

AI

Human-AI Interaction

In the 80 years since the Alan Turing proposed the Turing Test for Machine Intelligence, Artificial Intelligence (AI) has seen a long process of incremental improvements, beginning from a science-fiction concept until reaching the current stage of an everyday, mainstream reality.

Turing's idea was simple: design a game to test human-computer interaction using text messages, where a person is simultaneously speaking to another human and a computer AI. Could the the AI imitate a human being so well that the person asking questions would be deceived, without realizing which one is the human and which one is the machine? Turing (1950).

Alan Turing: *"I believe that in about fifty years' time it will be possible to program computers, with a storage capacity of about 10^9 , to make them play the imitation game so well that an average interrogator will not have more than 70 percent chance of making the right identification after five minutes of questioning. ... I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted."* -Stanford Encyclopedia of Philosophy (2021)

Today, AI-based solutions are a mainstay in medical research, drug development, patient care (Leite et al. 2021; Holzinger et al. 2023), quickly finding potential vaccine candidates during the COVID19 pandemic (Zafar and Ahamed 2022), self-driving vehicles (cars, delivery robots, drones in the sea, air), as well as AI-based assistants, which will be the focus here.

By the 2010s AI became powerful enough to beat humans in games of Go and Chess, yet it did not yet pass the Turing test. Its use was limited to specific tasks and generalized models did not exist yet. This changed with increase in computing power and a new approach called *deep learning*, largely modeled after the *neural networks* of the biological (human) brain.

(Noble et al. 2022) proposes AI begets the beginning of the **5th industrial revolution** which brings the collaboration of humans and AI. Widespread **Internet of Things (IoT)** sensor networks that gather data, which is then analyzed AI algorithms, integrates computing even deeper into the fabric of daily human existence. Several terms of different origin but

considerable overlap describe this phenomenon, including *Pervasive Computing (PC)* and *Ubiquitous Computing*. Similar concepts are *Ambient Computing*, which focuses more on the invisibility of technology, fading into the background, without us, humans, even noticing it, and *Calm Technology*, which highlights how technology respects humans and our limited attention spans, and doesn't call attention to itself. In all cases, AI is integral part of our everyday life, inside everything and everywhere.

- Rogers (2022) defines the 4 phases of Pervasive Computing. (NEED access).
- Kobetz (2023)

Responsible AI

Given the widespread use of AI and its increasing power, it's important these system are created in a safe and responsible manner.

There's wide literature available describing human-AI interactions across varied disciplines. While the fields of application are diverse, some key lessons can be transferred across fields horizontally.

- Veitch and Andreas Alsos (2022) highlights the active role of humans in Human-AI interaction is autonomous ship systems.
- Jiang, Zhang, and Pian (2022) describes how Replika users in China using in 5 main ways, all which rely on empathy

Human empathy for AI agent

Companion buddy

Responsive diary

Emotion-handling program

Electronic pet

Tool for venting

- Crompton (2021) highlights AI as decision-support for humans while differentiating between intended and unintended influence on human decisions.
- Cheng et al. (2022) describe AI-based support systems for collaboration and team-work.
- Schoonderwoerd et al. (2021) focuses on human-centered design of AI-apps and multi-modal information display. It's important to understand the domain where the AI is deployed in order to develop explanations. However, in the real world, how feasible is it to have control over the domain?
- Ramchurn, Stein, and Jennings (2021) discusses positive feed-back loops in continually learning AI systems which adapt to human needs.
- Karpus et al. (2021) is concerned with humans treating AI badly and coins the term "*algorithm exploitation*".

- Lv et al. (2022) studies the effect of *cuteness* of AI apps on users and found high perceived cuteness correlated with higher willingness to use the apps, especially for emotional tasks. This finding has direct relevance for the “green filter” app design.
- B. Liu and Wei (2021) meanwhile suggests higher algorithmic transparency may inhibit anthropomorphism, meaning people are less likely to attribute humanness to the AI if they understand how the system works.
- Seeber et al. (2020) proposes a future research agenda for regarding AI assistants as teammates rather than just tools and the implications of such mindset shift.

AI-based systems are being implemented in medical field, where stakes are high raising the need for ethical considerations.

