

Trees of Knowledge: Designing with Artificial Intelligence in the Urban Landscape

Xiaoxuan (Sally) Liu and Godiva Veliganilao Reisenbichler
Media Design Practices @ ArtCenter College of Design

Hello everyone [introduce ourselves]. We are both soon-to-be graduates of the Media Design Practices program at Art Center College of Design. Today, we're sharing our paper Trees of Knowledge: Designing with Artificial Intelligence in the Urban Landscape.

■ BACKGROUND

■ Project 01: **TOPOS** (speculative)

AI-embedded Urbanism

Designing AI Into Public Spaces

Prototype no.1: experiential +
spatial

Prototype no.2: visual + animated
AI and The “Right to the City”

■ Project 02: **TRAINING THROUGH TENDING**

(applied)

[GVR] Our paper centers around two iterations of our speculative design project entitled Topos.

■ BACKGROUND

■ Project 01: **TOPOS** (speculative)

AI-embedded Urbanism

Designing AI Into Public Spaces

Prototype no.1: experiential +
spatial

Prototype no.2: visual + animated
AI and The “Right to the City”

■ Project 02: **TRAINING THROUGH TENDING**

(applied)

[GVR] And before we continue, how many people in the room have an idea of what speculative design is?

[Speculative design definition?]

To borrow from Tony Dünne and Fiona Raby, speculative design refers to design as a means of imagining possible futures. It also refers to a way of identifying new problems, new ideas, and new realities that ARISE FROM emerging tech, rather than propose solutions that those technologies can perform on the world as it is.

■ BACKGROUND

■ Project 01: **TOPOS** (speculative)

AI-embedded Urbanism

Designing AI Into Public Spaces

Prototype no.1: experiential +
spatial

Prototype no.2: visual + animated
AI and The “Right to the City”

■ Project 02: **TRAINING THROUGH TENDING**

(applied)

[XXL] After we discuss those prototypes and their implications, we will shift to my thesis project: Training Through Tending, in which my design research re-contextualize the questions that emerged from Topos.

BACKGROUND

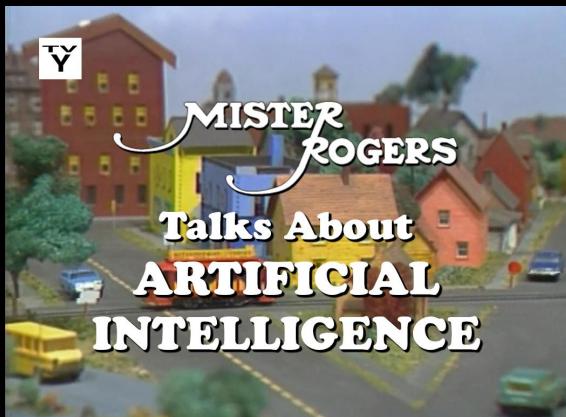
INTERACTING WITH THE URBAN AT HUMAN SCALE

[AI in “the neighborhood”]

[GVR] Before we get into our paper and projects, we wanted to provide you with some background context of how this work emerged. The first project, Topos, was developed in a class taught by Phil van Allen and Ben Hooker that gave us a crash course in what AI and ML can already do, so that we can think through its near-future implications. Our projects centered around how AI and ML fit into the neighborhood, where people interact with the urban at a human scale.

What is interesting to us about artificial intelligence?

[XXL] The two of us were interested in AI for very different reasons...





[GVR] Although our interests were very different, the common thread we found was the idea that there is a strucutral opacity to AI systems and ML processes. You can't see them or touch them, but we wanted to see if we could speculate on how to make AI systems (and how they work) more transparent

SPECULATIVE DESIGN PROJECT

Project 01: TOPOS*

(Greek) literally, “place”

[XXL] The first project we want to talk about is “topos”

