

DESIGN APPLICATIONS

COMPUTER VISION EXAMPLE

- Digital Twins
- Construction Safety

GENERATION EXAMPLE

- Topology. Optimization
- Floor Plant generation
- Structural Forms Generator

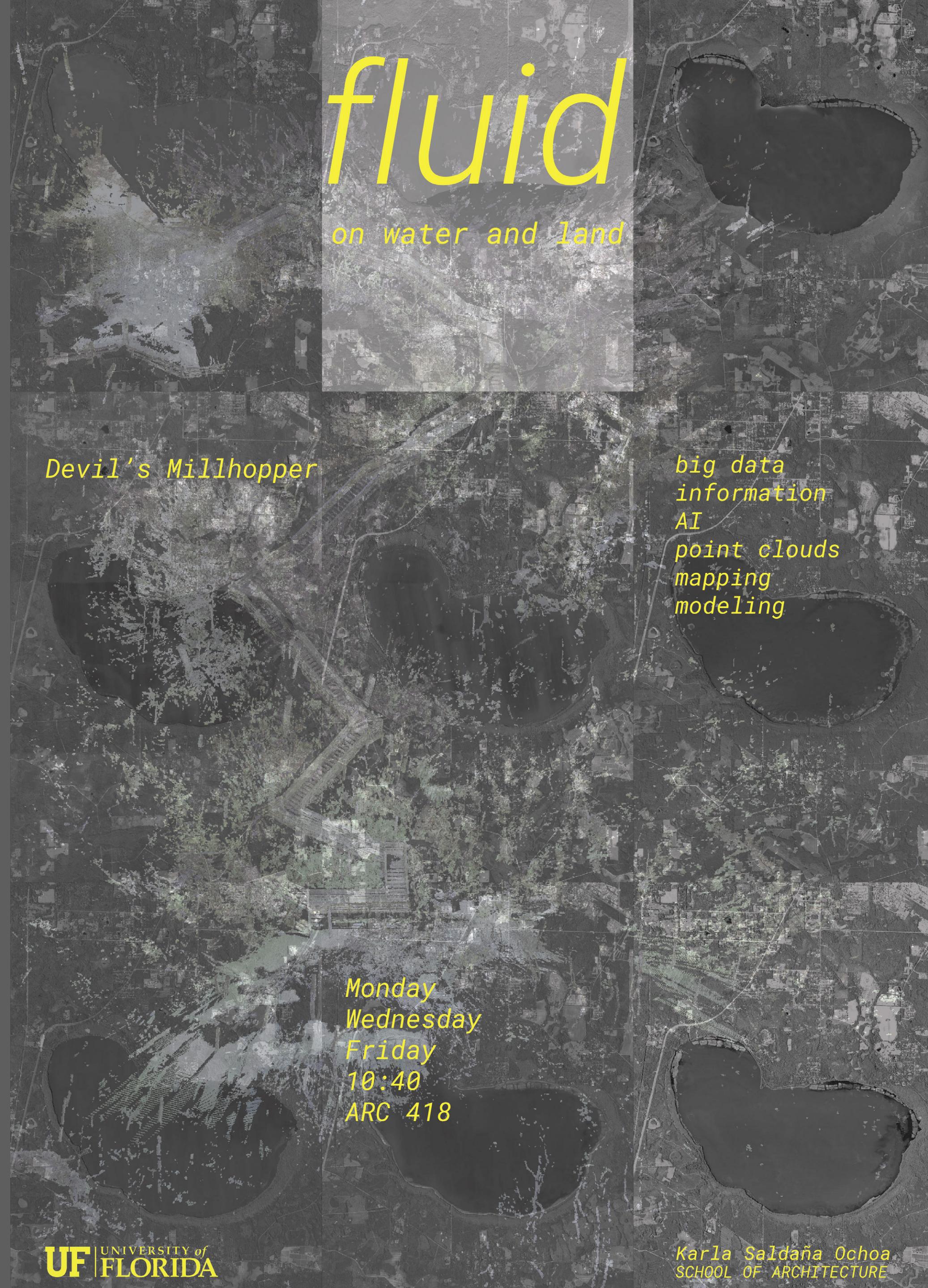
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NATURAL LANGUAGE PROCESSING

