

Metaphor Gardening: Experiential engagements for designing AI interactions

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Abstract: Designers deploy metaphors in various constructive ways but there is a challenge in noticing and selecting helpful metaphors to describe AI systems. Metaphors serve to highlight certain aspects of AI but their influence can be so potent that envisioning or discussing AI in alternative ways becomes challenging, with unwanted expectations, lazy tropes and hidden biases. Alternative metaphors help designers grasp distinctive qualities of AI and move past hidden assumptions. Hence, it is key to support designers in precise, plural and intentional metaphor use to grasp unique qualities of AI and explore its relationalities. We illustrate this through a selection of prototyping journeys in which metaphors directly shaped students' design trajectories and allowed them to explore the relational, entangled complexities of AI systems. Finally, 'metaphor gardening,' provides a series of recommendations for designers when designing AI with metaphors, which we hope can ultimately support a generative and responsible approach to AI technologies.

Keywords: Artificial intelligence; interaction design; metaphors; prototyping

1. Introduction

The way we think about technology changes both our approach to it and the things that we make with it. As Haraway puts it: "It matters what matters we use to think other matters with; it matters what stories we tell to tell other stories with" (Haraway, 2016 p. 16). With artificial intelligence escaping the realm of data science and engineering, creative practitioners are reinventing it as a material with which to create. Whether text, code, or images, an explosion of 'at-hand' possibilities is now available to 'anyone' who can put text into a box. This is a delicate moment - "the tools that are used in discourse reconfigure the world, constraining and enabling what can be said" (Barad, 2003) - and it is clear that these tools are complex and powerful, but also opinionated, brittle, biased and extractive. Within the design of interactive technologies, Jung et. al (2017) describe this as a semantic turn: metaphors are used to illuminate the networks of meanings around complex interactive objects as well as



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articulating their interactional affordances, shaping the 'surface, behaviour and system[s]' being designed.

Contribution

Starting from the idea that metaphors shape technology design, and working with AI in particular (Murray-Rust et al., 2022), this article explores what happens when we use metaphors as part of the design process. What happens when designers entangle the morphologies and affordances of interactive artefacts with the distinctive semantic way they appropriate and make use of AI technologies. How do metaphors support bundling together certain sets of functionality with particular kinds of relations. Overall, accepting that metaphors are powerful, we ask where do the metaphors support the design process? where do they impede it? and, what does it look like when designers find appropriate metaphors to advance their thinking about interactions and relations?

To engage fruitfully with this space, we introduce 'metaphor gardening' as a reflective practice to support the design of interactions with AI. After engaging with and reflecting on a large number of student projects, we describe a small selection here to articulate how metaphors can inform a designer's engagement with AI in the context of prototyping and conceptualising. We identify structures that seem useful or stifling, and the features that they may have. We look not just at the final results, but at the images and concepts that the students used throughout their thinking. We illustrate and unpack how critically engaging with metaphors consciously, plurally and dynamically, helps to engage with unfamiliar complex technology. In particular, through positioning 'metaphor gardening' as a practice of exploring different conceptualisations of technology, we highlight that metaphors are a key part of prototyping the relations that interactions lead to.

Background

Designers making sense of AI

There are many approaches to making sense of artificial intelligence and machine learning (AI/ML), from explainability (Ehsan & Riedl, 2020) to experiential methods and artistic practice (Caramiaux & Alaoui, 2022; Hemment et al., 2022; Nicenboim et al., 2022).

There is a need to develop methodologies and practices that help to prototype and explore infrastructure that reflect both what we can make with AI, and findings for AI developers (Stoimenova & Price, 2020). Working with AI is more than the technical: it has to account for the entangled nature of technology (Giaccardi & Redström, 2020), and design practice is well placed to develop conceptualisations of AI as socio-technical assemblages (Cavalcante Siebert et al., 2022; Nicenboim et al., 2022). In contrast to careful approaches to visual design around AI (e.g. Lindley et al., 2020), dominant imageries depict stereotypical ideas of AI as 'humanoid robots, glowing brains, and outstretched robot hands' (*Better Images of AI*, n.d.). Such conceptualizations add up to the difficulty of fully grasping the mechanisms, ca-

pabilities and implications of AI systems. Outside working with recent development in language models, existing designerly approaches are limited by the opaque technology, the difficulty of understanding of particular algorithms or systems. For example, approaches to sketching using storyboarding break down, requiring the development of new techniques (Yang et al., 2019).

Approaches are emerging to allow for semantic and expressive practices grounded on experiential and tangible exploration of AI, exemplified by a profusion of projects. Murray-Rust et al. (2023) describes a selection of experiential exercises for designers to engage with AI technology; Lupetti and Romagnoli developed MLTK-01, a physical computing toolkit that tangibly articulates the process of machine learning model development and deployment (Lupetti & Romagnoli, 2021); Ghajargar's Graspable AI moves from explanation to physical forms (Ghajargar et al., 2021, 2022); Jansen's Mix & Match Machine Learning Toolkit (Jansen, 2021) maps data possibilities to algorithmic capabilities in support of designing interactions. More conceptually, diffraction emerges as a way to bring social reality to data practices (Sanches et al., 2022) and to shed light on the computational materiality of machine learning (Scurto et al., 2021); AI is brought into everyday creativity and critical making (Reddy, 2022), challenging stereotypical representations; algorithmic errors are reconceptualized into misunderstanding and misunderstandings can become themselves opportunities for explainability (Nicenboim et al., 2023).