AI-embedded Urbanism

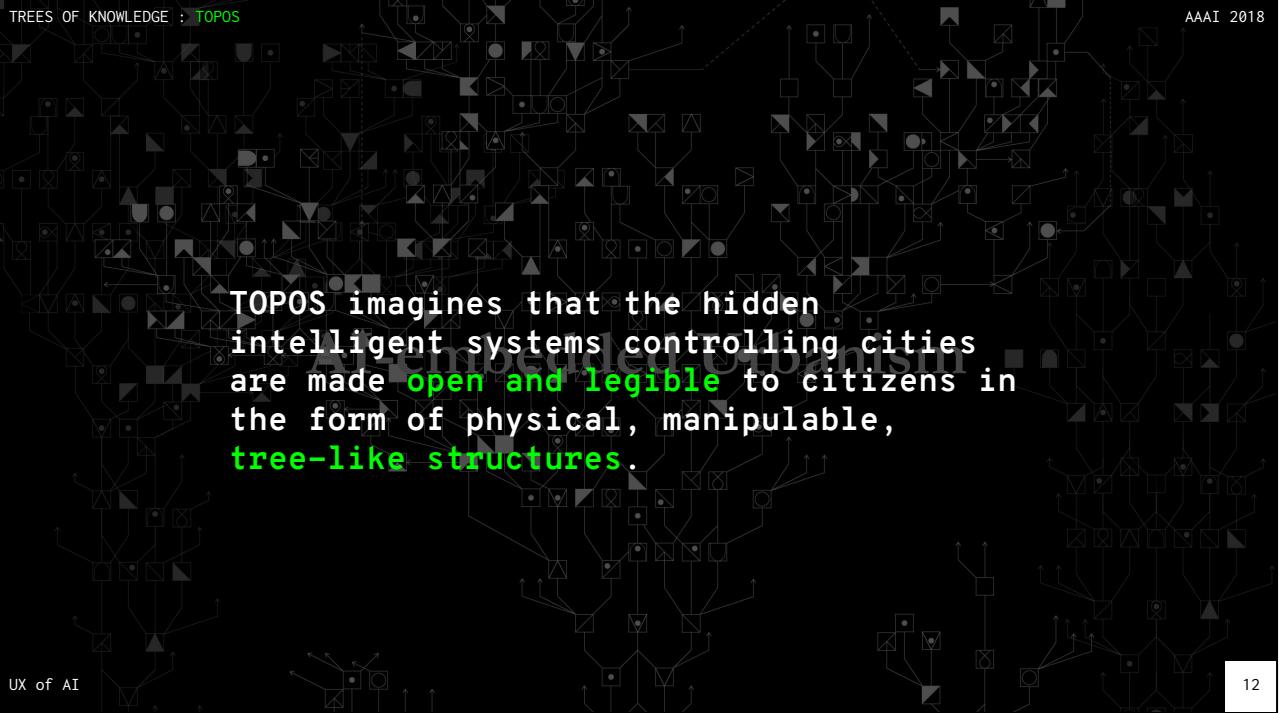
[GVR] Topos addresses the possibility of ubiquitous AI systems, and anticipates the shadows they might throw on the urban landscape. When a city's infrastructure is embedded with autonomous AI systems that can track, redirect, and predict urban rhythms faster than we can, the **machine readable city** might become illegible and inaccessible to humans.

[Could the city know itself
better than you (the citizen)
could ever know it?]

[XXL] Question we asked Could the city know itself better than you could ever know it?

The design of AI interfaces can
illuminate the algorithmic dimension of
the city for the people living in it.

[GVR] If the inner-workings of AI systems that drive the city are neither visible nor tangible, then how we design AI interfaces can illuminate the algorithmic dimension of the city for the people living in it.



TOPOS imagines that the hidden intelligent systems controlling cities are made **open** and legible to citizens in the form of physical, manipulable, tree-like structures.

UX of AI

12

[XXL] Topos imagines that the hidden intelligent systems controlling the city are made readable to citizens in the form of physical, manipulable, tree-like structures.

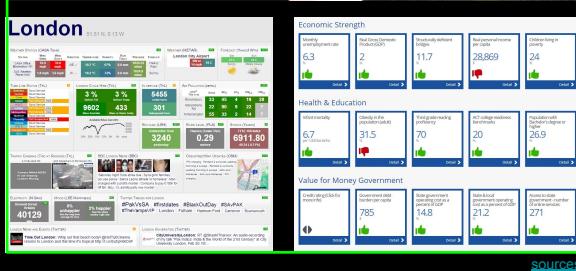


[GVR] How might pruning and tending these civic interfaces—these trees of knowledge—literally and figuratively reshape the urban landscape?

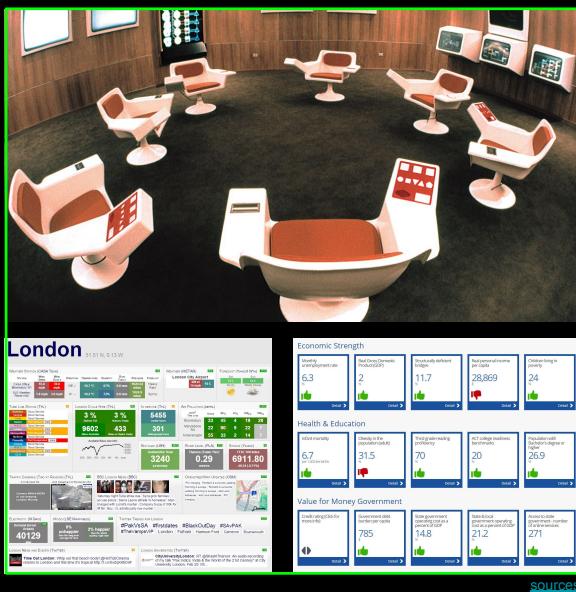
Designing AI into Public Spaces



to Public Spaces



[GVR] We propose a new typology of public space that combines the mechanical qualities of urban dashboards and city control rooms...