- Twitter sentiment analysis for decision making



<https://www.surveymonkey.com/r/5Z73HT8>



fluid

on water and land

Devil's Millhopper

*big data
information
AI
point clouds
mapping
modeling*

*Monday
Wednesday
Friday
10:40
ARC 418*

 devils millhopper

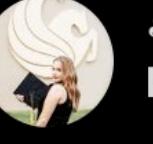
Explore

Settings

Top Latest People Photos Videos

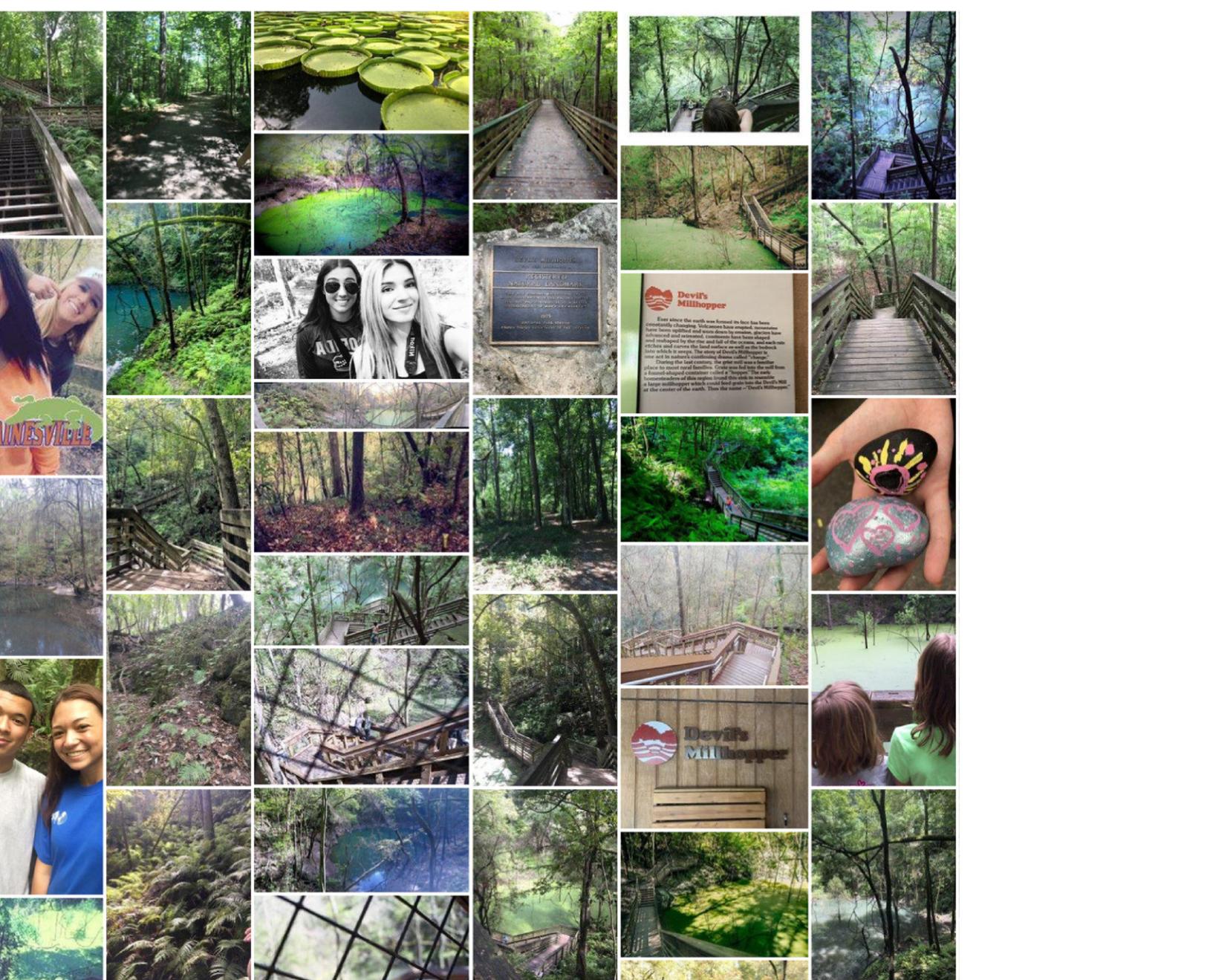
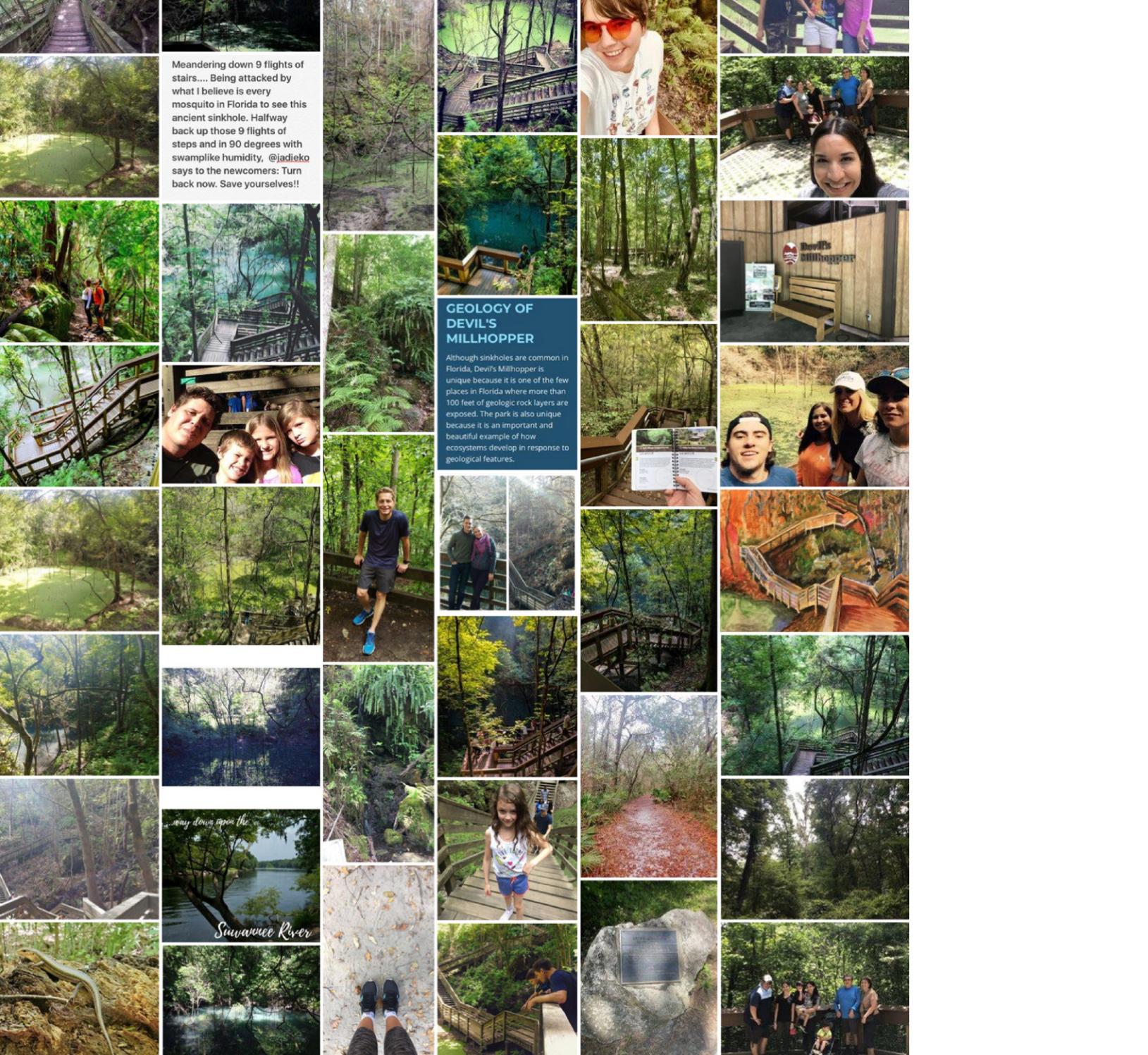


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 @itsbrittanyheey · Mar 24, 2016
Devils Millhopper

