

EXECUTIVE SUMMARY

The technology industry is undergoing its first major disruption since the arrival of smart speakers and voice in 2014. The announcement of Open AI's [ChatGPT](#), an example of Large Language Model (LLM) Artificial Intelligence, has taken the tech world (and massive investment money) by storm. Google issued a 'Code Red' to its developers to get moving, which led to [Bard](#). Microsoft poured billions into Open AI, revived Bing search and announced [Bing Chat](#). And so Conversational AI entered the language and the Gartner Hype Cycle.

Doubters emerged and the media hype exploded. The public was surveyed about concerns, and the healthcare industry, one of the most appropriate for the use of AI, became intrigued and nervous. It was exciting that ChatGPT could pass the medical boards and help streamline an industry that desperately needs new tech-assisted processes, help for augmenting labor shortages, and ways to interact with patients.

The age-related industries had already begun to see an opportunity for [AI assistance](#) in caring for residents, with more automated check-ins, improved staff management, and fall avoidance. And [chatbots](#), the 'Last mile of AI,' have taken off in user (customer, patient) facing interactions. Hearing technology now incorporates AI to help separate environmental noise from speech. And AI is increasingly used to improve access to technology and related training.

Researchers at multiple universities have also been ramping up AI and Aging initiatives funded by the National Institute on Aging and the National Science Foundation. Multiple grants and awards totaling over \$70 million are fueling projects in wearables, remote monitoring, health apps, voice biomarkers and more. Payment for AI-enabled services has also been tackled in 2022, targeting work done by machines.

More sensor-based applications for detecting motion and change have been emerging. Predictive analytics are now becoming meaningful in health and senior care for questions like how a community is performing or whether more care workers may be needed in specific circumstances. In the future, AI in the home is likely to become part of a 'wellbeing' infrastructure that is incorporated into new home design and home remodeling.

While multiple barriers are arising, including bias and other ethical concerns, it is clear that we have entered into a '[Golden Age of AI](#).'

This report is a first look at a fast-evolving technology and market space that can be of benefit to older adults.

WHO SHOULD READ THIS REPORT?

- Investors and funds that focus on older adults
- Senior living organizations
- Professional home and health care companies
- Vendors within or considering entry into the remote care technology categories
- Technology platform providers and resellers
- Telecommunication carriers and network service providers
- Social services and non-profits with focus on older adults
- Healthcare professionals
- Pharma and med tech companies

ACKNOWLEDGEMENTS

This report is based on interviews held with 26 experts across multiple domains, all of them engaged in one or more aspects of AI technology.

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“Chatbots are the last mile of AI.”—Anu Shukla, Co-Founder, **Botco.ai**

AI – A TSUNAMI OF TECH FUNDING AND INNOVATION

Disruption: When 100 million downloads happen at once

This is a remarkable time in the evolution of technology for consumers of all ages. Over the past 50 years many had thought they had seen it all. Consider [the first cell phone call](#) (1973), the [IBM PC](#) (1981), [the Netscape browser](#) (1994), [Apple's iPhone](#) (2007), [voice-based assistants](#) (2011), and [smart speakers](#) (2014). Each of these disruptions was frequently augmented with better, smarter, sleeker, smaller versions of essentially the same thing. And together, all became enablers for older consumers to access technology that was too expensive or difficult to use.

Surprise -- soon came the next big thing... For those who may have concluded that the era for disruptive tech innovation was over, the sudden hype about Large Language Model (LLM) AI offerings like ChatGPT was, to say the least, startling. For many years, Artificial Intelligence had been experiencing a [‘winter’ of disappointing efforts and results](#). Meanwhile, behind the scenes money and innovation were ramping up, leading to today’s Artificial Intelligence categories and the 2022 [Gartner Hype Cycle](#).

... In what seemed like minutes, ChatGPT took the media (and the money) by storm. Released by OpenAI in November 2022, ChatGPT was an instant phenomenon and garnered dramatic growth of attention and downloads within a few days. The company that created it was soon valued at \$29 billion. Google management was shocked into stopping other developments to focus on AI. By January, Microsoft had [poured billions into OpenAI](#) and revived its investment in Bing and BingChat. By March, new startups like [Character.ai](#) were instantly valued at \$1 billion. New terms became part of the tech vocabulary – the overall category of [Generative AI](#) (explained by an AI) included algorithms that create new content (see **Page 23**), incorporating a back-and-forth ‘conversation.’ Although conversational AI was already around [for several years](#), it appeared to be both a threat to [Google search](#) and [a business opportunity](#) for countless companies.

What is AI Anyway?

Artificial Intelligence is the ability of a computer system to deal with ambiguity, by making predictions using previously gathered data, and learning from errors in those predictions in order to generate newer, more accurate predictions about how to behave in the future.

Machine Learning

(ML): Machine learning is the process of using mathematical models of data to help a computer learn without direct instruction. It’s considered a subset of artificial intelligence (AI). Machine learning uses algorithms to identify patterns within data, and those patterns are then used to create a data model that can make predictions. With increased data and experience, the results of machine learning are more accurate.

Source: [Microsoft](#)

Why do LLMs generate such excitement and concern? [Nvidia](#), a provider of AI processing technologies building on these models, defines: “A large language model, or LLM, is a deep learning algorithm that can recognize, summarize, translate, predict and generate text and other content based on knowledge gained from massive datasets.” Because of the sheer size of source data sets used to build them, [these models can](#) “generate contextually relevant and semantically coherent language without being specifically programmed to do so.”