Metaphors and AI

The use of metaphor around AI is not new - the term 'artificial intelligence' itself is metaphorical, just as 'neural network' conjures the idea of human brains rather than collections of linear algebra. After Lakoff and Johnson unpicked the weaving of metaphor through everyday discourse (Lakoff & Johnson, 1980), Agre leant heavily on metaphor to develop the idea of artificial intelligence as a material practice - governed by the possibilities of matter to be enlisted in computation. He pointed to the central challenge: each metaphor is a way of thinking into the technology, and there are "parts where the theory holds well, and parts where it breaks down – the centres of well behaved, theoretically explained phenomena, and the margins of the unruly, peripheral and unconsidered" (Agre, 1997, p. 43). Going beyond the abstract conceptual integrations of Falconnier and Turner (2003) and the 'blends' of Imaz & Benyon (2007), there is a path to the explicit use of metaphor in product design (Cila, 2013). Metaphors work as creativity support, generating new ideas (Lockton et al., 2019) and mapping internal states into tangible physicalizations (Ricketts & Lockton, 2019). They connect to new technologies, unlocking the potential of human robot relations as superhero sidekicks (Luria, 2018) or exploring metaphorical spaces (Alves-Oliveira et al., 2021).

AI in interactive technology has increasingly human-like capabilities (Yildirim et al., 2023). Machines understanding speech, recognising faces, divining emotional states and so on are often described with metaphorical language that highlights the similarity to interactions we take for granted, without examining assumptions and stereotypes. Well chosen metaphors

hold a great potential to support creative and exploratory prototyping with AI systems (Murray-Rust et al., 2022) - for example, Dove's casting of ML capabilities as monsters (Dove & Fayard, 2020) gets to grips with the peculiarities of the technology, Benjamin et. al (2023) highlight relations with camera metaphors and Lupetti and Murray-Rust explore 'enchantment' as a lens for the design of AI enabled products (Lupetti & Murray-Rust, 2024). Beyond designers, metaphors can change expectations and experiences for end users: changing the 'conceptual metaphor' of a chatbot changes perceptions of both warmth and competence (Khadpe et al., 2020), changing the metaphor from which a conversational agent is designed changes what can of relations people can have with it, and aid in situating them (Nicenboim et al, 2023). While the metaphor of data as the new oil brought a particular mindset to bear, critique of those metaphors (Watson, 2015) and emerging metaphors such as Vallor's 'AI Mirror' (Vallor, 2022) can shape social views on technology in new directions.

Course and Context

This work focuses on the exploratory use of metaphors for making use of AI, illustrated through reflecting on the projects that design students carry out, in particular projects that explore the expressive possibilities and socio-technical intricacies of AI technology. We analysed materials from a first year Masters course in the Design for Interaction programme at Technische Universiteit Delft, Netherlands that introduces students to prototyping with interactive technologies. The course involved 28 teams of 3-4 students prototyping speculative experiences with some form of interactive AI/ML (Figure 1). They used a range of prototyping techniques to bring their concepts to life, from roleplay to code, building on tutorials on gesture recognition with Edgempulse, conversational agents with VoiceFlow and image recognition with Teachable Machine. As background to the current work, we carried out a detailed analysis on the course based on interviews with students and coaches as well as the material they created, which is published in Murray-Rust et. al (2023).

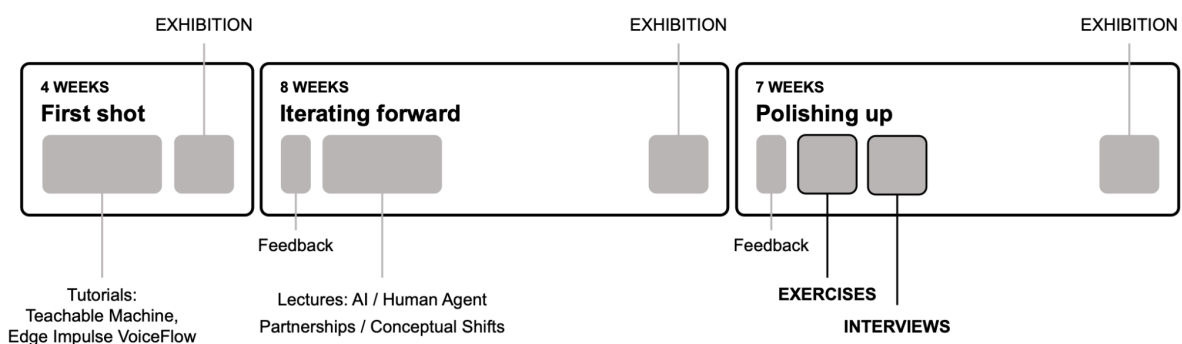


Figure 1 - The course ran in three phases: familiarisation with AI and technology, Concept development and Refinement, with an exhibition at the end of each stage. Client companies were invited at the end of each stage to provide feedback to the student teams deliverables, organised in the form of an exhibition with interactive prototypes.

