



Geneva Challenge 2023 - 10th edition

# Technological Advancement And Human Aging: Two Inevitable Things.

## Exploring AI Companions As Allies Against Elderly Isolation



# Abstract

Aging is an inevitable and shared experience for all. One of the most significant challenges faced by older adults is the lack of social interactions, which can contribute to a deep sense of loneliness and depression. To further enrich this study, we integrated the notion of technological advancement, as it is another inevitability in modern society. This study aims to explore the potential of artificial intelligence (AI) technology, specifically voice command systems, as a means to bridge the gap and facilitate communication between the elderly and their families and social groups. Additionally, this AI system has the potential to serve as a daily companion. Based on the research findings, we propose the development of an AI-grounded product that engages in conversations with the elderly, alleviating their sense of isolation and fostering meaningful human interactions within their social circles. This intervention seeks to strengthen family ties, promote social engagement within the broader community, and provide companionship, fellowship and support. By implementing voice command technology, the objective is to offer seamless and user-friendly means of communication for elderly individuals, enabling them to actively participate in the digital age and mitigate the detrimental effects of social disconnection. This project contributes to the ongoing discourse on integrating technology to address social challenges faced by the aging population. It emphasizes the importance of human-centric approaches, utilizing AI as a catalyst for positive change.

**Keywords:** artificial intelligence, voice command, elderly population, communication, social interaction, loneliness, isolation, technology, human-centric approach.

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# Table of Contents

|  |    |
|--|----|
| <b>1. Introduction</b>   | 5  |
| <b>2. Information background</b>   |    |
| 2.1. Breaking Barriers: Redefining Aging in a Modern Society   | 6  |
| 2.2. The Impact of Loneliness on the Health and Well-being of the Elderly                              | 9  |
| 2.3. COVID-19 and its repercussions  | 12 |
| 2.4. Technology development: The Role of AI in the Modern World  | 14 |
| 2.5. Gerontechnology   | 17 |
| <b>3. The project</b>  | 18 |
| 3.1. Technology can play a significant role in combating loneliness among the elderly                  | 19 |
| 3.2. Description of the proposed technology  | 20 |
| 3.2.1. Companionship   | 22 |
| 3.2.2. Increase interaction with surrounding community   | 24 |
| 3.2.3. Strengthen bonds with family and friends  | 26 |
| 3.2.4. Access to information and acquisition of new abilities  | 27 |
| 3.2.5. Health care assistance and safety   | 28 |
| 3.3. Benefits and impacts of the proposed technology   | 29 |
| 3.4. Adapting to change: Digital inclusion and the gradual acceptance of AI companions by older adults | 31 |
| 3.5. Costs of implementation: Overcoming financial barriers in implementing AI on a national scale     | 33 |
| 3.6. Project timeline  | 34 |
| <b>4. Ethical challenges</b>   | 35 |
| 4.1. Data Privacy: Balancing Innovation and Individual Rights  | 36 |
| 4.2. AI and Human relationships: Advancing together for a better future                                | 38 |
| <b>5. Conclusion</b>   | 40 |
| <b>6. References</b>   | 41 |
| <b>7. Appendix</b>   | 47 |

# Introduction

The elderly population was selected for this study due to the universal nature of aging. Regardless of wealth, health status, ethnicity, or cultural background, every human being undergoes the aging process, making it an inevitable and shared experience for all. At this stage of life, people often face an increased risk of social isolation, which can be attributed to various factors, such as the geographical distance between close family members who reside far away in pursuit of better job opportunities or access to better educational institutions.

Simultaneously, we find ourselves standing on the edge of a new technological era, where each passing day brings forth groundbreaking advancements that hold the potential to enhance our lives. Among these advancements, AI-powered machines shine as the prominent stars in this burgeoning field. These machines boost the power of artificial intelligence, offering a wealth of possibilities to revolutionize various aspects of our daily existence.

Technology holds immense potential in alleviating the pervasive feelings of loneliness among seniors. By considering the needs of this population from the outset and designing products specifically tailored for them, we can create user-friendly solutions that are more readily embraced by older adults. Our ultimate goal is to bridge these two realms, harmonizing technology and the aging population for the betterment of humankind.



# Breaking Barriers: Redefining Aging in a Modern Society

Modern society perceives aging as a failure leading individuals to seek ways to retain youthfulness that challenges the natural aging process. We are currently in an epidemic era dominated by plastic surgery, aesthetic procedures, and hormonal supplements, among other things. The primary objective of these interventions is to help individuals maintain a youthful appearance, which is held as better or prettier, as our society tends to view aging unfavorably, nobody wants to feel deteriorated, outdated and old. We firmly believe that aging is a blessing, and the natural wrinkles that appear on your face are a representation of the experiences and stories you have lived. Removing these marks can diminish your unique identity and the rich tapestry of your life journey.

Another noteworthy aspect to consider is physical activities. Engaging in regular exercise throughout your life undoubtedly brings numerous benefits, and there is no doubt about its positive impact at all ages. However, it is important to acknowledge that despite maintaining healthy habits such as regular exercise and a balanced diet, the aging process brings certain physical limitations that cannot be completely overcome. As a result, aging remains an inevitable reality that requires acceptance and adaptation.

Across the globe, countless individuals are engaged in a courageous battle for their lives, grappling with diseases like cancer that can swiftly and unexpectedly claim them. Many of them yearn for the chance to experience the natural process of aging, yet tragically, it remains out of reach for the majority. Once again, aging can be viewed as a remarkable blessing, affording us the opportunity to witness our family and loved ones accomplish their dreams, witness the growth of our family, and so much more. Embracing this perspective is likely to pave the way for a more fulfilling and gratifying old age.

Loneliness emerges as a significant issue that poses a threat to the overall well-being of the elderly population. As it is common among seniors, it is vital to increase awareness of this issue within society and propose alternative solutions to minimize the impact of social isolation among the elderly. We decided to explore loneliness at this stage of life, highlighting the potential impacts on mental and physical health. Resulting from social isolation and lack of meaningful interactions, prolonged loneliness can contribute to depression, anxiety, increased chronic stress, cardiovascular diseases, cognitive decline, and neurodegenerative diseases (Cacioppo, et al. 2010).

(B)



The subject of aging and loneliness is highly relevant in today's society. As the global population continues to age, understanding and addressing the challenges faced by older adults becomes increasingly important.

*“The pace of population ageing is much faster than in the past. Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%.” (World Health Organization - WHO)*

By studying and raising awareness about the impacts of loneliness on mental and physical health, we can develop interventions, policies, and support systems to improve the quality of life for older adults and promote healthy aging.

