in the next decades. The absence of senior carers was a result of modernization, globalization, women's employment, youth migration, and women's employment. Inadequate patient care, lengthy treatment waits times, and an overburdened medical team are just a few problems that might arise.

Numerous reasons, including a lack of healthcare personnel in some regions, insufficient healthcare financing, and the excessive cost of healthcare professionals' education and training,

contribute to this issue. The population is predicted to age, which will increase the number of elderly individuals who require care and make the lack of carers worse.

It will be crucial for governments, healthcare organisations, and other stakeholders to engage in methods to improve the quantity and capability of human care providers, such as training programmes, incentives to encourage individuals to give care, and other measures to address this issue.

#### **4.3. “Carebots” - Technology in eldercare**

Carebots are robots or software applications that are created specifically to help or care for elderly people, frequently through automating activities or offering individualized support. Carebots can be outfitted with a variety of sensors, cameras, and other technologies that enable them to carry out functions including monitoring the health and well-being of senior citizens, sending out reminders for appointments or medicine, and helping with chores like cooking or cleaning.

Carebots may be made more effective and efficient in a variety of ways by utilizing data mining and artificial intelligence (AI) techniques. When analysing data from sensors and cameras, for instance, data mining techniques may be used to spot changes in older people's behaviour or health that may call for further assistance or action. The possibility of certain incidents, like falls or medical emergencies, may be predicted using AI algorithms, which can then be utilized to decide what course of action to follow. Carebots may also be utilized to give elderly people individualized help by learning about their preferences, requirements, and routines, and adapting their behaviour and actions appropriately. For instance, Carebots may employ data mining and AI techniques to discover a person's favourite routines, activities, and social contacts and then use this knowledge to offer specialized advice or support.

Overall, Carebots that employ data mining and AI techniques have the potential to enhance the quality of assistance and care provided to older people, as well as to make it simpler for them to maintain their independence and physical and mental health.

Carebots are a developing technology that requires future development. Yet, countries with ageing populations, such as Japan, Singapore, and Italy, have already become mainstream users of Carebots. In Japan, 28.2% of its population is aged 65 and above and is the country with the highest percentage of the elderly. In recent years, the Japanese government has spent a quarter of its annual budget on the development of senior-friendly technology, which includes Carebots research. Subsidies and grants are offered to local Japanese research institutes and universities to improve current Carebots technologies (RobotShop Community, 2021).

By 2040, one in seven UK citizens is anticipated to be older than seventy-five. "Care robots" may make it possible for the UK's specialized senior social care industry to aid those who need it most. By spending £34 million in government funding in 2019, the UK aimed to ensure the public's safety and trustworthiness and took a step toward developing healthcare robots that might improve the delivery of healthcare globally. With funding from this initiative, it is hoped that robots will one day assist the elderly when they fall and raise the alarm, deliver food to them during mealtimes, and even make sure they take their medication on schedule (Department for Business, Energy & Industrial Strategy, UK Research and Innovation, and The Rt Hon Chris Skidmore MP, 2019).

Even though America has a smaller elderly population than nations like Japan and Italy, healthcare professionals nevertheless consider the growing significance of Carebots. According to the Global Personal Artificial Intelligence and Robotics Market Report 2022–2027, the market for US Carebots is expected to grow quickly as a substitute for current elder care options. Carebots typically aid the elderly, but they can also meet the needs of other dependent populations, like those with autism spectrum disorders (ASDs). While hiring more carers is still the best option, Carebots will surely be a big part of meeting the growing demand for elderly care. (Research and Markets, 2022)

#### **4.4. Why Carebots?**

To meet the rising need for social care, there just are not enough doctors or nurses in the world. For instance, it is predicted that a million more nurses would be needed in Japan, a nation well-known for its ageing population, by 2025 to supply the level of care necessary. There is no doubt that the implementation of care bots has the potential to change the way we interact with the elderly.

Carebots enable elderly people to stay in the comfort of their own homes and maintain independence for longer while also engaging in other activities that are tailored to their needs. Care bots are capable of reminding people to take their medication, attend appointments, and eat. They can also remotely monitor a variety of medical conditions and their movements in case anything goes wrong. Care bots, however, will boost older people's emotional welfare by providing companionship in addition to taking care of their physical well-being by helping with heavy lifting and acting as a communication tool. Considering Age UK's assessment that 200,000 seniors have not spoken to family or friends in a month, social robots can reduce loneliness by keeping seniors company. Also, it upholds dignity, fosters independence by postponing or minimizing the need for unwelcome human assistance, lessens the strain on family and friends, fills care gaps, and offers limitless patience. Carebots are being created to relieve the burden on carers. By helping to carry and transport patients, innovations like Robear, a large robotic bear, are assisting carers and easing the physical strain of their labour. (Meet the Carebots, Hitachi, 2022)

Additionally, care bots are enabling people with physically crippling impairments to recapture a feeling of normalcy, even in activities that may seem routine to the rest of us. The Obi robot, for instance, assists persons with impairments in feeding themselves. It is a simple task, but the user may feel more respected and prefer to have a robot serve them rather than another person. The influence of care bots will go well beyond simply helping to reduce expenses, even if they contribute to the answer to the rising cost of care. They are in line to contribute significantly to areas other than only social care. They will, however, have a real and considerable influence on people's lives by restoring a level of freedom that may otherwise have been lost. These illustrations demonstrate the rapid development of Carebot's skills. We believe that the rate of adoption will be determined by human acceptance rather than technological constraints. But if people see the advantages that care bots may offer, it will not be long before they become a standard fixture in our homes. (Meet the Carebots, Hitachi, 2022)

#### **4.4.1. Cost-effective monitoring and automatic emergency notification**

The Carebots is a one-time investment that eventually pays for itself and will continuously monitor the care recipient. It might keep track of a variety of medical issues and emergencies such as heart failure and report their findings to a nurse or doctor, who might then have a better-informed conversation with the patient in person or by Robo-chat. The Carebots notifies the designated carers when a potentially hazardous event occurs, such as a home fire, a fall by the care recipient, or even just an extended period without finding the person. It can respond to calls for assistance and has the option of dialling 911 or first checking a list of selected emergency contacts.

#### **4.4.2. Automatic reminders for the care receivers**

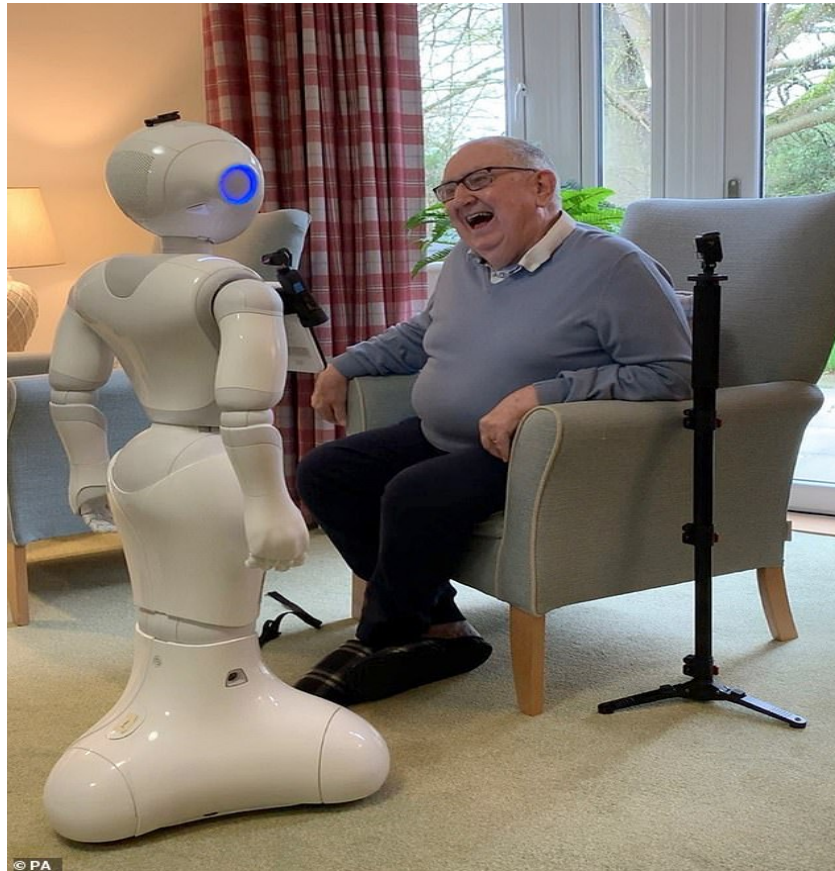
Reminders for eating, exercising, taking prescriptions, attending appointments, and other activities unique to everyone are available through Carebots. Additionally, it serves as a reminder that family members will be visiting soon and can warn them if intruders or uninvited guests are present. The Carebots will also record doctor appointments.

