Designing Artificial Intelligence Technologies for Older Adults

INSIGHT REPORT

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Contents

Foreword

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Artificial intelligence (AI) will likely be one of the most transformative technologies to affect human society in the near future. It will affect so many aspects of the human experience: from personal interactions with AI (e.g. digital assistants, self-driving cars) to the AI-influenced design and management of organizations (e.g. hiring decisions in the workplace) and even cities. As transformative and wide-ranging as it is, there are potential pitfalls if AI is not designed with specific focus on the potential dangers of unanticipated effects. Once the Pandora's box of ill-designed AI is opened, the damage will be unexpected and irreversible. This warning is even stronger for those who might benefit most from AI: older adults. The issues and potential problems are large and complex, and will require collaborations from social scientists, engineers, philosophers and policy experts, among others.

We are an ageing world, experiencing remarkable gains in longevity in every global region. Yet we tend to view ageing from a lens of dependency, focused on declines and problems to be solved by others who know best. Supporting health and economic security is fundamental, but we are more than our medical charts and pension, as we grow old. We are members of communities and families, we work and volunteer our time, and we learn, worship, create and reflect. We can live full, robust lives even as our health changes.

As advances in technology continue to soar, there is great opportunity in applying emerging innovations like AI to elders' needs and desires, and to integrate them into the social and physical environments in which we age. But AI applications must not be constrained by paternalistic views of ageing-as-dependency. Innovators must design with older people, create applications that are responsive to needs while preserving user control, build for the possibilities of recovery and growth, and develop solutions that not only support health but also elevate meaningful connections and ways to thrive – just as is done with the young.

Executive summary

Driven by declining fertility, increased life expectancy, reduced birth rate and migration, the global population aged 60 years and older is growing at a fast pace and is estimated to reach over 1.6 billion by 2050.[1] Given the projected growth of this population, which will occur in virtually every country, governments, health systems and the private sector should prepare to address the older population's needs.

Artificial intelligence (AI), in the form of assistive autonomous robots, self-driving cars, AI-enabled health apps and wearables, voice-activated devices and intelligent homes, could tackle key ageing-related challenges: ageing in place (i.e. the desire to live autonomously in communities of a person's choice), health, mobility, social engagement,

financial well-being and caregiver burden.[2] These technologies, however, should be designed with intention and should consider privacy and consent. They should also balance the needs of autonomy and safety, protect data against misuse, minimize social isolation and reduce the risks associated with over-reliance on AI.

Drawing from existing AI literature, expert interviews and focus groups, this report provides a list of guidelines that can help support the responsible development of AI and meet the needs of the ageing population. Rather than serving as an exhaustive list of guidelines, this publication is a starting point to guide AI development.

Guidelines

Articulate the potential benefits of artificial intelligence (AI)

Specifying clearly, and early in the product life cycle, how AI will benefit older adults is important. This includes articulating the values of older adults, the problem being solved, how the technology is going to be used to solve the problem, and how older adults might benefit from the offering. These benefits should be supported via user and market research. In addition, gauging both ideal and negative outcomes associated with the technology is essential, as is proactively addressing any harms.[3]

Adopt an older adult-centred design process

Older adults and other relevant stakeholders, such as family and professional caregivers, should be invited to provide feedback throughout the product development process, from early conceptualization to post-deployment.[4] Interviews, focus groups, community jury and participatory design techniques can help understand the needs, motivations and concerns of this population, and minimize potential barriers to adoption of AI.[5] Older adults can be recruited for product research using a variety of means: newspapers, online recruiting platforms (e.g. Amazon Mechanical Turk), social media and partnerships with local agencies.[6]

Include older adults in AI data sets

A key part of creating AI systems that work for older adults is ensuring that the latter are represented in the machine learning training and test models. A recent analysis of publicly available face data sets showed that older adults are under-represented, and many of the data sets do not even include age-related metadata.[7] Creating data sets that capture the diversity of the ageing population (age, gender, ancestry, disability) and annotating the essential metadata in the data sets is a first step in forming fair and positive AI experiences for older adults.

Practise inclusive product development

Contrary to popular belief, chronological age is not the key attribute of older adults. In other words, older adults are a diverse group of individuals who have varying physical, sensory and cognitive abilities. They also differ in educational levels and technological experience.[8] Proactively recruiting and considering the needs of older adults across a spectrum of demographic attributes during the AI development process, including those from different geographies, those belonging to different socioeconomic status and those living in rural areas, can help create products that work for many.[9]

Consider the disabled ageing population

While disability in the older population can result from age-related declines in sensory, mobility and cognitive functions, individuals can also experience disability resulting from pre-existing impairments.[10] In addition to compliance with common accessibility standards, obtaining feedback from older adults with long-term impairments is critical to ensuring the AI system can be used as intended by a broad audience.