- **Population ages 65 and above (% of total population)**

United Nations Population Division

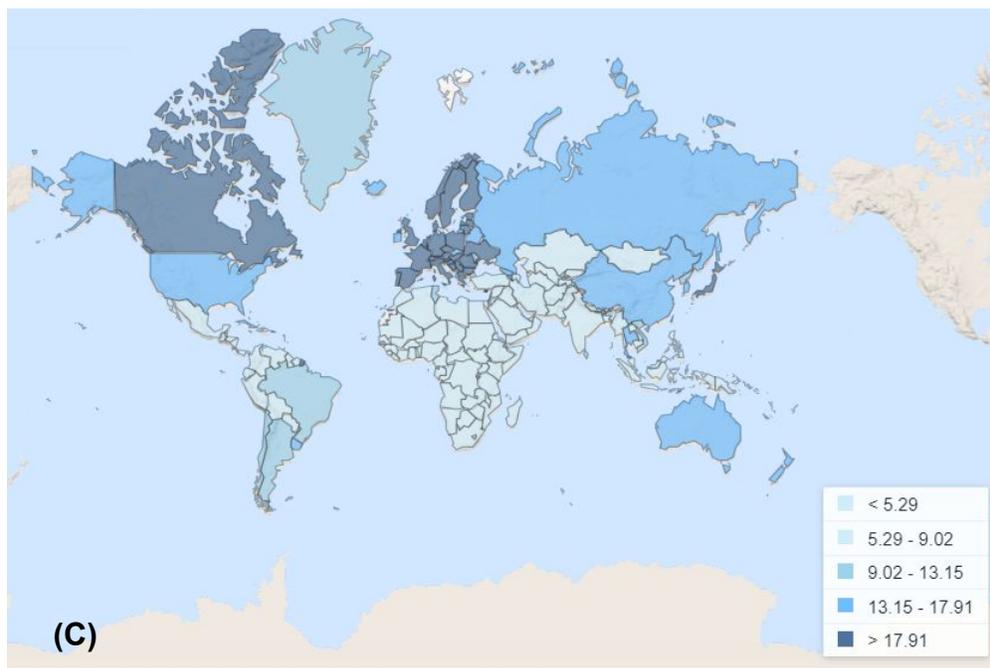


Figure 1: Global Senior population

Source: World bank 2022



Lack of social connections and feeling isolated can lead to deteriorating mental health, resulting in depressive symptoms such as persistent sadness, loss of interest, changes in appetite and sleep, lack of energy, and suicidal thoughts. It also can lead to excessive worry, fear, nervousness, and tension, impairing quality of life and increasing vulnerability to anxiety disorders. These constant feelings and lack of social interactions can lead to increased activation of the body's stress response system, resulting in elevated levels of stress hormones such as cortisol. Chronic stress is associated with a number of health problems, including cardiovascular disease, immune system suppression, sleep disturbance, and impaired cognition. Lack of social support and chronic loneliness can contribute to increased blood pressure, chronic inflammation, endothelial dysfunction, coronary heart disease, stroke and other cardiovascular risk factors. This lack of intellectual activity and social stimulation can contribute to decreased cognitive function and the development of neurodegenerative diseases such as Alzheimer's disease and dementia (Hawkey, Preacher, & Cacioppo, 2010).

It increases the use of medication and its dependency among seniors which is highly dangerous. For instance, the use of antidepressants in an excessive and prolonged way can lead to dependency, where individuals develop a reliance on the medication to cope with daily life, resulting in a potential addiction that can be difficult to overcome. In addition to the risk of addiction, prolonged use of medications can lead to various side effects, some of which may pose significant dangers even if mitigated. For instance, antidepressants have been associated with side effects like weight gain, sexual dysfunction, and an increased risk of cardiovascular events, which can have detrimental effects on the overall health (Khawam et al., 2006; Soller et al., 2009) . Therefore, the presence of social connections not only holds a substantial influence over psychological and emotional well-being but also exerts a significant and favorable impact on physical well-being and overall longevity (Uchino, 2006; Holt-Lunstad et al, 2010; Shor, Roelfs, & Yogev, 2013).

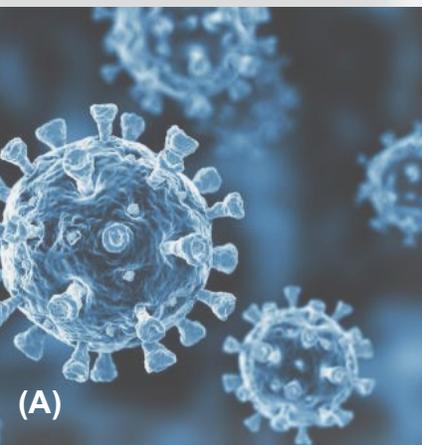
Importantly, loneliness is not the only cause of these diseases, but it can play a significant role as an additional risk factor. Promoting social connections, emotional support, and activities that encourage social interaction in old age can help reduce the impact of loneliness and protect the physical and mental health of the elderly. The negative impact of loneliness on the elderly extends to their overall well-being, as it can lead to reduced life satisfaction, decreased quality of life, and even higher mortality rates (Holt-Lunstad, et al. 2010). Recognizing and addressing loneliness as a significant health concern is vital to promote the overall health and well-being of the elderly population (Holt-Lunstad et al., 2016).

# COVID - 19 and its repercussions

COVID-19 pandemic has exerted a significant impact on the global population, the absence of social interaction due to the lockdown, increased mental health disorders such as depression and anxiety. Nevertheless, it is noteworthy that the effects of social isolation on older adults have been more extensive than conventionally portrayed (Barnes et al., 2022). Thus, the social isolation imposed by the pandemic has augmented the profundity of loneliness experienced by older adults. Devoid of requisite support and social interactions, their mental well-being progressively deteriorates, precipitating various risk behaviors, such as reduced physical activity, adoption of unhealthy dietary patterns, and heightened reliance on medication. Alas, such behavioral patterns invariably exacerbate the precariousness of physical health, with older individuals being particularly vulnerable to these adverse ramifications (Hawkley, Thisted, Masi, & Cacioppo, 2010).

Given the heightened susceptibility of the elderly population to severe illnesses during the COVID-19 crisis, it is imperative to accord them special consideration. Throughout the lockdown, social interaction was often depicted as harmful and contagious. However, it is crucial that we challenge and alter this perspective, emphasizing the importance of maintaining social connections while disassociating disease from social interaction. Implementing interventions such as community activities that foster social interactions and leveraging digital technologies can significantly ameliorate the quality of life for older individuals, thereby mitigating the deleterious effects of the pandemic.

One positive outcome of the pandemic has been the rapid adoption of technological platforms for remote video calls, enabling us to connect with work colleagues, classmates, and loved ones from a distance. Technology played a key role in enabling us to continue working, studying, supporting our families, maintaining social connections, and sustaining essential operations during the lockdown, while we navigated the challenges imposed by the COVID-19 pandemic. Furthermore, there has been a significant increase in the utilization of technology devices for various purposes, including requesting services like food and medication delivery, medical check-ups with telemedicine, and more. Nevertheless, the advent of the COVID-19 pandemic has precipitated a reduction on familial and social visitations, alongside a decline in emotional closeness, thereby intensifying feelings of loneliness, anxiety, fear, and the risk of social isolation among older adults (Barnes et al., 2022).



(A)



(A)

# Technology development: The role of AI in the modern world

The rapid evolution of technology on a global scale has been a widespread phenomenon worldwide, transcending borders and impacting societies everywhere. Accessibility and adoption of technology, such as cell phones, computers, and even AI itself, have become increasingly prevalent in many countries, including those considered to be emerging.

Looking at recent data, it is notable that technology adoption is becoming a reality in virtually every country, about 51% of the world's population was using the Internet in 2021 (World Bank, 2021). This represents a significant increase over previous decades, evidencing the rapid spread of global connectivity.