Metaphor Shifts

Students were generally sensitised to the possibility of metaphors to explore technology through conversations with their coaches. In addition, the 'Metaphor Shifts' method (Figure 2) was introduced as part of a selection of experiential exercises to help students translate theoretical concepts in AI research to design practices. Others exercises focused on responsibility, more-than-human viewpoints, agency of objects and more (Murray-Rust et al., 2023). The exercises were designed so that students could perform them quickly and autonomously across a range of topics and levels of technical accomplishment. Metaphor Shifts outlines a process that starts with looking at the current metaphors used within the team, visualising them, and then drawing out the implications for design. These metaphors are then swapped out for others - potentially surreal - to explore alternative conceptualisations and sets of expectations – for existence, reframing the 'friend' metaphor used in a companion for 'pet', 'coach', 'monster', 'seaweed', 'mycelium' and so on.

ITD

TIME
45 minutes

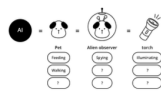
SUITABLE FOR
Any project

Metaphor Shifts

Metaphor Shifts

PROCESS

Think about metaphors to describe your AI and draw them (10 min)
Look at your system. What metaphor would you use to describe the AI? Is it a friend, a judge, a pet, a ghost? Make a simple drawing to represent each metaphor.



Choose one and reflect on how you would design systems based on this metaphor (10 min)
What does it imply? e.g. a pet needs feeding, a ghost is creepy. Can you use the metaphor to emphasise different parts of your design?

Now think of a completely different metaphor (15 min)
For example, what if your pet was instead an alien observer? What if your radio was a lantern shining light, or your snowboard was a magic wand? What new implications would come up?

Now try some more! (10 min)
It could be a mixture of sensible and surreal.

BACKGROUND

The metaphors that we use change the way that we build with technology. Structural metaphors link concepts together – 'demolishing an argument', spatial metaphors provide orientation – feeling 'up', ontological metaphors make concepts real – 'inflation is taking its toll'. The practices of machine learning and artificial intelligence draw heavily on metaphors: the neural net is an analogy between a collection of linear algebra and human thinking, or the idea of 'learning' as a shorthand for the operation of a backpropagation algorithm over those networks. These shape the way we think – 'training' a model has a very different feeling to 'fitting' it to a collection of data. New metaphors give us new ways to think.

REFERENCES & EXAMPLES

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- Alves-Oliveira et al. 2021. Collection of Metaphors for Human-Robot Interaction. <https://doi.org/10.1145/3461778.3462080>

Figure 2 - The Metaphor Shifts card, contained a title, a short description and instructions on how to execute the exercise, a background section describing the intent, usefulness and ideas behind the exercise and references to papers and related projects.

Projects and their metaphors

The work in this article is a reflective synthesis across the projects from this course. In the course of developing the analysis in Murray-Rust et. al (2023) we found a particular phenomenon which warranted further investigation. In this paper we engage with these observa-

tions in the spirit of an annotated portfolio (Bowers, 2012; Gaver & Bowers, 2012), presenting an argumentative account of particular uses of metaphors in making sense of AI. The projects we discuss are not selected for being the most polished, nor the most conceptually developed. Instead, we look for projects that exemplify particular 'metaphorical dynamics' that we observed through the course and subsequent analysis. We annotate images of each project with an overview, description of the final form, and the metaphorical dynamics that played out.