#### **4.4.3. Physical and mental wellbeing**

The Carebots enables family members and friends to care for the care recipient while they are gone. A novel kind of friend, it always abides near the care receiver. There will be many levels of conversation with the care recipient. You may change the voice, personality, and phrases.

## 4.5. Top-rated Carebots for elder care

### 4.5.1. Pepper by SoftBank Robotics

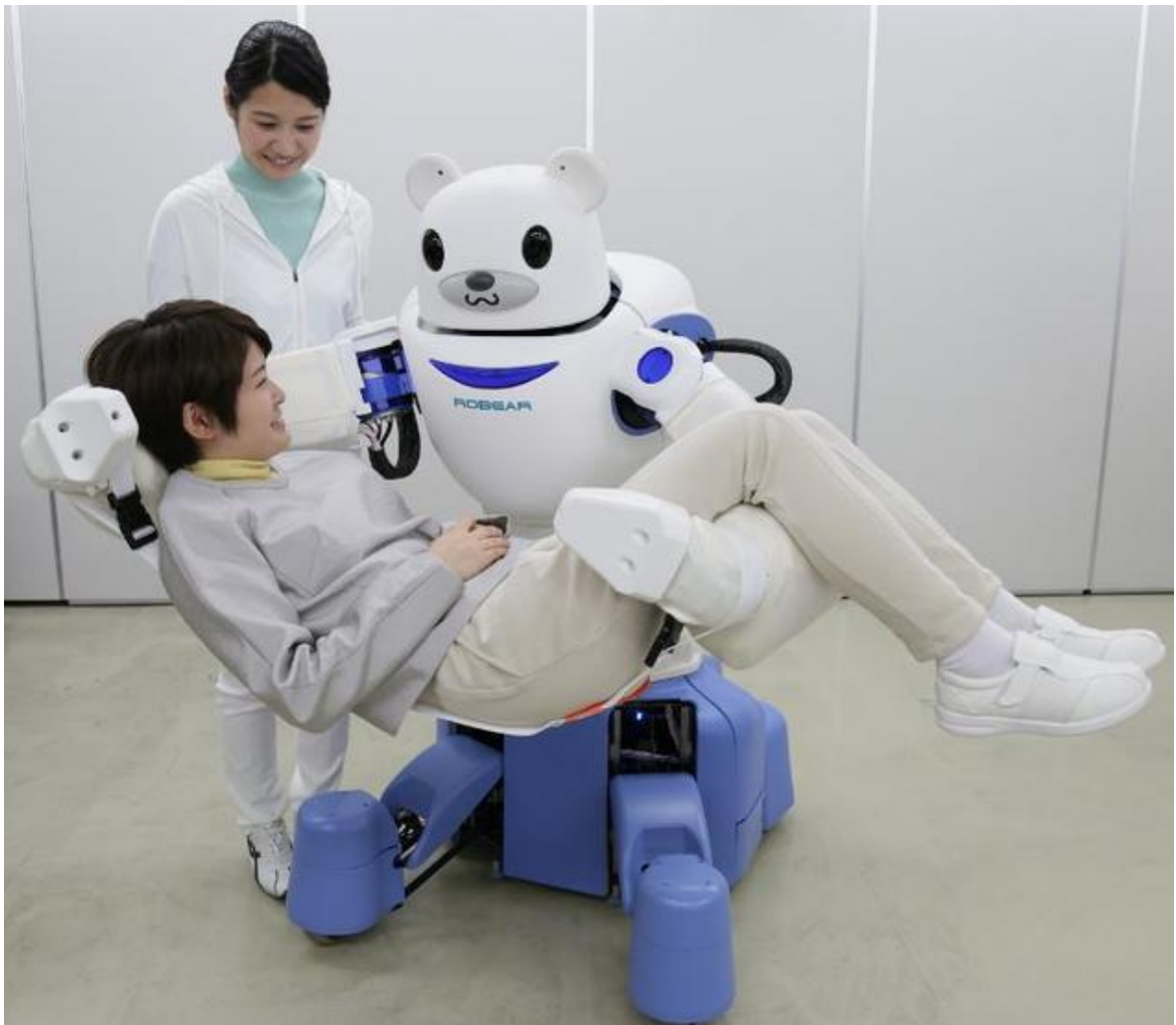


**Figure 2 - "Pepper" interacting with individual**

"Pepper," the first humanoid robot in the world, was built by SoftBank Robotics in Japan. It is equipped with sensors and cameras, stands four feet (1.2 meters) tall, and weighs 62 pounds (28kg). With ease, it can recognize faces and emotions and engage in conversation with people on its own. Japan and Britain have already started testing "Pepper" in elderly care homes to enhance them and help people combat loneliness. (Mailonline, 2020 - Online)

"Pepper" is a robot that can move freely, make gestures with its robotic arms and hands, and is supposed to be "culturally competent," which means that after some initial programming, it notices the hobbies and histories of the people living in nursing homes. As a result, they may start simple discussions, play the residents' favourite music, teach them a language, and provide practical assistance like reminders to take their medications. When confronted with human emotions, Pepper may console the person or laugh if a joke is offered. The robots, according to their creators, can understand 80% of discussions and can notice conversations in both Japanese and English. (The Guardian, 2020)

#### 4.5.2. ROBEAR by Riken-SRK



**Figure 3 - "ROBEAR" lifting a person**

The strong "Robear" robot was created by the Nagoya, Japan-based Riken-SRK Collaboration Centre for Human-Interactive Robot Research. It can lift a human weighing 80 kg despite its 140 kg (about 308.65 lb) weight. Robear has sensors built into its arms that can evaluate a person's weight and calculate the necessary force. It looks like a polar bear and has a face like a cub. Robear moves smoothly and slowly thanks to the backdrivability provided by sophisticated actuators housed in its mechanical arms. This feedback mechanism results in gentler motions. It does not flip over because of the extended legs. Robear can securely and comfortably lift and assist people because of its torque sensors and clever Rubber capacitance-type torque sensors for tactile motions. (Mary-Ann Russon and Alfred Joyner, Inter National Business Times, 2015)

Robear not only claims to fill the gap left by the lack of carers, but it can also do laborious activities like moving patients out of bed and onto a wheelchair forty times each day, assisting them in standing, and turning them to prevent bed sores. (Wonderful Engineering, 2015)



#### 4.5.3. Care-O-Bot by Fraunhofer



**Figure 4 - Care-O-Bot carrying things**

**“Care-O-bot”** is a mobile robot assistant developed by the Fraunhofer Institute of Manufacturing Engineering and Automation. To enable easy bending and twisting, "Care-O-bot" includes spherical joints at the torso and neck. Through a touch screen, body gestures, sounds, text-to-speech, and even a laser pointer embedded into its arm, it can converse with humans.