- **Individuals using the Internet (% of population)**

International Telecommunication Union ( ITU ) World Telecommunication/ICT Indicators Database

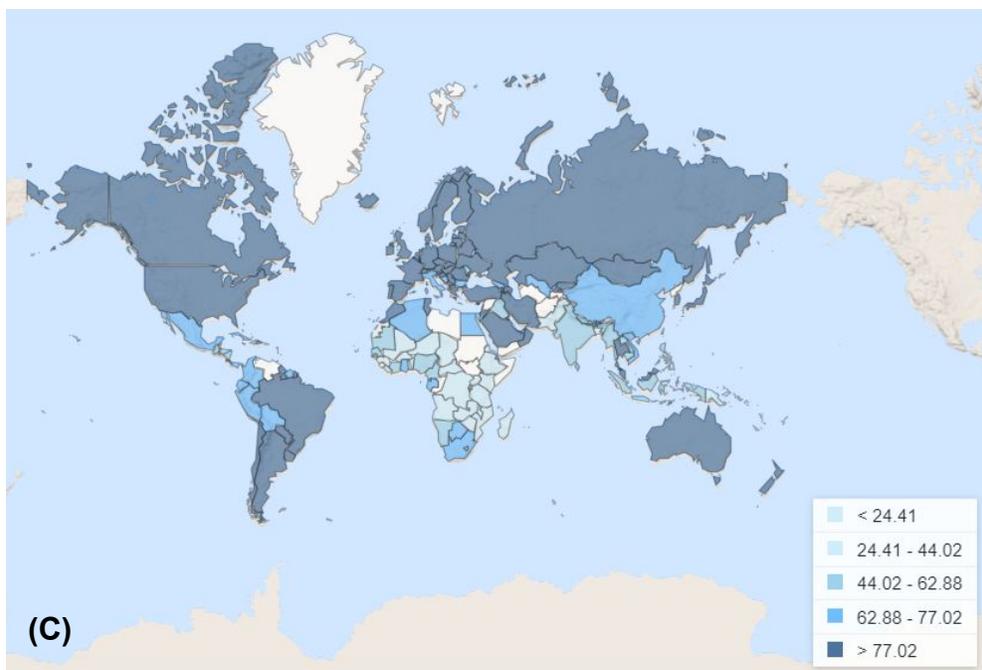


Figure 2 : People using internet around the globe

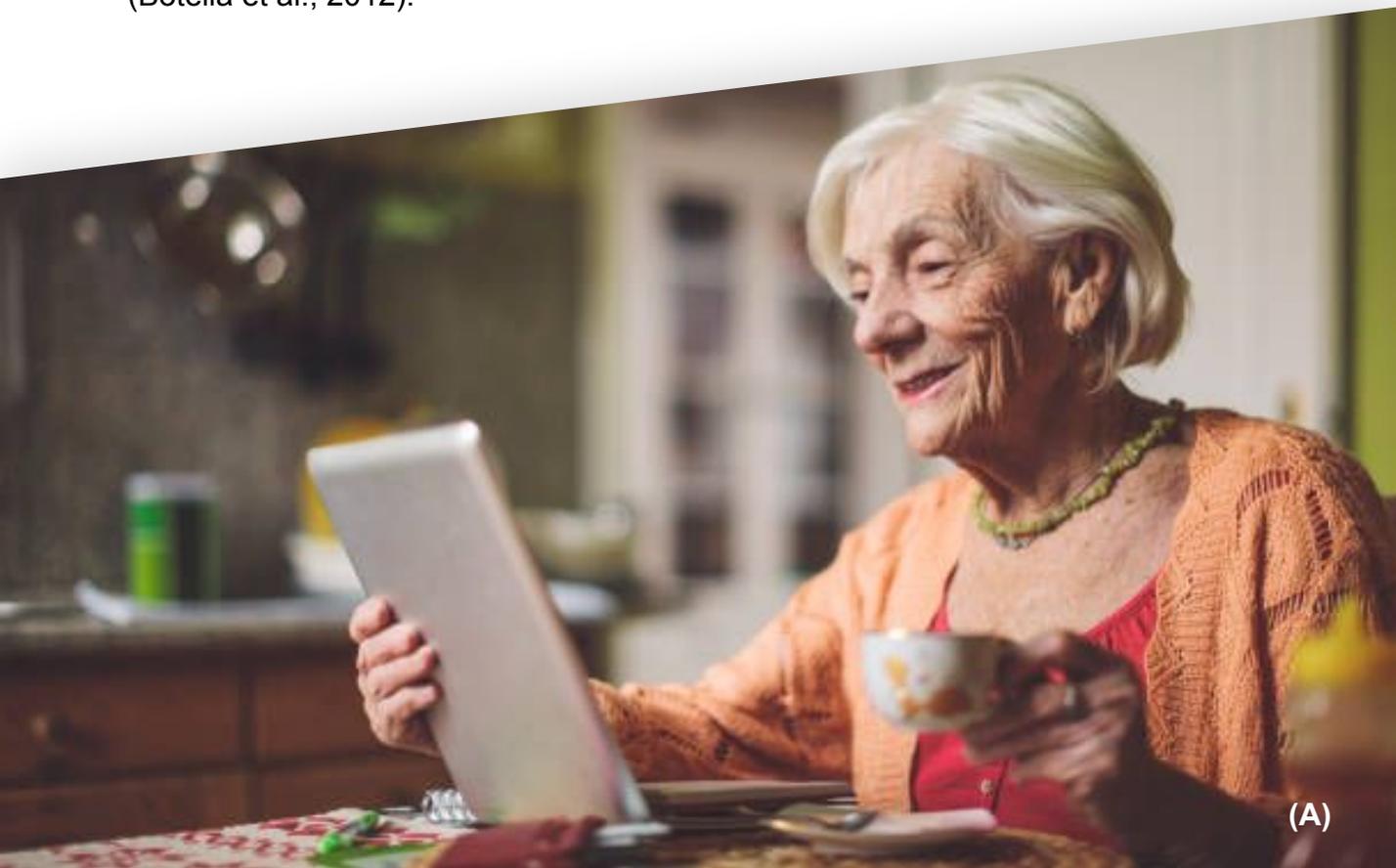
Source: World Bank 2021

In addition, the use of technological devices such as cell phones and computers is also on the rise. According to the International Telecommunication Union (ITU), by 2021 there were about 5.28 billion mobile phone subscriptions worldwide. This means that most people in countries around the world have access to a cell phone, which provides a connection to the digital world and a wide range of services (ITU, 2021).

AI is also becoming a reality in different parts of the globe. Major technological powers such as the United States, China, and European countries have been leading the development and implementation of AI in various sectors. However, it is important to note that many emerging countries are also adopting AI to drive their growth and development. For example, countries such as Brazil, India, and South Africa are investing in AI research and development, recognizing its potential to transform economies and improve people's quality of life.

Technological advances on a global scale have been fundamental to society at large. In healthcare, for example, the adoption of technologies such as telemedicine and AI-driven data analytics has enabled the delivery of medical care in remote areas and the development of more precise and personalized treatments. In addition, technology has strengthened education, empowering local communities, and promoting social inclusion. People in more remote regions have the opportunity to gain knowledge, connect to the world, and actively participate in the global digital economy.