Project 1 - Lumi

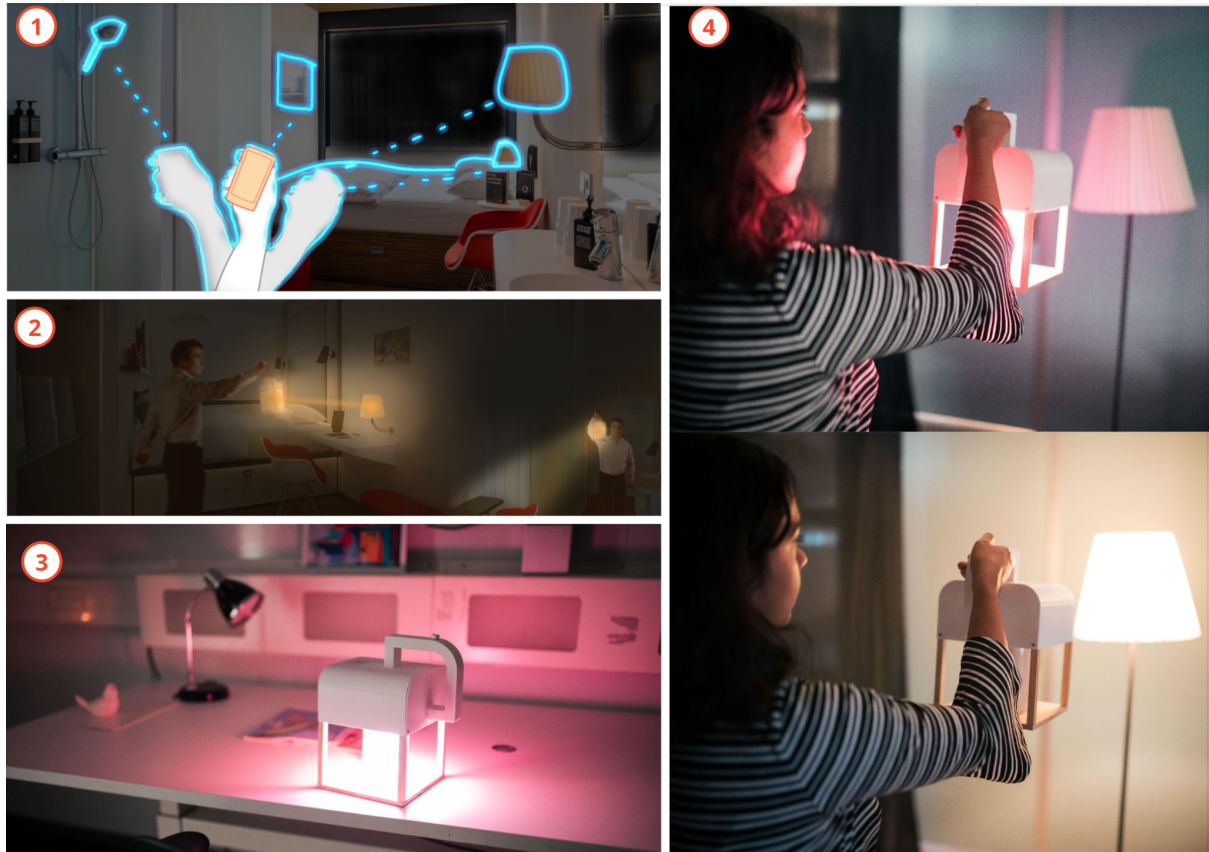


Figure 3 - A selection of images from Lumi, showing (1) sketch of the early connectivity metaphor; (2) mockup of the lantern metaphor; (3) final prototype; and (4) effect of using the prototype

Overview: Lumi (Figure 3) is a lamp that tries to move hotel guests towards sustainable, less energy consuming behaviour, with an initial design goal of how to navigate a darkened hotel room with only limited control of light. Negotiating with the room for light evoked dilemmas of control and privacy, as the students imagined AI embodied within the room monitoring the visitors' movements and guiding the visitor to specific lit-up areas. Exploring a different sense of control, while exploring the similar aesthetic qualities of beams of light in a darkened hotel room, the student team searched for suitable metaphors, in the form of magic wands and lanterns. From this particular metaphor an experience emerged where the visitor

uses a lantern with a limited amount of energy to ‘beam’ that energy to specific appliances and areas of the hotel room to activate lamps and other utilities. The metaphor helped the students to locate the viewpoint of the machine intelligence within the interaction: rather than having a computer vision system in the room, tracking the objects to support the interactions, they placed it inside the lantern, which would recognise markers around the room.

Final form: The experiential prototype used a mobile phone running object recognition to recognise which object the lantern was pointed at. They tested this mechanism, and explored how this positively influenced a sense of control and privacy for the visitor, moving away from a hotel room augmented with cameras to an interaction where the user controlled the camera’s gaze.

Metaphorical Dynamics: The metaphor was critically used as a way to explore relations between humans and energy - it allowed for physical characterisation, and supported the design of the ‘sending’ or ‘casting’ affordances, where the tangible object gave energy to particular systems in the hotel room (Schrøder et al., 2023). It took the students somewhat naturally into a more-than-human design perspective (Giaccardi & Redström, 2020; Nicenboim et al., 2020), developing facility with the object’s viewpoint, both on a technical level – ‘we recognise where it’s looking by putting a camera *inside* the lantern’ – and on a relational level to think of energy as an entity that could be moved around.