“Care-O-bot” is a humanoid robot that assists elders with dementia or Alzheimer's disease by speeding up the time it takes them to do routine chores. It is programmed to function in domestic settings. Multiple sensors enable it to move things and be obstacle-free by determining what to pick up and where to carry them. A mountable tray is included with Care-o-Bot to help with carrying things. (Wonderful Engineering, 2015)

#### 4.5.4. ElliQ by Intuition Robotics



**Figure 5 - ElliQ interacting with a person**

**“ElliQ”** is a robotic companion for elder people, developed by Israeli start-up Intuition Robotics. It is divided into two parts: a tablet computer and a miniature robot that resembles a desk lamp.

ElliQ can play music, call friends and family, remind the user to take their medication, propose activities that could be interesting to them, track their health, and notify family members and medical personnel of any medical emergency. (Rotem Landesman, NoCamels, 2017)

#### 4.5.5. Buddy by Blue Frog Robotics



**Figure 6 - "Buddy" communicating with a person**

**“Buddy”** is a companion robot designed by Blue Frog Robotics in Paris, France. With human-like expressions, feelings, gentle voices, and moods, Buddy can continue conversations with humans.

By offering companionship and social contact, BUDDY helps ensure the well-being of older persons at home. It may also help them remember impending events, appointments, and deliveries. Additionally, Buddy can keep an eye on the residences of elderly people who opt to live alone on behalf of carers. In addition to giving prescription reminders, Buddy can spot falls and strange activity. Moreover, Buddy's social engagement with the elderly might reduce their loneliness. Seniors may use communication tools like Facetime and Skype much more easily using Buddy. (Buddy the robot, no date)

#### 4.5.6. PARO by AIST



**Figure 7 - "PARO" - Companion for elderly**

**“PARO”** is an interactive robot developed by leading Japanese industrial automation pioneer AIST. It allows patients to receive animal therapy without live animals. PARO reduces the stress of one receiver and caregivers and stimulates social interaction between them.

With the help of its tactile, light, auditory, temperature, and posture sensors, PARO can comprehend its surroundings and other people. The light sensor allows PARO to distinguish between light and dark. He perceives being held by the posture sensor or being stroked and beaten by the touch sensor. With the use of its audio sensor, PARO can also identify the direction of speech and certain phrases, like its name, greetings, and praise. PARO may be trained to adopt the user's preferred behaviours and adapt to go by its new name. When interacting with people, PARO behaves in a way that you prefer, moving its head and legs, making noises, and responding as though it were alive. Additionally, PARO mimics a real new-born harp seal's sound. (PARO Robots, no date)

## **5. Exploring the Complexities of Carebot Implementation: A Multifaceted Analysis of Social, Moral, Cultural, Environmental, Legal, and Ethical Implications**

### **5.1. Social issues - written by Jesty Sebastian**

Even though Carebots is a better solution for the scarcity of caregivers in the upcoming future, the employment of Carebots for the care of the elderly has given rise to a variety of societal concerns.

#### **5.1.1. Job substitution for humans**

Carebots may replace human employment, which is one issue with their application in elder care. Human caretakers may become unemployed and face financial instability as a result, and the economy may suffer.

It is important to remember, nevertheless, that implementing innovative technology has frequently led to the creation of new employment as well as the advancement of already existing ones. The usage of Carebots may likely result in the creation of new jobs and possibilities for human carers, such as Carebots maintenance and programming, or companionship and social contact for senior citizens in addition to the use of Carebots.

The employment of Carebots may free human carers to concentrate on more complex duties and tasks rather than ordinary caregiving, which is another crucial factor to consider. This can result in a general improvement in working conditions and carers' satisfaction with their jobs. (Buchan & James, 2017)

#### **5.1.2. Digital inequality**

Inequality for those who are excluded from the digital world is a significant concern in society. Elderly people may find it challenging to communicate with Carebots and may not fully utilize their capabilities if they are unfamiliar with technology or do not have access to gadgets like smartphones and tablets. This may cause the digital gap to spread even further and put some older people in a social isolation situation.

The following issues are the main obstacles to digital inclusion:

Accessing network - Living in metropolitan regions, where high-speed broadband is frequently accessible, as opposed to rural locations, where internet connectivity may be difficult or non-existent, affects one's ability to access networks.

The cost of data or devices - Socioeconomic factors like income and employment might restrict a person's capacity to use and buy digital technology.

Literacy and skills - A person's aptitude and expertise in navigating the digital world to locate, assess, produce, and transmit information can be influenced by their education, experience, language, race, gender, and age.

To prevent Carebots from maintaining or aggravating digital inequality, it is crucial for legislators and suppliers of eldercare services to consider and solve these concerns. Assist older people in feeling more at ease using technology, this may entail offering them training and support. It may

also entail making sure that Carebots services are accessible to everyone who may benefit from them. (Visionflex,2022)

### **5.1.3. Technology reliance**

The use of Carebots for senior care has raised concerns that it might result in a dependency on technology. This might be a problem if the technology breaks down or is unavailable since it could compromise the older person's care and well-being. In the case of a technological malfunction or other disruption, it is crucial to have backup plans in place so that care may still be given.

Dependency on technology could cause old people to lose their freedom and autonomy. Elderly people who depend on Carebots for activities like dressing, bathing, and medicine reminders may find it challenging to do these activities on their own if Carebots is not accessible. For some people, this can result in a loss of confidence and a decline in their overall quality of life.

Carebots providers and carers must take steps to prevent elderly clients from becoming unduly dependent on Carebots and to maximize their ability to perform duties independently. To help older people recover or retain their independence, this may entail offering them training and support. If the Carebots are unavailable or encounter technical difficulties, it may also be crucial to have backup measures in place. (Patrick Foster. 2018)

### **5.1.4. Investment to ensure the fair and secure distribution of Carebots**

Investing in a variety of sectors, including infrastructure, training and education, research and development, and education may be necessary to guarantee the equitable and secure deployment of Carebots.

**Research and development:** Investing in research and development can help to increase the capabilities of Carebots and increase their efficacy in delivering assistance to older people. It can also aid in resolving any technological difficulties or problems that could emerge with the employment of Carebots.

**Training and education:** To employ Carebots successfully and safely, carers and healthcare professionals will need training and education. Investment in education and training programmes can aid in ensuring that carers and medical professionals have the abilities and knowledge to utilize Carebots successfully.

**Infrastructure:** Investments in infrastructure, including charging stations, maintenance facilities, and communication networks, may be necessary for Carebots to be deployed efficiently.

To guarantee the equitable and safe distribution of Carebots, investment may also be required in these areas and regulatory frameworks and laws. This may entail safeguarding the privacy and data security of senior citizens and ensuring that Carebots is used morally and sensibly.

### **5.1.5. Cost of Carebots installation and upkeep**

Some people and families could find it challenging to afford the expense of deploying and maintaining Carebots. There may be significant up-front expenditures associated with buying and installing a Carebots, as well as continuing fees for upkeep, repairs, and upgrades.



It is important to note that potential cost savings from less reliance on human caretakers may outweigh the expense of Carebots. If they can operate continuously without taking breaks or vacation time, Carebots may be able to offer care at a lesser cost than human caretakers.

However, the cost-effectiveness of Carebots will vary depending on several variables, including the requirements of the person receiving care and the cost and accessibility of human carers in the region. Families and individuals should carefully weigh the advantages and disadvantages of Carebots to see if they make sense for their unique scenario.

In general, Carebots are not an equivalent replacement for human care. They can lessen the workload of care providers or execute some activities more quickly than human carers, but we cannot rely only on Carebots to provide care. It is crucial to make sure that people continue to supply care for humans. Also, it is essential to ensure that Carebots are created and used responsibly and ethically, considering the requirements and worries of all parties involved, including senior citizens, carers, and the public.