A NEW TYPOLOGY OF PUBLIC SPACE

Designing AI into Public Spaces

[GVR] We imagine that these “AI-parks” contain trees of knowledge that physicalize what is otherwise invisible to citizens: the algorithms, decision trees, and neural nets that have taken on or augmented the responsibilities of city departments and bureaus.

Trees of knowledge are **tangible user interfaces** (TUIs) that form a relationship between AI systems + humans.

[XXL] AI-parks are where civic decisions happen in plain sight and in real time. The trees of knowledge are tangible user interfaces that allow humans to read and revise civic AI systems by interacting with them through the physical environment.





The lesson here is that we can't know our cities *merely through a screen*. From time to time, we also need to fly by sight, fiddle with exploding radiators, and tramp around in the mud.

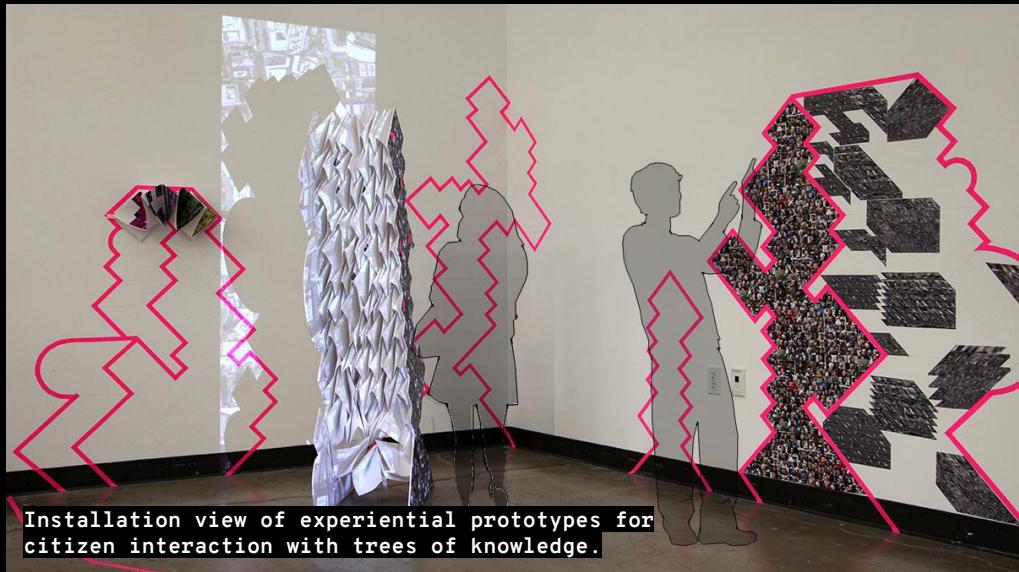
Shannon Mattern, [Mission Control: A History of the Urban Dashboard](#)

[GVR] We were really influenced by Shannon Mattern's survey of city control systems, and determined that these trees of knowledge would not only function as AI-interfaces, but also as civic symbols and platforms of alternative governance. Trees of knowledge are not slick graphical summaries of quantifiable city data—they have tangled branches and deep roots—they are complex and messy interfaces (on purpose).