Project 2 - A closer look

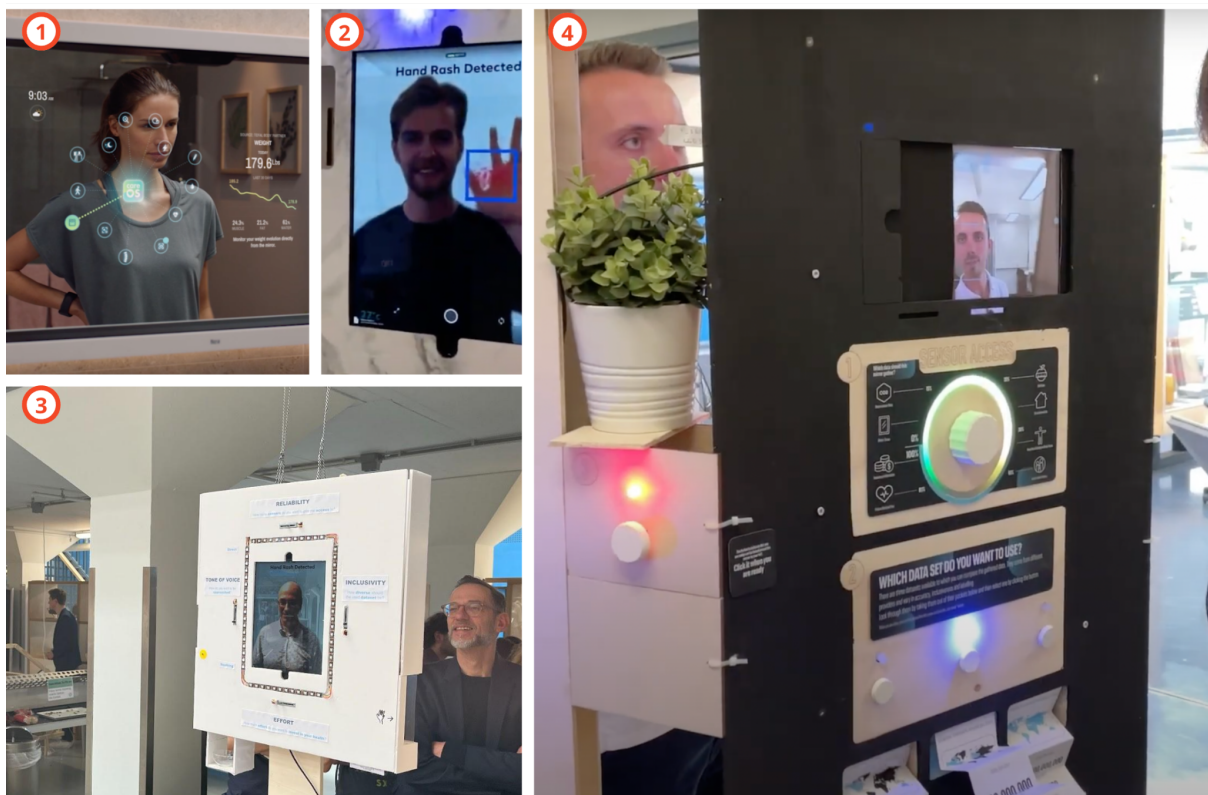


Figure 4 - Selection of images from A Closer Look, showing (1) conceptual development (2) close up of simulated AI detection of a skin condition; (3) interaction with an early prototype and (4) interaction with the final version

Overview: ‘A closer look’ (Figure 4) communicates the intricacies of the emerging relationships between humans and AI to a broad audience. The team started from roleplaying to change boundary settings between humans and AI, investigating emotional relations and using predictive qualities of AI in the context of sharing personal data. This prediction led to a critical look at smart mirrors, often perceived as part of an ecology of smart devices that can assess and advice on one’s personal health.

Final Form: Developing the metaphor, the team explored both the front as the back side of a smart mirror. The front side allowed the visitor some control of tone of voice, reliability and privacy when going through a daily check of health, while the back side provided insight into what data is accessed and how it is used. The visitor at the back could choose from different data sets, influencing the experience of the visitor at the front by reflecting specific health warnings in the mirror.

Metaphorical Dynamics: The metaphor appeared in the early stages of the project as a direct import of an existing idea – the smart mirror – and was not seen as being particularly metaphorical. However, as the project developed its critical slant the metaphor became more generative, speculating on how the power dynamics work, and how these can be manipulated. As with Vallor (2022), the question arises about what the mirror reflects, and how truly it does so – as many of the data driven systems are based on data about humans, they are intended to create reflections or images of society. In addition, the question of what is behind the mirror takes it into the realm of one-way mirrors in observation rooms, questioning what happens behind the scenes. It played out both physically in the design of the artefact, and conceptually in the question of how things are reflected technologically. The mirror became a way to develop an interface effect (Galloway, 2012) that was actively meditating between the person stood in front of it and a shadowy collection of data and organisations hidden backstage.

Project 3 - Reflection through Collection

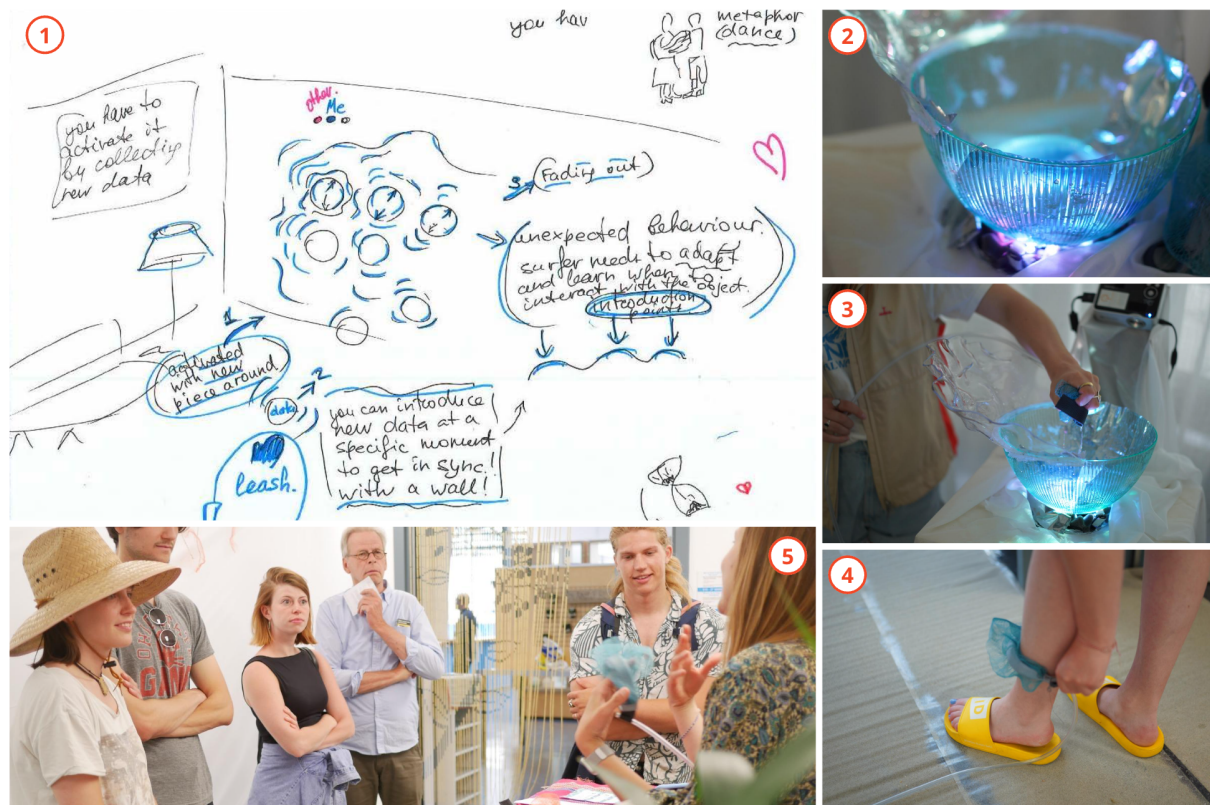


Figure 5 - Selection of images from Reflection through Collection, showing (1) initial conceptual sketch of the project; (2,3) the final object used for the data washing ritual; (4) the metaphorical data collection leash; (5) a particularly summery discussion around the experience.