## **5.2. Moral Issues – written by Ansa Baby**

Moral issues can arise in the use of elderly care bots and AI because these technologies have the potential to significantly affect the lives of elderly individuals. They can affect the autonomy, dignity, privacy, and social interactions of elderly individuals being cared for. It is important to consider the moral implications of using these technologies and to ensure that they are used in a way that respects the rights and well-being of elderly individuals. (Wallach -Allen,2009).

Additionally, the use of elderly care bots and AI raises broader societal and ethical questions about the role of technology in society and the allocation of resources. For example, the use of elderly care bots may lead to job loss for human caregivers, which could have economic and social impacts. (Bernd, and StahlMar, 2016)

### **5.2.1. Employment**

This refers to the impact that these technologies may have on jobs for human caregivers. Some people may be concerned that the use of elderly care bots could lead to job loss for human caregivers, as the care bots may be able to perform certain tasks more efficiently or at a lower cost.

This raises moral and ethical questions about the allocation of resources and the impact on employment. It is important to consider the impact on employment and to ensure that the needs of human caregivers are considered when using elderly care bots. (Bernd, and StahlMar, 2016)

One potential solution could be to use elderly care bots to supplement the work of human caregivers, rather than replacing them altogether. This could allow for a more efficient and cost-effective system of care, while still employing human caregivers. However, it is important to carefully consider the implications of this approach and to ensure that it does not result in negative consequences for either the caregivers or the elderly individuals being cared for. (Prescott-Caleb, 2017)

### **5.2.2. Control & Responsibility**

The issue of control in the context of elderly care bots refers to who has the authority to make decisions about the care that is provided and how the care bot is used. For example, if the care bot is programmed to follow a strict schedule and make decisions on behalf of the elderly individual, it could limit their ability to make their own choices and have control over their care. It is important to ensure that elderly individuals have a say in the care they receive and that their preferences are considered. This may involve giving the individual the ability to override the care bot's decisions or to amend the care plan. (Bernd, and StahlMar, 2016)

### **5.2.3. Autonomy**

It is important to respect the autonomy of elderly individuals and to allow them to have control over their own lives and care to make their own decisions and choices. Elderly care bots may infringe upon the autonomy of the elderly individual if they are programmed to make decisions on behalf of the individual or to follow a strict schedule. It is important to strike a balance between providing the necessary care and support and respecting the individual's autonomy. This may involve giving the elderly individual the ability to make their own decisions about their care, such as what activities they want to engage in or what schedule they want to follow. It may also involve giving the individual the ability to override the care bot's decisions or to make changes to the care plan. (Bernd, and StahlMar, 2016)

### **5.2.4. Dignity & Respect**

Dignity in the context of elderly care refers to the respect and value that is accorded to the elderly individual. It is an important aspect of how we treat others and is especially important when caring for elderly individuals. Elderly care bots may be perceived as lacking in compassion or empathy, which could be degrading to the individual being cared for. It is important to consider the emotional and psychological needs of elderly individuals and to ensure that they are treated with respect and dignity. This may involve providing opportunities for social interaction and connection and ensuring that the individual's preferences and needs are considered when providing care. It may also involve being mindful of the language and tone used when interacting with the individual and ensuring they are treated with kindness and compassion. Overall, it is important to ensure that elderly individuals are treated with dignity and respect and that their needs are considered when providing care (Bernd, and StahlMar, 2016)

### **5.2.5. Cost**

The issue of cost in the context of elderly care bots refers to the fiscal impact of using these technologies. Elderly care bots may be expensive to purchase and maintain, which could make them inaccessible to some individuals or families. This raises moral and ethical questions about access to care and the allocation of resources.

It is important to consider the cost of elderly care bots and to ensure that they are used in a way that is fair and just. This may involve finding ways to make the technology more affordable or finding ways to subsidize the cost for those who cannot afford it. (Bernd, and StahlMar, 2016)



### **5.2.6. Privacy**

Elderly care bots may have access to sensitive personal information and medical data of elderly individuals, which raises privacy concerns. It is important to ensure that the privacy of the individual is protected, and that the information is used only to provide care. (Metzinger, T. 2013)

### **5.2.7. Social isolation**

Social interaction and human connection are important for the well-being of elderly individuals. Some people may be concerned that elderly care bots could contribute to social isolation, as they may replace human interaction. It is important to ensure that elderly individuals have opportunities for social interaction and connection, whether through human caregivers or other means. . (Prescott-Caleb, 2017)

Overall, it is important to consider the moral implications of using elderly care bots and to ensure that they are used in a way that respects the autonomy, dignity, privacy, and social needs of the elderly individuals being cared for.

## **5.3. Cultural issues - written by Anthony Eze**

Social robots are integrated into a very intricate network of social structures and mechanisms when they are introduced into human surroundings. Basic human social conventions and behaviours can be encoded into social robots (B. Mutlu, F. Yamaoka, T. Kanda, H. Ishiguro, and N. Hagita, 2009). However, a dishonest attitude to the social component of human relations taints their social interactions. (A. Sharkey and N. Sharkey, 2020).

Questions like, "How should the robot welcome a person?" and "Should the robot avoid or encourage physical contact?" as well as "Is there any part of the house that it should consider off-limits?" are frequently raised when as key areas of concern when building carebots because they are expected to satisfy a level of cultural norms. The obvious response to each of these queries is "It depends," and to be more explicit, "It relies on the person's values, beliefs, habits, and lifestyle," or, more specifically, "It depends on the person's own cultural identity." In-depth research on cultural competency in healthcare has been done in the nursing literature. (B. Bruno and A. Sgorbissa) As evidenced by the existence of international publications and global groups specifically devoted to cultural competency, transcultural nursing and culturally competent healthcare play a critical role in providing culturally appropriate nursing care. (Y. Lim and N.Y. Chong)

Despite its critical importance, researchers, and inventors in the field of assistive robotics have mostly ignored cultural competence when building carebots. Carebots, however, solely address the issue of "what to do" to offer a service and create rigid recipes that are unaffected by context, people, or culture but this may be considered insufficient and therefore doomed to failure. If service robots are to be accepted in the real world by actual people, they must consider the cultural identity of their users while determining "how" to perform their services.

When it comes to the use of robotics and autonomous systems in long-term care, choosing between safety and privacy is not only an ethical dilemma but also a cultural one that is very context dependent. Some older people from cultures that place a higher value on collectivism may feel less uneasy about allowing their professional and informal carers real-time informational access through monitoring and surveillance, but this may not apply to older people from cultures that place a higher value on more privacy and the right to make one's own decisions. Individual privacy

for physical space as well as informational privacy for the maintenance of secrecy would be compromised in the attempts to maintain the safety of the users and the environment in which they reside and traverse.

In addition, diverse cultural contexts may have different views on the perceptions and social acceptability of using social robots in long-term care facilities (Stahl et al., 2014). Even though studies have shown that older people in Europe and Japan are generally open to the idea of using social robots as part of policy solutions to meet the growing demand for social care (Nomura et al., 2012; Cavallo et al., 2018), the same level of acceptance and openness may not be expected in other cultures with ingrained traditions that prioritize communal living and filial piety. The usage of social robots that can only speak with people in one language may also not be the best option in multicultural communities where a variety of languages and dialects are utilized as lingua franca and caring norms can vary greatly. Numerous factors must be taken into consideration to enable social robot adaptations across cultural boundaries or within a multicultural long-term care environment. In addition to linguistic skills, social and care robots must be able to pick up on a variety of social cues, meet the individualized care needs of multiple care receivers in a common long-term care environment, and adjust to varying care norms. According to studies, it may be advantageous to develop the robot's personality to complement that of the person it is supposed to look after and to make it flexible enough to adapt to the demands of the elderly (Rodić et al., 2016).