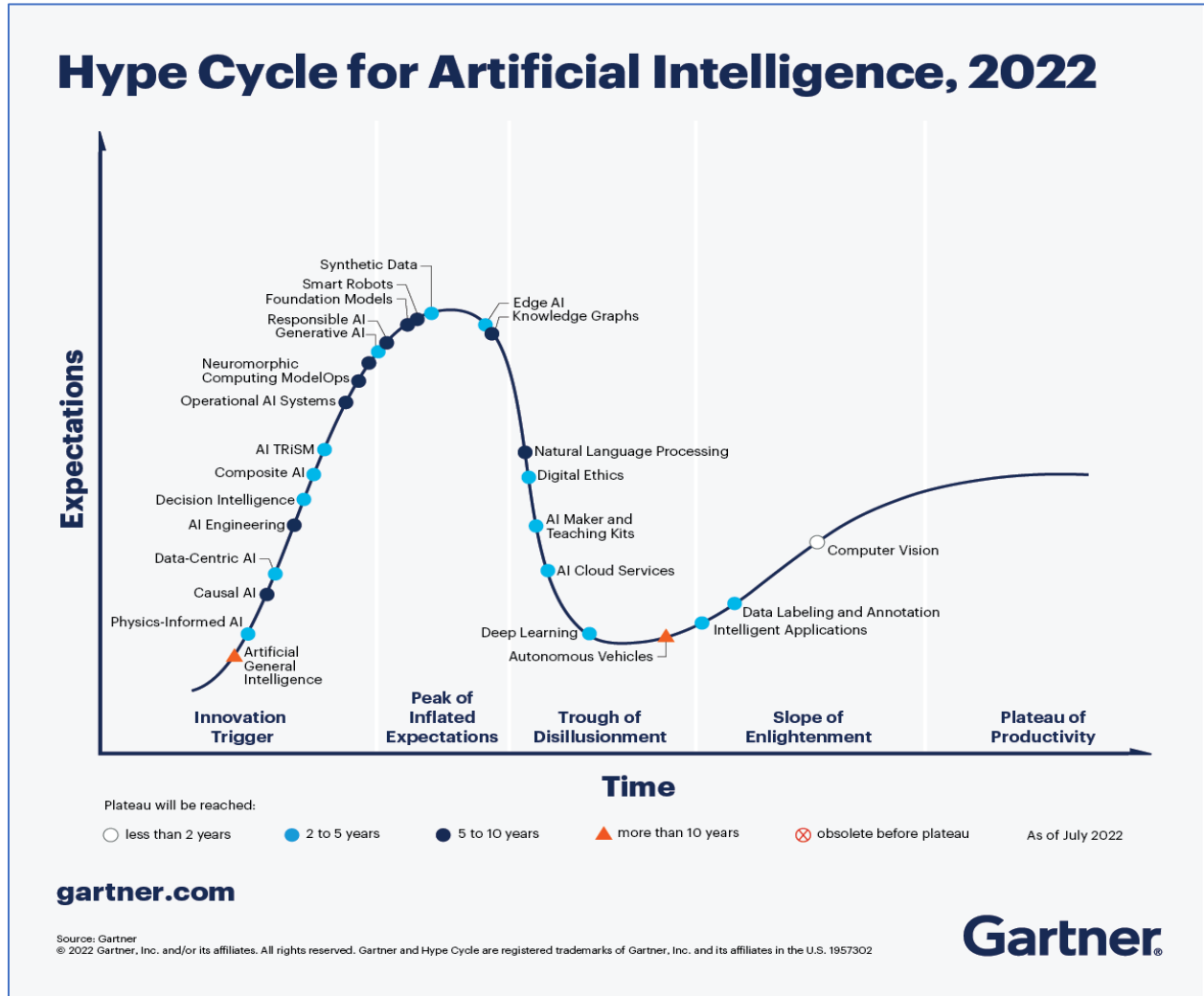


Figure 1 – the Gartner Hype Cycle for AI, September 2022 (Source: [Gartner Research](#))

From this Gartner report, a number of these models can be applied and be useful in the health, care-related and older adult market. But the hype cycle’s visualization indicates that within the next 2-5 years AI technology will head into ‘the Trough of Disillusionment’ in aspects like Digital Ethics, already creating quite a bit of [controversy](#) and discussion about [regulation](#).

“Innovations here include AI engineering, decision intelligence, operational AI systems, ModelOps, AI cloud services, smart robots, natural language processing (NLP), autonomous vehicles, intelligent applications and computer vision.” -- [Gartner Research, 2022](#)

AI in healthcare inspires doubt...and possibilities

Surveys began to emerge by December 2022 to assess consumer viewpoints about the role of artificial intelligence in healthcare – would they trust it, and would it improve care (see **Figure 1**)? Judging from the response to the Pew survey, responders were conflicted, although likely it was just too early to ask.