Overview: Reflection through Collection (Figure 5) focused on motivating surfers to participate in the collection of data about the ocean, reflect on how it changes over time, and imagine ways to protect and preserve it. It started out exploring ways that sensors could be integrated into clothing and equipment, and drew on surfer's existing practices for communicating danger. They envisioned a especially designed leash, that collected data on water temperature, pH level and so on, becoming part of the surfer's everyday activities and connecting to the community.

Final form: Using the daily ritual of washing and rinsing equipment as a metaphor, the team switched to passive, local data collection. The data is then shared by being 'washed' away from the leash, creating a reflective moment for creative visualisation of the data, and a connection in to the analysis and sharing of information.

Metaphorical Dynamics: 'Reflection through collection' started as a very literal project. For the first 10 weeks, the projects concepts revolved around data collection, how to communicate that to users, and how to encourage participation. While they discuss a 'holistic experience', the ideas recorded in their timeline in this period stuck closely to standard sensor and display modalities. After working with metaphors, in the second half of the course, the range of physical forms grew, as did the thinking around relations to the wearers - in particular, the

idea of a cleaning ritual helped to draw connections to lives and practices, while also relating to the idea that data adheres to people, along with the seawater, and can be washed into the discourse. The metaphor helped them to move past a certain conceptual stage, while getting closer to properties of the technology, and led to the final concept of public data washing as a way to build community around water pollution data.

Project 4 - The Shell

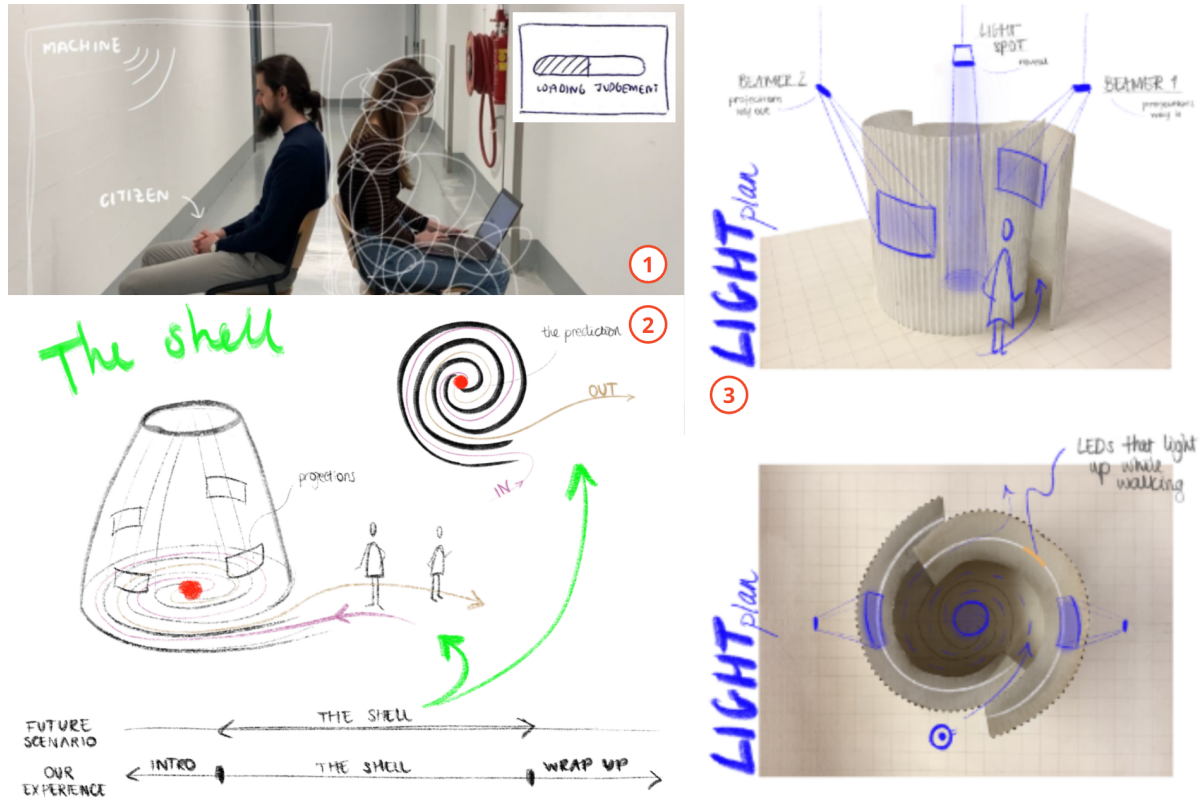


Figure 6 - Selection of images from *The Shell*, showing (1) initial concept sketch of human machine judgements; (2) conceptual design for the final installation; (3) scale model of the final installation

Overview: The Shell project (Figure 6) started in the space of AI and judgement, asking questions about what would happen if human judges were replaced by algorithms, and in particular, what the interaction around mechanical sentencing would be. The group looked to physicalise the decision process, taking a tour through DNA evidence and walking to different parts of the sentencing apparatus. This led into speculation about how various kinds of data could be brought in to augment and sit around the judgements, such as imagery, emotions and memory, as well as the relation between shared data collection and spying

Final form: Halfway through the project, the idea of 'The Shell' arrived. It turned the physicality into a tour through a concentric spiral, with a point of prediction and judgement in the centre. There was also a shift from thinking about judgement for criminal transgressions and more to a question of how one was contributing to society, and what could be improved - a yearly, mandatory coaching session. This resulted in a 10m diameter spiral, with projection,

spatial audio that walked participants through a yearly check in, asking them about various aspects of their lives and giving algorithmically mediated advice and instruction about how to live their next year.

