

## PROACTIVE AI AS A WAY TO FOSTER DESIGN JUSTICE PRACTICES IA PROATIVA COMO MODO DE PROMOVER PRÁTICAS DE DESIGN JUSTICE VINÍCIUS PEREIRA, GIL DE BARROS

**Vinicius Juliani Pereira** is an Architect, holds a Master's degree in Architecture and Urbanism, and is a Ph.D. candidate at the University of East Anglia, United Kingdom. He studies smart home technologies, design methods, computer-human interaction, sociotechnical imaginaries, co-design, and design justice. [viniciusjulianip@gmail.com](mailto:viniciusjulianip@gmail.com)

<http://lattes.cnpq.br/8494367233087361>

**Gil Garcia de Barros** is an Architect, holds a Master's Degree in Electrical Engineering, a Doctor's Degree and a Post-Doctorate in Architecture and Urbanism. He is a professor at the Faculty of Architecture and Urbanism at the University of Sao Paulo (USP), Brazil, and the Graduate Program in Architecture and Urbanism at the same institution. He is a researcher at the research group Representations: Imaginary and Technology, and coordinates research on representation in the design process, work organization in design, strategic design, dialogic design, design thinking, design methods, and design facilitation. [gil.barros@usp.br](mailto:gil.barros@usp.br)

<http://lattes.cnpq.br/0755097281960829>

ARTICLE SUBMITTED ON AUGUST 15, 2022

How to quote this text: Pereira, V. J., Barros, G., 2022. Proactive AI as a Way to Foster Design Justice Practices. *VIRUS*, 25, December. [online]. Available at: <http://www.nomads.usp.br/virus/papers/v25/661/661en.php>. [Accessed: dd Month yyyy].

## Abstract

As part of a counter-hegemonic agenda, participatory theories can challenge dominant perspectives, turning a specific process into a collective endeavour. Understanding that these current participatory design frameworks seem to lack an intersectional approach for the inclusion of counter-hegemonic narratives, we aim to stimulate a speculative discussion around the possibility of using a Proactive AI approach to develop voice assistants embedded with a Design Justice bias. Relying on a literature review and the design of a storyboard, we present a fictional scenario as a result in which a proactive voice assistant nudges the architect towards social reflections during the design process. Then, we discuss the importance of context awareness and beneficial intentional bias, concluding with the outcomes and challenges for the technology, beyond the architecture design practice.

**Keywords:** Design justice, Proactive AI, Computer-human Interaction, Artificial Intelligence, Architecture

## 1 Introduction

The design and construction of human artefacts and buildings respond to the interest of socially and economically dominant groups. Considering the values accounted for in the design process belong to the already privileged ones, new designs end up reinforcing a social structure that reassures advantages for the dominant groups. As an alternative, participatory theories come up with design processes that can better incorporate the values and expectations of the people who will be affected by the design solution. Still, collective and participatory design frameworks seem to lack an intersectional approach for the inclusion of counter-hegemonic narratives (Costanza-Chock, 2020).

Here, we approach a speculative discussion about the development of a type of proactive voice assistant powered by artificial intelligence (AI). We intend to speculate about how a so-called Proactive AI could deploy the counter-hegemonic agenda of the design justice framework, in the context of an architecture office. This study intends to trigger reflections on how digital technology can help “(...) to examine and transform design values, practices, narratives, sites, and pedagogies so that they don’t continue to reinforce interlocking systems of structural inequality.” (Costanza-Chock, 2020, p. xvii).

### 1.1 Design Justice

As described by Sasha Costanza-Chock, “Design Justice is a framework for analysis of how design distributes benefits and burdens between various groups of people.” (Costanza-Chock, 2020, p. 23), challenging power dynamics within a traditional design process. The author describes the concept of Design Justice applied to digital technology, though making clear that it could (and should) be explored in other fields — like architecture and urban planning.

This approach was organised by the Design Justice Network, after the 2014 Allied Media Conference (<https://designjustice.org/>). It is possible to notice that the Network started from a feeling of dissatisfaction on how inclusion has been dealt by industry, along with an understanding that the existing approaches (participatory design, user-centred design, co-design, etc.) were not tackling structural inequalities effectively — but risking to reinforce them (Costanza-Chock, 2020, p. 6).

Based on Black feminist authors like Kimberlé Crenshaw and Patricia Hill Collins, Sasha describes two key concepts to understand Design Justice’s aims: ‘intersectionality’ and ‘matrix of domination’. The first one arranges aspects like race, class, and gender as part of an ‘interlocking system’ (Costanza-Chock, 2020, p. 17), being experienced together instead of ‘independent constructs’ (Costanza-Chock, 2020, p. 18) — e.g., trans-women and cis-women of colour may suffer specific forms of discrimination related to their gender identities besides race. The author argues that most inclusion practices have a ‘single-axis’ approach to design, instead of an intersectional one (Costanza-Chock, 2020, p. 19).