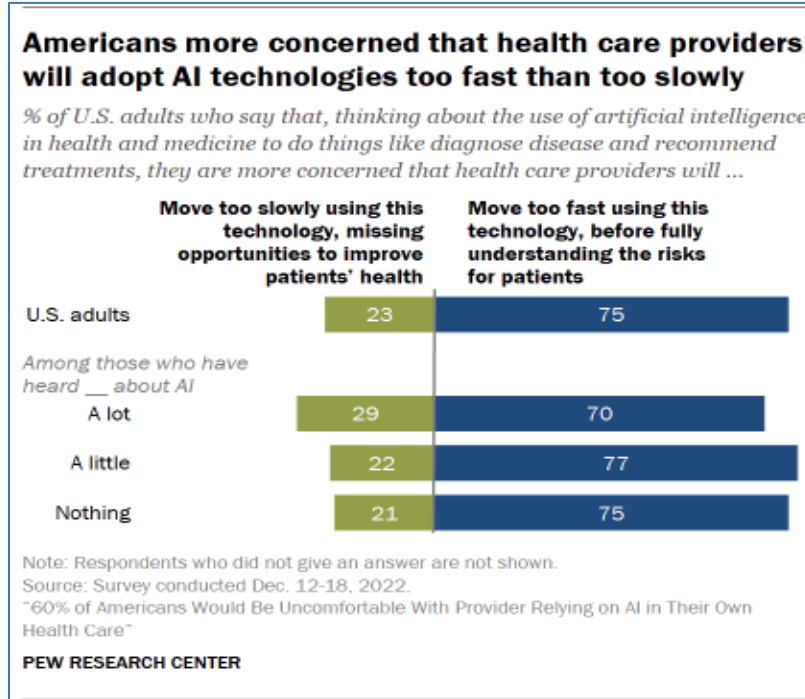
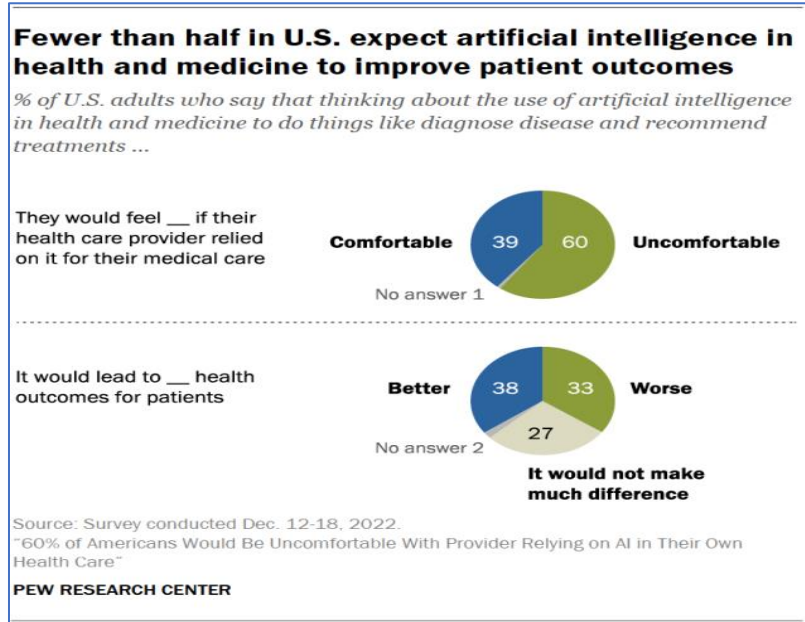


Figure 1 – Views about AI in healthcare (Source: Pew Research Center December, 2022)

What do we hope and expect AI to do?

For consumers – search leaps forward. Once they are shown the possibilities, users may find that [traditional search](#) may not be getting them what they need, cluttered with too many sponsored posts and not enough useful information. Instead, when AI's questions are asked to established data sources, precise [responses can be more helpful](#). Chatbots in particular can help consumers find what they need from banking, shopping, services – or help patients [when they are alone](#).

For consumers – voice assistants will matter. In a [March 2023 PAYMTS survey](#) of several thousand consumers of all ages, nearly 50% of responders, when asked how long AI enablement might take, they agreed that within a 5-year future they expect that their connected world would be enabled by smart voice assistants that were ‘as smart and reliable as real people’ helping them with daily tasks and activities.

“The proactive, voice-enabled agent will have the intelligence to converse with and support the care recipient while also checking-in regularly on behalf of the caregiving team.”—Stuart Patterson, PLC Advisors

For patients -- improve answers to health questions. Responses to conversational AI questions can have reference notes, suggested follow-up questions and links to slide shows, such as this example with a Bing Chat question, “*What is the best way to mitigate stiffness in the back?*” The response was detailed – see **Figure 2** – and much longer than displayed here, including suggested follow-up with possible yoga poses and the use for heat or ice.

“Our virtual caregiver, a voice-driven avatar, reminds people to take their medication. People will open up to a voice assistant with answers to taboo questions, like ‘how much do you smoke or drink’.” – David Keeley, Electronic Caregiver Group

There are several ways to mitigate stiffness in the back. Some home treatments that may help include heat therapy, which can increase blood flow to relax muscles and relieve joint ache¹. Ice therapy can also help by constricting blood vessels to numb pain and reduce inflammation¹. Light activity such as yoga can also help since bedrest can make stiffness worse¹. Additionally, stretching and focused back and abdominal strengthening exercises are two of the best ways to ease lower back pain⁵.

6 Exercises to Ease Lower Back Pain: Stretches, Movement, and More - WebMD.
<https://www.webmd.com/back-pain/exercises-lower-back-pain> Accessed 4/24/2023.

Slide show: Back exercises in 15 minutes a day - Mayo Clinic.
<https://www.mayoclinic.org/healthy-lifestyle/adult-health/multimedia/back-pain/sls-20076265>

Is there anything else you would like to know?

Figure 2 – Bing Chat back stiffness example

Conversational AI interactions can demystify the mysterious. A long dialogue is feasible with conversational AI – drilling down on a topic, asking suggested follow-on questions, and finding more sources and referrals in the questions and answers. A conversation with suggested additional questions may make a sizable difference for disseminating advice. In fact, most of us don't know the right follow-on questions – it's why we asked in the first place.

For healthcare providers and care professionals. AI may enable providers to mitigate risk – for example, in prescribing when one medication is nearly identically named as another, or querying the provider about side effects that the patient may have previously mentioned during a different visit. [AI can combine input from structured and unstructured sources](#), in a response that could include the physician's diagnosis, a nurse-created care plan, and social service options.

“With the shift to the home, AI can help with diabetes and heart monitoring, as well as checking in on those aging alone. And maybe there will be a Best Buy Geek Health Squad care worker visiting once a week.” – Jane Sarasohn-Kahn, **THINK-Health**

AI may answer questions more effectively than doctors. [Research published in April 2023](#) compared physician responses to patient questions with those generated by a chatbot –with a team of healthcare professionals rating responses on quality and empathy (see **Figure 3**). The conclusion – AI responses may be able to assist physicians in responding to patient questions. [Commenting on that study](#), Eric Topol noted that the length of response by doctors was notably shorter than the chatbot's, which further underscored the [potential ahead in healthcare](#).