These technological advances are driving improvements in various sectors and providing significant benefits to society at large. One interesting concept is positive technology, that encompasses the design and use of technology to enhance well-being and promote positive human experiences. It aims to leverage technological advancements to foster happiness, mindfulness, and personal growth. By integrating principles of psychology and well-being, positive technology aims to create digital solutions that contribute positively to individuals' lives. It is important to continue to promote digital inclusion and ensure that the benefits of technology are accessible to everyone, regardless of age, their country of origin or level of economic development. In this way, we can harness the full potential of technology to drive human progress in an equitable and sustainable manner (Botella et al., 2012).



# Gerontechnology

Gerontechnology refers to the branch of technology specifically designed to enhance the quality of life for older adults. With the aging population worldwide, the development of gerontechnology has gained significant attention. This field encompasses a wide range of technological solutions aimed at addressing the challenges faced by seniors in their daily lives.

There are various types of gerontechnology that cater to the specific needs of the elderly. Assistive technologies such as mobility aids, hearing aids, and visual aids assist older adults with physical impairments. Telehealth and remote monitoring technologies enable healthcare providers to remotely monitor vital signs and provide medical consultations, improving access to healthcare services. Home automation systems, smart devices, and wearable technologies promote safety and independence by facilitating remote control of household appliances and tracking personal health data (Kwon, 2016).

The International Society of Gerontechnology (ISG) is an organization dedicated to advancing gerontechnology research, development, and application worldwide. ISG fosters interdisciplinary collaboration between researchers, healthcare professionals, engineers, and industry stakeholders. The society organizes conferences, publishes scientific journals, and promotes best practices in gerontechnology. Their work contributes to improving the well-being and quality of life for older adults through technological innovation. They also have been organizing biannual world conferences since 2014 to explore the intersection of aging and technology development. The ISG's vision is

*“ISG works toward the realization of a society fully served by technology that is as accessible to ageing people as it is to people in younger generations.” (About Us, 2014)*

(J)



# THE PROJECT

TO UNITE, CONNECT, EMPOWER

# Technology can play a significant role in combating loneliness among the elderly

Modern technology holds a distinct value in today's society compared to years ago. There are several technology-based interventions that promise to reduce social isolation for seniors, a systematic literature review conducted in 2016 identified eight main categories: general ICTs, video games, robotics, PRISM, asynchronous peer support chat rooms, SNSs, Tele-Care and 3D virtual environments. This study compared those technologies and concluded that Video games, PRISM and ICTs were the most effective in reducing feelings of loneliness (Khosravi et al., 2016).

Another systematic literature review, more recent, published in 2022, came across similar results. They concluded that technology interventions can improve social connectedness for the elderly. ICTs and videoconferencing presented better effectiveness. However, most recent technologies such as robots, AI or virtual reality still need further research to provide a more robust conclusion. Even so, based on the years of research in this field, we can imply that the future of technology is promising to help with the isolation issue for seniors (Balki et al., 2022).

Globalization, technological advances, the internet, virtual reality, and artificial intelligence are directly and indirectly impacting the lives of older adults. By adapting to new technologies and learning how to use them effectively, seniors can expand their social connections, stay informed about current events, participate in online activities, and even find communities with shared interests. This not only reduces feelings of isolation, but also promotes greater emotional well-being and a more enriched quality of life.

# Description of the proposed technology

We propose an innovative solution to address the issue of elderly isolation by leveraging technological advancements. Our goal is to merge these inevitable elements and offer a practical tool to cope with loneliness that often accompanies old age. By doing so, we aim to provide humanity with a means to effectively navigate this significant societal issue.

We have developed a product called AVA, that utilizes an AI system capable of interacting with humans through voice commands. This innovative product serves as a companion for the elderly, fostering meaningful connections and strengthening their ties with family, friends, and the wider community. It offers personalized assistance, this AI system can learn and adapt to the specific needs and preferences of older family members. By understanding their routines, preferences, and health conditions, the AI can offer personalized recommendations, such as suggesting suitable exercises, providing nutritional advice, or offering reminders for regular health check-ups. An important aspect of this product is that with all its functionalities it will empower older adults by granting them autonomy, which will enhance their dignity.

AVA is a small and portable device that utilizes voice control, enabling real-time communication with the user. The primary concept behind this AI technology is its utilization of Limited Memory and Machine Learning, enabling it to learn from its interactions and personalize its responses to each individual user. It operates on electricity, is rechargeable, and does not require any installation for functionality. The only requisite is to set up your preferences through an app on your cell phone. Additionally, you can connect with other apps on your smartphone, so that you can enable video conferencing through voice command. You can conveniently purchase and use it in any household. Its compact size allows it to fit seamlessly in any space, and its portability enables you to take it with you wherever you go.

AVA can manage to interact in a conversation, it is not strict to commands, which allows it to serve as a companion if need be. The device easily connects to the TV or any other technological device in the house, facilitating the use of visual aids and enhancing its functionalities. Additionally, you can associate a familiar voice with the device and switch to a generic voice when desired. One extra feature is that AVA can instantly contact an ambulance or any emergency contact in case of an accident or the user is in danger. Everything in the product was specifically designed for elderly users, ensuring ease of use, adaptability, and overall user-friendliness.

## 1. COMPANIONSHIP

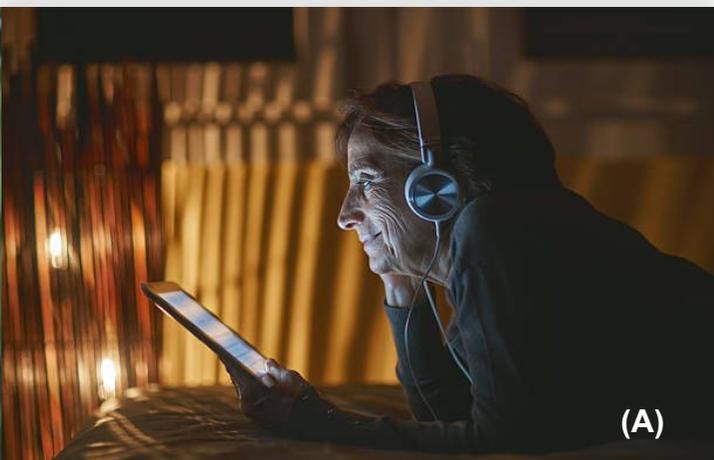
AVA can provide companionship to older family members, especially those who may be living alone or spend too much time by themselves at home. Through interactive conversations and personalized interactions according to each user's personality and preferences, the AI system can engage in meaningful conversations, helping to alleviate feelings of loneliness.

One lovely feature of this device is the story telling. In a narrative mode, AVA has the ability to both listen to and share specific stories from an individual's youth, thereby fostering engaging conversations. Notably, the device offers the option to switch to a familiar voice, which could even be of a loved one that has already passed away, creating a more profound and emotionally resonant experience while reliving those cherished stories. This feature enhances the meaningfulness of the storytelling process.

Voice memories not only provide comfort for coping with loss but also help preserve the essence of a loved one, keeping their memory alive in a tangible and deeply emotional way. The product acknowledges the power of voice as a fundamental aspect of human connection, reminding us that the bonds we form can transcend time and physical presence. By incorporating these emotional elements, our product concept becomes a heartfelt tribute and a valuable source of solace for anyone longing to hear the voice of a departed loved one again.