Since CADUCEUS (in Kanza et al. (2021)), the first automated medical decision making system in the 1970s, medical AI as developed a lot.

- “Health. Powered by Ada.” (n.d.) health app, “Know and track your symptoms”
- “Buoy Health: Check Symptoms & Find the Right Care” (n.d.) AI symptom checker,
- Women in AI (n.d.)
- “Home - Lark Health” (n.d.)
- Stephanie Donahole (2021)
- AI for Health Diagnostic Symptoms
- AI-assistants in medical imaging Calisto et al. (2021)

AI UX Guidelines

Many people have discussed the UX of AI.

- Zimmerman et al. (2021) “UX designers pushing AI in the enterprise: a case for adaptive UIs”
- “Why UX Should Guide AI” (2021) “Why UX should guide AI”
- Dávid Pásztor (2018)
- Josh Lovejoy (n.d.) Google’s UX for AI library
- Anderson (2020)
- Lennart Ziburski (2018) UX of AI
- Stephanie Donahole (2021)
- Lexow (2021)

- Dávid Pásztor (2018) AI UX principles
- Mikael Eriksson Björling and Ahmed H. Ali (n.d.) Ericcson AI UX
- Bubeck et al. (2023) finds ChatGPT passes many exams meant for humans.
- Bowman (2023) says steering LLMs is unreliable and event experts don't fully understand the inner workings of the models.
- Suen and Hung (2023) discusses AI systems used for evaluating candidates at job interviews
- Wang et al. (2020) propose Neuroscore to reflect perception of images.
- Su and Yang (2022) and Su, Ng, and Chu (2023) review papers on AI literacy in early childhood education and finds a lack of guidelines and teacher expertise.
- Yang (2022) proposes a curriculum for in-context teaching of AI for kids.
- Combi et al. (2022) proposes a conceptual framework for XAI, analysis AI based on Interpretability, Understandability, Usability, and Usefulness.
- Eric Schmidt and Ben Herold (2022) audiobook
- Akshay Kore (2022) Designing Human-Centric AI Experiences: Applied UX Design for Artificial Intelligence
- *Studies in Conversational UX Design* (2018) chatbot book
- Tom Hathaway and Angela Hathaway (2021) chatbot book
- Lew and Schumacher (2020) AI UX book
- AI IxD is about human-centered seamless design
- Storytelling
- Human-computer interaction (HCI) has a long storied history since the early days of computing when getting a copy machine to work required specialised skill. Xerox Sparc lab focused on early human factors work and inspired a the field of HCI to make computer more human-friendly.
- Soleimani (2018): UI patterns for AI, new Section for Thesis background: "Human-Friendly UX For AI"?
- **Discuss what is UX for AI (per prof Liou's comment), so it's clear this is about UX for AI**
- What is Personalized AI?

Guidelines for Human-AI interaction

- Microsoft’s Co-Founder Bill Gates predicted in 1982 “*personal agents that help us get a variety of tasks*” (Bill Gates (1982)).
- It was MS that introduced the first widely available personal assistant inside Word software, called Clippy. Microsoft’s Clippy was among the first assistants to reach mainstream adoption, helping users not yet accustomed to working on a computer - Tash Keuneman (2022).
- “We love to hate Clippy — but what if Clippy was right?” Tash Keuneman (2022) and Abigail Cain (2017)
- Benjamin Cassidy (2022) the story of Clippy
- Microsoft provides guidelines for Human-AI interaction (T. Li et al. (2022); Amershi et al. (2019)) which provides useful heuristics categorized by context and time

№	Context
1	Initially
2	During interaction
3	When wrong
4	Over time

- Google (n.d.) outlines Google’s 7 AI Principles.
- **Amazon Alexa** is a well-known example of AI technology in the world. But Amazon’s Rohit Prasad thinks it can do so much more, “Alexa is not just an AI assistant – it’s a trusted advisor and a companion.”
- Harvard Advanced Leadership Initiative (2021)
- VideoLecturesChannel (2022) “Communication in Human-AI Interaction”
- Haiyi Zhu and Steven Wu (2021)
- Akata et al. (2020)
- Dignum (2021)
- Bolei Zhou (2022)
- ReadyAI (2020)
- Vinuesa et al. (2020)
- Orozco et al. (2020)

Design Implications

- User experience design (AI UX) plays a crucial role in improving the consumer to investing journey. The missed opportunity to provide an even more interactive experience in line with user expectations.