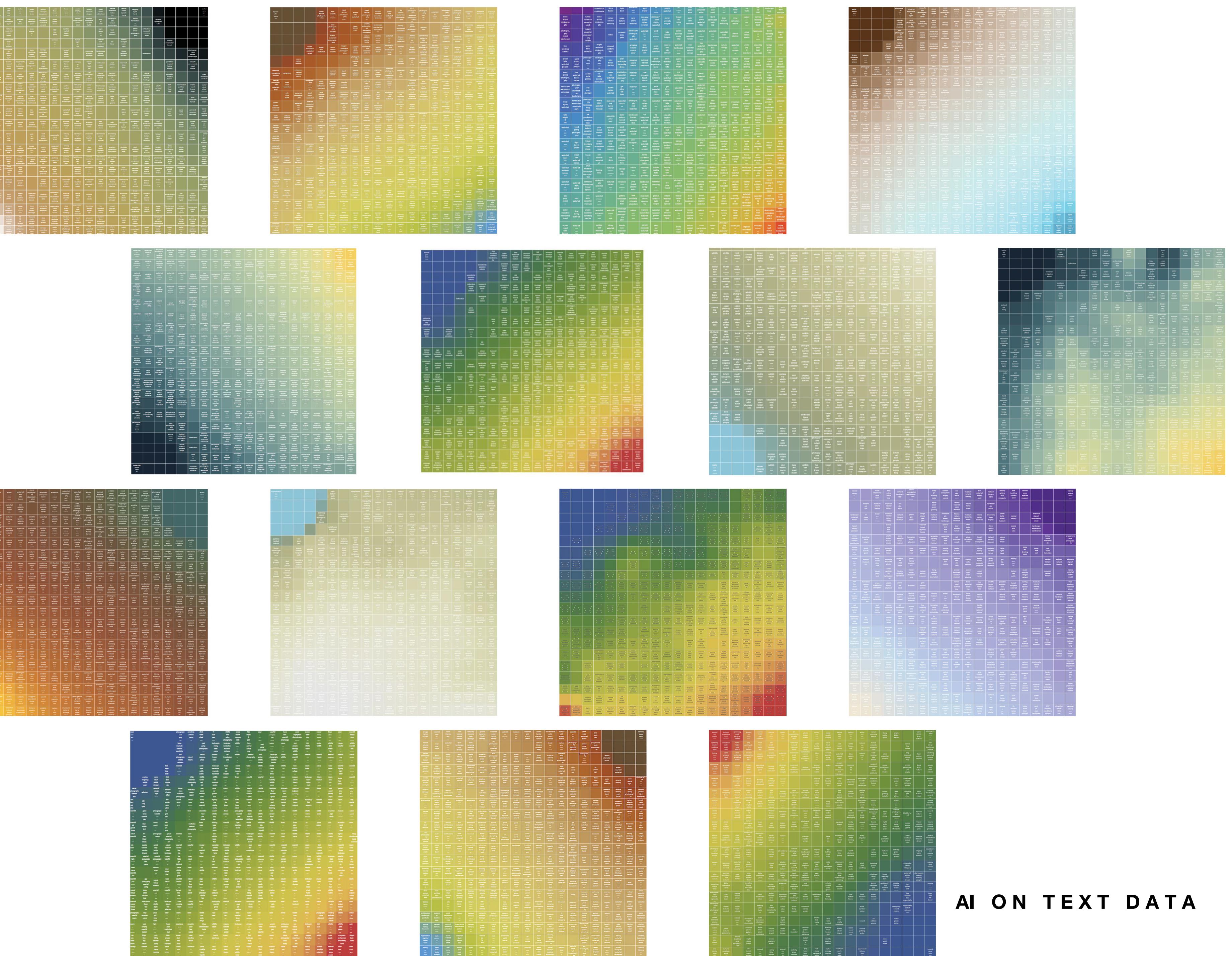


SOCIAL MEDIA DATA

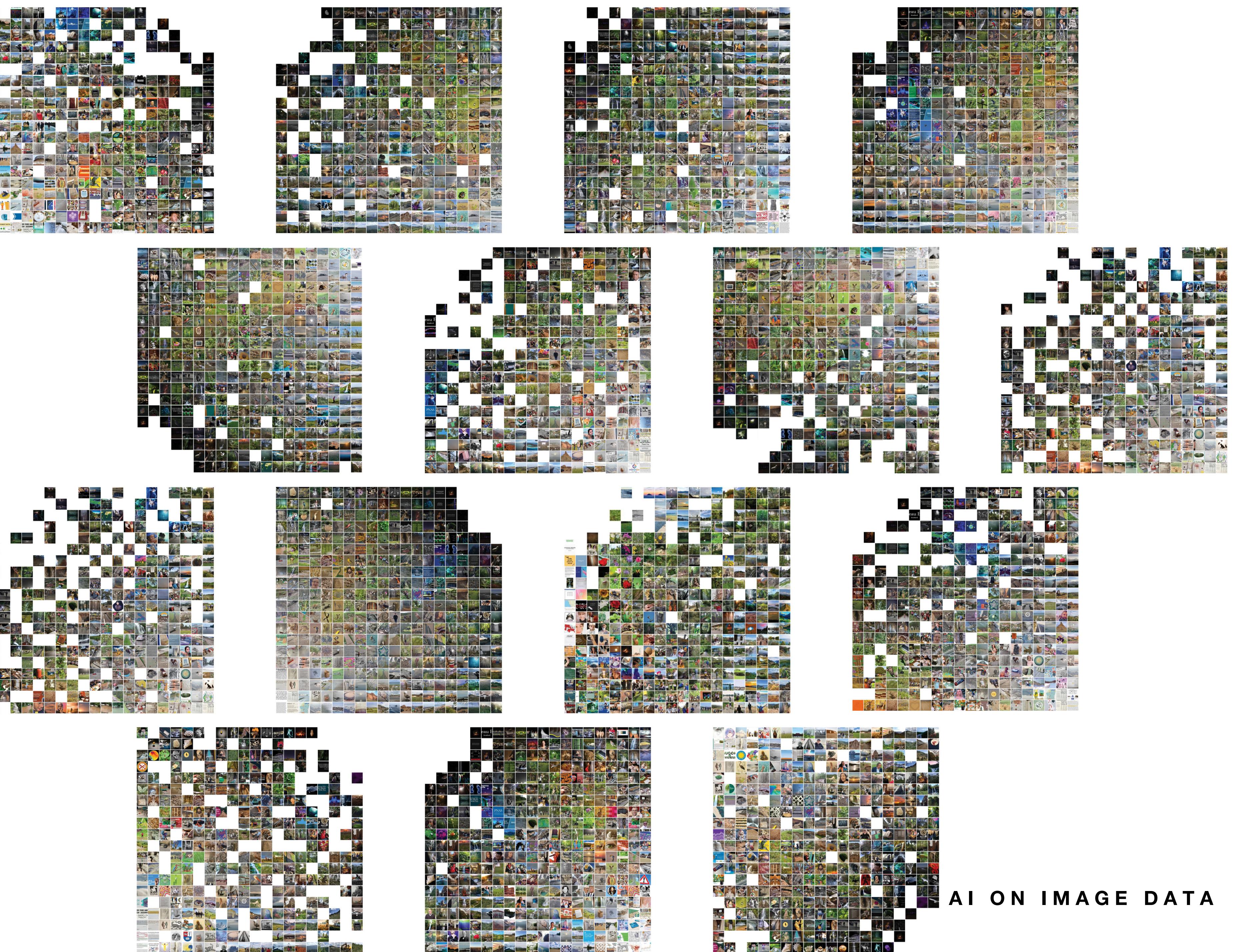


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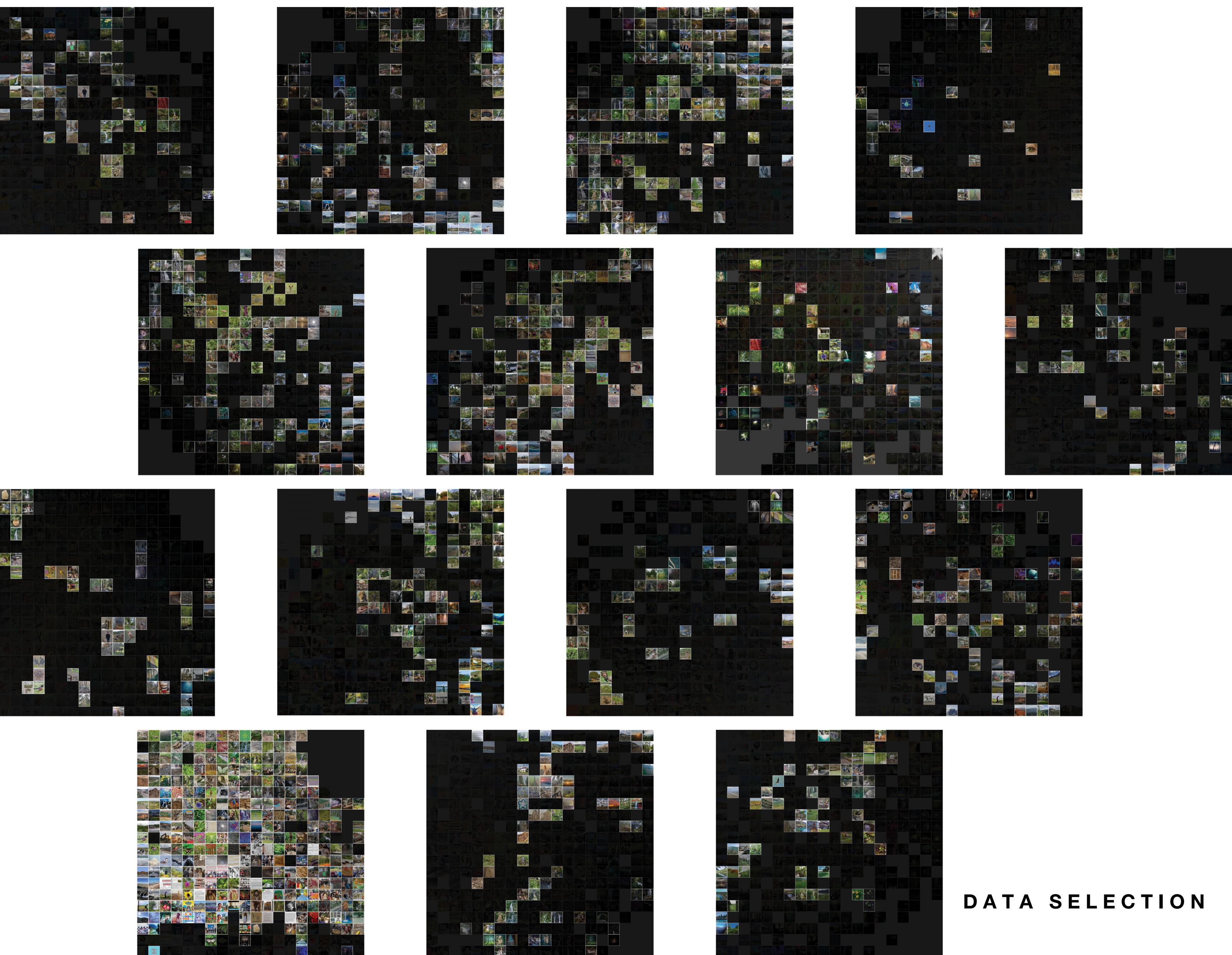
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