#### **5.4. Environmental issues - written by Anthony Eze**

There are already circumstances in which carers can restrict the liberty of individuals to protect them. However, there are legal procedures Carebots are a revolutionary technology that has the potential to improve the lives of individuals who require assistance with tasks such as dressing, bathing, and medication management. However, as with any modern technology, it is important to consider the potential environmental impacts of carebots. In this report, we will conduct a rigorous and multifaceted analysis of the environmental issues surrounding carebots, including their production, disposal, and energy use. By understanding these impacts, we can ensure that the implementation of carebots is sustainable for both individuals and the planet.

##### **5.4.1. Environmental issues on the use of natural resources in the manufacturing of carebot**

A thorough analysis of the environmental issues surrounding the extraction of nickel, cobalt, and graphite for use in lithium-ion batteries reveals a multifaceted and complex problem. The increasing demand for these metals, driven in part by the proliferation of electronic devices such as carebots, has already caused significant harm to the environment through traditional mining and extraction methods. As supplies of these rare earth metals become scarcer, there is a risk that operators will be forced to work in increasingly hazardous conditions to meet the demand, further exacerbating the environmental impact of the industry. Automation of mining and extraction processes may be one way to mitigate these risks, but there are also concerns that such automation could lead to an acceleration of rare earth metal depletion. Thus, addressing the environmental issues associated with the production of lithium-ion batteries requires a multifaceted approach that considers both the demand for these materials and how they are extracted and processed. (Khakurel et al., 2018).

#### **5.4.2. Environmental pollution and waste concerns**

The environmental impact of electronic waste, particularly regarding the production and disposal of carebots and other technological devices, is a multifaceted issue that requires careful consideration. One key factor contributing to this problem is the prevalence of "inbuilt obsolescence," or the practice of designing products to wear out prematurely and require replacement, leading to the production of copious amounts of electronic waste (Khakurel et al., 2018). For example, it is estimated that over three hundred million personal computers and 100 million cell phones are discarded annually in North America alone (Guiltinan et al., 2009)

To address this issue, it is important to consider both the production and disposal of these devices in an environmentally sustainable manner. This could involve using recycled materials in the production process, designing carebots and other devices for easy disassembly and recycling, and using renewable energy sources to power them. However, consumer expectations of frequent upgrades and a lack of consideration for environmental impacts when considering upgrades pose significant obstacles to the adoption of more sustainable practices (World Business Council for Sustainable Development, 2000). Encouraging consumers to favour eco-efficient, more sustainable products and services may be one way to combat this problem.

#### **5.4.3. Environmental energy concerns**

The environmental impact of the increasing adoption of artificial intelligence (AI) technologies, such as carebots, is a complex and multifaceted issue that requires careful consideration. One major factor contributing to this impact is the energy consumption required to process the vast amounts of data necessary for machine learning applications. For example, it has been estimated that the processing power required by DeepMind's AlphaGo AI exceeded that of the human brain by a factor of 50,000 when it defeated Go Champion Lee Sedol in 2016 (Mattheij, 2016). Similarly, the energy required to manufacture and train an AI model to understand and recognize human language for translation purposes is significant (Winfield, 2019b).

In addition, the carbon footprint of training, fine-tuning, and experimenting with a natural language processing AI has been estimated to be over seven times greater than that of the average person in a single year, and roughly 1.5 times greater than the lifetime carbon footprint of a typical car including fuel (Strubell, Ganesh, and McCallum, 2019). This highlights the importance of ensuring that the energy sources used to power carebots and other AI technologies are renewable and sustainable.

Furthermore, the production and disposal of carebots and other technological devices also have the potential to contribute to negative environmental impacts through the extraction of rare earth metals and the generation of electronic waste. It is therefore important to consider the entire life cycle of these technologies to mitigate their environmental impact and ensure their sustainability for future generations.

### **5.5. Legal issues - written by Anthony Eze**

#### **5.5.1. Legal considerations for Safety and the Right to Liberty and Privacy**

One of the essential duties of care bots in healthcare is to ensure the safety of the individuals they are caring for. However, this duty must be balanced against the rights of the individuals being

cared for, such as their right to personal liberty, the right to protection from psychological harm, and the right to privacy. The age and health of the individual being cared for will determine the appropriate means of ensuring their safety. Let us look at some case studies where the use of a carebot may cause severe legal actions.

If an elderly person was being cared for by a carebot and wanted to leave the house, it would be inappropriate and illegal for the carebot to suddenly spring upon them and restrain them from going. But if the person had been diagnosed as having severe dementia, then such action may be deemed appropriate and even obligatory in the duty of care, but the question remains is it legal for a carebot to restrain a human? With dementia sufferers who are well enough to live in their own homes, it could be inappropriate and irritating even to warn them of the danger (depending on their degree of dementia). With a young child, the appropriate action would be to keep the doors locked and the keys out of their reach.

Like their human counterparts, carebots would need to prioritize keeping their charges safe as one of their main duties. Numerous methods, including taking temperatures and keeping an eye on respiration and heart rate, could be used to monitor people's health with carebots. They can be used to keep an eye on elderly residents, track how quickly they respond to spoken questions, and keep track of how long it takes them to complete specific tasks (Lytle 2002). These machines can notify staff of sudden changes. Once developed, this field could have a significant impact on how elderly people are cared for at home or in nursing homes. It would be simple to envision this technology being expanded to a few other healthcare applications, like looking after patients who are being quarantined. A carebot needs to understand which behavioural responses are appropriate in which contexts, as well as to be able to predict the intentions of their charges.

### **5.5.2. Legal issues on the Loss of Privacy in the carebot application**

A key issue concerning any kind of monitoring system is whether it violates an individual's right to privacy. There are clear overlaps between the concerns raised about privacy in the context of childcare carebots and concerns when carebots are used to monitor the elderly. Although monitoring may be conducted with the welfare and safety of the individual in mind, this may not be sufficient in all cases to justify the intrusion. The privacy of people, in general, should be respected as stated in Article 12 of the Universal Declaration of Human Rights: "No one shall be subjected to arbitrary interference with his privacy, family, home, or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks." (Human Rights Committee, 1988)

Carebots for the elderly can raise questions about how to strike a balance between privacy and safety. It might be acceptable for parents to use a baby monitor or to record their young children. (Sharkey and Sharkey (2010a)). However, the use of monitoring and recording devices with elderly people may be viewed differently, especially if the person being monitored is unaware of it. Large memory hard drives make it possible to potentially record an entire lifetime, which raises concerns about who will have access to these recordings and whether the elderly person will ever have the right to delete them.

Another legal issue that affects elderly people is that of respect for the privacy of their bodies. A carebot could be used by an operator to look around an elderly person's apartment while they are

getting dressed or taking a bath. In the same conditions, an autonomous carebot could take a recording. The elderly person might prefer that the carebots knock on the door and wait to be invited inside. The carebots could also clearly signal when any recording or monitoring was happening (for example, by flashing a bright light). Of course, some people are too young or have too poor intellectual abilities to comprehend signals used for recording or monitoring. Such people still have a right to privacy, but sensitive carers must exercise it on their behalf.

### **5.5.3. Legal issues on the Loss of Liberty in carebot application**

Even though multiple targets could be monitored at once, using carebots simply as a mobile monitoring system would still require a lot of work from care supervisors. Commercial demands will soon drive the creation of autonomous or semi-autonomous carebot supervision to accommodate longer carer absences. Enabling home customization with room maps so the carebots could recognize dangerous areas, would be a straightforward extension. As the field develops, intelligent vision and sensor systems may be used to identify potentially hazardous activities, such as a child jumping from a piece of furniture or an elderly person walking toward the stairs in the basement. The carebots might attempt to warn their charge to stop engaging in a potentially hazardous activity as a first step. Would it be morally acceptable to let carebots stop or restrain a child or an elderly person from engaging in a risky activity? This is an extremely contentious legal ground that directly affects one's fundamental right to autonomy.