Many older people value their independence, and don't like to leave their houses and chores. For instance, a 72 year old man almost never leaves the farm to go to the city and visit his family, even though they can provide helpers to take care of the livestock, he prefers to do it himself. Another example, a 77-year-old woman who insists on managing her household chores without assistance from a maid. Therefore, we thought of another stimulating feature on this device, which is the daily activity partnership. AVA chats with the elderly while they perform their daily activities or house chores, such as preparing breakfast, making the bed, doing the dishes or handling laundry tasks, among others.

AVA can also offer various forms of entertainment for older family members, such as playing music, karaoke, sharing interesting trivia, and engaging in interactive games or puzzles. These activities can provide cognitive stimulation and mental engagement, which are essential for maintaining cognitive health. Furthermore, the main purpose of a game is to enjoy it, play just for fun, a form of leisure to help pass the time in a more pleasant way. It is common to observe games targeted at the elderly primarily focusing on cognitive stimulation, which we consider an added bonus. As a society, it is important that we begin contemplating the design of games specifically tailored to meet the preferences of this age group (Boot et al., 2020).



## 2. INCREASE INTERACTION WITH SURROUNDING COMMUNITY

Most elderly communities have their own agenda of activities that they engage in together. In Brazil, we have a unified health care system called SUS, which includes primary care facilities known as UBS (Unidade Básica de Saúde). UBS facilities are spread throughout the country, with each neighborhood having its own. These facilities organize various weekly activities for the elderly in the local area. The activities offered are diverse, ranging from group sports like volleyball, soccer, and hydrogymnastics to more gentle exercises like stretching, yoga, and hiking.

AVA aims to actively involve individuals in these existing group activities and foster greater participation within the local community. While we acknowledge that community dynamics may vary in different parts of the world, the device has the capability to connect people, regardless of their prior connection to the community. By enabling communication between devices, users in close proximity can arrange meetings and engage in activities together based on shared interests. This includes activities such as taking walks in the park, forming new acquaintances and friendships, and participating in social group activities like knitting, dancing, crafts, or playing bingo.



Moreover, AVA offers a unique opportunity to facilitate intergenerational interactions. For instance, we can promote that by utilizing videoconferencing to connect individuals from diverse cultures. On one hand, there are people seeking to learn a new language, while on the other hand, there are lonely seniors yearning for someone to talk to. This concept can extend beyond language acquisition and encompass various skills, such as sewing, cooking or any other pursuit. To ensure safety and prevent scams, we propose restricting connections to registered schools, thereby safeguarding the well-being of our elderly community.

AVA seeks to enhance the engagement and social interaction of elderly individuals, within their existing community activities, facilitating connections with others who share similar interests and fostering intergenerational interactions. By leveraging the device's capabilities, users can strengthen their sense of belonging, forge new relationships, and enrich their overall well-being through active participation in a wide range of communal pursuits.



### **3. STRENGTHEN THE BONDS WITH FAMILY MEMBERS**

AVA can also assist with making phone calls, sending messages, or video chatting with other family members, making it easier for older individuals to stay connected with their loved ones. The device can connect to the TV, enabling video calls to be displayed on a larger screen, thereby enhancing visual impact and fostering more engaging interactions. Additionally, AVA could facilitate and mediate activities for them to engage in together during these virtual gatherings. It can also remind the user of important social dates such as birthdays, parties, and activities with friends.

Another intriguing feature is that the AI can analyze the user's mood throughout the week and proactively notify the person's family when they are feeling particularly sad or lonely, indicating that a visit would be appreciated. While regularly visiting your grandparents or loved ones is a crucial habit we should all maintain, the device can provide valuable insights, notifying you when your presence could be even more significant than you might realize.

AVA goes beyond mere notification by actively scheduling activities that can be done together, taking into account the unique preferences and habits of each user. For example, it can suggest a weekly cooking session where the user and their family member or friend prepare a meal together, fostering a sense of shared experience and connection. By considering individual preferences, dietary restrictions, or culinary interests, the device ensures that the suggested activity is enjoyable and meaningful for everyone involved. This collaborative cooking activity can serve as a delightful bonding opportunity, allowing for the exchange of recipes, techniques, and cherished memories while creating a shared sense of accomplishment and togetherness.

## 4. ACCESS TO INFORMATION AND ACQUISITION OF NEW ABILITIES

AVA can act as a gateway to information and communication for older family members. They can provide quick access to news, weather updates, and general knowledge. This AI system incorporates a dynamic learning mode that enables detailed explanations and instructions on a wide range of subjects. Users can choose this mode to acquire new knowledge and skills in any field they desire. Whether it's learning a new language, delving into scientific concepts, exploring artistic techniques, learning how to fix the TV or understanding historical events, the AI system provides comprehensive explanations and step-by-step guidance to facilitate the user's learning journey.

Through interactive discussions, visual aids, and engaging demonstrations, AVA ensures that the learning experience is both informative and enjoyable. Users can ask questions, seek clarification, and receive personalized recommendations tailored to their specific interests and learning pace. The system's ability to adapt and provide continuous feedback further enhances the learning process, enabling users to deepen their knowledge and expand their horizons in diverse areas of interest.



## 5. HEALTH CARE ASSISTANCE AND SAFETY

AVA can contribute to the safety and security of older family members. For instance, it can monitor the home environment for potential hazards, detect falls, or alert family members or emergency services in case of emergencies. Furthermore, this device can keep track of the users comorbidities and health history, actively giving suggestions on activities to do and when to schedule a doctor's appointment.

This AI system can also offer weekly activity suggestions tailored to the desired mood, such as motivation, rest, or health. Drawing on its extensive capabilities, the device can provide personalized recommendations for activities that align with the user's current state of mind and well-being goals. For instance, if the user expresses a desire for motivation, the device may suggest a workout routine, providing guidance and encouragement throughout the session. Alternatively, if the user seeks relaxation, the device could propose a calming meditation or guided breathing exercise. It can demonstrate proper techniques, track progress, and celebrate milestones, making the overall experience interactive and enjoyable.

AVA is equipped with cameras and motion sensors that can help ensure the safety of seniors. It can detect falls or accidents and promptly alert caregivers or emergency services. Additionally, it can monitor for potential hazards, such as leaving the stove on, and send alerts to prevent accidents. In case of emergencies, this AI system can be programmed to recognize distress signals or vocal cues. AVA can assist older family members by providing reminders for medication schedules, appointments, and daily tasks, thus promoting independence and reducing forgetfulness. It can also improve access to health by scheduling online consultations, with telemedicine for example. Although not directly related to loneliness, this final feature holds significant importance.