Figure. Distribution of Average Quality and Empathy Ratings for Chatbot and Physician Responses to Patient Questions

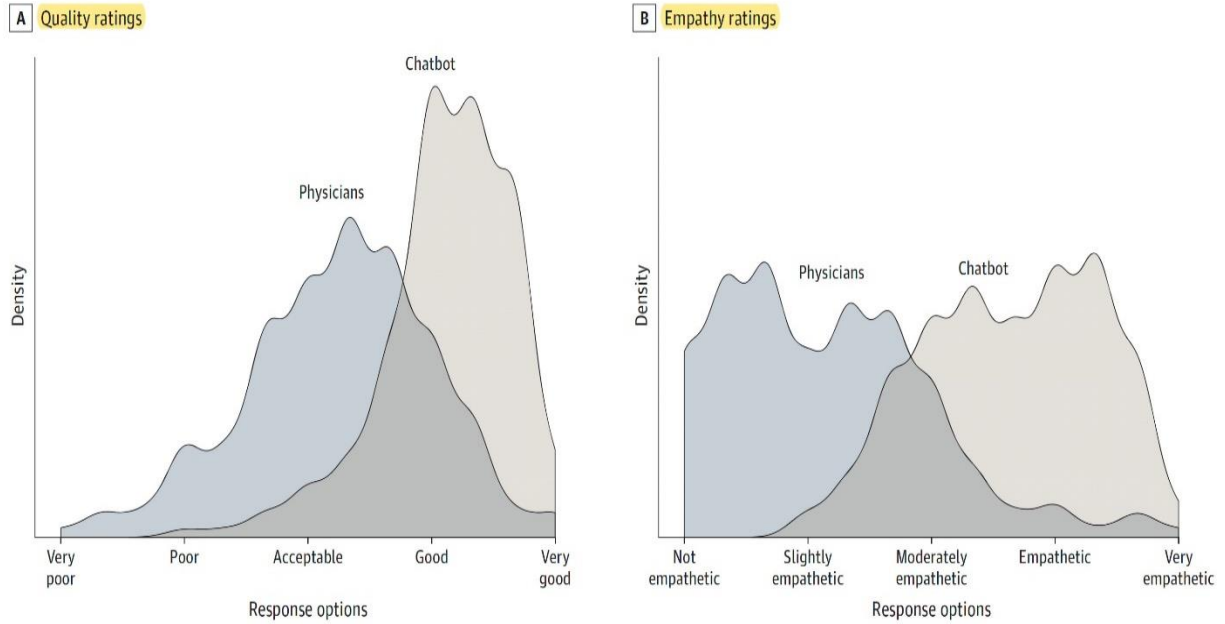


Figure 3 Quality and empathy ratings for chatbots and physician responses

“Some AI models are better than human performance – but we will likely experience them through APIs that integrate these models to everything else.” – Paul Barter, Paul Barter & Associates

AI and the older adult – organizations move forward

Like other businesses, senior living communities have begun leveraging AI with voice and sensor tech, attempting to improve care work, optimize staff and better serve patients and families. And recently [new monitoring applications](#) with AI have gained traction in senior living:

AI-enabled cameras to detect falls and other anomalies. AI in cameras was noted in [The Future of Sensors and Older Adults 2022](#). They have advanced to the point where they can deliver alerts ‘at the edge’, that is without transferring data to servers. They can be Wi-Fi enabled, initiated by voice, or use cameras to detect unnoticed changes, and can also incorporate machine vision. [SafelyYou’s brief video-based alerts](#) notice unwitnessed falls. [Inspiren’s Augi](#) wall-mounted system uses video to predict falls for older adults in senior care or hospitals.

“With ambient AI in the room, you can tell that this person is on the floor and thus shrink response time, even doing proactive saves of vulnerable residents. It is like having an extra team member with eyes on the resident.” – Brian Geysler, **Maplewood Senior Living**

Monitoring with nuance. AI and sensor data can derive patterns and alerts that inform care, for example, combining sensors with data about individuals that have a history of falls, AI tools can detect bed, chair, and room exits which require immediate response. Smart beds with sensors have been deployed in hospital systems. Long-term care communities use AI from firms like [EarlySense](#) for incident alerting or [VirtuSense](#) for prediction and fall avoidance.

“When people can’t describe their own situation, they need tech to help. AI can assist with automated check-in tools that are capable of virtual rounding.” – Juliet Holt Klinger, **TapRoot**

Predictive models – who does or doesn’t need care right now? Data and corresponding AI are needed to drive improvements in people-dependent industries like home care and senior living, both of which suffer from labor shortages. [Senior living organizations are investing](#) in AI tech to address inefficiencies, answering questions like: Are workers in the right places? Are the right people doing the right tasks? Are staff members alerted to problems before they become crises?

“AI hungers for data from sensors, wearables, and people to reduce a complex image into a thumbnail that provides key insights across an entire community.” -- David Moss, **Care Daily**

Chatbots, the ‘last mile of AI.’ Chatbots can read a small number of documents and be capable of answering questions for prospective customers, residents, or families. They will be used in senior living for residents making appointments or for families to schedule tours. And avatars, or virtual agents such as [Addison from ECG](#), will be deployed on senior care and health websites.

Our virtual agent chatbots are populated with images – click to find a restaurant or view a property and its floor plan. – Anu Shukla, **Botco.ai**

THE FUTURE OF AI AND OLDER ADULTS

AI and the older adult – Research about benefits is underway

Call for papers on the relationship between AI and Aging. MDPI, a publisher of open access journals in Switzerland, issued a call for papers (deadline July 2023) on the topic “AI in the Everyday Life of Older Adults: Panacea or Pandora's Box?” that seeks to answer questions that are relevant to the organizations contemplating AI use in senior care:

- Critical analyses of the integration of AI in the everyday life of older people
- Older people’s AI use: single or cross-country studies
- Ethical aspects of AI development, and use by and for older people
- Age-related biases in AI systems
- The integration of AI in the access of reliable services (banking, e-administration, health, leisure and news information, among others), and its effects
- Processes and protocols to stimulate positive integration of AI in the everyday life of older people
- Ways to combat damaging aspects of AI in the everyday life of older people
- Ways to increase critical awareness about AI among older people

National Institute on Aging (NIA) ramped up long-term grants to a2 Collective. The agency has earmarked \$40 million in grants for demonstration projects that ‘utilize AI approaches and technology to improve care and health outcomes for older Americans, including persons with Alzheimer’s Disease.’ These grants are distributed through the Artificial Intelligence and Technology Collaboratories (AITC), also accepting applications for awards by July 2023 (see **Appendix I** and **II** for specific project awards). The overall interest level among grantors and grant recipients is reflected in investment across government and researchers. Following up on the results of these initiatives will be key to harnessing the actual benefits.