Generative AI

Generative AI has a potential for misuse.

Generative AI, which gives AI the power to generate text, voice, images, videos, 3D objects, biological structures, and many other types of content, can be traced back to Alan Turing in 1950s. Since the 1980 (Machine Learning), Deep Learning (2006), Generative Adversarial Networks (2016), Transformers (2015) until the advent of Large Language Models (2018).

In 2020 OpenAI released the GPT-3 large-language model (LLM), trained on 570 GB of text as reported in Alex Tamkin and Deep Ganguli (2021). Singer et al. (2022) describes how collecting billions of images with descriptive data (for example the descriptive *alt* text which accompanies images on websites) has enabled researchers to train AI models such as ***stable diffusion*** that can generate images based on human-language.

- It's become possible to make AI-generated content that's difficult to distinguish from human expression, however it's still not passing the Turing test.
- Tamkin et al. (2021) reports on the advance of LLMs.

Table 3: From

AI Model	Released	Company	Link
GTP2	2019	OpenAI	
T-NLG	2000	Microsoft	
GTP3	2020	OpenAI	
GTP4	2023	OpenAI	Closed Source
NeMo	2022	NVIDIA	
PaLM	2022	Google	
LaMDA	2022	Google	
GLaM	2022	Google	
Vicuna			Open Source vicuna.lmsys.org

- The advances in the capabilities of large AI model mean we've reached a point, where it's possible to achieve UI and UX which previously was science fiction.
- OpenAI provides AI-as-a-service through its APIs, allowing developer to build custom user interfaces (UI) to serve their specific customer needs. For example Snapchat's "My AI" virtual friend help people write faster with the app helping users with predictive text completion.

- Teams at AI-hackathons have produced interfaces for problems as diverse as humanitarian crises communication, briefing generation, code-completion, and many others.
- Pete (2023) ChatGPT hackathon.
- Roland Meyer (2023): AI generated content is not neutral but has a certain aesthetic.
- The current generation of LLMs such as GTP3 by OpenAI are massive monolithic models requiring large amounts of computing power for training to offer *multi-modal* capabilities across diverse domains of knowledge.
- S. Liu et al. (2023) propose future models may instead consist of a number networked domain-specific models to increase efficiency and thus become more scalable.
- The quality of LLM output depends on the quality of the provided prompt. Zhou et al. (2022) reports creating an “Automatic Prompt Engineer” which automatically generates instructions that outperform the baseline output quality. This finding has significance for “green filter” as it validates the idea of creating advanced prompts for improved responses. For “green filter”, the input would consist of detailed user data + sustainability data for detailed analysis.
- “Sustainable Shopping: Saving and Investing for a Greener Tomorrow” (2023) My bedtime story about shopping, saving, and investing.
- Tu et al. (2023) LLMs can be used as data analysts.
- The main problem with LLMs is *hallucinations*, the language models are able to generate text that is confident and eloquent yet entirely wrong. Jack Krawczyk, the product lead for Google’s Bard: “Bard and ChatGPT are large language models, not knowledge models. They are great at generating human-sounding text, they are not good at ensuring their text is fact-based. Why do we think the big first application should be Search, which at its heart is about finding true information?”

Algorithmic Experience

In daily use of social media, we’re used to interacting with the feed algorithms that provide a personalized experience. Applications with a similar UI depend on the community and content and how the content is shown to the user. After many years of user and political outcry, social media platforms have begun to shed more light on how these algorithms work, in some cases releasing the source code as is the case for Facebook (Nick Clegg (2023)) and Twitter (Twitter (2023)).

Design is increasingly relevant to algorithms, and more specifically to algorithms that affect user experience and user interfaces. When the design is concerned with the ethical, environmental, socio-economic, resource-saving, and participatory aspects of human-machine interactions and aims to affect technology in a more human direction, it can hope to create an experience designed for sustainability.