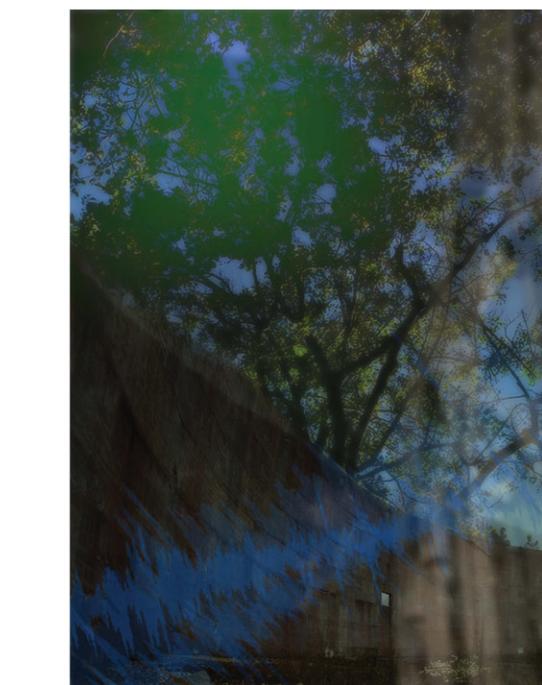
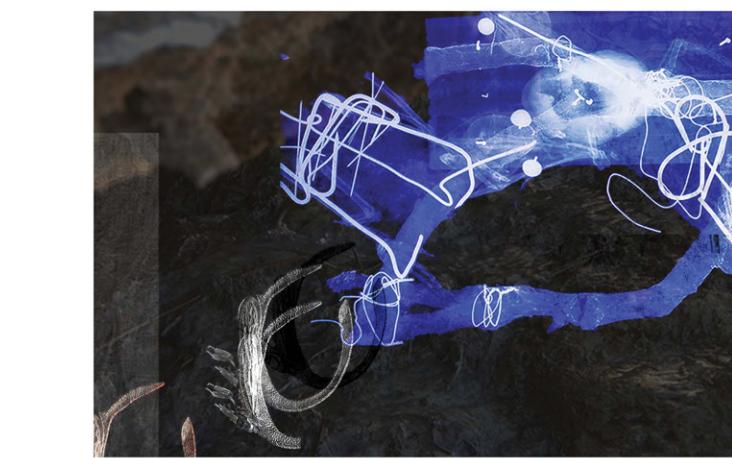
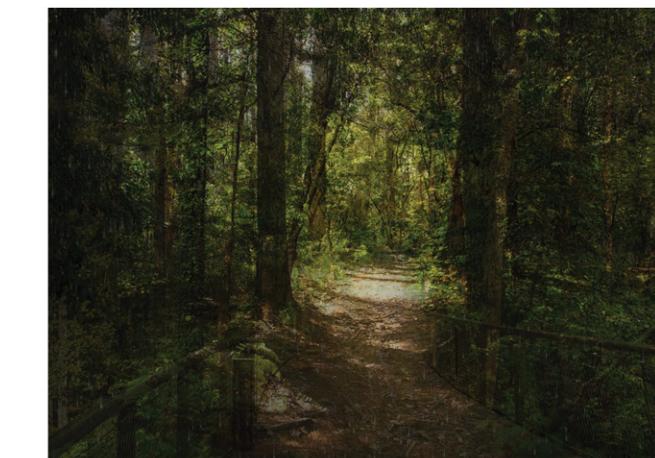
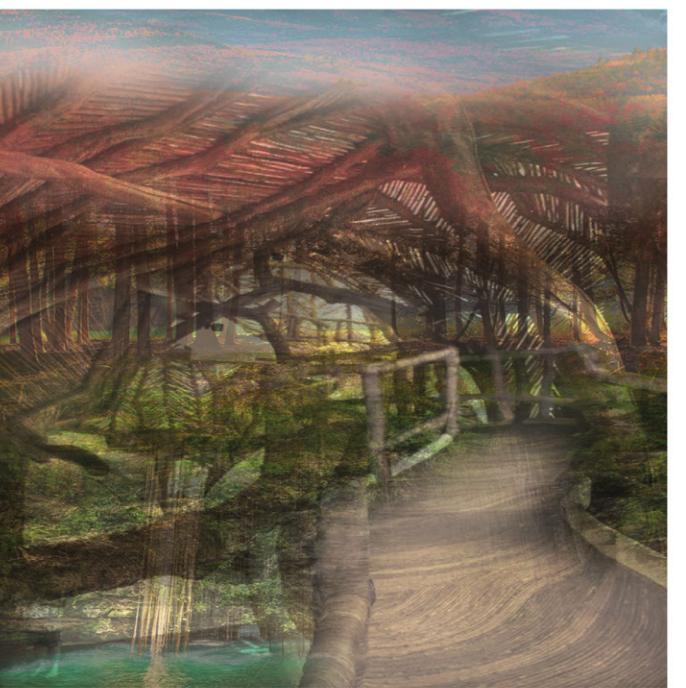
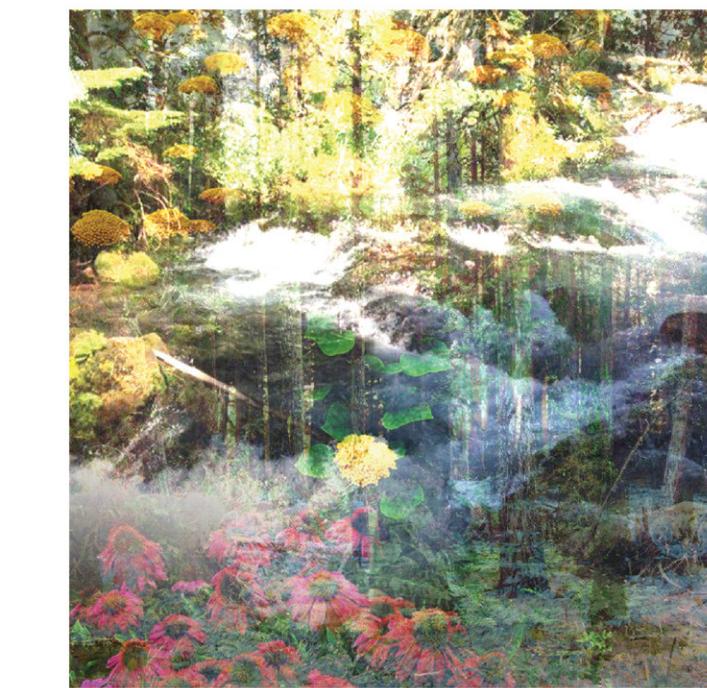
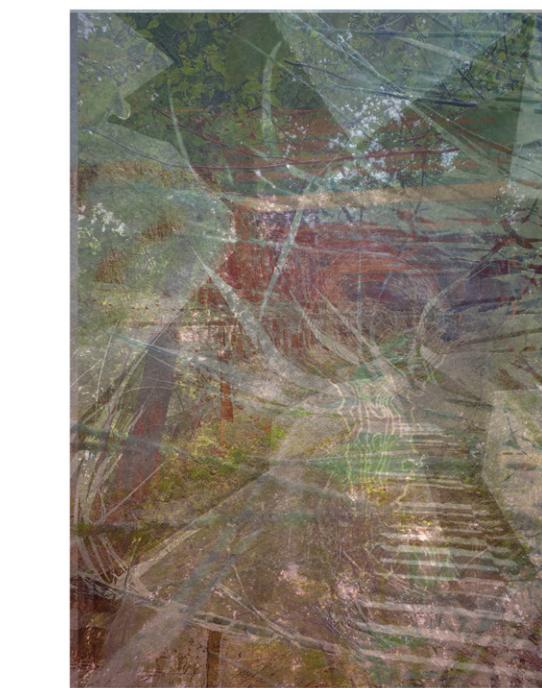