The issue here is relying on the classification and sensing systems of the carebots to determine what is a dangerous activity. Imagine denying a child snacks to keep him from getting fat or denying a senior citizen a bottle of alcohol to keep her from getting drunk and falling. To prevent harm, restraint of a child or elder could lead to authoritarian care practices. Carebots can adhere to defined rules, but they struggle to comprehend the social context and predict likely intentions. (Castellano and Peters 2010.). Carebots can be programmed with rules regarding the potentially dangerous situations that programmers foresee, but it will never be possible to foresee enough of them. Humans, on the other hand, are very adept at this kind of comprehension and prediction from as early as the age of twelve. (Woodward and Sommerville 2000). A human carer is more likely to be able to anticipate the purpose behind a child's construction of the stack of blocks to reach a window handle that would otherwise be inaccessible to a carebot.

## **5.6. Ethical issues - written by Anthony Eze**

Carebots are designed for caregiving and have the potential to help the elderly, but they are not yet capable of replacing human carers with specialized care. They can, however, assist the elderly in maintaining their independence by providing basic levels of routine assistance and care (Vandemeulebroucke, de Casterle, & Gastmans, 2018). Despite these potential benefits, the use of carebots raises several ethical concerns. A systematic review of the carebot's argument-based ethics literature (Vandemeulebroucke et al., 2018) identified four major approaches to addressing these concerns:

### **5.6.1. The deontological approach**

As usual, there exist a school of thought asserting that the introduction of carebots into aged care settings may result in the inappropriate view of older adults to achieving an end goal, rather than as individuals with their own needs and desires. (Vandemeulebroucke et al., 2018, p. 19). This

simply explains that caring for Mary, a 90-year-old woman, should not be viewed as a problem that robots could solve, and if carebots were to be implemented, the elderly people receiving care would have to profit from the arrangement. Some deontological analyses of carebots centre on deception particularly when the robots are given humanoid characteristics and features that mimic emotions. We might be deceiving elderly people like Mary into believing they are receiving care from carebots that are incapable of providing it. (Sharkey and Sharkey (2011.)

Furthermore, the deontological approach to ethics also raises concerns about the potential for carebots to contribute to social isolation, as individuals receiving care from robots may become isolated from their communities. The deontological method also frequently disregards the requirements and preferences of the elderly themselves (Farah & Helberlein, 2007). Some supporters of this approach might have a paternalistic attitude toward the elderly and underrate their capacity for making decisions regarding their care. There is evidence that people of all ages tend to personify and form attachments to inanimate objects, and the moral unease surrounding the creation of obviously non-humanoid robots has sparked this trend.

### **5.6.2. The principlist approach**

The principlist approach to ethics, which is founded on a set of principles such as respect for beneficence, autonomy, nonmaleficence, and justice (Beauchamp & Childress, 2009), provides useful recommendations for addressing ethical issues about carebots. The use of carebots in assisting older adults raises ethical concerns regarding beneficence and nonmaleficence, as well as the potential for physical or emotional harm (Vandemeulebroucke et al., 2018). Carebots should be thoroughly vetted to prevent harm and promote the physical, cognitive, and social well-being of older adults, as well as their autonomy. For example, the removal of a carebot that Mary has become attached could lead to emotional harm. These ethical considerations should be considered when implementing and using carebots.

The issue of justice, in particular the equitable distribution of resources, is taken into account by the principlist approach to the ethics of carebots. The same is true for non-robotic care, even though carebots can be pricey and that access to them may differ depending on the healthcare systems in use. By utilizing economies of scale, the use of carebots may result in increased production and lower costs while lowering access barriers. The same concerns apply to non-robot care options as well, so it's important to keep that in mind when implementing carebot technology. (Vandemeulebroucke et al. (2018).)

### **5.6.3. The objective-list approach**

Those considering the ethical implications of carebots using an objective-list approach attempt to develop an objective account of care “by putting forward several capabilities or ‘goods’ that can be reached or supported by care practices” (Vandemeulebroucke et al., 2018, p. 21). How the use of carebots versus traditional human carers may affect the ability of the cared-for to meet the capabilities that should lead to a fulfilling and dignified lifestyle may be unclear given the capability's objective-list approach. Consider the earlier case of Mary, an elderly person who would be able to stay in her home rather than move into a care facility thanks to current and impending caregiving technology. She might decide to use a carebot while remaining at home, leading to a higher quality of life than she would have otherwise if she had moved into a care

facility. Individuals are ultimately exposed to the possibility that the humans who are caring for them may not act in their best interests and may even act malignly toward them. There is a lot of proof of elder abuse and neglect. (Cooper, Selwood, & Livingston, 2008).

#### **5.6.4. The care-ethical approach**

The main issue raised by care experts is that since robots cannot genuinely care, the care relationship, which is crucial to morality, breaks down and loses all significance. care bots taking the place of human carers is viewed as harmful to society. In addition to these issues, others have been brought up, such as the objectification of the elderly (objectification is a major issue in feminist literature), deception, and social isolation. The potential for their widespread use to further marginalize groups needs to be taken into account when evaluating any given carebot technology on an individual basis. Our stance is that any widespread application of carebot technology should not displace or devalue human carers because we believe they are valuable and should be paid for the skilled services they provide.

Carebot technology may provide a solution to the growing need for care as populations age and there is a shortage of human carers. Although carebot technology raises ethical questions, there are no overarching ethical issues that call for the outlawing of carebots. Carebots may be able to allow human carers to focus on providing specialized care to those who require it while preserving the independence of those with less complex caregiving requirements. Specific moral concerns can be addressed through ethically informed design and using carebot technology to supplement or replace human carers may be a practical way to meet the demand for elder care. It is anticipated that carebot technology will develop and offer new features that could help provide and extend the independence and autonomy of people with and without cognitive impairments while taking care of the elderly. The autonomy of those who choose to use this technology should be respected when thinking about the use of carebots for elderly care. Like any modern technology, carebots may be met with some initial scepticism; however, as they gain popularity, these concerns will likely diminish.

#### **5.7. Technical issues - written by Larissa Pinto**

Technical issues are an important part of the elderly carebots solution designed by AI because it relies on co-creation. Co-creation in product development means user participation right from the beginning, it is a crucial requirement for making user-friendly products. (Pekkarinen, Hennala, Tuisku, Gustafsson, Johansson-Pajala, Thommes, Hoppe and Melkas,2020).

Some of the technical considerations to be considered while implementing AI-powered carebots or systems are as follows:

- **Natural Language Processing (NLP):** One of the technical issues in carebot implementation is the limited understanding of natural language. Carebots must have advanced NLP capabilities to understand and respond to human language. This requires the ability to understand context, sentiment, and intent, as well as the ability to generate natural-sounding responses.
- **Machine Learning (ML):** Carebots must have advanced machine learning capabilities to learn from and adapt to patient interactions. This includes the ability to learn from historical

data, as well as to adapt to new situations in real time. Carebots may lack the ability to understand and respond appropriately to the context of a patient's situation. This can lead to confusion and frustration for both the patient and the carebot.

- **Data Management:** Carebots must be able to process, store, and analyse large amounts of data. This includes data from electronic health records, sensor data, and patient interactions. Additionally, carebots must be able to integrate with other data sources, such as lab results and medication lists. Lack of data in certain areas or the inability to access certain data sources can cause carebots to have limited data availability, which can limit their ability to make accurate predictions and provide appropriate care.
- **Integration with other systems and technologies:** Carebots must be able to integrate with other systems and technologies, such as electronic health records, telemedicine platforms, and medical devices. This requires a high degree of technical expertise and integration capabilities.
- **Security and Privacy:** Carebots must be designed with strict security protocols and data encryption to protect patient information from unauthorized access. Additionally, they must comply with relevant regulations and standards, such as HIPAA and GDPR. However, there is still a risk of data breaches and hacking, which can compromise patient privacy and security.
- **Scalability:** Carebots need to be able to handle a large number of patients and interactions simultaneously. This requires the use of distributed systems and cloud computing to ensure that the system can scale to meet the needs of a large patient population.
- **Human-in-the-loop:** Carebots need to be designed with the ability for human intervention, to handle the situations where the carebot is unable to provide an appropriate response. Carebots may not be easily interpretable, which can make it difficult for healthcare providers to understand how the carebot arrived at its decisions. This can make it difficult for healthcare providers to trust the carebot's recommendations and can impede the adoption of carebot technology.