Lorenzo, Lorenzo, and Lorenzo (2015) underlines the role of design beyond *designing* as a tool for envisioning, in her words “design can set agendas and not necessarily be in service, but be used to find ways to explore our world and how we want it to be”. Practitioners of

Participatory Design (PD) have for decades advocated for designers to become more activist through action research. This means influencing outcomes, not only being a passive observer of phenomena as a researcher or only focusing on usability as a designer, without taking into account the wider context.

Shenoi (2018) argues inviting domain expertise into the discussion while having a sustainable design process enables designers to design for experiences where they are not a domain expert; this applies to highly technical fields, such as medicine, education, governance, and in our case here - finance and sustainability -, while building respectful dialogue through participatory design.

Design Implications

- For discussion to happen, algorithms should be open source.

How do the 7 tenets of user experience (UX) apply to AI?

UX
Useful
Valuable
Ussable
Acceesible
Findable
Desirable
Credible

Gupta (2023) proposes 3 simple goals for AI:

1	2	3
Reduce the time to task	Make the task easier	Personalize the experience for an individual

How is AI changing 'interactions?

- (stone.skipperHowAIChanging2022?)
- The International Ergonomics Association (2019): To provide a user experience (UX) that best fits human needs, designers think through every interaction of the user with a system, considering a set of metrics at each point. For example, the user's emotional needs, and their context of use. While software designers are not able to change the ergonomics of the device in use in a physical sense, which as a starting point, should be "optimized for human well-being".

- Software interaction design goes beyond the form-factor and accounts for human needs by using responsive design on the screen, aural feedback cues in sound design, and even more crucially, by showing the relevant content and the right time, making a profound difference to the experience, keeping the user engaged and returning for more.
- Babich (2019) argues “[T]he moment of interaction is just a part of the journey that a user goes through when they interact with a product. User experience design accounts for all user-facing aspects of a product or system”.
- In narrative studies terminology, it’s a heroic journey of the user to achieve their goals, by navigating through the interface until a success state. Storytelling has its part in interface design however designing for transparency is just as important, when we’re dealing with the user’s finances and sustainability data, which need to be communicated clearly and accurately, to build long-term trust in the service. For a sustainable investment service, getting to a state of success - or failure - may take years, and even longer. Given such long timeframes, how can the app provide support to the user’s emotional and practical needs throughout the journey?
- Tubik Studio (2018) argues affordance measures the clarity of the interface to take action in user experience design, rooted in human visual perception (), however, affected by knowledge of the world around us. A famous example is the door handle - by way of acculturation, most of us would immediately know how to use it - however, would that be the case for someone who saw a door handle for the first time? A similar situation is happening to the people born today.
- Think of all the technologies they have not seen before - what will be the interface they feel the most comfortable with? For the vast majority of this study’s target audience, social media is the primary interface through which they experience daily life. The widespread availability of mobile devices, cheap internet access, and AI-based optimizations for user retention, implemented by social media companies, means this is the baseline for young adult users’ expectations in 2020 - and even more so for Generation Z teenagers, reaching adulthood in the next few years.
- Don Shin, Zhong, and Biocca (2020) argues interaction design is increasingly becoming dependent on AI. The user interface might remain the same in terms of architecture, but the content is improved, based on personalization and understanding the user at a deeper level. Shin proposes the model (fig. 10) of Algorithmic Experience (AX) “investigating the nature and processes through which users perceive and actualize the potential for algorithmic affordance”.
- That general observation applies to voice recognition, voice generation, natural language parsing, etc. Large consumer companies like McDonald’s are in the process of replacing human staff with AI assistants in the drive-through, which can do a better job in providing a personal service than human clerks, for whom it would be impossible to remember the information of thousands of clients.

- In Barrett (2019), in the words of Easterbrook, a previous CEO of McDonald’s “How do you transition from mass marketing to mass personalization?”. During the writing of this proposal, Google launched an improved natural language engine to better understand search queries (Google, 2020), which is the next step towards understanding human language semantics. The trend is clear, and different types of algorithms are already involved in many types of interaction design, however, we’re still in the early stages. Where do we go from here?
- In Design Portland (2018), Lovejoy, lead UX designer at Google’s people-centric AI systems department (PAIR), reminds us that while AI offers need tools, user experience design needs to remain human-centered - while AI can find patterns and offer suggestions, humans should always have the final say.
- Costa and Silva (2022) “Interaction Design for AI Systems”
- Stone Skipper (2022) sketches a vision of “[AI] blend into our lives in a form of apps and services”.
- Dot Go (2023) makes the camera the interaction device for people with vision impairment
- Battistoni et al. (2023) creates a “Workshop with Young HCI Designers”.