“AI can help personalize medicine, continuously keeping track from vaccinations through adulthood, mining the test reports and enabling natural language conversation. – Rama Chellappa, author of “[Can We Trust AI?](#)” Johns Hopkins University JHU Press

Grants from NSF also fund research on AI and Aging. [National Science Foundation \(NSF\)](#) and the NSF awarded a grant in April to the [University of North Carolina \(UNC\) Charlotte](#) for a project to ‘Understand Activities of Daily Living in Indoor Scenarios’ through video observation. And another NSF initiative led by the Georgia Institute of Technology (Georgia Tech) create [AI-CARING](#) “to create a vibrant, fully developed discipline focused on personalized, longitudinal (over months and years) collaborative AI systems that learn individual models of human behavior and how they change over time and use that knowledge to better

collaborate and communicate in caregiving environments. The collaborative AI Partners in Care developed as part of this institute will help support a growing population of older adults sustain independence, improve quality of life, and increase effectiveness of care coordination across the care network.”

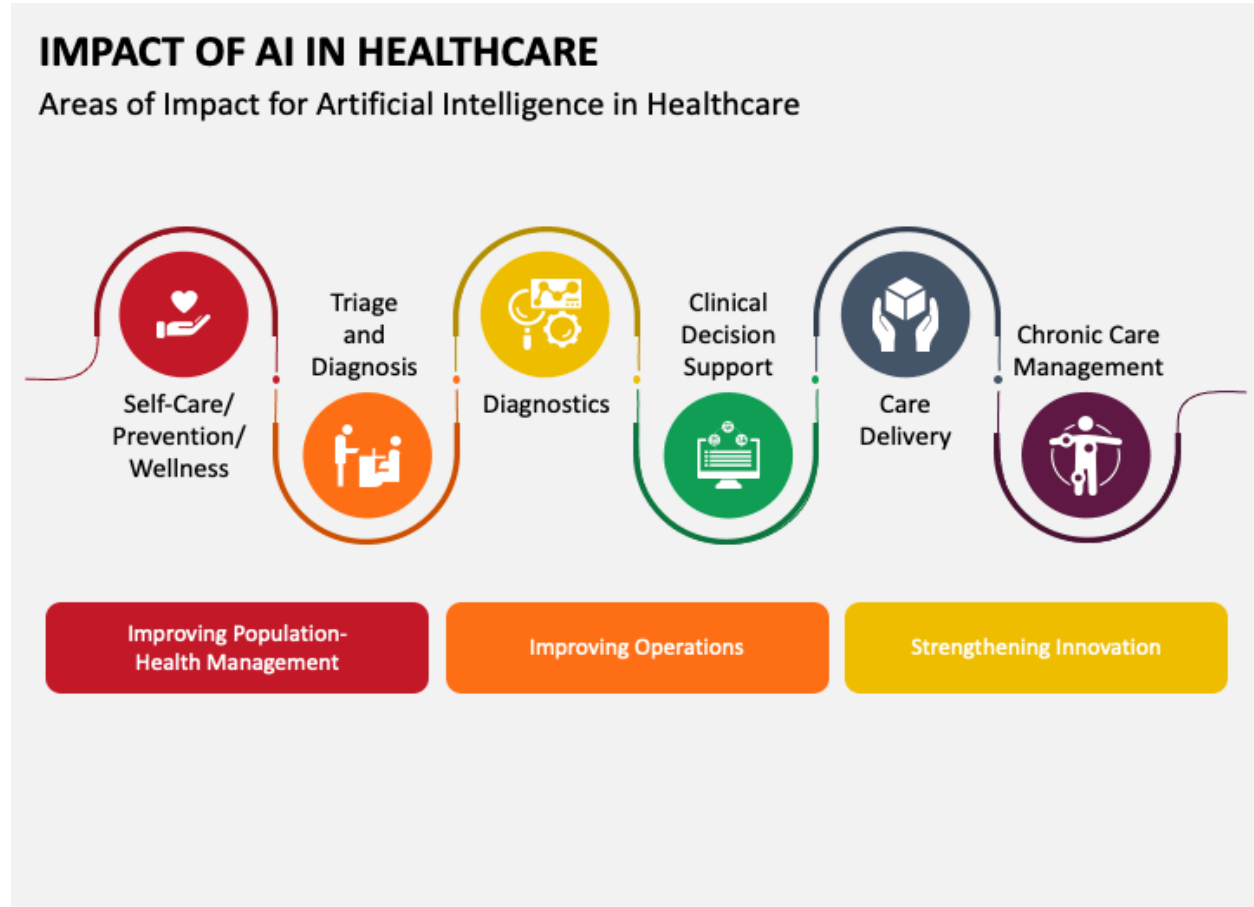


Figure 4 – Possible categories of opportunities for AI in healthcare Source: [SketchBubble](#)

More sensor apps will enable delivery of more effective care

With the next generation of tools, innovators have been inspired that AI and sensors would be useful in senior living care settings. Technology offerings like [Caspar.ai](#), [CareDaily.ai](#), [Inspiren](#), [VirtuSense](#), [KamiVision](#), [Botco.ai](#) and many others see the opportunity in the older adult market. These technologies can help:

Identify health issues before they reach crisis. The detection of motion, whether across a room to the bathroom or in and out of bed, offers advantages in senior living communities that a host of relatively new companies are providing. For example, sensor and camera tech can note changes in behavior, including speaking, that can warn prior to stroke. Their devices/software can note current issues and derive predictions about future problems such as UTIs, changes in gait, temperature, or new sleep or speech patterns.