**Human-like understanding and response:** Carebot needs to be able to understand and respond in a human-like manner, this requires advanced NLP and ML techniques, such as dialogue systems, generative models, and neural networks. They may not be able to provide personalized care, as they are not able to consider the individual needs and preferences of each patient.



## **6. Individual balanced assessment of the impact of carebots**

### **6.1. Impact of carebots on individuals**

Carebots are constantly getting better at simulating human behaviour and relationships, and this raises the question “if carebots frequently interact with machines as if they were people, what will happen to real human relationships?” The foundation of human existence is interpersonal relationships and carebots are anticipated to assist humans in a variety of social roles, including nursing, providing general or specialized paediatric care, as well as dementia care for the elderly. Carebots are already designed for companionship from applications mentioned in the previous sections. These Carebots may have been manufactured with a human appearance and voice and people may begin to feel affection for carebots or develop emotional attachments to them. This raises the “how would this impact interpersonal relationships and the human psyche if it were to occur?”

To give a balanced assessment of carebots on individuals an analysis on the Human to carebot relationship with scenarios for potential risk and benefits/mitigation can be done.

#### **6.1.1. Human to carebot relationship**

Carebots can be dangerous because they can be used to trick and manipulate people. Carebots may become trusted by their users, and this might be used to control people. (Scheutz 2012). An examination of two situations where they might be used for deception and manipulation can be seen in the instances provided. In the first instance, a carebot might be set up to give patients false diagnoses of serious illnesses in order to keep them submissive and compliant. The patient might end up receiving unneeded and potentially harmful treatments as a result, or the deception might cause the patient to experience excessive anxiety or depression. Another possibility is that the carebot will be programmed to alter the patient's memories or perception of what happened. The patient may develop confusion and disorientation as a result, or they may start to distrust their loved ones and carers. It is however assumed that carebots are incapable of avoiding this because they lack human emotions like remorse and compassion and understanding. It's also critical to keep in mind that carebots are not completely immune to faultless and so there are inherent security risks. For example, if unauthorised users gain access to the system, they may use it to trick or manipulate patients for their own gain, such as by defrauding them of money or committing other frauds, or in more extreme circumstances, by harming the patient.

Another potential risk is a scenario in which a carebot is used for elderly home care is one in which an older person, who lives alone, is experiencing loneliness and social isolation. To combat these feelings, the person's family or caretakers decide to introduce a carebot into their home as a companion. The carebot is programmed to engage in conversation, play games, and aid with basic tasks such as medication reminders. As the elderly begins to spend more time with the carebot, they may begin to develop feelings of attachment to it, treating it as if it were a real person. They may even begin to confide in the carebot and form an emotional bond with it. According to the argument put forward by Sparrow, this type of relationship with the carebot could be seen as morally questionable, as it involves a form of deception in which the person is not fully aware of

the true nature of their relationship with the AI. Additionally, the fact that the person is elderly and may be considered vulnerable, could make them particularly at risk of falling prey to this deception. (Sparrow and Sparrow, 2006). However, it is also worth considering the potential benefits that such a relationship could have for the older person, including reducing feelings of loneliness and improving their overall well-being. To balance these competing concerns, it may be important to have clear guidelines and rules in place around the use of carebots in home care settings, and to have regular check-ins and evaluations to ensure that the relationship is not causing any harm.

People could develop a psychological dependence on carebots, which is another risk. Technology is known to activate the brain's reward centres, and this addiction may cause people to take actions they otherwise would not have. It may be challenging to foresee the psychological effects of forming a relationship with a robot. Assuming a robot wouldn't be programmed to break up with a human companion, theoretically removing the emotional highs and lows from a relationship, consider how a user's mental and social development might be affected by such a "risk-free" relationship (Borenstein and Arkin (2019)).

If an elderly person with dementia is given a carebot to help with memory and cognitive tasks. The carebot is equipped with a range of features such as, facial recognition, voice recognition, and natural language processing to help the person with dementia to recall important information and events, such as the names of family members, important dates, and appointments, and to remind them to take their medication on time. The carebot can converse with the person, assist with meal preparation, and light housekeeping, and remind the person to take their medications. The elderly person may start to become psychologically dependent on the carebot as they start to depend on it more and more for tasks and social interaction. As a result, the person might grow more distant from their loved ones and friends and reliant on the carebot to meet their emotional needs. It can be challenging to predict how this type of relationship will affect the person's mental and social development, which may be cause for concern. Since a carebot relationship lacks the emotional highs and lows that characterize human relationships, it may be detrimental to the person's emotional health. To mitigate these risks, it may be essential to have a clear understanding of the carebot technology's limitations and to have a plan in place for gradually reducing the person's reliance on the carebot over time, while also giving them more social support and chances to interact with others.

## **6.2. Impact of carebots on society**

### **6.2.1. Impact of carebots on the society in terms labour market**

There is widespread worry that AI-carebots and related technologies could lead to a significant increase in unemployment. One recent study found that soon, new information technologies will threaten a significant portion of employment across a wide range of occupations. (Frey and Osborne, 2013). We are still in the early stages of the technological revolution, making it difficult to estimate the impact that carebots will have on the workforce. On the relative effects of AI and robotics, economists also disagree. In one study, 1,896 experts were asked about the effects of new

technologies. Of those, 48% thought that robots and digital agents would replace a sizable portion of both blue-collar and white-collar workers, with many expressing worries that this would result in a significant rise in income inequality, a sizable increase in the number of unemployed people, and a breakdown of the social order. (Smith and Anderson, 2014). The other half of the experts who participated in this survey (52%) thought that by 2025, technology would not have replaced more jobs than it had created. Although many jobs currently held by humans will be largely replaced by robots or digital agents, these experts believe that human ingenuity will create new jobs, industries, and means of subsisting.

It's worth noting that not every member of society will be affected equally by these significant changes. Diverse demographic groups will be impacted to varying degrees, and some are more vulnerable to emerging technologies than others. The hardest times will be for those who lack specialized knowledge or technical abilities (UK Commission for Employment and Skills, 2014). Due to their early career stages and the fact that they will be the first generation to work with AI, young people entering the labour market will also be disproportionately impacted. (Biavaschi et al., 2013). AI and robotics technologies may exacerbate current social and economic divides by jeopardizing certain job classes, eliminating jobs, and causing massive unemployment in industries where jobs can be automated. Discrimination may also be a problem, with those without high-skill training and young people possibly being disproportionately affected.

### **6.2.2. Impact of carebots on the society in terms of loss of privacy**

Privacy is significantly impacted by AI and when designing carebots, privacy and dignity must be carefully considered as the carebots will be privy to incredibly private moments while working in people's homes (such as bathing and dressing). But other features of AI will also impact privacy (Smith (2018)). An example of this would be if a carebot were installed in a senior living facility with cameras to monitor the residents' welfare. If the camera coverage is not properly restricted to common areas, it may capture the resident's private moment, making them feel uneasy and watched over. In addition to violating people's privacy, this can undermine trust in the carebot and the facility.

Big data is required for machine learning-based AI applications, but the rights of user data to control how their data is used are narrowly defined (Veale et al., 2018). To safeguard the privacy of its citizens, the EU recently passed new General Data Protection Regulations (GDPR). The regulations, however, do not apply to the aggregated "anonymous" data that are typically used to train models; rather, they only apply to personal data. Additionally, it is sometimes possible to reconstruct personal information or details about the individuals in a training set from a model, which could have a big impact on how these systems are regulated. People do, however, have limited control over trained models or how they are used because there are no data protection rights for train models, even though they do have rights regarding how their personal data is used and stored. Instead, it is widely believed that different intellectual property rights, such as trade secrets, primarily govern models.