Prototype no.1

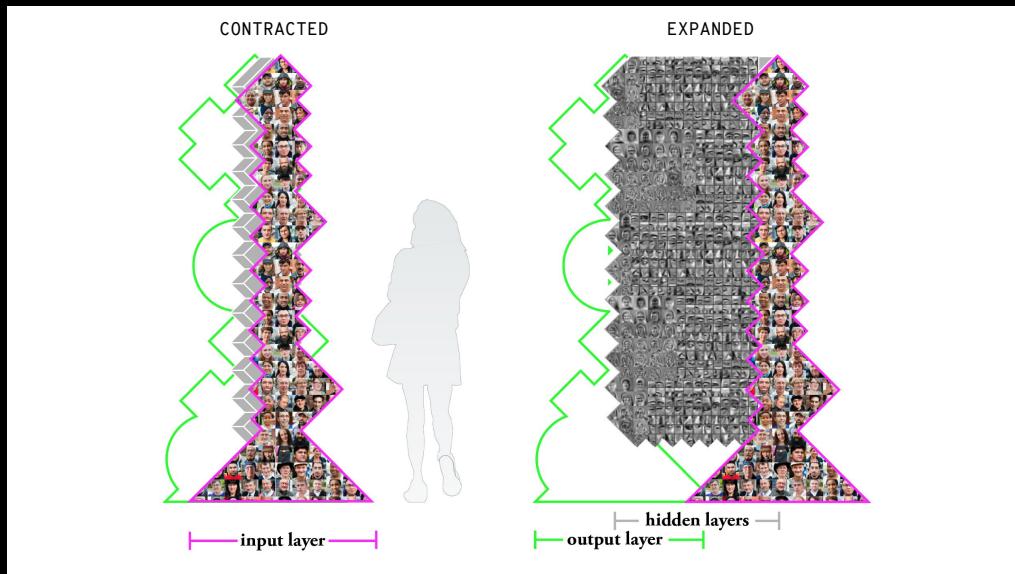
experiential + spatial

[XXL] To model our proposed human-to-AI interaction, we created an experiential prototype that simulates reading and revising AI systems through the trees of knowledge.

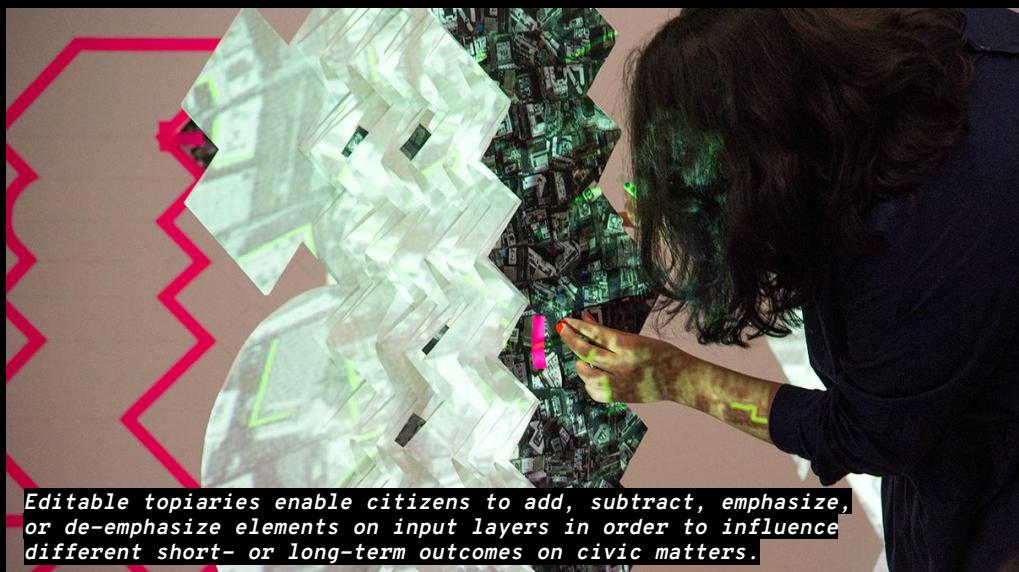


Installation view of experiential prototypes for citizen interaction with trees of knowledge.

[GVR] Our first prototypes for the trees of knowledge were civic monument-scaled forms that manually contract and expand.



[GVR] The outer faces of this form serve as input layers and output layers for the neural nets that learn from city data in different ways; by unfolding and expanding the form, citizens and civic workers can respectively read and revise the hidden layers—where AI systems transform city data into intelligence.

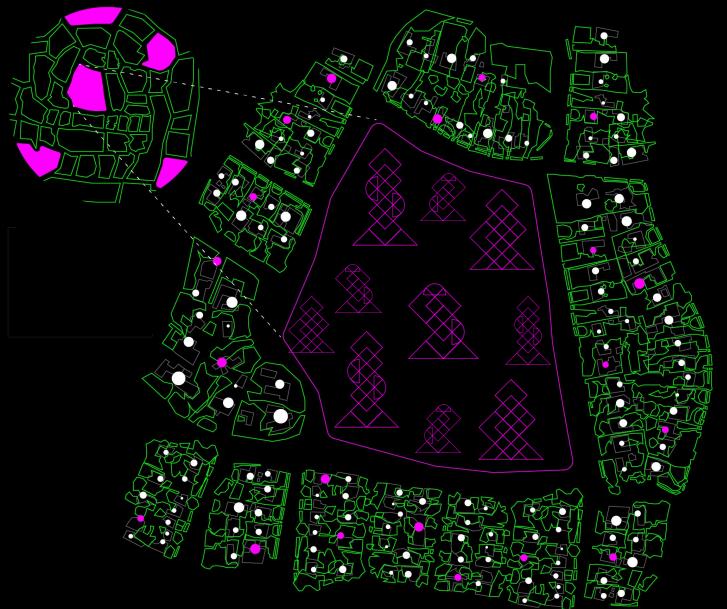


Editable topiaries enable citizens to add, subtract, emphasize, or de-emphasize elements on input layers in order to influence different short- or long-term outcomes on civic matters.