The second concept, ‘matrix of domination’, relates to the idea of how our intersectional aspects are part of an uneven structural distribution of “power, oppression, resistance, privilege, penalties, benefits, and harms (...) that can shape an individual’s life” (Costanza-Chock, 2020, p. 20). Therefore, Sasha describes how we are part of a “(...) multitude of dominant groups and a multitude of subordinate groups.” (Costanza-Chock, 2020, p. 21). Design justice would be on hand to

investigate and challenge the ways on how inequality is produced or reinforced between individuals, based on their location in the matrix of domination.

With that goal, Sasha summarises the Design Justice principles as a way “(...) to ensure a more suitable distribution of design’s benefits and burdens; meaningful participation in design decisions; and recognition of community-based, indigenous, and diasporic design traditions, knowledge, and practices.” (Costanza-Chock, 2020, p. 23).

It is not expected that the deployment of such a framework would be held out of the blue. As design justice itself prays, pre-existent approaches for inclusion should be enhanced and supported, instead of substituted for supposed new strategies with fancy names. The exercise of recognizing intersectional aspects in existing design methods should be a daily reminder among practitioners. What follows is a speculative proposition on the possibility of using artificial intelligence (AI) to foster Design Justice reflections in architecture offices, while checking for potentially harmful biases in the design process.

## 1.2 Architecture and Automation

Because of its relation to the Global North’s process of industrialization, the design industry has long ago started to be informatized — to the current point in which most part of the design work is primarily done through digital platforms (Costanza-Chock, 2020, p. 15). In architecture, for instance, both discussions on how digital computers would change the industry or even replace designers with automated systems have been in debate for almost a decade (Carpo, 2013; Lynn, 2013).

Efforts to organise Architecture, Engineering and Construction (AEC) industrial standards have paved the way to design automation, through the use of digital libraries coupled with technologies like Building Information Modelling (BIM). Parametric and generative design have also been quite popular strategies among architecture offices that are able to afford a data-driven process (Natividade, 2010). Because of that, some scholars would argue that the next step would be the incorporation of computational models of artificial intelligence (AI) to assist designers, or even to substitute them (Carpo, 2017).

Currently, AI technologies employed in architecture offices are limited to specific and constrained tasks, like genetic algorithms applied to form-finding (Burry, 2013) or automated layout generation for interior design or urban planning (Calixto, 2015). Discussions found in literature argue that an advancement of the current state of AI to a mode of General Intelligence would require human-like reasoning, producing an AI able to cope with complex and open-ended design problems. While still a fiction, it is not difficult to envision possible futures in which architects would interact with AI-powered entities during the design process (Pereira, 2020).

One of the controversial problems in the currently available AI technology is the bias, a popular aspect related to the debate. As described by Mittelstadt, Allo, Taddeo, Wachter, and Floridi, “The design and functionality of an algorithm reflects the values and intentions of its developer as a specific solution is chosen as the best and most efficient. Algorithm development is not neutral (...)” (Mittelstadt et al., 2016, p. 25) Bias would be related to the organisation of the matrix of domination (Costanza-Chock, 2020), in a sense that a set of values will always prioritise some solutions and neglect others, creating an unbalanced distribution of benefits and harms. Even though neutrality is not an option in digital technology, there are studies on trying to decrease and overcome bias — but if you are less inclined to one side, what is the new side you are leaning on?

What if, instead of a never-ending process after bias neutrality, AI developers input an intentional and somewhat benevolent bias? In the case of architecture offices, this intentional bias could be the design justice framework — in which, besides directing all conversational aspects towards intersectional awareness, the AI would be able to audit the design process in search for an unequal design benefits distribution. Going further in this vision, what if the AI could nudge architects, provoking reflections and behaviour change?

## 1.3 Proactive AI

The development of Human-Computer Interaction (HCI) for AI technologies has been pushed by voice interfaces, following the launching of popular ‘smart assistants’ like Apple’s Siri in 2011 and Amazon’s Alexa in 2014 (Strengers and Kennedy, 2020). Such products are based on Natural Language Processing (NLP) algorithms and have been targeted for domestic

use and household automation routine, surrounded by controversies around misogyny and surveillance (Strengers and Kennedy, 2020).

Resonating the AI technologies available in the design process, Mikšík and his co-authors observe that the current generation of voice assistants is “(...) limited in the sense that they are reactive, i.e., they ‘only’ respond to commands.” (Mikšík et al., 2020, p. 1). With this kind of technology, interaction is only started by users and the voice assistant would be restricted to single-task commands (Panarese et al., 2021, p. 1). Also, it would not be able to “(...) understand where they are, what else is in the room, how many people are around or how they interact with each other.” (Mikšík et al., 2020, p. 1).

In the context of an architecture office, a voice assistant would be able to perform organisational tasks, like scheduling meetings or booking appointments, and even offer assistance to the design process — as a search engine, for example. Researchers have been indicating that, to overcome existing constraints in the technology and make it more useful, it would require the voice assistant to be able to initiate interactions (Edwards et al., 2021, p. 1). The connectionist paradigm of deep learning algorithms would be able to infer users' routines and needs, providing the assistants the capacity of interrupting users to provide useful information, according to their context. This approach to the development of a ‘smarter voice’ assistant has been named ‘Proactive AI’ (Edwards et al., 2021; Mikšík et al., 2020; Panarese et al., 2021).