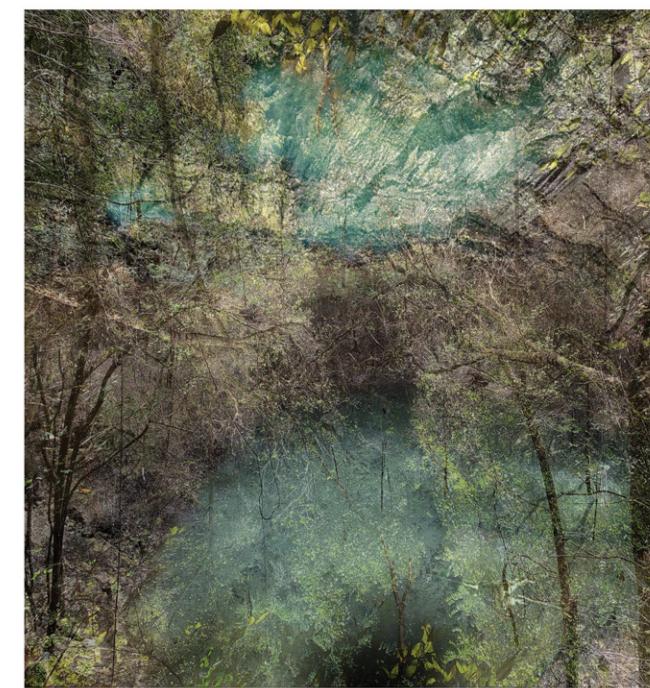
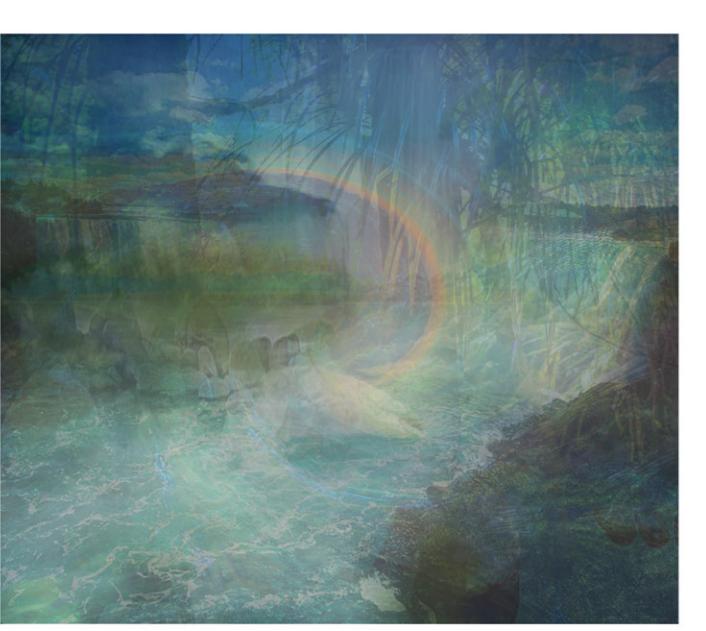
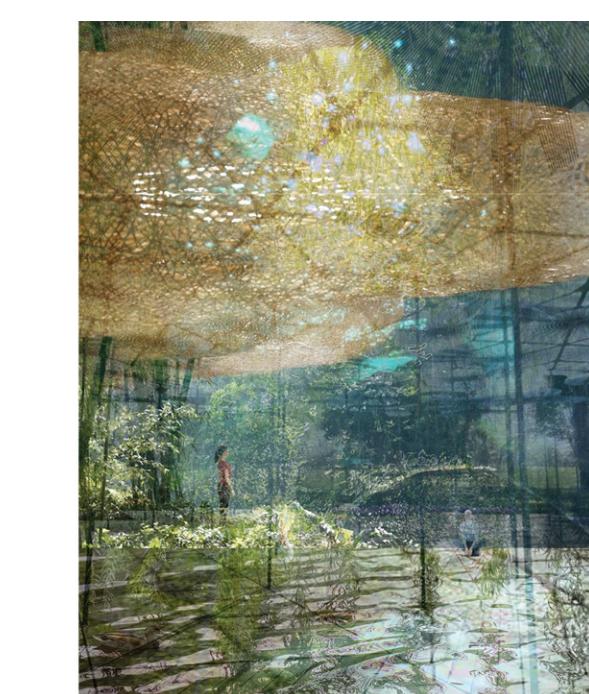
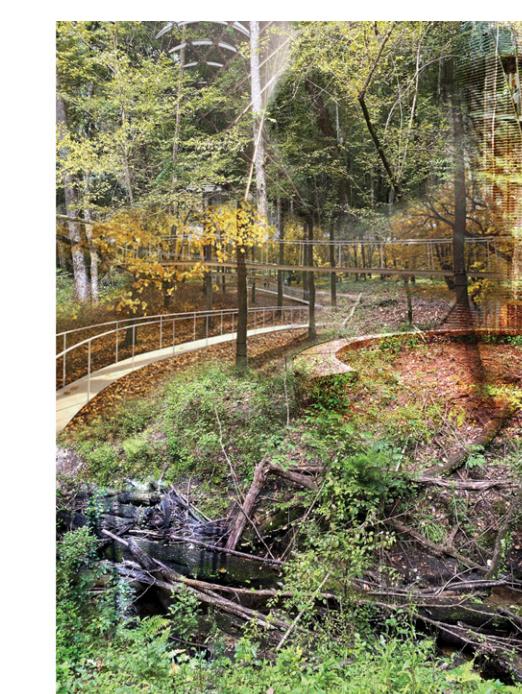
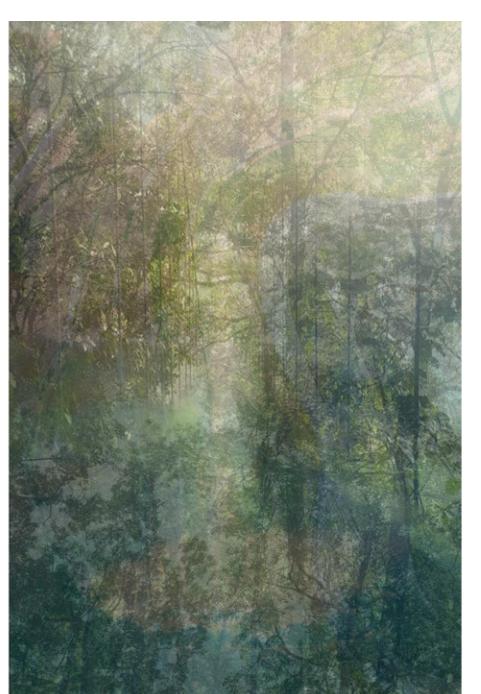