Photo Credit: Phil van Allen

[XXL] This photo shows citizen editing the tree of knowledge.

Editable trees of knowledge enable citizens to add, subtract, emphasize, or de-emphasize elements on input layers in order to create different short- or long-term outcomes on civic matters—ranging from self-driving car congestion to urban green space development. Civic workers take these citizen annotations into account as they modify learning pathways in the hidden layers.

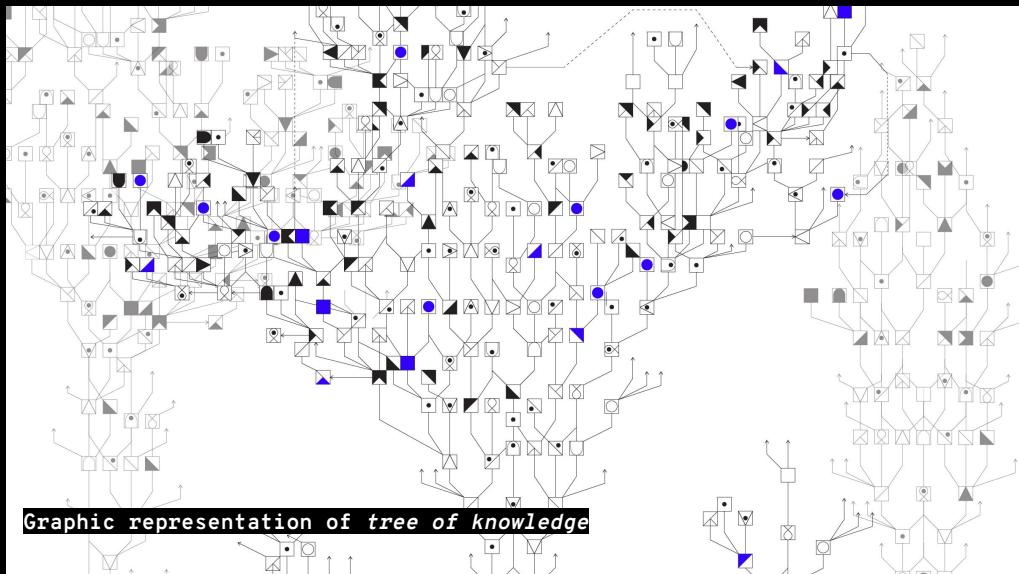


[GVR] By externalizing civic AI systems into public space, Topos aims to create active and participatory modes of collecting data that were used to train these systems, as opposed to passive accumulation and the infinite sigh-low-ing of data.

Prototype no.2

visual + animated

[XXL] Our second prototype used graphics and animation to show our concept.



[XXL] We didn't focus on what the human-to-AI interaction would look like, but rather how the act of "pruning" these trees of knowledge would affect the larger urban landscape



[GVR] We started to think about these bigger effects by illustrating what a city full of AI-parks and their corresponding trees of knowledge might look like. Imagine every city department and bureau being an open-air park, instead of a building with offices.



[XXL] To bridge the gap between this larger context and the human-to-AI interaction proposed in our first prototype, we made a short animated video where a person prunes a tree of knowledge, and the effects of their inputs are simulated in the abstracted city.

AI and The “Right to the City”

- Henri Lefebvre

[GVR] At its core, Topos envisions a model of AI-embedded urbanism that guarantees what Henri Lefebvre calls the “right to the city”—an idea and social movement that advocates for the participation of individual and collective agents alike to shape the city.

“Right to the City” AS A HUMAN RIGHT

[Leveraging the complexities and contradictions of human-to-city interaction]

[GVR] Knowing that an urban landscape WITHOUT AI systems can sacrifice this “the right to the city” to the demands of privatization and capital, UX designers must take on the problem of designing civic AI interfaces that will not allow this human right to disappear

It is easy for AI systems to reproduce more of the world we already have, but it will be up to designers to bring the messiness of human-to-city interaction to the surface, and make it usable.

How do we ensure that all citizens are
still guaranteed the right to reshape
their cities in collaboration with AI
systems?

[XXL] How is the human agency to reshape a city mediated by AI systems? What agency do AI systems have to reshape our cities?

Taking TOPOS Into The Real World

Taking TOPOS Into The Real World

[How to deal with “dirty (un-‘cleaned’) data”?]