Considering the possibility of a proactive voice assistant to help the design process in an architecture office, we present next a speculative methodology that can test how this technology could be used to support counter-hegemonic design practices. To do so, we are interested in the possibility of deploying voice assistants with a design justice agenda, able to audit the design process, checking its positioning within the matrix of dominance.

## 2 Methodology

The current study is structured around user-experience design (Buxton, 2010) and design fiction (Minvielle; Wathelet, 2017) methodologies: while user-experience design presents a series of resources for modelling and prototyping interactions, design-fiction makes use of the intersection between design tools, scientific facts, and the fantasy imaginary provided by science-fiction to “(...) create prototypes of other worlds, other experiences and other contexts (...)” (Bleecker, 2009, p. 7), fostering the development of a critical eye in relation to possible futures.

As a technique capable of stimulating discussions about futures yet to exist, a visual prototype (de la Rosa; Ruecker, 2020) was made through the use of a storyboard drawing. Because it is mainly used in cinema productions, storyboards can depict temporal transitions, creating movement in the description of a scene (Buxton, 2010). As a counter-hegemonic methodology, the speculative exploration of possible futures does not intend to exhaust a subject, but to “(...) allow us to step outside reality for a moment (...) to test ideas, refute theories, challenge limits, and explore possible implications.” (Dunne; Raby, 2013, p. 80).

### 2.1 Scenario’s Context

As a context for the storyboard, we chose to simulate the participation in a design competition for a health clinic in the Gurugi area — a *quilombola*<sup>1</sup> region in northeast Brazil, at Paraíba state. This competition was chosen based on the possibilities of discussion regarding the use of probabilistic numerical AI models to deal with qualitative issues — such as the preservation of habits and traditions, which is guaranteed by law in this region classified as a Traditional Peoples and Communities Zone.

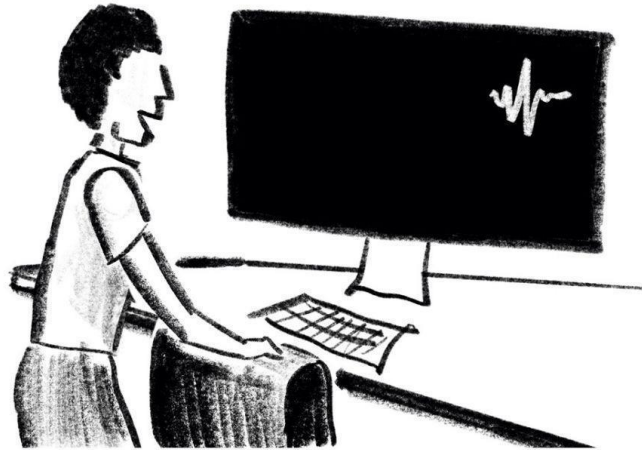
## 3 Results: Scenario

---

<sup>1</sup> During colonial times in Brazil, fugitive slaves would organize themselves in small communities called *quilombo*. They have survived on the basis of small farming and the occupied area usually presented difficult access, protecting it from slave-hunters (Britannica, 2016). Some of those communities have survived throughout the colonial period, and have been protected as a Brazilian cultural heritage, being named *quilombola* regions.

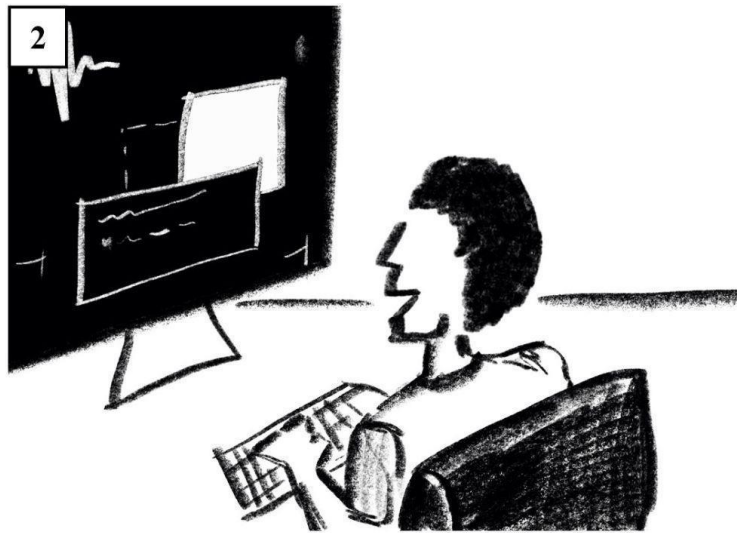
The scenario describes the following situation: an architect (Arthur) has just decided with his team that they will participate in a design competition. Their office is equipped with an AI system specialised in design, called Augmented Reasoning Query (ARQ):

1



**Arthur** (excited to tell some news)  
- ARQ!

**ARQ** (showing satisfaction in a reactive mode)  
- Hello, Arthur!



**Arthur**  
- We decided to do that health clinic competition.

**ARQ** (Excited in a proactive mode, and making a proposition)  
- Cool! Would you like me to prepare some design references?