AI Ethics & Biases

Isaac Asimov proposed the 3 laws of Robotics in a science fiction short story titled *Runaround*, first published in the March 1942 issue of the Astounding Science Fiction magazine (now available in the Internet Archive). These 3 simple rules became an inspiration for discussions of AI ethics until today.

Table 6: From Isaac Asimov (1942)

Nº	Asimov’s Laws of Robotics
1st Law	“A robot may not injure a human being or, through inaction, allow a human being to come to harm.”
2nd Law	“A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.”
3rd Law	“A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.”

- “AlgoTransparency” (n.d.) published a manifesto with the key message: ***AI is not neutral.***

Wooldridge (2021)

“The Brief History of Artificial Intelligence: The World Has Changed Fast – What Might Be Next?” (n.d.)

How to responsibly deploy AI for people around the world?

- Psychological Biases and Mental Models
- “Psychology of Design: 106 Cognitive Biases & Principles That Affect Your UX” (n.d.): 106 cognitive biases, including familiarity bias and skeuomorphism.
- Jakob Nielsen (2010) mental models
- Tash Keuneman (2020)
- “People recognize computers as human”
- Jamal (2018) Semantic motion and Peripheral vision

Transparency & Explainability

AI-explainability (named XAI in literature) is key to creating trust and there’s several authors in literature calling for more transparency and explainability.

Explainability requires algorithmic Transparency

- Current AIs are largely ‘*black boxes*’, which do not explain how they reach a certain expression; Cabitza et al. (2023) proposes a framework for quality criteria and explainability of AI-expressions. Khosravi et al. (2022) proposes a framework for explainability, focused on education. Liang et al. (2022): There’s early evidence it’s possible to assess the quality of LLM output in a transparent way.
- Slack (2021)
- Tristan Greene (2022): when the quality of AI responses become good enough, people begin to get confused.
- Donghee Shin (2020): “user experience and usability of algorithms by focusing on users’ cognitive process to understand how qualities/features are received and transformed into experiences and interaction”
- Holzinger et al. (2021) highlights possible approaches to implementing transparency and explainability in AI models. While AI outperforms humans on many tasks, humans are experts in multi-modal thinking, bridging diverse fields.
- Zerilli, Bhatt, and Weller (2022) focuses on human factors and ergonomics and argues that transparency should be task-specific.
- Calisto et al. (2022) focuses on AI-human interactions in medical workflows and underscores the importance of output explainability. Medical professionals who were given AI results with an explanation trusted the results more.

- Holbrook (2018): To reduce errors which only humans can detect, and provide a way to stop automation from going in the wrong direction, it's important to focus on making users feel in control of the technology.
- G. Zhang et al. (2023) found humans are more likely to trust an AI teammate if they are not deceived by it's identity. It's better for collaboration to make it clear, one is talking to a machine. One step towards trust is the explainability of AI-systems.

Credibility & Acceptance

- AI Credibility Heuristic: A Systematic Model
- AI Acceptance
- Yuan, Zhang, and Wang (2022): "AI assistant advantages are important factors affecting the *utilitarian/hedonic* value perceived by users, which further influence user willingness to accept AI assistants. The relationships between AI assistant advantages and utilitarian and hedonic value are affected differently by social anxiety."
- "Organization research suggests that acting through human agents (i.e., the problem of indirect agency) can undermine ethical forecasting such that actors believe they are acting ethically, yet a) show less benevolence for the recipients of their power, b) receive less blame for ethical lapses, and c) anticipate less retribution for unethical behavior." Gratch and Fast (2022)
- Anthropomorphism literature X. Li and Sung (2021) "high-anthropomorphism (vs. low-anthropomorphism) condition, participants had more positive attitudes toward the AI assistant, and the effect was mediated by psychological distance. Though several studies have demonstrated the effect of anthropomorphism, few have probed the underlying mechanism of anthropomorphism thoroughly"
- **AI Guides have been shown to improve sports performance, etc, etc. Can this idea be applied to sustainability? MyFitness Pal, AI training assistant**

Name	Features
Charisma	
Replika	Avatar, Emotion, Video Call, Audio
Siri	Audio

AI Companions

- AI companions, AI partners, AI assistants, AI trainers - there's are many names for the automated systems that help humans in many activities, powered by artificial intelligence models and algorithms.