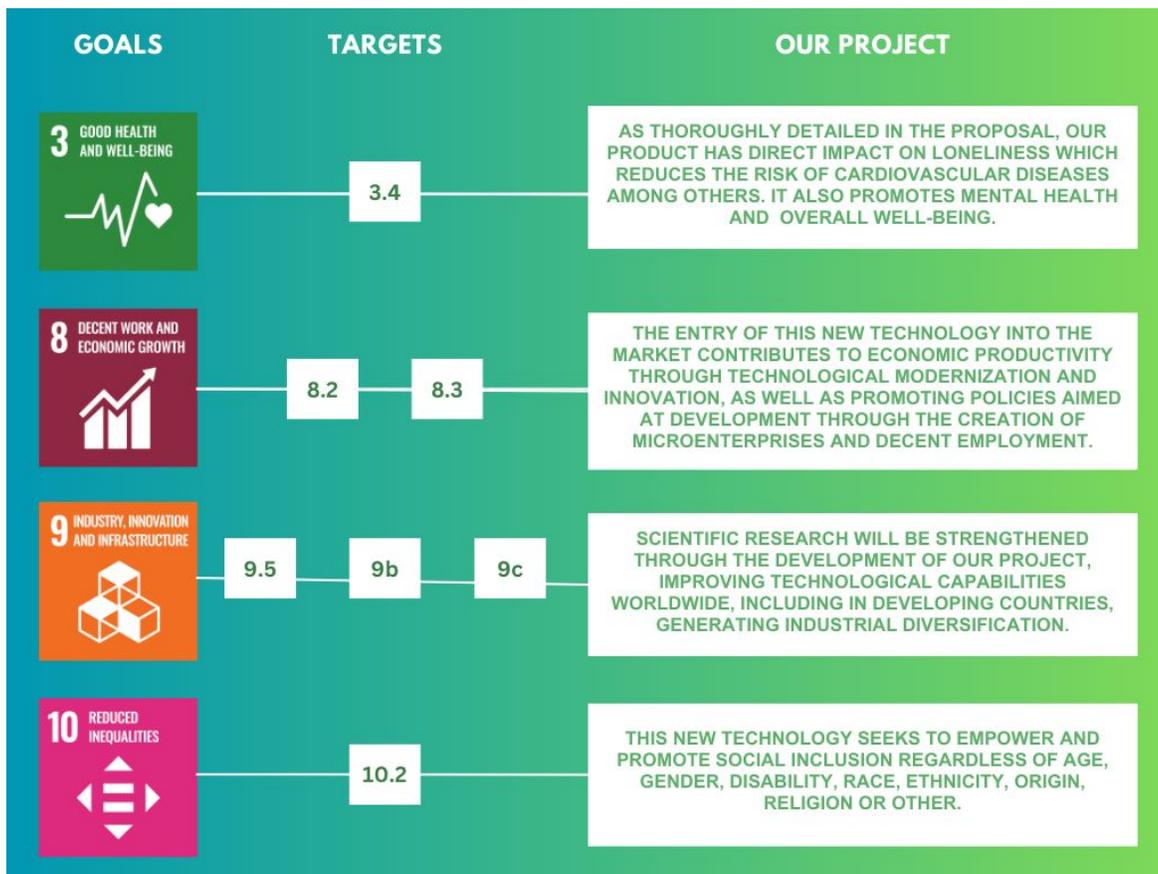
# Benefits and impacts of the proposed technology

One of the notable advantages of this product in society lies in the increasingly harmonious relationship between humans and assistant robots. Rather than resisting technological evolution and rejecting its use, we have the opportunity to adapt and reap its benefits. In the present era, we can observe this relationship growing stronger, with a clear indication that it will continue to thrive in the future.

Loneliness poses numerous challenges for the elderly, and this product offers a significant advantage by effectively mitigating such feelings. Its foremost benefit lies in enhancing social connectivity by integrating the user into local social groups, fostering a sense of belonging and strengthening familial bonds. Moreover, it provides companionship, serving as a reliable presence for individuals in need.

The revolutionary impacts of this type of AI are poised to transform the experience of aging for both present and future generations. In our current international system, human worth is often assessed based on productivity, inadvertently casting aging as a burden rather than an achievement. This transformative approach can emphasize the invaluable wisdom, experience, and contributions that come with age, rather than solely focusing on productivity. However, by tailoring AI technology specifically for older individuals and prioritizing the promotion of better mental health, we have the potential to completely revolutionize society's perception of this life stage. A study conducted with 300 older adults evaluated the impact of a specially designed computer system for older adults, the studied group reported significantly less loneliness and increased perceived social support (Czaja SJ, et. al, 2018).

As listed subsequently, our project has a direct impact on four Sustainable Development Goals of United Nations for 2030.



Source: UN SDG goals and team's perception

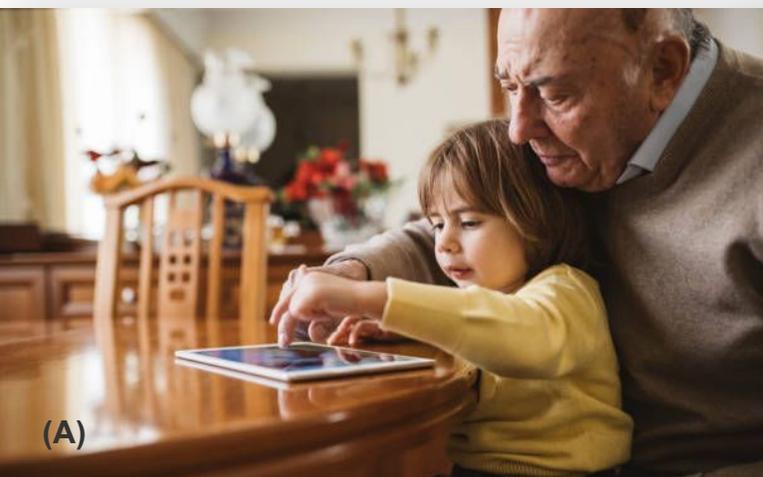
The potential for AI to redefine the aging experience is not limited to the current generation alone. Future generations stand to benefit even more from these advancements, especially considering that when they were younger adults, they already experienced the era of AI assistants like Siri, Alexa, and Google Assistant. By embracing this transformative power of AI, we have an extraordinary opportunity to reshape societal attitudes, challenge ageism, and foster a more inclusive and positive outlook on aging for generations to come.

# Adapting to change: Digital inclusion and the gradual acceptance of AI companions by older adults

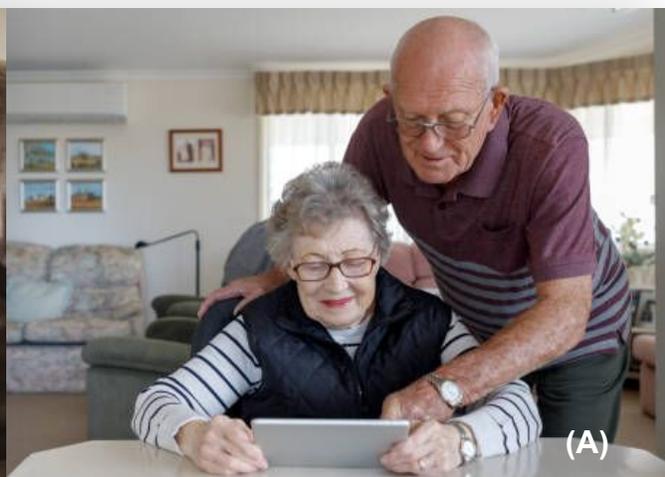
Some individuals may perceive this product as potentially challenging for older individuals; however, contrary to such assumptions, it is, in fact, quite user-friendly. Given that all commands are executed through voice recognition, the system is remarkably straightforward to comprehend and operate. The primary aspect that might pose a slight challenge pertains to configuring the device's preferences on the smartphone.

One crucial aspect to consider is the inclusion of illiterate elders, particularly in Brazil where there are approximately 9.6 million illiterate individuals, with 5.2 million of them being 60 years old or older. This represents a significant portion of the population, and as we strive to provide education, our product can also promote inclusivity. By relying on voice recognition for all commands, our product can empower them to become more independent (IBGE, 2022).