Be transparent about AI's capabilities and limitations

Users are more likely to have higher expectations about high-fidelity and high-reliability AI systems. Inappropriate use can occur when system capabilities fail to meet those expectations and can result in unintended consequences.[11]

Develop metrics to assess outcomes after deployment

Developing metrics to assess user satisfaction with AI technology is important. Depending on the intended uses of the AI, metrics should also consider the technology's impact on quality of life, loneliness, well-being and optimism. In addition, telemetry and error reporting can also help gauge the health and effectiveness of the AI system.

Respect the privacy of older adults

The following approaches can help to respect privacy: 1) collect only data that is absolutely required so that the AI cannot reveal information about actions older adults want to keep private; 2) protect privacy by regulating data storage and deleting data that is no longer wanted (older adults often question the need to store their data over the long term); moreover, data collection and retention should be instrumental towards specific beneficial outcomes and not be a default activity; 3) consider the rooms where computer vision systems would be placed if they are being employed in homes; certain rooms, such as bathrooms and bedrooms, are typically considered off-limits by older adults,[12] thus they should be able to weigh their desire to protect their privacy against the benefits of safety and autonomy (e.g. fall detection); 4) consider the individuals who would have access to the data, such as close family members and professionals, and restrict data access to specified people who are able to provide older adults assistance when needed; and 5) provide older adults privacy-preserving user controls, such as being able to easily turn certain AI devices/features on and off

Disclose the data being collected

Older adults have underlying concerns regarding invasion[13] of privacy in their homes and about their privacy online.[14] With AI technologies, older adults may not always understand how the technology functions or how their data is being used. A successful disclosure is therefore essential and should proactively address any concerns that older adults may have, such as regarding the devices being used in their home, the data being collected and processed, the purpose of the data collection, the benefits to them, the people who have access to this data, the data retention period, and the privacy and security measures in place.

Obtain meaningful consent

AI systems should be built so that they help older adults make an informed decision about consent, which is both a legal requirement for a range of data collection scenarios and pivotal to building user trust. When given the headspace, people undertake an internal "value exchange" debate, asking themselves: "What are the benefits if I agree?" and "What are the risks?" They also bring their past experiences and perceptions about how other companies or products treat their data.

Users are often subjected to lengthy, legalistic privacy policies or coerced into consent. True meaningful consent happens when users are aware that they are being asked for something, can understand what they are being asked for, do not feel manipulated into giving consent, and are able to revoke their consent without losing access to minimum viable functionality.[15] Building a consent experience based on the four pillars of awareness, understanding, freedom of choice, and control, and evaluating the consent experience through a rigorous user research protocol, can help determine if the consent flow meets the expectations and addresses the concerns of older adults.

Acknowledging that consent is not transitive is also critical. In other words, consent provided in one situation does not automatically transfer to another situation.[16]

Minimize risks from deception

AI-enabled virtual avatars (e.g. care.coach) are increasingly being used to engage with older adults and provide customizable services to meet their needs.[17] If a human-sounding voice is used to interact with older adults, disclosing that it is a synthetically generated voice can help calibrate the right expectations about the agent's capabilities and minimize the risks of harmful consequences from the deception. For more information, see the section by Microsoft on how to disclose ("Disclosure design guidelines").[18]

In the case of older adults with moderate-to-severe cognitive impairments and where disclosure and consent may not be effective, a careful examination of the benefits versus the harms of the technology should be performed and may even require proxy consent.[19]

### Protect data from misuse and unintentional access

Private information about older adults should be protected via effective security safeguards from malicious actors who might seek to obtain that information.[20]

Design for appropriate trust

AI systems are probabilistic and will inevitably make occasional errors. The consequences of these failures can be high when AI is used by seniors in high-stake situations, such as financial planning[21] or health management.[22] Furthermore, older adults are more susceptible to over-reliance on AI due to age-related cognitive changes.[23] Therefore, a successful experience is one in which older adults can understand the operations of the AI, have accurate representation of outcomes, and have reasonable expectations of AI reliability. Calibrating appropriate trust (where trust matches AI capabilities) is desired versus overtrust (where trust exceeds AI capabilities).