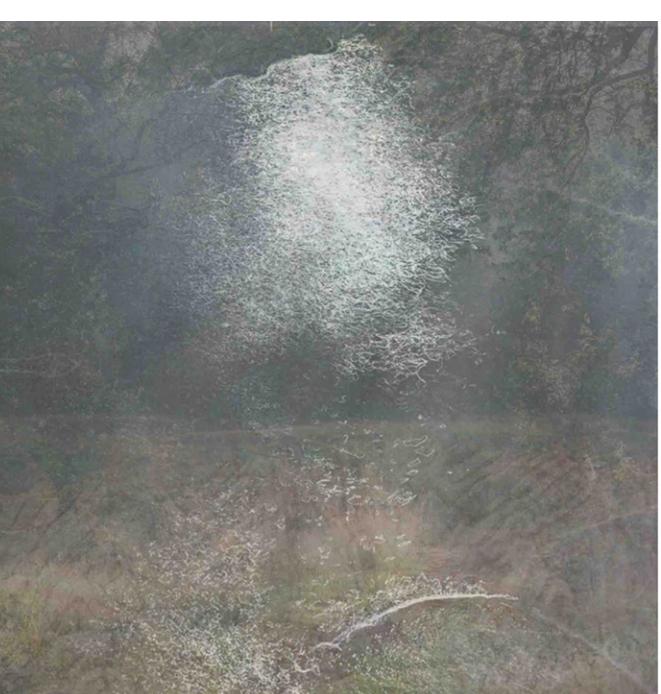
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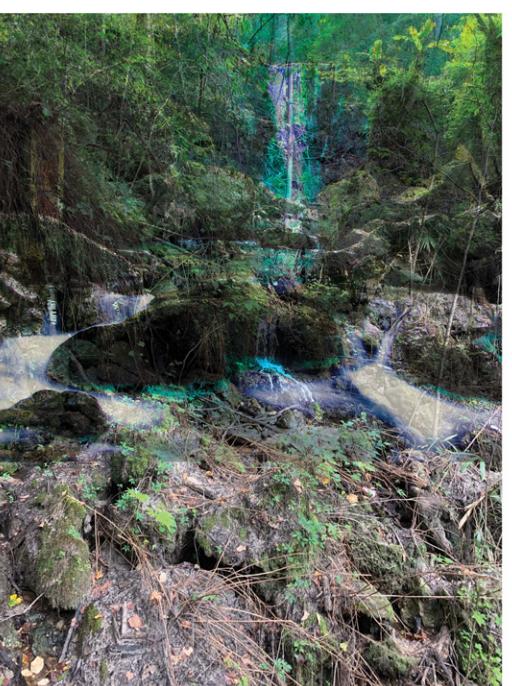
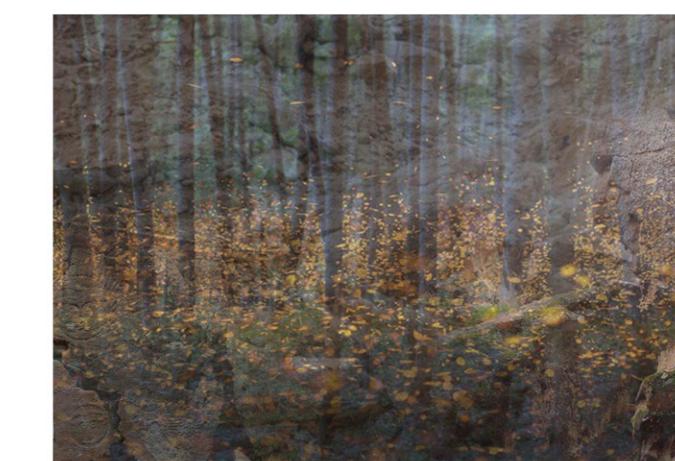
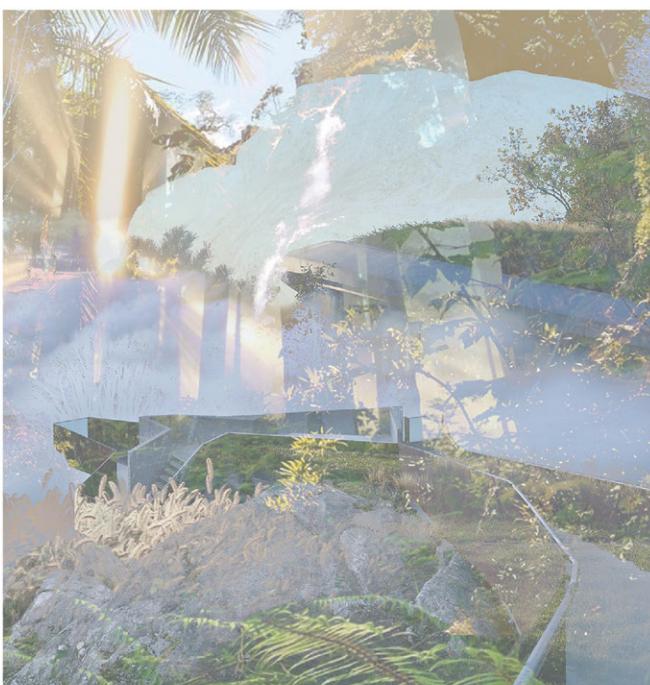
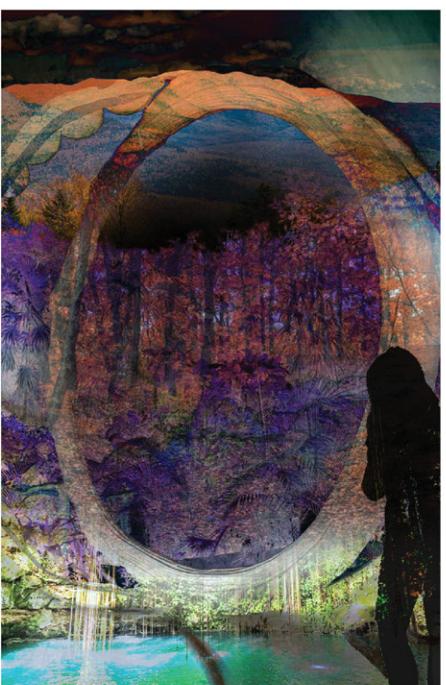