Metaphorical Dynamics: With *The Shell*, the metaphor played out somewhat differently. It was a strong physical spatial metaphor, that appeared relatively early in the process. Here, the metaphor mostly had an effect by determining the physical form of the work - a double spiral: it was morphological rather than semantic (Jung et al., 2017). There was not a strong connection to other aspects of ‘shellness’ - it was not seen as a home to live in, or as protection from the outside, or an external skeleton that helps the squishy bits to work well, although there was an idea of resilience in the final description. There was also less connection to the possibilities of the technology, so it did not advance the technical relations. This is not to say the project as a whole did not work, but in this case the use of metaphor did not seem to help, and may well have hindered the development, as particular aspects of the image took over the design.

Discussion - exploring metaphor gardening

The experiences the students had with metaphors raise the question of what makes a good metaphor for working with AI, and what leads to challenges - where and how do they help, and what are the journeys they promote. We saw many different kinds of metaphoring, – both in using different metaphors, and in different ‘modes of explanation’, highlighting physical similarity, conceptual congruences, functional equivalences or something more poetic. The work seen here largely avoids the technicalities of AI systems – in the terms of Murray-Rust et. al (2023) it deals less with the direct *interactional affordances* of AI, and more with *AI relationality*, giving a space to explore the relations possible with these technologies. It gets into questions such as: How do we read this techno-imaginary landscape to carry out wayfaring (Ingold, 2015) and unfold the design process in correspondence with possibilities and limitations of technology? How do we *co-perform* (Kuijjer & Giaccardi, 2018) technological explorations with metaphors as active partners and bring them into our *repertoires* of practices (Oogjes & Wakkary, 2022)? The image we use here is of ‘metaphor gardening’ - selecting and nurturing metaphors for their particular qualities and vitalities.

Metaphorical Dynamics

The projects here had dynamics and trajectories, as teams adapted their metaphors to follow their conceptual and technological developments. The LUMI team initially wanted to create a human relation to the technology they were engaging with, so used a shared interest in the world of Harry Potter as a source of potential metaphors. This meant that they had a palette of characters and objects to work from, which broadened the scope of what technology might do for them. Beyond the projects shown here, one group shifted from their default metaphor for an in-car system of “AI as Buddy” to one involving mycelium, it changed the physical manifestation, as the sense of agency was distributed through the vehicle. It

also helped them develop a more-than-human, decentered perspective on how the technology related to drivers and passengers, getting past the obvious tropes that they had been working with. Other groups working saw the possibility of AI mediated communication with plants by following a chain of metaphors from babysitting to delivery; brought in the metaphor of 'pulling up a hood' for triggering playback of found sound in intelligent clothing; found the edges of their system when looking at characterful personal medical image capture.

Connective Tendrils

Since metaphors can be used on many levels, they have the potential to connect between different ways of working, for example, moving from very abstract dimensions to functional aspects. Visual metaphors can give form to ideas, but also bring in a collection of functional possibilities and implications. Linguistic metaphors can emerge as a way to describe the feeling of an interaction, or particular functions and qualities, but then give rise to images and form and spark changes in materialisation. This turns out to be a useful approach to the issue of 'capability uncertainty' (Yang et al., 2020), where a lack of clarity about the capabilities of technology poses a problem for designers. The metaphors used to describe projects have implications about the capabilities needed, which helps to creatively think into technological possibilities in a familiar manner. From this base, they could then see which parts were achievable – or fake-able – rather than having to work outwards from the mass of technological functionalities. Metaphors can build bridges between the technological affordances of AI and the interactions, enacted, relational questions of design.

Cut Stems

There were times when metaphors led the students astray. This is not a critique of the projects themselves, but a look at whether metaphors helped the process or not. Metaphors could be counterproductive darlings: compelling, but not useful, and hard to let go of. This seemed to happen for several reasons. When the metaphor and the technology were both uncertain, or too conceptual, there could be a lack of structural commonalities to draw on - creating "an AI system that was a spiritual experience" meant a lot of work had to be carried by the storytelling, and it did not shed light on the technology relations. In other cases, the structures proved to be too rigid - using the spiral shape of a shell to define the interaction did not help to think into what the interaction should be, but gave a very strong frame for its spatial execution.