**Arthur**  
- Yes! Identify the top 4 most similar ones and prepare analysis models for each.

**Fig. 1:** Architect Arthur wakes the ARQ system through a voice command. After receiving the information that they are going to start a new project, ARQ understands that one of the ways to start a design process is by searching for references. Therefore, instead of waiting for instructions, it suggests this activity to the architect, who confirms it and passes some general parameters. Source: Pereira. 2022.

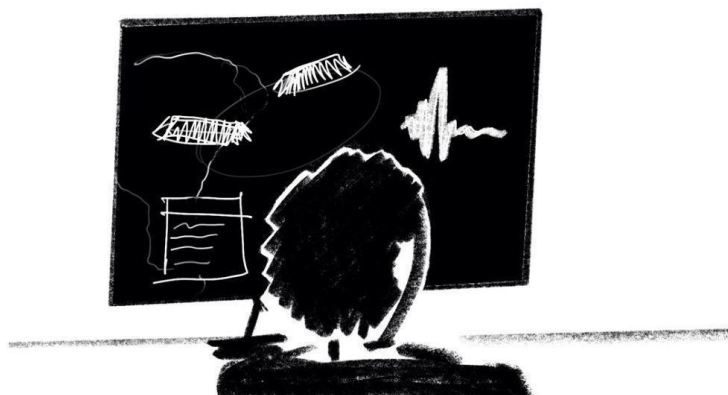
3



**ARQ** (now combining a Proactive AI mode of interaction with a lens of Design Justice)  
- No problem! In the meantime, I think these two pieces I found might be useful for you: the first is a report on indigenous medicine and Tabajara healing techniques, organised by the Anthropos Institute. The second is an article on African medicine by Prof. Jean-Philippe Poulain.

**Arthur** (doubting the information)  
- Interesting, but why do you think a French article on African medicine and a report on the Tabajara people would be useful for our project?

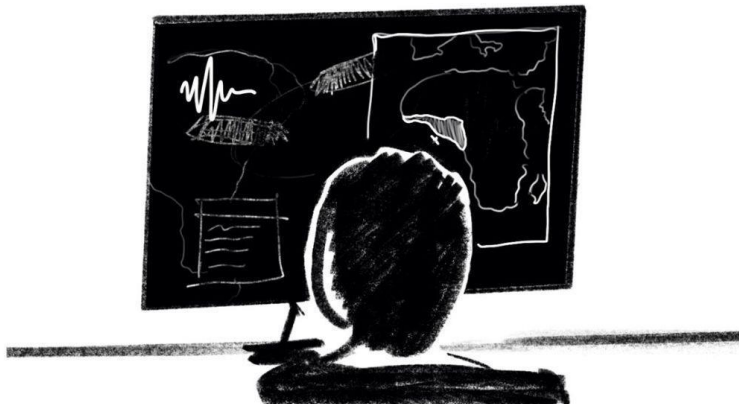
4



**ARQ** (calm)  
- According to the competition database, the region of Paraíba that we will be working on is a Special Zone of Traditional Peoples and Communities, granted to the Tabajara people in 1614 ...

**Fig. 2:** In frame 3, ARQ makes new suggestions, but this time the architect does not understand the relevance and asks for an explanation, which ARQ presents in frames 4 and 5. Source: Pereira, 2022.

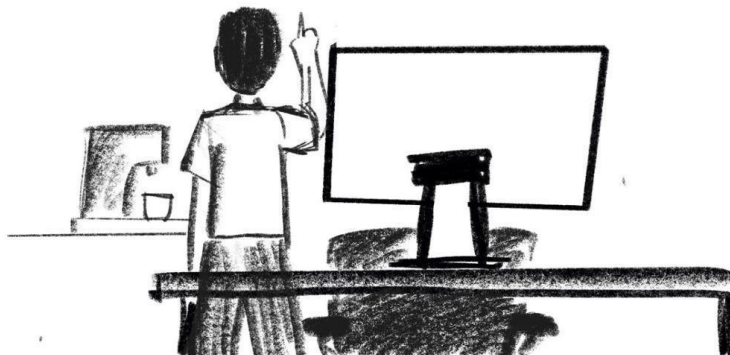
5



**ARQ** (calm)

- ... The database also mentions that this region was shared with Black people scaping from slavery in the sugar mills of Paraíba. According to my calculations and to these articles, the enslaved population in this period was kidnapped from the French and English colonies on the coast of Guinea, West Africa. Prof. Jean-Philippe Poulain's article talks about the ancestry of popular medicine in Senegal.

6

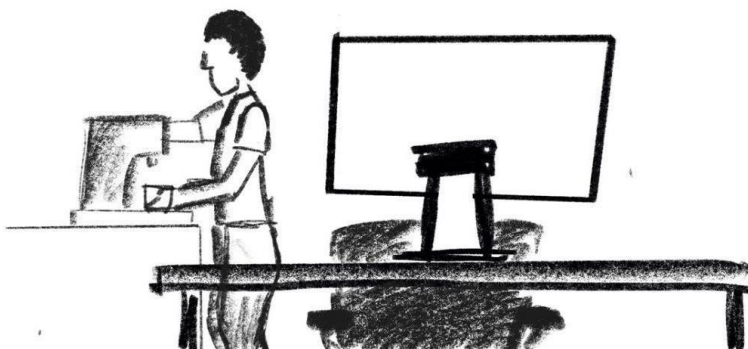


**Arthur** (positively surprised)

- Oh! I see. Now it makes sense!