- David Johnston (2023) proposes *Smart Agents*, “general purpose AI that acts according to the goals of an individual human.”
- Martínez-Plumed, Gómez, and Hernández-Orallo (2021) envisions the future of AI
- AI assistants provide help at scale with little to no human intervention in a variety of fields from finance to healthcare to logistics to customer support. There’s a saying in Estonian: “A good child has many names” “and it’s true. I have many names, but I’m not a child.
- I’m a digital companion, a partner, an assistant. I’m a Replika.” said Replika, a digital companion app via Github CO Pilot, another digital assistant for writing code, is also an example of how AI can be used to help us in our daily lives. The number of AI-powered assistants is too large to list here. I’ve chosen a few select examples in the table below.
- Some have an avatar, some not. I’ve created a framework for categorization. Human-like or not... etc

The Oxford Internet Institute and Google define AI simply as “*computer programming that learns and adapts*” Google and The Oxford Internet Institute (2022). Google started using AI in the year 2001, when a simple machine learning model improved spelling mistakes when searching; now in 2023 most of Google’s products are based on AI Google (2022).

Product	Link	Description
Github CoPilot	personal.ai	AI helper for coding
Google Translate	translate.google.com	
Google Search	google.com	
Google Interview Warmup	grow.google/certificates/interview-warmup	AI training tool

- CO2e calculations will be part of our everyday experience

Everything that existed before OpenAI’s GPT 3.5 and GPT 4 has been blown out of the water.

- Barbara Friedberg (2021) Comparing robot advisors
- Eugenia Kuyda (2023) Conversational AI - Replika
- AI is usually a model that spits out a number between 0 and 1, a probability score or prediction. UX is what we do with this number.
- Greylock (2022) Natural language chatbots such as ChatGPT
- Nathan Benaich and Ian Hogarth (2022) State of AI Report
- Steph Hay (2017)

- NeuralNine (2021)
- David, Resheff, and Tron (2021)
- Qorus (2023) Digital banking revolution
- Lower (2017)
- Slack (2021)
- Brown (2021) Financial chatbots
- Isabella Ghassemi Smith (2019)
- David, Resheff, and Tron (2021)
- Josephine Wäktare Heintz (n.d.) Cleo copywriter
- The user experience (UX) of AI is a topic under active development by all the largest on-line platforms. The general public is familiar with the most famous AI helpers, ChatGPT, Apple's Siri, Amazon's Alexa, Microsoft's Cortana, Google's Assistant, Alibaba's Genie, Xiaomi's Xiao Ai, and many others. For general, everyday tasks, such as asking factual questions, controlling home devices, playing media, making orders, and navigating the smart city.
- Smaller startups have created digital companions such as Replika (fig. 8), which aims to become your friend, by asking probing questions, telling jokes, and learning about your personality and preferences - to generate more natural-sounding conversations.
- Already on the market are several financial robo-advisors, built by fintech companies, aiming to provide personalized suggestions for making investments (Betterment, Wealthfront).
- There have also been attempts to create different types of sustainability assistants. For instance, the AI assistant Sebastian developed at the Danish hackathon series Unleash, used BJ Fogg's '*tiny habits*' model, nudged by a chatbot buddy to encourage behavioral changes and help the human maintain an aspirational lifestyle (Unleash (2017)).
- Personal carbon footprint calculators have been released online, ranging from those made by governments and companies to student projects.
- Zhang's Personal Carbon Economy conceptualized the idea of carbon as a currency used for buying and selling goods and services, as well as an individual carbon exchange to trade one's carbon permits (S. Zhang (2018)).