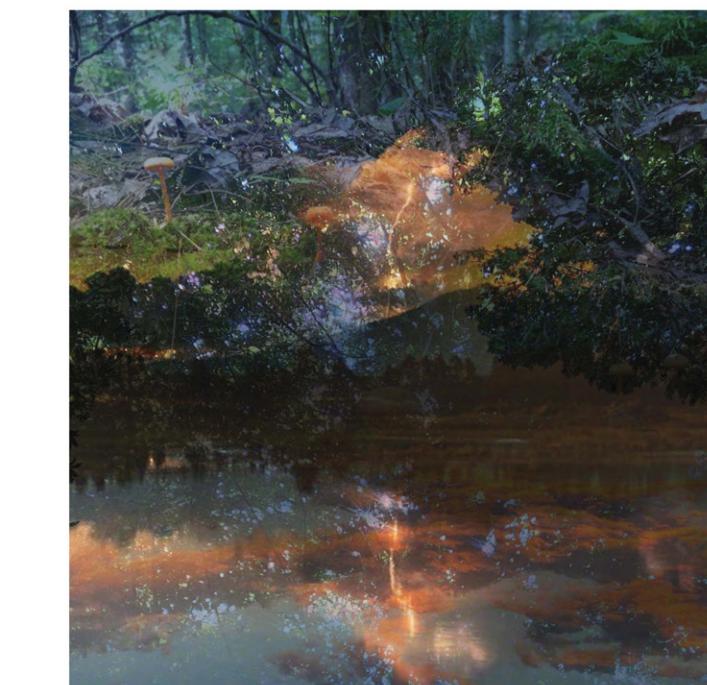
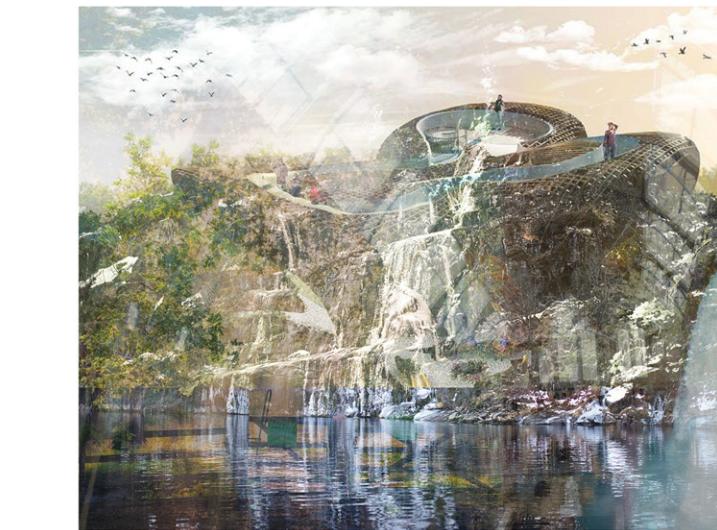
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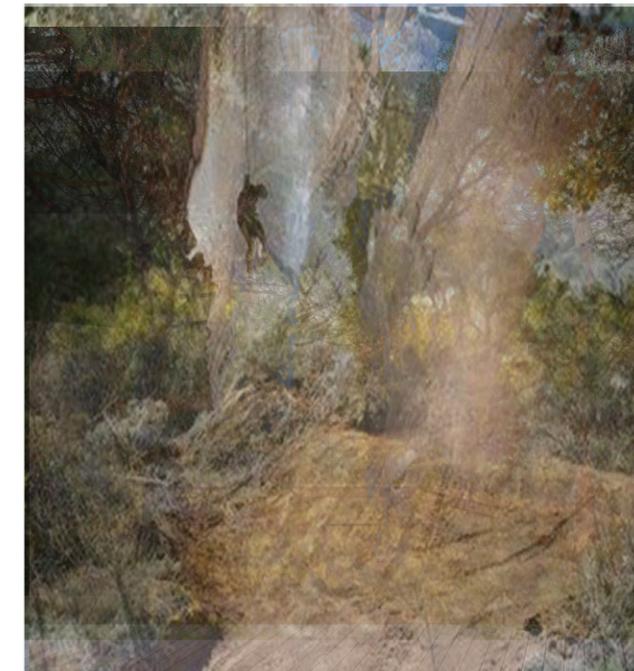
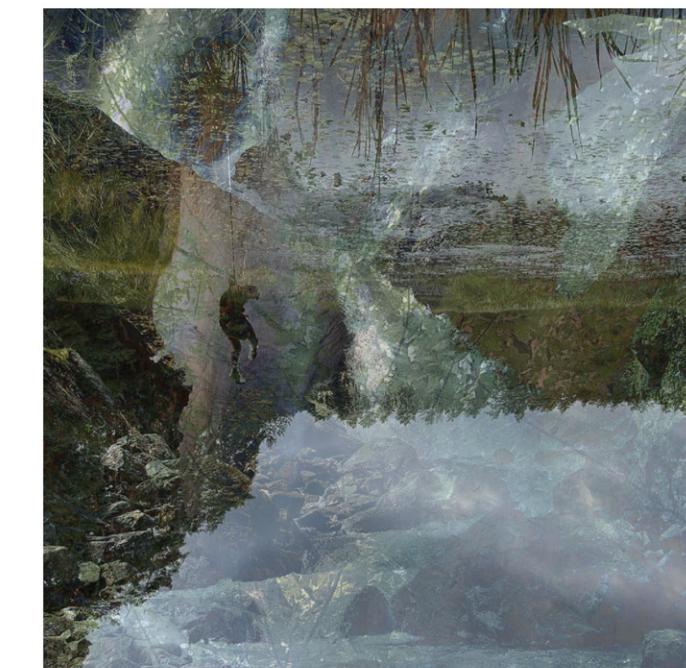