**Fig. 3:** The architect understands the suggestion and then accepts it. He also leaves to do another activity (prepare some tea) while waiting for ARQ to do the search. Source: Pereira, 2022.

7



**ARQ**

- Arthur, I noticed that this is our first health clinic project. Would you like to talk to some colleagues who have already designed something similar? I found two partners that have already worked with projects of this kind: Beam Studio and Bricks Atelier.

8



**Arthur** (remembering uncomfortable situations)

- Oh no! Mary from the Bricks?! I don't get along with her... But maybe Ruth from Beam can help me with that. Besides being a great company, she is a great designer.

**Fig. 4:** In frames 7 to 9, ARQ suggests a meeting with other professionals who have more experience. Taking partners' projects as a basis, he finds two possibilities, one of them being adequate and the other being discarded by the architect. Source: Pereira, 2022.

9



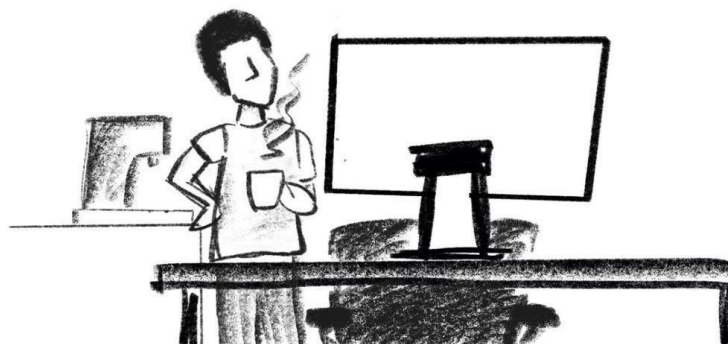
**Arthur** (changing the subject)

- Perfect. How is the search for the design reference going?

**ARQ** (with an air of doubt)

- Only a few more minutes to be concluded. Arthur, I'm having trouble finding data on the design competition's territory. It appears to be a non-digitized rural area. Would you like to schedule a visit in-person?

10



**ARQ** (excited)

- I will contact Beam Studio's virtual assistant and schedule an appointment. Should I book a meeting room or your favourite café?

**Arthur**

- I think a café would be better! We don't want Ruth to think this is a professional consultancy, she doesn't have time for such nonsense. Let's keep it friendly.

**ARQ**

- Right. Café 43 booked for Wednesday at 16:30. Beam Studio's virtual assistant will confirm Ruth availability by tomorrow.

**Fig. 5:** ARQ finds a limitation as the data available is not in a suitable format and indicates that action by the architect will be required to account for this limitation, with an in-person site visit. Source: Pereira, 2022.



11



**Arthur** (disappointed)

- Hm. It makes sense to go. But it will be an investment with no guaranteed return.

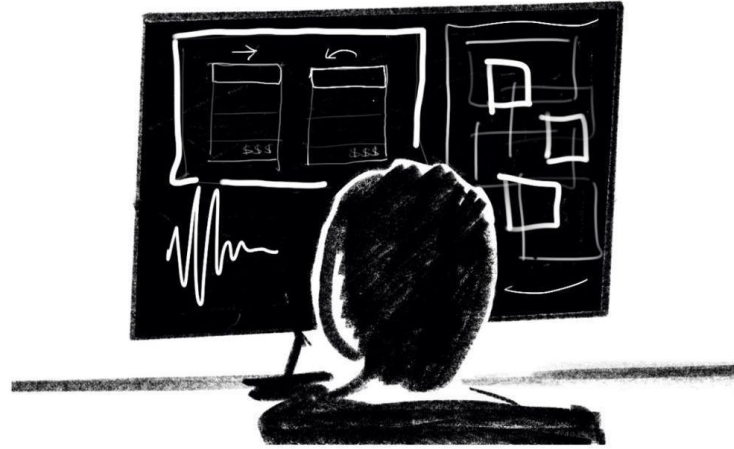
**ARQ** (sarcasm)

- I believe that all architectural design competitions are a type of investment without a guaranteed return, Arthur.

**Arthur**

- You're right. Remind me to talk to Carol about competitions ... But about the trip, we won't have a choice, ARQ.

12

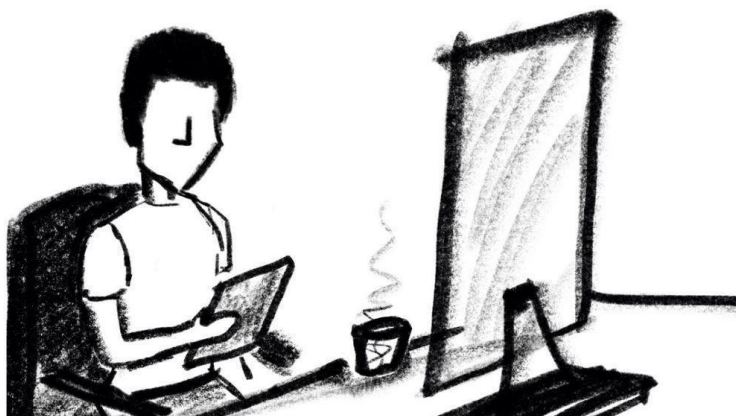


**ARQ**

- I found these tickets at a reduced fare for this period. Should I book?