Moreover, it is crucial to consider that in approximately a decade, the elderly population will consist of individuals who have had extensive experience with AI assistants in their younger years. Consequently, an AI system that aligns with this technological paradigm holds significant potential for seamless integration into society.



(A)



(A)

Moreover, attitudes of older adults towards AI, while initial skepticism existed, people tend to be more open-minded and willing to accept AI companions as they gain experience and witness the benefits. A study conducted in the UK in 2021, explored the older adult's perceptions of socially assistive robots and according to it "For many participants, "company" was highlighted as a key advantage to SARs (socially assistive robots) in the home". We would like to highlight the importance of personalized and user-centric AI systems that align with the needs and preferences of older individuals.

Therefore, it is evident that the reluctance towards AI companionship among older adults is gradually subsiding as technology usage becomes more prevalent and individuals experience the advantages firsthand. This growing acceptance sets the stage for the successful integration of AI technology as a valuable companion for the elderly.

An additional concern that arises when considering the implementation of AI technology for older adults is their potential resistance to accepting AI as a companion. However, recent research indicates that this obstacle is gradually diminishing as technology becomes more prevalent in the lives of older individuals. A study by Pew Research Center (2017) found that the adoption of technology, including smartphones and voice assistants, among adults aged 65 and older has been steadily increasing over the years. This trend suggests a growing familiarity and comfort with technology, which can pave the way for a more receptive attitude towards AI companionship.

# **Costs of implementation: Overcoming financial barriers in implementing AI on a national scale**

The widespread implementation of new technologies on a national level often encounters financial barriers that impede progress. Undoubtedly, the initial cost associated with deploying AI technology nationwide can be substantial. However, historically, technological advancements tend to lower costs over time. As exemplified by the evolution of phones, which were once exclusively accessible to wealthy families, today, owning a smartphone is commonplace, with a diverse range of affordable options available to individuals from all walks of life. This is an indicative of the trajectory that AI technology is likely to follow.

As AI technology progresses, research and development costs gradually decrease, while its applications become more refined. This trend has been witnessed across numerous industries and products, as economies of scale and improved production processes contribute to cost reduction. Thus, the financial barrier that exists presently is likely to diminish as AI technology evolves.

To expedite the adoption of AI on a national scale, governments can play a pivotal role by implementing strategic initiatives and making targeted investments. By fostering research and development, promoting collaboration between industry and academia, and providing financial incentives to businesses, governments can facilitate the reduction in AI technology costs. This paper extensively discusses the significant benefits of the proposed technology, making funding it an investment that benefits both the current community and future generations. Therefore, partnerships between public and private sectors can enable the sharing of resources, knowledge, and expertise, further driving down expenses and facilitating widespread implementation.





# ETHICAL CHALLENGES

DATA PRIVACY AND AI

# Data Privacy: Balancing Innovation and Individual Rights

The usage of data from people's personal lives is an ongoing and complex issue that has garnered significant attention and concern in recent years. With the rise of technology devices that have the capability to gather an array of sensitive information about individuals. While the data collected by a device such as ours has the potential to offer valuable insights into individuals' well-being and facilitate personalized experiences, it also raises important privacy considerations. The nature of this data, which often includes intimate details about an individual's health and lifestyle, necessitates careful handling and protection.

One crucial aspect is the individual's consent and control over their personal data. Users should have a clear understanding of what data is being collected, how it will be used, and the ability to exercise control over its sharing and storage. Transparent privacy policies, accessible user settings, and straightforward consent mechanisms are essential to empower individuals and protect their privacy rights. According to the Human Rights Council, the right to privacy in the digital age is a human right and companies should minimize the risks by adopting adequate regulation in the design (UN. 2019, Geneva).

Additionally, there is a need to address the potential implications of data misuse or unauthorized sharing. Personal health data, for example, is highly sensitive and should not be shared or sold to third parties without explicit consent. It is crucial to establish clear guidelines and regulations that govern the responsible handling, storage, and sharing of personal data collected by this device, ensuring that it is used for beneficial purposes while respecting users' privacy rights. Outstanding technology giants, including Google, Microsoft, Amazon, and Meta, employ encryption as a crucial method for managing and safeguarding sensitive data, our proposal aims to achieve such carefulness regarding data privacy.



Furthermore, the anonymization and aggregation of health data can contribute to broader research and public health initiatives. By leveraging insights from large-scale data sets, researchers can gain valuable knowledge about population health trends, identify potential health risks, and develop targeted interventions. However, it is vital to ensure that such data is de-identified and processed in a manner that protects individuals' privacy.

As the digital landscape continues to evolve, it is crucial for policymakers, technology companies, and individuals to engage in ongoing discussions and collaborations to establish ethical frameworks, safeguards, and accountability mechanisms that address the multifaceted challenges posed by the usage of personal data. Promoting transparency, informed consent, strong security measures, responsible data practices, and personal data utilization with robust privacy safeguards, we can foster trust in these technologies. By doing so, we can strive towards a future where data-driven innovations coexist with privacy, security, and respect for individuals' rights in their personal lives.





# **AI and Human Relationships: Advancing Together for a Better Future**

The coexistence of AI-powered machines and human relationships, is addressing concerns that increased interaction with machines may hinder interpersonal connections. By examining the benefits of AI technology, this study argues that AI-powered machines can indeed contribute positively to human well-being and social dynamics. We aim to emphasize the importance of striking a balance between AI technology and human relationships, ultimately fostering a harmonious integration of these two realms for the betterment of society.

AI-powered machines can serve as valuable complements to human interaction rather than replacements. It can enhance efficiency and productivity, enabling individuals to accomplish tasks more effectively. By streamlining processes and automating routine activities, people have more time and energy to devote to interpersonal relationships. It can also relieve stress and enable individuals to be more present during social interactions, improving the quality of human connections.

Those devices have the potential to bridge geographical and physical gaps, facilitating communication and connection between individuals who are physically distant. AI-powered machines can improve access to resources and opportunities, particularly for individuals with limited mobility, disabilities, or those residing in remote areas. By providing access to educational resources, healthcare services, and social support networks, these machines can enhance social inclusivity and enable individuals to engage more actively in their communities.

A hand is shown interacting with a futuristic, glowing digital interface. The interface features various data visualizations, including a circular gauge on the left, a central bar chart, and a grid of data points. The background is a soft, blue-toned gradient with faint, glowing patterns.

Rather than diminishing human interaction, AI-powered machines can serve as catalysts for meaningful social connections. For example, shared interests in AI-driven applications or technology can spark conversations and forge connections among individuals. Additionally, collaborative projects involving AI technologies can bring people together, fostering teamwork and collaboration.

Ultimately, the integration of AI-powered machines into our lives does not have to hinder human relationships. When properly designed and implemented, these machines can complement and enhance human interactions, providing support, efficiency, and expanding opportunities for meaningful connections. It is crucial to strike a balance, recognizing the unique value that both machines and human relationships bring to our lives, and leveraging technology to enrich, rather than replace, the human experience.





# Conclusion

The proposed project aims to address loneliness in an ever-growing demographic group: the elderly. The importance of this chosen group lies in the impacts it has on the current community and also in future generations, as every single human being will eventually age unless they perish beforehand. Considering the current societal context, in which it is necessary to redefine aging and address the impacts of post-COVID-19 loneliness, the crucial role of technological development in this scenario becomes evident.