Assess the risk of intensifying social isolation

To address the caregiver void, countries around the globe are turning to carebots, with Japan leading the way.[24] Some scholars, however, argue that robots are incapable of fulfilling the social and emotional needs of older adults.[25] Further, over-reliance on too many carebots, especially as a substitute for human interaction, can be detrimental for older adults' well-being. Vulnerable older adults may also suffer from over-attachment to carebots.[26] These systems should therefore be designed to prioritize the well-being of older adults, minimize risks of misuse, and offload work-intensive tasks to bots, allowing human caregivers to focus on personal caretaking.
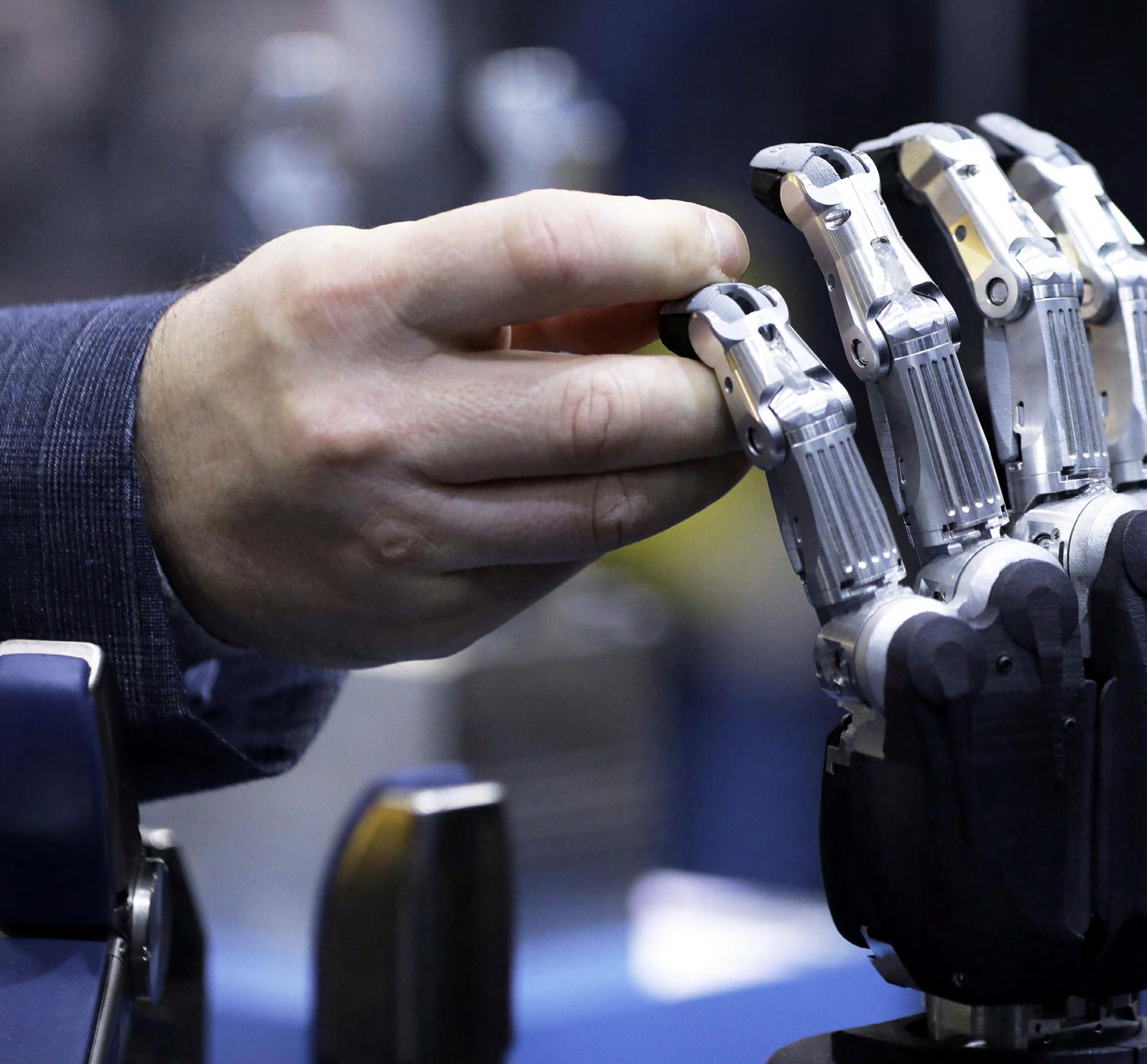
Conclusion

Globally, the population aged 60 years and older is growing at a faster rate than any other age group. This growth amounts to one of the greatest social, economic and political transformations of the current era, affecting healthcare, government and social systems that are largely not built to accommodate the needs of the ageing population.[27] Investments should now be made in support systems (scaled by technology), which will involve a coordinated response from governments, society, academia and the private sector. Emerging technologies such as AI have the potential to meet the care and support challenges of the ageing population. The development and deployment of these technologies, however, should be done by employing an older-adult-centred approach.

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