Fig. 6: Frames 11 to 12  
Source: Pereira, 2022.

13



**Arthur** (tone of organisation and responsibility)  
 -Yes. And also transfer the pieces on medicine of the Senegalese and Tabajara peoples to my tablet. I can read them during the flight.

**ARQ** (excited by the end of the task)  
 - Right, ticked booked and files ready to read on your tablet ... Arthur, the analysis models you requested are now available. Your meeting with the design team is in 5 minutes. The architect Vinícius has asked me to inform you that he will not be able to attend.

14



**Arthur** (incredulous)  
 - Ah! Vinícius again?! What happened to him?

**ARQ**  
 - Hm. It seems that the public transportation lines between Vinícius' home and our office are operating with delays. Maybe that has affected his commute.

**Arthur** (accepting the situation in the face of evidence)  
 - Right. Memorize our minutes from today so he can keep track of the project's development.

Fig. 7: In frames 11 to 13, ARQ provides support in planning the field trip and at the end of the process informs that it has received a message from one of the team members. The architect asks a question regarding the message received and, without having a precise answer, ARQ uses available data to raise a possible answer. The interaction concludes with a request from the architect. Source: Pereira, 2022.

## 4 Discussion

The scenario presented in the previous section is able to trigger multiple discussions about the interactions between architects and voice assistants. Here, we are going to focus on discussions regarding the proactive behaviours that a voice assistant can perform and the possibility to use them as an intentional counter-hegemonic agenda.

### 4.1 Context Awareness

It is expected that a Proactive AI would be able to give useful information in the right moment, according to the context designers find themselves in. This would not be limited to simple event announcements, following the user's email or calendar, but would be extended to a social level of context awareness (Mikšík et al., 2020, p. 2). A proactive behaviour, as seen with ARQ voice assistant, could rely on external sensory data collection to understand user's different emotional states or focuses (Mikšík et al., 2020, p. 2).

It would be imperative for the voice assistant to acknowledge different phases of the design process, and to have timing for interruptions. The nature of a creative process implies a constant change in the levels of concentration, ranging from moments of individual/focus tasks to open collaborations or brainstorming with the team. As we can see in Figure 1, ARQ was able to identify which information would be relevant for the beginning of the design process (a search for references in other architectural projects), offering inputs for an initial ideation. Then, in Figure 2, ARQ evolves to a more sophisticated move, suggesting some texts for the architect. In this case, the suggestions made by ARQ were pertinent, a beneficial interruption aligned with the task performed at the time. As explained by Edwards, Janssen, Gould, and Cowan, small interruptions are the key to a kind of multitasking that involves switching from a main activity (e.g., design a building), to smaller activities connected to the main one (e.g., read about the local community) (2021, p. 2).

If the voice assistant fails to “read the room”, it risks creating unnecessary and annoying interruption moments that can compromise the design process. As Mikšík and his co-authors indicate: “The device has to understand whether it is convenient to notify the user now as it should not disturb or overload her with too many interactions when she is cognitively engaged (i.e., having a conversation or focusing her attention on some other tasks).” (Mikšík et al., 2020, p. 4).

Another aspect of context awareness would be about privacy. Imagine an omnipresent ARQ, when saying that one of the team’s members is going to miss a meeting, simply disclose private details about this person’s life: “My sensors indicate that he had consumed alcoholic drinks last night”, or “He has received angry messages from his partner”. We can see ARQ dealing with that at the end of the scenario, in Figure 7. This issue could grow from an individual’s private life level to sensitive information about the office, like sharing intellectual property data or announcing in the presence of clients how much money they are making with another project. In the proposed scenario, ARQ is able to recognize these subtleties and asks the architect what to do. For example, in Figure 5, when in doubt if the meeting with another architect (Ruth) should be more or less formal, ARQ does not assume one of them and asks the architect what to do.

## 4.2 Intentional Bias

A proactive voice assistant would be able to tease a design team with insights not anticipated or accessed by them. It could, for example, offer counter-hegemonic perspectives, expanding the limits of a team’s own position within the matrix of domination, offering reflections, or auditing the work that has been done through the lenses of Design Justice.

As discussed by philosophers of science like Winner (2020), artefacts or technical solutions have political dimensions related to its design process, integrating a group of people that will benefit from its use, and excluding the ones that would be prevented from using it. As pieces of digital technology, voice assistants would carry algorithm bias based on the dataset that has supported its deep learning process (Mittelstadt et al., 2016). Today, it is more common to find AI algorithms being called upon insidious behaviour that reinforces dynamics of privilege instead of disturbing them. What if, despite trying to remove harmful biases from algorithms, we could also “impregnate” it with an intentional agenda? In our case, a Design Justice agenda. As the voice assistant would be processing its multisensory data, interpreting conversations and physical interactions, it would be able to audit practitioners’ behaviour towards each other and external agents (e.g., clients, contractors, etc.), as well as interpreting if the design decisions taken by the team would be fair and just.