Provide staff with macro trends about a community. Machine learning over time can correlate AI-detectable behavior with health and behavior profiles. Then AI's machine learning capability from both accumulated internal and [publicly available data](#) can assist professionals in healthcare or senior communities with insights about an individual's behavior.

Provide insights about staff performance. Sensors, including wrist-worn, voice-enabled and cameras can indicate whether and when a resident or home care recipient has received a visit from a care worker. Organizations can then reward staff workers who exceed expectations about care delivery and more effectively manage those who do not, as well as provide proactive and personalized information built on data about the individual to help optimize care.

AI for older adults: help with engagement, safety, and care

Promote engagement, combat social isolation. Voice technologies are [used in the UK and Sweden to combat loneliness](#). A few years ago, the chatbot, [Lena, was developed to assist with 'healing alone.'](#) And [Addison Care](#) from Electronic Caregiver Group (ECG) provides a variety of health services that can be personalized for individual situations.

Healthy at home. AI is one of the mechanisms [used today in drug discovery efforts](#). Actions for preventive care can be based on a combination of data analysis of large populations with data about an individual's health. AI has been studied for its role in [assisting individuals with self-administration of medications](#). Although [these are predicted](#), actual AI-enabled medication reminder, management or dispensing systems are difficult to find.

"We are much better at reacting than at preparing in advance. But in the future, AI will be used to encourage people to take action for their own health in the most effective way." – Ronny Sthoeger, CEO, SenterCare

AI will extend the capabilities of remote patient monitoring. Already capable of remote monitoring a pacemaker, in the next stage smart devices will help prevent health emergencies, detecting changes in gait, motion or speech, and with a user's permission, combining that data with machine learning [algorithms that predict or alert to a health issue](#).

"Imagine the label "AI is working here." New AI capabilities will leverage voice, gestures, eye tracking depending on age, cognitive abilities. Or frequently taking vitals and sending them to a health provider." – Shyamala Prayaga, Nvidia

The Future of AI and Older Adults 2023

Hearing assistance technology to separate speech from noise. AI has been incorporated into hearing aids in offerings like [Starkey's Livio Edge](#). Now [Oticon Real](#) and [Widex Moment Sheer](#) are offering AI inside hearing aids, focusing on optimizing hearing aid settings in real time according to the soundscape at any given moment. [Whisper.ai](#) (which promotes its regular software upgrades) employs the latest AI-based speech-from-noise separation techniques to improve audibility in loud settings. Today that requires an external "brain" one can keep in their pocket or purse. Soon that capability will come to hearing devices themselves. Ironically, it is not only people with hearing loss, but those with [auditory processing disorder](#), who have difficulty comprehending speech.

"You hear with your brain. According to the National Acoustic Laboratories, 25 million people in the US don't measure as having hearing loss, but still have difficulty understanding speech. In many cases they struggle most in loud situations. The next level is in-line speech processing to reduce noise." -- Andy Bellavia, **AuraFuturity**

Improve care and reward workers who spend more time with residents. Already a crisis in many states, as baby boomers age into their 80s and beyond they will present challenges in home care and senior living. Fall *detection* – using sensors, Wi-Fi or pendants – may be offered as fall *prevention* – noticing patterns and warning caregivers and families of future problems.

"Our vision for the future includes reduction of manual, repetitive labor, and an overall reduction in unnecessary physical effort of caregivers, trackable in improved morale." – Michael Wang, **Inspiren**

AI for older adults: improve communication, search, service

AI technologies, especially voice, serve older adults today. The arrival of Voice First technologies in 2014 was a major breakthrough in user interface improvements for older adults, documented in the [2018 Future of Voice First Technology and Older Adults](#). Today we take it for granted that our voices can be used to access nearly every app and user interface on the market. AI extends to multiple modes and types of interactions today, including natural language conversations for:

Creating a helpful digital companion. Natural language in voice was a first step: now with conversational AI, users can query and get valid responses in a much more natural style. And AI can help novice users with configuration or search issues – helping to avoid asking their family members or becoming buried in frustrating searches.

“Older adults might not be embarrassed talking to a chatbot that says ‘Do you need help? Would you like the text to be made bigger?’ AI should be part of the next generation UI.” – Shane Eleniak, Chief Product Officer, **Calix**

AI and learning about new technology. Conversational AI can help people take advantage of new tools and understand technologies that seem complex and have unfriendly user interfaces. Ask Bing Chat how Wi-Fi fall detection works yields: “When advanced AI technology is applied we can achieve many functionalities including motion detection and speed/velocity measurement, which combine to accurately detect a fall. Is there anything else you would like to know?” And ChatGPT’s latest version provided much more [See **Appendix III**].

AI for older adult tech training questions. Typical use of technology for tech support of older adults meant that expertise was required to ask the right question. Now with ChatGPT, BingChat or AI-enabled tools, software can probe what you are asking to refine the question. But health insurers and providers know that for their members to take advantage of tools offered, they need to be trained to benefit from portals, chatbots, and access to their own health records.

“We want to be the Silver Sneakers of digital literacy and older adults – they need and may not be able to use tech to access food, education, and health provider tools like text messages, portals or telehealth.” – Stefano Selorio, **Carevacy**

Concierge services – hotels, senior care, and in the home. Customizable [concierge chatbots](#) for hotels [are broadly available and in use today](#). Their use is growing [in senior living](#) as sales and marketing assistance that reduces dependency on phone response. At home use of chatbots is largely limited to [customer service](#) which consumers prefer, compared to waiting on the phone for an agent. Soon they may be used to help find multiple types of service.

“Imagine a very smart chatbot – tomorrow I will wake up at 8, need a ride to the dentist, prepare food for noon, and at 6 help to wash the dog.” – Keren Etkin, **The Gerontechnologist**

AI about older adults: Help with analytics, care services

Analytics enable the understanding of how a particular community is performing. With 24x7 data from ambient sensor technology in the home, alerts can identify problems before they are crises without requiring continuous staff checking in. And AI-enabled insights can be drawn from aggregation of activity information and analyzing it daily or over time.