Shannon Mattern, [Mission Control: A History of the Urban Dashboard](#)

[XXL] If our trees of knowledge worked in a real world context, we realize that things could go very wrong very quickly.

For instance, someone could tend to or prune the trees of knowledge in an damaging way—disrupting a balance between the AI-parks and its outputs in the urban landscape.

[Training and learning as a negotiation process]

[GVR] Some questions that we have for those who work with AI systems on a more practical level include:

How do AI systems "learn" from inputs that come later and are not part of the initial training data?

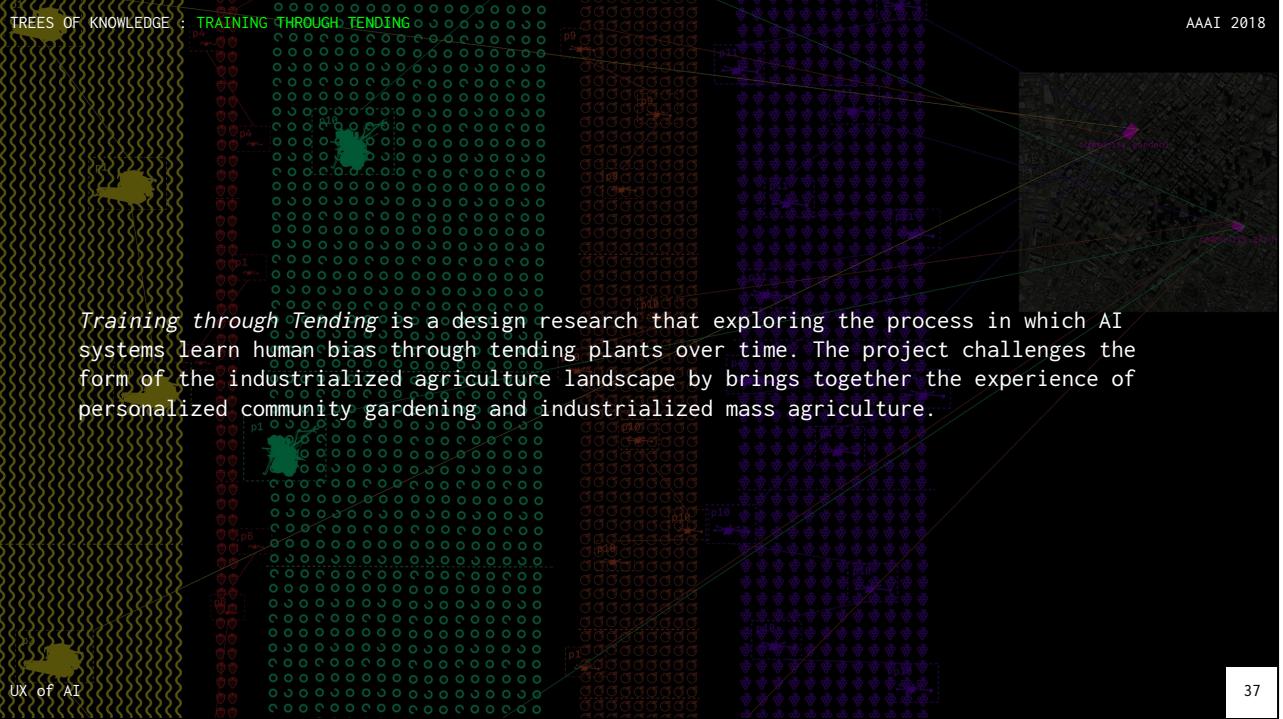
Could we design a "defense mechanism" into the trees of knowledge so that human inputs can align with a greater sense of public good?

How can trees of knowledge (a speculative interface) highlight a NEGOTIATION process with civic AI systems?

Project 02: TRAINING THROUGH TENDING*

tending: the action of care
both physically and emotionally

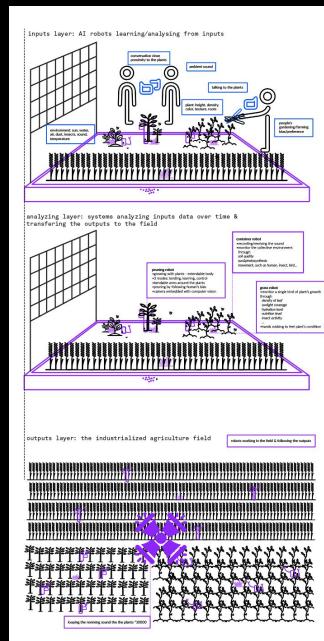
The second project we want to talk about is my on-going thesis project “TTT”.
By tending, I mean the action of care both physically and emotionally