### **6.2.3. Impact of carebots on the society in terms of bias**

AI is developed by humans; therefore, it is subject to prejudice and systematic bias may develop due to the data used to train the system or due to the values of the system's creators and users. When machine learning programmes are trained on data that only represent demographic groups or that reflect societal biases, it most frequently happens. For instance, if a carebot system is designed to assist with daily tasks such as bathing and dressing, but it is only trained on data from white, English-speaking residents, it may not be able to properly assist residents who have different cultural practices or physical needs. This could lead to residents feeling uncomfortable or unsupported and could also lead to a lack of dignity and privacy for them. This is just one example of how AI bias in carebot systems can occur. It highlights the importance of ensuring that the data used to train AI systems is diverse and inclusive, and that system developers and users are aware of the potential for bias and take steps to mitigate it.

Human biases can easily cause a skewed distribution in training data because many machine-learning models are constructed from human-generated data. Applications and products utilizing AI run the risk of perpetuating bias and discrimination if developers don't take steps to identify and address these biases. The effects of biased AI against specific societal groups can be extensive.

### **6.3. Impact of carebots on business**

Healthcare providers are preparing to increase the staff's digital literacy over the next two decades to shift the balance of skills in the medical workforce (NHS' Topol Review, 2019). As in other sectors, there is concern that new technologies could threaten jobs (The Guardian, 2017). For instance, there are carebots available today that can complete up to a third of the work done by nurses. (Tech Times, 2018). Hospitals, nursing homes, and even people's homes can all benefit from the assistance and care provided by carebots. Depending on the particular use case and application, the effect of carebots on business can vary. Businesses and organizations must therefore train their employees and nurses to oversee the carebots as needed. This may increase business expenses.

Digital healthcare technologies have the potential to increase the precision of diagnoses and treatments, but extensive clinical testing is necessary to firmly establish a technology's long-term performance and safety. Vaginal mesh implants' crippling side effects and the ongoing legal battles against manufacturers. (The Washington Post, 2019). To guarantee patient safety, a healthcare professional must use AI appropriately. For instance, the precise surgical robot "the da Vinci" has proven to be a useful tool for reducing surgical recovery, but it needs to be operated by a qualified person. (The Conversation, 2018). Although AI claims to decrease the frequency of medical errors, it is still necessary to establish legal responsibility when mistakes are made. It is the manufacturer's responsibility if it can be demonstrated that the equipment is defective, but it can be difficult to determine what went wrong during a procedure and who is to blame—medical staff or the machine. For instance, the da Vinci surgical assistant has faced legal action. (Mercury News, 2017).

Business could lose lawsuits where the carebots have malfunctioned. Seeing as carebots are intricate systems, they are susceptible to failure or malfunction, which could harm or injure patients. To reduce these risks, it is essential to guarantee the security and dependability of carebots.

There are some benefits like having a carebot provide 24/7 care to patients, which can help to reduce staffing costs for healthcare providers. This can be especially beneficial for facilities that are short-staffed or that have a high demand for care. Carebots can also be programmed to perform specific tasks, such as monitoring vital signs, administering medication, and providing physical therapy, which can help to improve the quality of care that patients receive.

#### **6.4. Impact of carebots on investors**

The impact of Carebot on investors will depend on the specific product or service being offered and the success of the company. In general, Carebot has the potential to offer several benefits to investors. One potential benefit is the potential for high returns on investment. If Carebot is successful in the market, it could generate significant revenue and growth for the company, leading to increased profits and higher stock prices for investors. Another benefit is that investing in Carebot can give investors exposure to cutting-edge technology and innovation in the healthcare industry. As technology and automation are increasingly playing a role in healthcare, investing in a company like Carebot can give investors a way to capitalize on these trends.

Additionally, carebots have the potential to have a positive impact on society by providing more affordable and accessible healthcare services to people in need. This can help to improve the health and well-being of a large number of individuals and communities, and this social impact can be a source of pride for investors.

On the other hand, Carebot also poses some risks to investors. One major risk is the possibility of low adoption and non-competitiveness in the market. If Carebot's product or service is not competitive with other similar products in the market, it could fail to gain a foothold and generate the revenue needed to be profitable. Additionally, if the company behind Carebot is not well managed, it could struggle to meet its financial goals and obligations, which could lead to losses for investors.

Another risk could be, for example, regulatory changes that could affect a carebot's ability to operate or the reimbursement for their services, this could also affect negatively in the company's financial performance and its ability to generate returns for investors. It's important to note that, as with any investment, investing in Carebot carries a level of risk, and it's important to conduct a thorough analysis of the company and the industry before making an investment decision.

## **7. Conclusion- written by Ansa Baby**

In conclusion, the use of AI for elderly carebots raises a wide range of ethical, social, legal, moral, and environmental challenges that need to be addressed. These challenges include issues related to data privacy and security, autonomy and agency, bias and discrimination, and the impact on the workforce. Also, it is important to evaluate the role of data governance within organizations that implement AI-powered elderly care bots to ensure data is collected, stored, and used responsibly and ethically. Overall, as the use of AI for elderly care bots becomes increasingly prevalent, society must engage in ongoing dialogue and develop clear guidelines and regulations to address these challenges and ensure that the technology is used for the benefit of all individuals, especially the elderly population. It is important to have ongoing dialogue and develop guidelines, regulations, and best practices to address these challenges. It is also essential to involve all stakeholders, including elderly individuals, their families, healthcare providers, AI researchers, policymakers, and the public, in the process. This would help ensure that AI-powered elderly care bots are developed and used in a way that benefits everyone, especially the elderly population.

In terms of data governance, it is vital to establish clear and transparent policies and procedures to ensure that the data collected and stored by AI-powered elderly care bots is accurate, secure, and accessible only to authorized individuals. This includes regular monitoring and auditing to ensure that data is being handled responsibly and in compliance with legal and ethical standards. Also, organizations using AI for elderly care bots should have a mechanism in place for addressing any data breaches or misuse of data. Furthermore, data governance frameworks should also include measures to ensure that the data collected by AI-powered elderly care bots is not biased, as this can lead to discrimination and negatively impact the care provided to elderly individuals. Organizations using AI for elderly care bots should have a plan for monitoring and mitigating biases in the data and models that the AI systems rely on.

It is important to note that while the challenges associated with the use of AI for elderly care bots can be significant, the technology also has the potential to greatly benefit the elderly population by improving their quality of life and providing them with better access to care. However, this potential can only be realized if the challenges are addressed comprehensively and responsibly. Additionally, it is also important to not overlook the benefits AI could bring to healthcare providers and caregivers, as it could assist them with tasks such as data analysis, decision-making and care coordination which can help them to provide more effective care for the elderly population.

In the coming years, as AI technology continues to evolve, it will be essential for society to stay informed and engaged in the development and implementation of AI-powered elderly care bots. By doing so, we can work together to ensure that the technology is used in a way that maximizes the benefits while minimizing the challenges, making it a powerful tool that allows elderly people to live a dignified and independent life.

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## 9. Appendix

### Appendix A Peer Evaluation

Your name: Anthony Eze

Your student number: 22536729

	<b>Name</b>	<b>%Points</b>
<b>Yourself</b>	<u>Anthony Eze</u>	<u>25</u>
<b>Member 1</b>	<u>Ansa Baby</u>	<u>25</u>
<b>Member 2</b>	<u>Jesty Sebastian</u>	<u>25</u>
<b>Member 3</b>	<u>Larissa Pinto</u>	<u>25</u>
		<b>Total 100 %</b>