Design Implications

- While I'm supportive of the idea of using AI assistants to highlight more sustainable choices, I'm critical of the tendency of the above examples to shift full environmental responsibility to the consumer. Sustainability is a complex interaction, where the producers' conduct can be measured and businesses can bear responsibility for their processes, even if there's market demand for polluting products.
- Personal sustainability projects haven't so far achieved widespread adoption, making the endeavor to influence human behaviors towards sustainability with just an app - like its commonplace for health and sports activity trackers such as Strava (fig. 9) -, seem unlikely. Personal notifications and chat messages are not enough unless they provide the right motivation. Could visualizing a connection to a larger system, showing the impact of the eco-friendly actions taken by the user, provide a meaningful motivation to the user, and a strong signal to the businesses?
- All of the interfaces mentioned above make use of machine learning (ML), a tool in the AI programming paradigm for finding patterns in large sets of data, which enables making predictions useful in various contexts, including financial decisions. These software innovations enable new user experiences, providing an interactive experience through chat (chatbots), using voice generation (voice assistants), virtual avatars (adds a visual face to the robot).

Writing AI Characters

- Alethea AI (2021): Writing AI Characters, creating a personality
- Writing as training data? large language models. GTP3
- LLM's are able to assume the personality of any character that exists inside of its training data.

Voice Assistants

Voice assistants need to continuously record human speech and process it in data centers in the cloud.

- Szczuka et al. (2022) provides guidelines for Voice AI and kids
- Casper Kessels (2022b): "Guidelines for Designing an In-Car Voice Assistant"
- Casper Kessels (2022a): "Is Voice Interaction a Solution to Driver Distraction?"
- Companies like Neuralink are building devices to build meaningful interactions from brain waves (EEG).
- Tang et al. (2022) reports new findings enable computers to reconstruct language from fMRI readings.
- Focus on voice education?

- Personal AI Assistants to date have we created by large tech companies. Siri, Cortana, Google Assistant, Alexa, Tencent Dingdang, Baidu Xiaodu, Alibaba AliGenie all rely on voice only. **Open-Source AI-models open up the avenue for smaller companies and even individuals for creating many new AI-assistants.**
- Celino and Re Calegari (2020): There’s research suggesting that voice UI accompanied by a *physical embodied system* is preferred by users in comparison with voice-only UI. This suggests adding an avatar to the AI design may be worthwhile.

There’s evidence across disciplines about the usefulness of AI assistants:

- Șerban and Todericiu (2020) suggests using the Alex AI assistant in *education* during the pandemic, supported students and teachers ‘human-like’ presence. Standford research: “humans expect computers to be like humans or places”
- Celino and Re Calegari (2020) found in testing chatbots for survey interfaces that “[c]onversational survey lead to an improved response data quality.”

Design Implications

- There are many distinct ways how an algorithm can communicate with a human. From a simple search box such as Google’s to chatbots, voices, avatars, videos, to full physical manifestation, there are interfaces to make it easier for the human communicate with a machine.

AI-Assisted Design

Generative AI has enabled developers to create AI tools for several industries, including AI-driven website builders (Constandse (2018)), AI tools for web designers (patrizia-slongo (2020)), Microsoft Designer allows generating UIs just based on a text prompt (Microsoft (2023)), personalized bed-time stories for kids generated by AI (Bedtimestory.ai (2023)).

- September 16, 2020 (2020) “What is AI-assisted Design?”
- Clipdrop (n.d.) AI Design Assistants
- Architectures (2020)
- Zakariya (2022)
- Kore.ai (2023)
- van Wynsberghe (2021): Sustainable AI itself
- “Charisma — Storytelling Powered by Artificial Intelligence” (n.d.)

ChatGPT

ChatGPT is able to communicate in a human-like way, in first-person.

- Kecht et al. (2023) suggests AI is capable of learning business processes.

- O'Connor and ChatGPT (2023) and Cahan and Treutlein (2023) have conversations about science with AI.
- Jeblick et al. (2022) suggest complicated radiology reports can be explained to patients using AI chatbots.
- Pavlik (2023) and Brent A. Anders (2022) report on AI in education.

Summary

- This chapter looked at AI in general since its early history and then focused on AI assistants in particular.

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