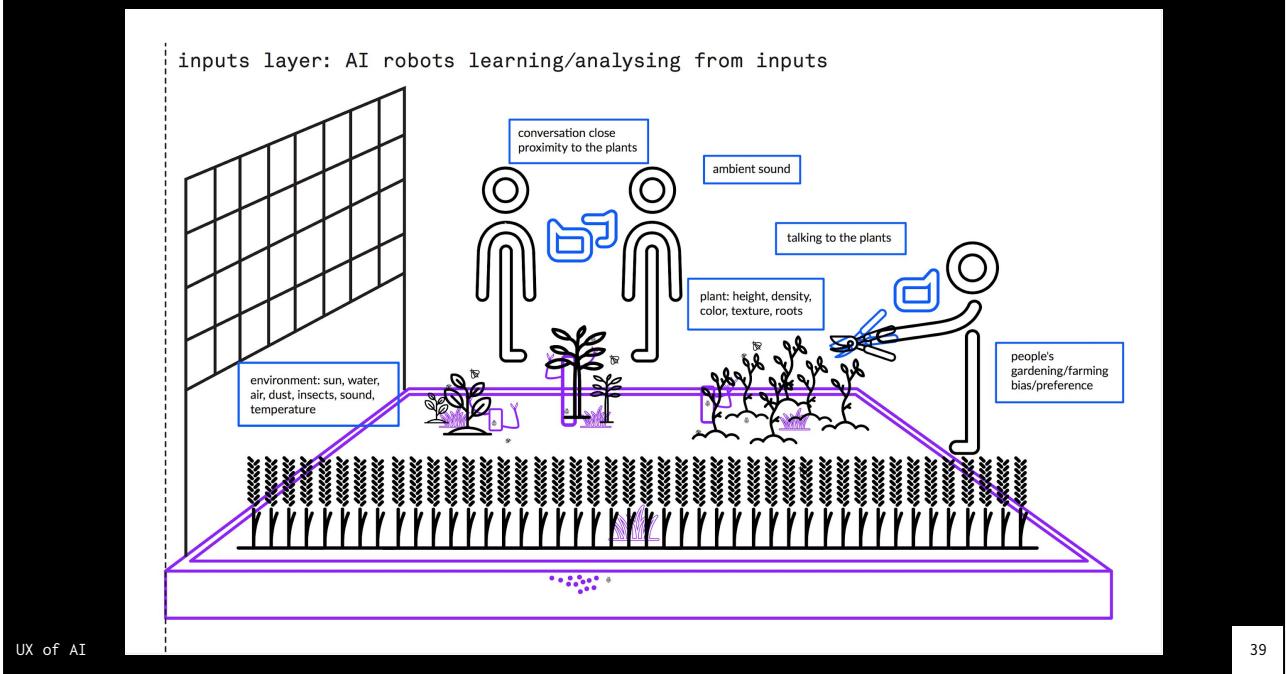
Training through tending is a design research that exploring the process in which AI system learn human bias through tending plants over time. The project challenges the form of the industrialized agriculture landscape by brings together the experience of personalized community gardening and industrialized mass agriculture.



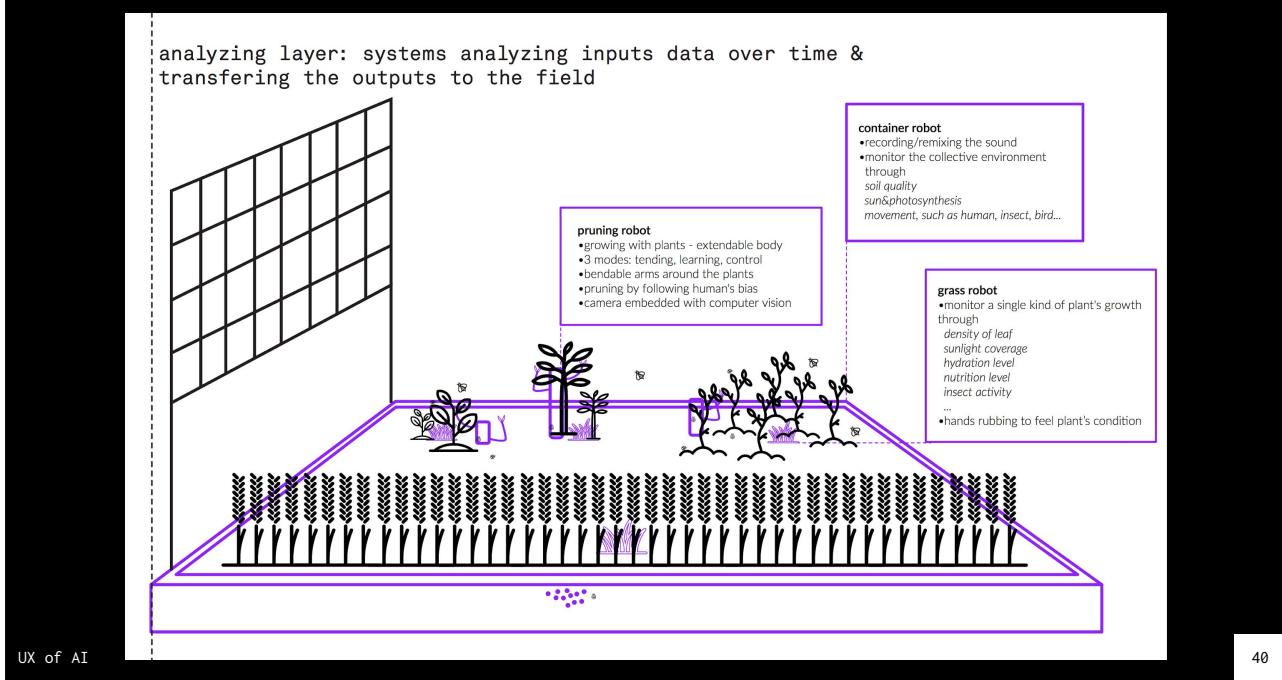
By collecting individual's tending bias in the community garden, the AI robots analyzing and transferring the decisions to industrialized agriculture field, where tending by thousands of AI robots. Those robots performing a similar method with the individual in the community garden.