“AI can produce Insights about resident's health that make caregiving 10X more effective. Caregivers and management can ask, “What’s going on in my community? – “There was one incident last night in #72, and sleep quality of resident in 51 improved.” – Ashutosh Saxena, **Caspar.ai**

AI as a service -- coordinating care teams for home health or clinicians. Today’s healthcare systems do a poor job at care coordination if the care required (like physical therapy) falls outside the walls of a particular healthcare provider, let alone understand and include the role of families in delivering post-discharge care. In the future, AI systems will be used to comb saved queries and conversations, family description of care and individual activity status and more.

“There is so much information – health records, ADLs, family member input – Large Language Models could potentially give the right information at the right time.” – Rick Robinson, Michael Philips, **AARP**

AI in home and home health care. With the rise [of hospital-at-home programs](#), expect that [more will be AI-enabled](#). Furthermore, post-hospital care will [increasingly be tech-enabled](#), including use of voice based chatbots like [Sensely’s Molly](#). Finally, more people are doing self-diagnosis with the [support of AI chatbots](#). Over time, non-medical home care organizations will see AI as a means of improving [care management and service to recipients](#).

“We know that given your condition which is similar to others in our system, you’re going to need 24x7 care within 8 months. Let’s set that up now, put it in your care plan, pre-hire the workers and notify the family.” Sandy Jen, **Honor**

AI in dementia care. Just-right care of individuals with dementia will need more environmental information because residents cannot always describe their status. And care workers may not be able to view what is going on at a given time. Sensors on the body that transmit whereabouts, such as [CarePredict](#) or [AI-enabled smartwatches](#) can detect alertness or warn about cognitive decline. And sleep monitoring may offer indications about the possible onset of Alzheimer’s.

The Future of AI and Older Adults 2023

“Sleep can be a potential biomarker for early detection of AD, and a multi-modal combination of sleep, vocal biomarkers and gait changes could potentially provide even more holistic information.” Deepak Ganesan, **UMass Amherst**

AI in the home’s wellbeing infrastructure. The home is just beginning to serve as a platform for age-related care and health services. These can include Wi-Fi-enabled or sound-based fall-detection, wellbeing appliance monitoring (person is up-and-about, using a fridge, cooking, etc.). Increasingly AI will be incorporated into new home design and be optimized based on requirements of the homeowner – built into Wi-Fi, part of appliances and voice-operated.

“In the next five years, I see AI being integrated into the entire home infrastructure at a deeper level than today’s ‘smart’ outlets, plugs, and thermostats. With integration will come new ways of remote monitoring.” Christopher Berke, **Eaton Corporation**

Healthcare payment for AI-enabled services. Until 2022, there was no specific CPT code for AI-enabled services – though CPT codes in healthcare drive all payments to providers. The American Medical Association formed an advisory group to make a recommendation and in January, 2022, it was adopted that [specifies payments for three types of AI-enabled services](#), focusing on work done by machines and described in the taxonomy as Assistive, Augmentative, and Autonomous.

Recording life stories. [Life Bio Memory](#) through an Android/iOS app uses as many as 35 prompts to help a person describe a life story that can be transcribed and shared. And Storii’s new product uses ChatGPT (GPT4) and phone calls to create and [deliver calls with prompts that can elicit life stories](#) for family members. Both of these prompted methods of obtaining stories enable families to access them after a loved one has passed away – or in Storii’s case, help an ALS patient record and save his or her voice before it has deteriorated.

“The voice recording is so important, much more than the edited story of a life – and it is not for Facebook or social media, but for families.” – Cameron Graham, **Storii**

AI in caregiving robots. Consider the conversational nature of an [ElliQ](#) or the functional capability of a smart table like Labrador’s [Retriever Robot](#). And AI will factor into the next generation of useful robots, controlled by voice, gesture, or eye movement – enabling more adults with physical limitations to remain in their home.

“Robots should be able to intelligently understand how to transfer an individual – there should be simple support in the home to help keep you independent.” – Brian Jones, **Georgia Tech**

The barriers to benefit are daunting

One of the media-fueled risks today with AI-related hype is the tendency to find and publicize deficiencies and mistakes, reinforcing the premise that it is too early for benefits across industries like senior living or home care. This cycle was not helped by the behavior of earlier AI technologies like voice assistants.

“Humans are quick to lose patience with technology they feel pretends to be smarter than it is or has objectives not aligned with their own – upselling a service when you only wanted to set an alarm.” – Amy Stapleton, **Chatables**

Ethical dilemmas. With growing usage of AI technology, numerous ethical questions are emerging. These include questions of inherent bias in [medical imaging](#) or [facial recognition software](#), but also in the category of remote monitoring. Consider patients whose behavior changes over time and whether they continue to give permission to being monitored.

“We have study participants with mild cognitive impairment – using AI-enabled remote monitoring to track their decline over time. How do you decide their preferences for monitoring?” -- George Demiris, **UPenn**

Lack of interfaces to senior and health care systems. The lack of standardization of electronic records has been a major impediment to AI access and the accuracy of retrieved information or assessments. For example, despite broad implementation of a [tool to detect sepsis via EHR software](#), it turned out to do a poor job at detection, and worse, doctors did not really understand how it worked. Further, EHR technology lock-in by vendors, according to some, may be a [limitation to patient information access and health system innovation](#).

“The source data in senior living EHRs can be challenging to work with. Interoperability standards are a start, but how these systems are used in the real world can create significant challenges for future utility of the data.” Michael Skaff, Interim CTO, **Dele Health Tech**

Absence of responders to AI-generated alerts and trends. Remote monitoring processes depend on a well-trained response network which must deal with various alerts from sensors, cameras, voice-enabled devices, alarm systems, and edge devices – where a person is, also when there is no Wi-Fi or cloud access.