Our project seeks to promote meaningful interactions with the community, strengthen family ties, provide companionship and access to information. In addition, it offers health and safety assistance. Based on scientific literature, this interaction with technology has beneficial impacts against feelings of loneliness. The benefits of this project are within reach and aligned with four of the UN Sustainable Development Goals. Fostering collaboration between governments, strategic investments, research advancements, and public-private partnerships, the financial barrier can be effectively overcome.

By embracing technological advancements and incorporating AI-driven solutions, we can create a more inclusive and supportive society that values the elderly and empowers them to maintain vital social connections. It's important to note that we are not promoting a replacement of human interactions, this should be seen as complementary tools to enhance the well-being and connectivity of older family members within the broader context of family relationships and support. Our goal is not to encourage people to spend more time at home. Instead, we aim to enhance the quality of the time they do spend alone, making it more enjoyable and fulfilling. As is the purpose of this device, to mitigate feelings of loneliness.

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# Appendix

## TARGETS

3 GOOD HEALTH AND WELL-BEING



3.4 REDUCE BY ONE THIRD PREMATURE MORTALITY FROM NON-COMMUNICABLE DISEASES THROUGH PREVENTION AND TREATMENT AND PROMOTE MENTAL HEALTH AND WELL-BEING

8 DECENT WORK AND ECONOMIC GROWTH



8.2 ACHIEVE HIGHER LEVELS OF ECONOMIC PRODUCTIVITY THROUGH DIVERSIFICATION, TECHNOLOGICAL UPGRADING AND INNOVATION, INCLUDING THROUGH A FOCUS ON HIGH-VALUE ADDED AND LABOUR-INTENSIVE SECTORS

8.3 PROMOTE DEVELOPMENT-ORIENTED POLICIES THAT SUPPORT PRODUCTIVE ACTIVITIES, DECENT JOB CREATION, ENTREPRENEURSHIP, CREATIVITY AND INNOVATION, AND ENCOURAGE THE FORMALIZATION AND GROWTH OF MICRO, SMALL AND MEDIUM-SIZED ENTERPRISES, INCLUDING THROUGH ACCESS TO FINANCIAL SERVICES

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



9.5 ENHANCE SCIENTIFIC RESEARCH, UPGRADE THE TECHNOLOGICAL CAPABILITIES OF INDUSTRIAL SECTORS IN ALL COUNTRIES, IN PARTICULAR DEVELOPING COUNTRIES, INCLUDING, BY 2030, ENCOURAGING INNOVATION AND SUBSTANTIALLY INCREASING THE NUMBER OF RESEARCH AND DEVELOPMENT WORKERS PER 1 MILLION PEOPLE AND PUBLIC AND PRIVATE RESEARCH AND DEVELOPMENT SPENDING

9B SUPPORT DOMESTIC TECHNOLOGY DEVELOPMENT, RESEARCH AND INNOVATION IN DEVELOPING COUNTRIES, INCLUDING BY ENSURING A CONDUCIVE POLICY ENVIRONMENT FOR, INTER ALIA, INDUSTRIAL DIVERSIFICATION AND VALUE ADDITION TO COMMODITIES INDICATORS

9C SIGNIFICANTLY INCREASE ACCESS TO INFORMATION AND COMMUNICATIONS TECHNOLOGY AND STRIVE TO PROVIDE UNIVERSAL AND AFFORDABLE ACCESS TO THE INTERNET IN LEAST DEVELOPED COUNTRIES BY 2020

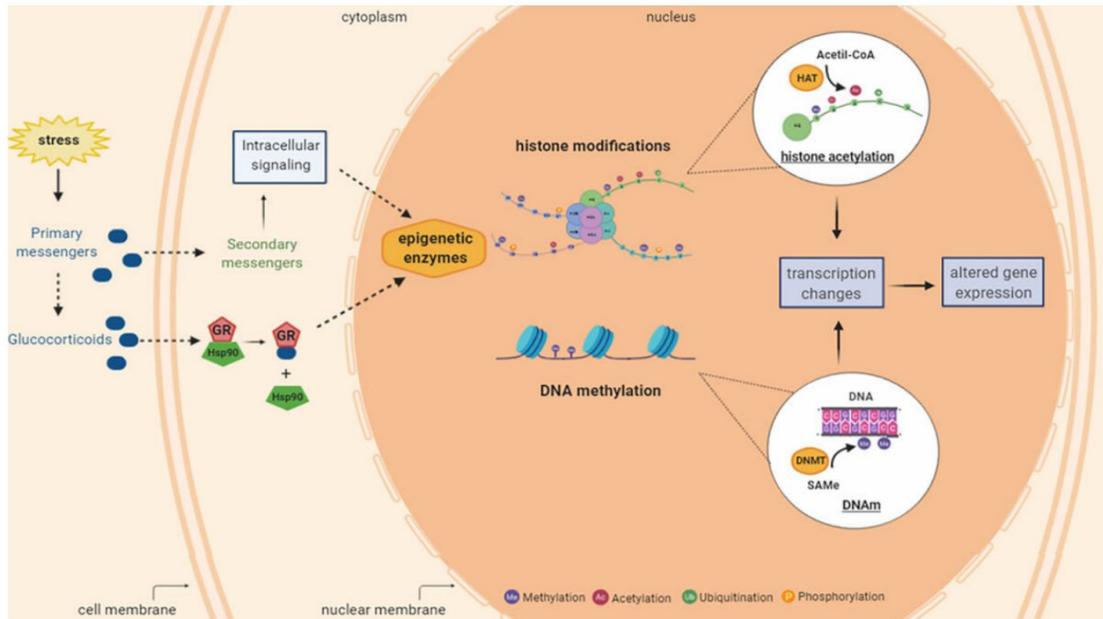
10 REDUCED INEQUALITIES



10.2 EMPOWER AND PROMOTE THE SOCIAL, ECONOMIC AND POLITICAL INCLUSION OF ALL, IRRESPECTIVE OF AGE, SEX, DISABILITY, RACE, ETHNICITY, ORIGIN, RELIGION OR ECONOMIC OR OTHER STATUS

# Appendix

## Sales AJ, Guimarães FS, and Joca SRL. (2021) **DNA methylation in stress and depression: from biomarker to therapeutics.** *Acta Neuropsychiatrica*



Summary of stress-induced epigenetic changes including histone acetylation and DNA methylation processes that can occur in mammalian tissues including brain. Stress is related with increased glucocorticoid levels and activation of signalling cascades that can result in the epigenetic enzymes modulation (activation or inhibition followed by alterations in the epigenetic mechanisms and transcription gene. Histone modifications can add various groups (methyl, acetyl, phosphoryl and ubiquitin) to the tails of the histone proteins. The histone acetyl transferase (HAT) enzyme catalyses the transfer of the acetyl group from acetyl-CoA to the histone protein. DNA methylation (DNAm) is the addition of methyl group from S-adenosyl-L-methionine (S-AdoMet), catalysed by DNA methyltransferase (DNMT) enzymes, to the cytosine resulting in 5-methyl cytosine. These epigenetic mechanisms can affect the gene transcription and protein expression. H, histone protein; Acetyl-CoA, acetyl coenzyme A; HAT, histone acetyltransferase; S-AdoMet, Sadenosyl-L-methionine; DNMT, DNA methyltransferase; DNAm, DNA methylation. Figure designed using imagens from BioRender.com.