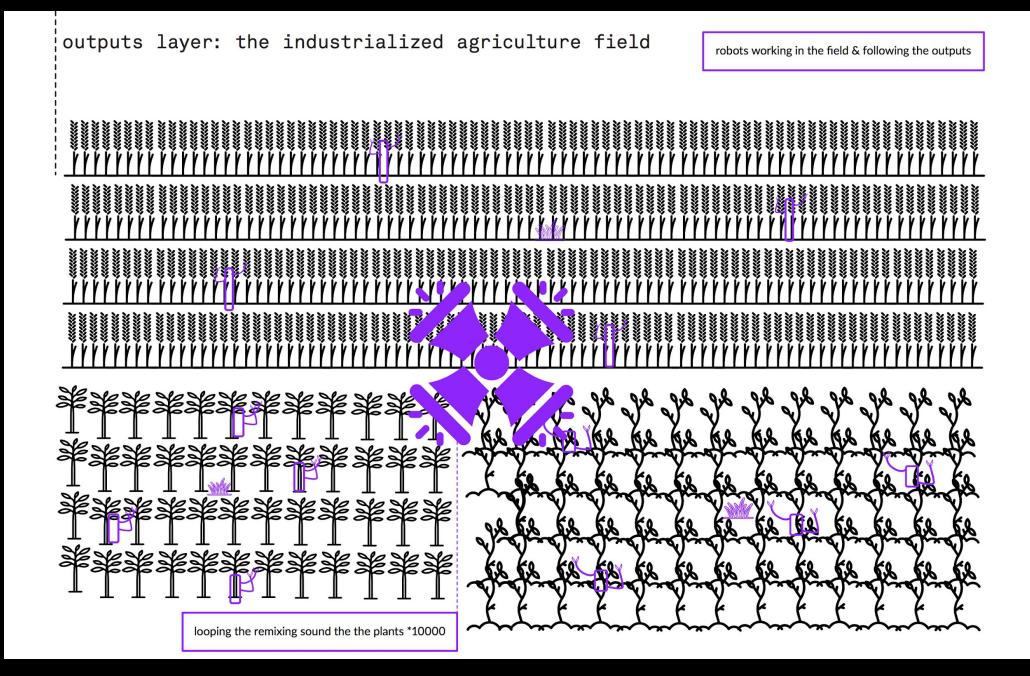
Here is a overview diagram shows how the system works.



In the first layer, AI robots learning and analysing from inputs in the community garden environment. Inputs are from people's gardening and farming bias, environment, plants



In the second layer, system analyzing inputs data over a period of time and transferring the outputs to the field .





UX of AI

42

ON A SYSTEMS LEVEL, Training through Tending is a way for me to think about new relationships between nature and human and how emerging technology play into the condition. Specifically, how AI system could learn through people's daily inputs and make decision in a higher level.

But most importantly ... this tending process is a way for me to express the disconnect I see with technological advancements in farming and what we as humans consume and think about these larger urban agricultural systems.

THANK YOU!

Xiaoxuan(Sally) Liu
Godiva Veliganilao Reisenbichler

sallyliu.sam@gmail.com
godivareisen@gmail.com