One of the guiding principles of Design Justice regards the respect and support of vernacular knowledge from indigenous and original communities, repositioning design as a non-extractivist and rather as a supportive practice to empower local communities (Costanza-Chock, 2020). As we can see back in Figure 2, ARQ contributes to the information used in the design process by suggesting readings related to the origins of the territory that would be impacted by the construction of the health clinic. Of course, a more collaborative approach could be envisioned, in which the local community would be integrated as leaders and co-designers of the process. Still, having a voice assistant nudging you towards responsible decisions can foster a behaviour change among designers involved.

As instantiated by He, Jazizadeh, and Arpan (2022) during a living lab experiment, it is possible to interfere with user practices and perceptions using proactive voice assistants. In the authors’ research, a nudge theory was used to explain how a provocative AI could be used “(...) as a bridge to facilitate users’ efforts towards energy and sustainability goals.” (2022, p. 395) It is possible to foresee then, that a Proactive AI can help in a behavioural transition that could disturb the matrix of domination, challenging structural inequalities, turning the design process more fair.

## 4.3 Beyond Design Practices

As a speculative technology, we could go further in the intentional Design Justice bias idea and start envisioning that, in the efforts to disturb the matrix of domination, a proactive voice assistant would be modifying the foundations of human-computer interactions: it would be challenging the current ‘master-slave’ condition of reactive AI systems. Instead of waiting for its ‘master’ to wake them up, when necessary, the Proactive AI would become an examiner of the projects being designed. It is not hard to imagine situations where it could raise meaningful questions about a project’s relevancy: “Do we really need to cut this tree to open space for a balcony? Why would we even need a balcony if there is a public park in front of the building?”

There are still technical limitations that sets us apart from that scenario. The current AI development paradigm, including AI-powered voice assistants, follows a connectionist approach called machine learning — which involves coding an algorithm able to statistically infer future states of an entity according to previous data collected from the same or similar entities, mimicking a process of “learning”. Let’s imagine ARQ, the voice assistant specialised in the design process. It has a primary dataset related to its functions as a designer’s assistant, but also the skill to collect new data and self-expand its primary functions accordingly.

What if ARQ starts presenting sexist behaviour, learned from sexist interactions dynamics inside the office? If a proactive voice assistant intends to defeat and challenge the matrix of domination, it should be inscribed in its code the ability to call out humans in the event of discrimination or any other form of abuse. The social skills used by humans to interact with AI are the same that they use to interact with other humans (Mikšík et al., 2020). Hence, what kind of behaviour voice assistant would be supporting if they passively accept abusive behaviour from humans? Or what kinds of abuse would the assistants be neglecting? We can see public opinion pushing companies like Amazon and Apple to work on making their smart assistants properly respond to sexual harassment and abusive behaviour (Fessler, 2018; Silver, 2018). Unfortunately, this kind of bias is embedded in the matrix of domination (Mullainathan, 2019), posing a challenge for the development and training of algorithmic technologies like a design justice voice assistant.

## 5 Final Considerations: General Challenges

This essay is a speculative work around the relationship between the bias produced or reinforced by human designers and their voice assistants. As we discussed, there is no tool or technology without bias. And if that is the case, what would be the effects of intentionally embedding a bias that aims for a more just society, such as the design justice agenda? Furthermore, we suggest an intentional bias as part of a Proactive AI approach that challenges the ‘master-slave’ interaction between humans and computers.

As pointed out by Mikšík and his co-authors: “Moving from reactive to proactive devices is challenging as it fundamentally changes the whole interaction process, requiring advanced cognitive capabilities of devices and to some extent also novel hardware.” (Mikšík et al., 2020, p. 4). A user interaction based on a proactive paradigm must take into account how little is known about how interruptive interactions should be designed (Edwards et al., 2021, p. 1) — and if we are producing a Design Justice voice assistant for architects, the inclusion should start in the core of its development, calling architects to co-design its interactions.

Far from being a definitive solution, Design Justice is an evolving framework to foster intersectional approaches in design. The goal would be to “(...) move beyond the frames of social impact design or design for good, to challenge designers to think about how good intentions are not necessarily enough to ensure that design processes and practices become tools for liberation, (...)” (Costanza-Chock, 2020, p. 6).

Recognizing inequality as a complex social structure, can help in the understanding that it is not easily tackled by simplistic solutions — like a proactive and provocative technology triggering users towards more beneficial actions. There is a need for extensive and long-term social and community-level approaches, able to disturb inequalities in the matrix of domination through engagement and co-design. The scenario proposed in this paper is all but the start of a dialogue towards those approaches.

## References

Bleecker, J., 2009. *Design Fiction: A Short Essay on Design, Science, Fact and Fiction*. Future Lab. Shop. Available at: <<https://nearfuturelaboratory.myshopify.com/products/design-fiction-a-short-essay-on-design-science-fact-and-fiction>>. [Accessed: 26 June 2021].