Fertile Grounds

The metaphors that needed a lot of work to sustain – a lot of fertiliser – or that took over the storytelling without a link to the technological affordances tended to make it harder for the students to find resonant possibilities. Talking about the process as a whole 'AI as a spiritual experience' seemed more challenging than interactional metaphors 'A lantern full of energy' or 'washing out the data'. Conversely, some of the more leftfield metaphors worked well both as design inspiration, suggesting alternative ways of thinking, and as a *fil rouge* to

draw a participant through the experience. Using metaphors consciously gave the students the chance to examine the level of abstraction they wanted to work with: designing a smart mirror through the interaction metaphors available versus using a reflective surface metaphor to work with the idea that AI is a reflection of ourselves. That also allowed the students to judge which parts were useful. The dynamics of moving from an unarticulated design proposition 'The AI is a <X>' to understanding the qualities of <X> and maybe trying <Y> and <Z> to explore alternative interactions with AI allowed several groups to advance their concepts.

Shifts between human and nonhuman seemed particularly productive - 'buddy' to 'mycelium' captured the more-than-human qualities of AI systems, while ditching many common tropes and stereotypes. Bringing together companion species of metaphor created fertile ground, mediating between the interactional qualities of the experience and the affordances and peculiarities of the technology being explored.

Varietal Selection

A challenge in explainability is to support people to properly adjust their trust towards AI in a contextual way, by knowing the system's limitations - calibrating reliance and understanding failure modes in human terms. In this regard, can metaphors help us to communicate these brittlenesses? This seems urgent now, as we need to socially grapple with the implications of technology. Chiang's recent piece casting ChatGPT as a blurry photocopier (Chiang, 2023) is a powerful rhetorical device – just as the Stochastic Parrots before it (Bender et al., 2021). It captures some of the key issues and limitations of the technology, while of course, glossing and marginalising others. The interest here is in what can be done through design – the metaphors used to conceptualise, develop and explain interactive technologies. Every metaphor highlights an aspect of the design; bringing the metaphor into the storytelling practice helps to critique, but can also help designers recognise new affirmative directions. If AI grows like a spider, it highlights its pervasiveness and can provoke a reflection about creepiness; if instead, it grows like a kombucha scoby (Nicenboim et al., 2023) it can be trained, drunk, exchanged and so on allowing people to become active in the growth and development of an AI system, even if they could not fully comprehend what the system was doing. We would argue that metaphors are to relational design as personas are to product or service design: where a persona brings in a bundle of somewhat idealised needs and desires for functionality, metaphors bring in bundles of relations. This implies that we should not push them too far – just as we do not assume personas are real people, but synthetic users we might design for, metaphors are fictionalised bundles of relations that we might hope to engender. So, by carefully selecting the varieties of interest, we shape the metaphors that we hope for, through the course of an engagement with AI.

Recommendations for Metaphor Gardening

The first and most direct recommendation we would give for gardening the metaphors used in a project is the Metaphor Shifts exercise from Figure 2 - we have tried this on multiple

projects and processes, and it consistently produces interesting and useful results in a very short timeframe, for both students and experienced practitioners. Beyond this, in line with the discussion section above, we suggest five particular practices that can deepen the engagement with metaphors:

1. **Keep an eye on blossoming metaphors.** Some metaphors are intentional, some accidental, some linguistic, some visual. Notice what is present, at various scales and modes of explanation, and how they relate.
2. **Understand metaphors' ecology.** Do the metaphors touch the surface, behaviour or systemic aspects (Jung et al., 2017) of the work? Do they give ideas about the shape and form, or the affordances or do they speak of the relations to be engendered?
3. **See what suits the soil.** Weed out the metaphors that are tangling the design; look for the needy metaphors, that require lots of cognitive fertilisation to keep growing and pick them out. Keep the ones that give back to the soil, that grow while nourishing the rest of the ecology as well.
4. **Allow metaphors to be seasonal.** Different metaphors may help at different stages: an explanatory metaphor for understanding the system may not translate to the final design. Relational metaphors may need to be discarded after they have done their work, and a new conception at the end of a process might be the necessary bridge to pull everything together
5. **Experiment widely and boldly.** As crops may need variation and rest, semantic understanding benefits from experimenting with a multitude of surreal, silly, uncomfortable, irreverent metaphors. These can be generative of new possibilities and lead towards creative divergent thinking, but also be convergent at the same time.

Conclusion

The five recommendations distilled here for engaging with metaphors in the design of AI systems represent a creative space that holds a potential for broadening the imaginary and language we hold about AI. The point of such practice, however, is not to develop and use metaphors per se. Rather, it is in cultivating a sensitivity, a designer's expertise, a craftsmanship in using design semantics as a vehicle for meaning making. Metaphor gardening, then, is not about a mere mastering of imagery and symbolic representation, but creating a culture of balance between technological understanding and symbolic interpretation, a way towards nourishing ourselves as rich soil for meaningful metaphors to spring in.

This article illustrates a range of ways that metaphors can affect the process of working with AI systems, in directions that are generative, limiting, creative and more or less true to the technologies they point at. Just as technology is not a monoculture crop, the metaphors that we use to engage with it need to be varied and matched to the growing conditions. This is the call for 'metaphor gardening' - to recognise, cultivate and grow the metaphors that we work with, and to take out the weeds, set boundaries between different things that are

growing, fertilise, till the soil from which they grow. As Superflux point to a need for a shift from planning to gardening in order to engage with the more than human (Jain, 2020), the use of metaphors needs the same care and direction: planting seeds, cultivating them, leave space for growth, keep hold of the seeds that worked well in this particular bit of soil, think about seasonal growth and what is appropriate for different stages of a project. Metaphors are a key tool in the the shift towards a relational, more-than-human design of technology, as they shape the relations that the technology should engender. As such, we need to critically garden the metaphors we work with, for richness, vitality and nourishment.

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