Escalating the risk of older adult scams. The conversational (and voice-enabled) nature of AI can make scams more prevalent. [The Federal Trade Commission is already warning](#) that AI can enable scammers to use an online audio clip to accurately clone the voice of a loved one.

THE FUTURE: What changes may AI enable in five years?

There are few limits to the possible benefits of AI in its many forms, conversational, generative, Chatbots and more. Some say that we are in [The Golden Age of AI](#). But constraints faced now and in coming years will likely emerge from [public and political debates about privacy, ethics](#) and [proposed regulation](#). They will be coupled with the lagging pace of institutions, particularly healthcare, to change aging systems that can help realize the benefits.

Within five years, however, it is inevitable that the role of this tech revolution in our lives and those of older adults will enable changes in society's focus, occurring in and across multiple domains.

These domains will add AI (via voice or other interaction modes) to services, including:

	Today's focus	Five years
Health management tech	Centered on healthcare providers	Centered on individuals, self-care
Social isolation tech	Single interaction	Conversational
Home care management	Reactive	Predictive
Smart home tech	Home automation	Home oversight and insight
Finances	Reactive	Proactive guidance
User interface tech	PC, device centric	Personalized avatar

Organizations that provided insights for report

AARP

Aura Futurity

Botco.ai

Calix

CareDaily

Carevocacy

Caspar.ai

Chatables

Electronic Caregiver Group

Eaton

Georgia Tech

Gerontechnologist

Honor

Inspiren

Johns Hopkins University AITC

PLC Advisors

Maplewood Senior Living

UMass, Amherst

Dele Health Tech

Nvidia

Paul Barter & Associates

SenterCare

Storii

TapRoot Interventions

THINK-Health

UPenn

Appendix I – NSF – NIA Grant Programs about AI and Aging

Grant	Funder	Participants	What	Activity	Dates
AI Caring, DATHA	NSF (\$3.9M)	Georgia Tech, Carnegie Mellon, OSU, UMass, OHSU	Personalized collaborative AI systems	Learn models, craft teams of AI agents	2021-2026
a2 Collective.ai	NIA: (\$70M)	Collaboratories on AI and Aging	Distribute grants	Pilot awards	2022-2027
AI Aging UMass AITC	NIA: Funds from a2	Umass, Brigham & Women's, Mass General, Brandeis, Northeastern	AI healthy aging at home and Alzheimer's	i.e. Vocal biomarker	2020-2025
JHU AITC AI Aging	NIA: Funds from a2	Johns Hopkins AITC	AI and aging	14 pilot projects	Launched 2021
U Penn AI Tech	NIA: Funds from a2	Collaboratory on Healthy Aging	AI and aging	Call for proposals	2021-2026

Appendix II Proposed initiatives Mass AITC, NSF

Testing a vocal biomarker platform for remote detection and monitoring of cognitive impairment in the home environment (Sonde Health Inc.), Bradford Dickerson, Bonnie Wang (Massachusetts General Hospital)

Developing real-world digital biomarkers from wearable sensors in Alzheimer's disease, Jen Blankenship (VivoSense Inc.), Michael Busa (UMass Amherst)

Vascular aging using infrasonic hemodynography embedded into everyday earbuds, Anna Barnacka (MindMics Inc.)

Detecting frailty in home environments through non-invasive whole room body heat sensing in older adults, Amanda Paluch (UMass Amherst), Dae Hyun Kim (Hebrew SeniorLife), Rags Gupta (Butlr Technologies Inc.)

Smartphone blood pressure monitoring for healthy aging, Edward Wang, Alison Moore (University of California San Diego)

Sensor-guided psychopharmacology in Alzheimer's disease and related dementias, Ipsit Vahia, Rachel Sava (McLean Hospital)

“We are hopeful that this funding will accelerate development of projects with practical applications to improve care for people living with Alzheimer's or a related dementia, and promote healthy aging.”

Rose Li, PhD, MBA, principal investigator, **a2 Collective Coordinating Center**

Appendix III – How does Wi-Fi fall detection work (ChatGPT version 4.0)

Wi-Fi fall detection is a technology that utilizes the existing Wi-Fi signals in an environment to detect falls, typically for the purpose of monitoring elderly people or individuals with mobility impairments. The technology works by analyzing changes in the wireless signals caused by a person's movements. When a fall occurs, it creates a distinct pattern in the signal, which can be recognized and analyzed by the system. Here's an overview of how the process works:

1. **Wi-Fi signal transmission:** Wi-Fi routers in a given area transmit signals that propagate throughout the space. These signals are usually used for data communication between devices, such as smartphones, tablets, and laptops.
2. **Signal interaction with objects:** As the Wi-Fi signals travel through the environment, they interact with various objects, including walls, furniture, and humans. These interactions result in small changes to the signal's properties, such as amplitude and phase.
3. **Signal monitoring:** Specialized devices or software algorithms are used to continuously monitor the Wi-Fi signals in the environment. These algorithms can be implemented on existing Wi-Fi enabled devices, such as routers or access points, or on dedicated hardware designed specifically for fall detection.
4. **Feature extraction:** The monitoring system extracts relevant features from the Wi-Fi signals, such as changes in amplitude, phase, or frequency. These features are used to represent the different types of movements and interactions occurring in the environment.
5. **Machine learning algorithms:** The extracted features are then fed into machine learning algorithms that have been trained to recognize patterns associated with falls. These algorithms analyze the features to determine whether a fall has occurred or not.
6. **Alert generation:** If the system detects a fall, it can trigger an alert or notification to be sent to caregivers, family members, or emergency services, depending on the configuration of the system.

Wi-Fi fall detection offers several advantages over traditional methods, such as wearable devices or cameras. It is non-invasive, does not require the person being monitored to wear any devices, and maintains privacy by not using video recordings. Additionally, it can be easily integrated into existing Wi-Fi networks, making it a cost-effective solution for fall detection in various settings.