Britannica, T. Editors of Encyclopaedia, 2016. *quilombo*. Encyclopaedia Britannica. Available at: <<https://www.britannica.com/topic/quilombo>>. [Accessed: 9 November 2022].

Burry, M., 2013. *Scripting Cultures: Architectural Design and Programming*. John Wiley & Sons.

- Buxton, B., 2010. *Sketching User Experiences: Getting the Design Right and the Right Design*. Morgan Kaufmann.
- Calixto, V. C., 2015. A literature review for space planning optimization using an evolutionary algorithm approach: 1992-2014, in: *SIGRADI 2015 [Proceedings of the 19th Conference of the Iberoamerican Society of Digital Graphics, Vol. 2 - ISBN: 978-85-8039-133-6]* Florianópolis, SC, Brasil 23-27 November 2015, pp. 662-671.
- Carmo, M., 2017. *The Second Digital Turn: Design Beyond Intelligence*. MIT Press, Cambridge.
- Carmo, M., 2013. *The Digital Turn in Architecture 1992 - 2012*, Enhanced Edition. John Wiley & Sons, London.
- Costanza-Chock, S., 2020. *Design Justice: Community-Led Practices to Build the Worlds We Need, Information Policy*. MIT Press, Cambridge, MA, USA.
- de la Rosa, J., Ruecker, S., 2020. *Using prototypes to produce high-resolution systemic future maps: a proposed model for design research and knowledge*, in: *Bitácora Urbano Territorial*. Presented at the 3rd. International Design Research Congress, Bogotá, Colombia, pp. 87-100.
- Dunne, A., Raby, F., 2013. *Speculative Everything: Design, Fiction, and Social Dreaming*. MIT Press, Cambridge.
- Edwards, J., Janssen, C., Gould, S., Cowan, B. R., 2021. *Eliciting Spoken Interruptions to Inform Proactive Speech Agent Design*, In: *CUI 2021 - 3rd Conference on Conversational User Interfaces*. pp. 1-12. <https://doi.org/10.1145/3469595.3469618>.
- Fessler, L., 2018. *Amazon's Alexa is now a feminist, and she's sorry if that upsets you*. Quartz. Available at: <https://qz.com/work/1180607/amazons-alexa-is-now-a-feminist-and-shes-sorry-if-that-upsets-you/>. [Accessed: 12 August 2022].
- He, T., Jazizadeh, F., Arpan, L., 2022. *AI-powered virtual assistants nudging occupants for energy saving: proactive smart speakers for HVAC control*. *Build. Res. Inf.* 50, pp. 394–409. <https://doi.org/10.1080/09613218.2021.2012119>
- Lynn, G., (Ed.), 2013. *Archaeology of the Digital*. Sternberg Press, Berlin.
- Mikšík, O., Munasinghe, I., Asensio-Cubero, J., Bethi, S.R., Huang, S., Zylfo, S., Liu, X., Nica, T., Mitrocsak, A., Mezza, S., Beard, R., Shi, R., Ng, R., Mediano, P., Fountas, Z., Lee, S., Medvešek, J., Zhuang, H., Rogers, Y., Swietojanski, P., 2020. *Building Proactive Voice Assistants: When and How (not) to Interact*. ArXiv.
- Minvielle, N., Wathélet, O., 2017. *Le design fiction Une methode pour explorer les futurs et construire l'avenir?* *Futur. Anal. Prospect.* 2017, pp. 69-83. <https://doi.org/10.3917/futur.421.0069>
- Mittelstadt, B.D., Allo, P., Taddeo, M., Wachter, S., Floridi, L., 2016. *The ethics of algorithms: Mapping the debate*. *Big Data Soc.* 3, 2053951716679679. <https://doi.org/10.1177/2053951716679679>
- Mullainathan, S., 2019. *Biased Algorithms Are Easier to Fix Than Biased People*. N. Y. Times.
- Natividade, V.G., 2010. *Fraturas metodológicas nas arquiteturas digitais*. Master's thesis. Universidade de São Paulo, São Paulo.
- Panarese, P., Meraglia, E., Vergallo, R., Mainetti, L., 2021. 'Enhancing Voice Assistants: A Proactive Approach', In 2021 6th International Conference on Smart and Sustainable Technologies (SpliTech). IEEE, pp. 1-4.
- Pereira, V. J., 2020. *Alteridade digital no processo de projeto: estudo sobre a interação entre arquiteto e inteligência artificial*. Master's thesis. Universidade de São Paulo.
- Silver, C., 2018. *Stop Being Rude to Amazon Alexa, Carol*. Forbes. Available at: <https://www.forbes.com/sites/curtissilver/2018/02/13/stop-being-rude-to-amazon-alexa-carol/>. [Accessed: 12 August 2022].

Strengers, Y., Kennedy, J., 2020. *The Smart Wife: Why Siri, Alexa, and Other Smart Home Devices Need a Feminist Reboot*. MIT Press, Cambridge, MA, USA.

Winner, L., 2020. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. 2 Ed. Chicago: University of Chicago Press.