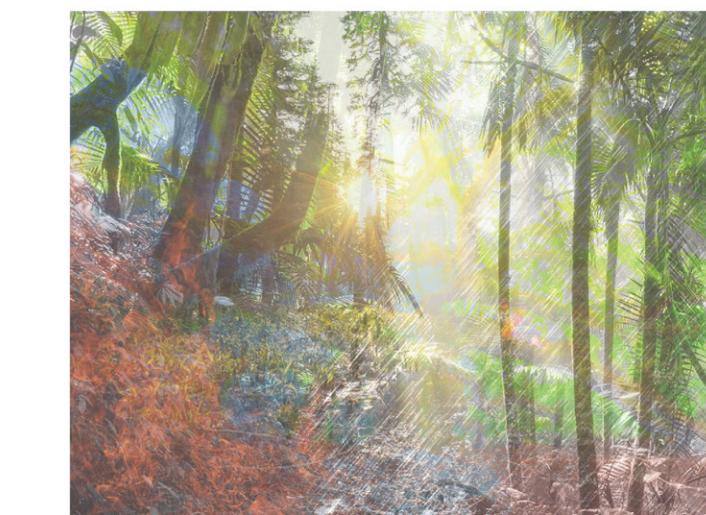
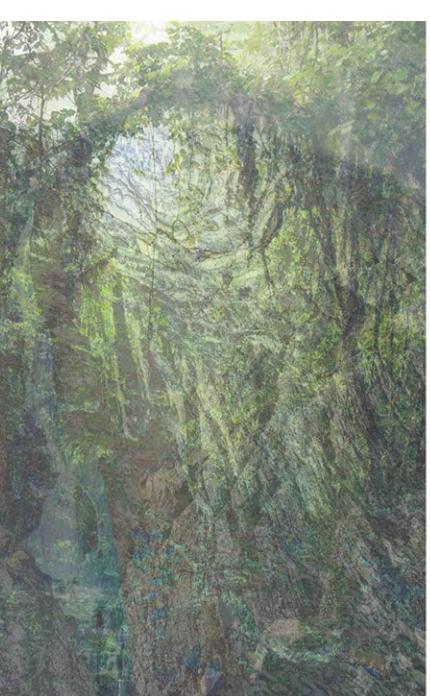
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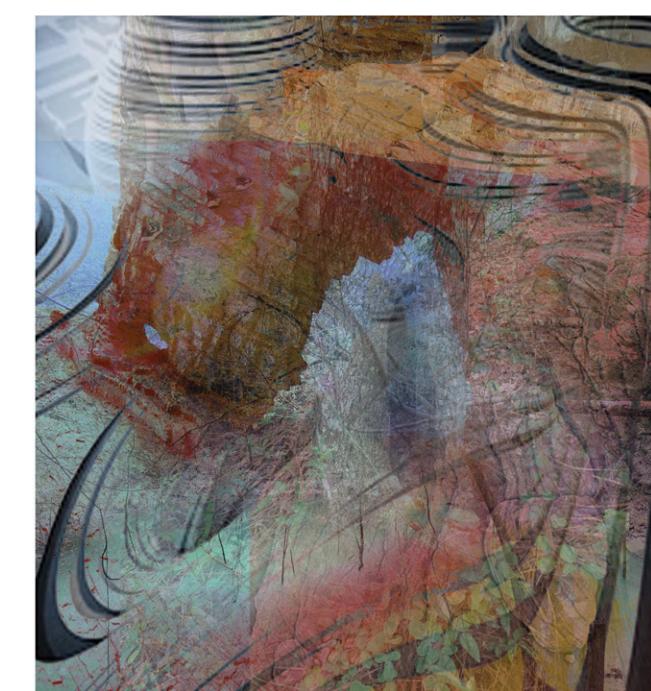
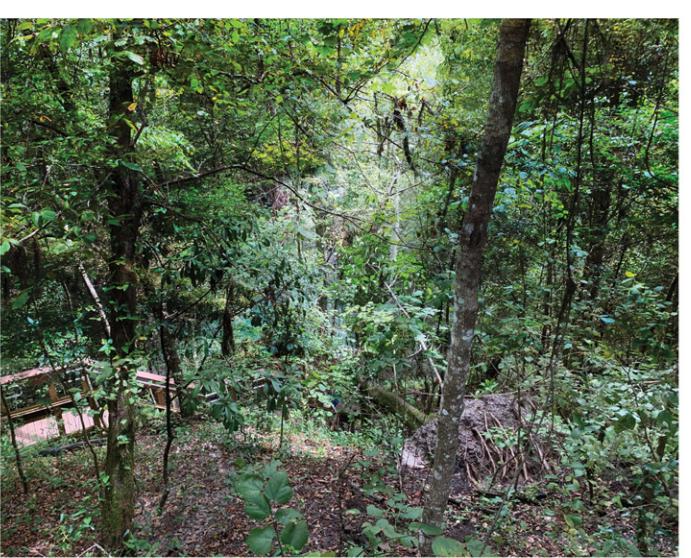
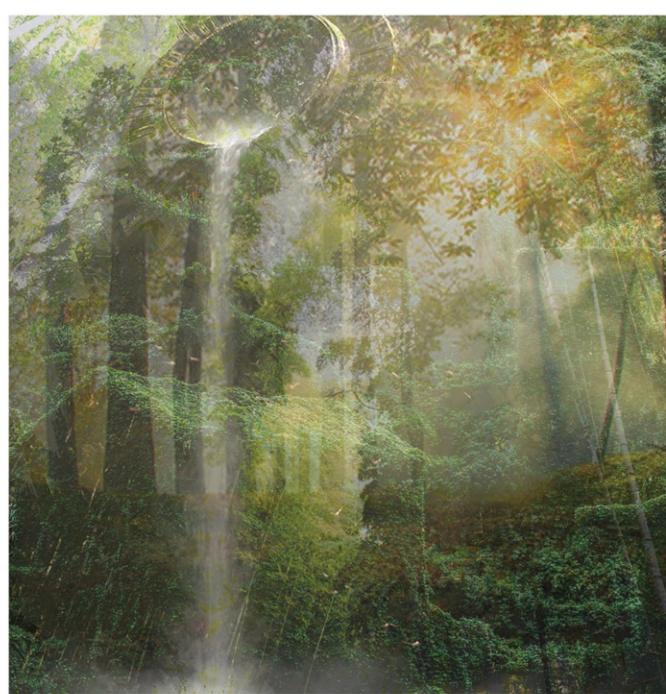
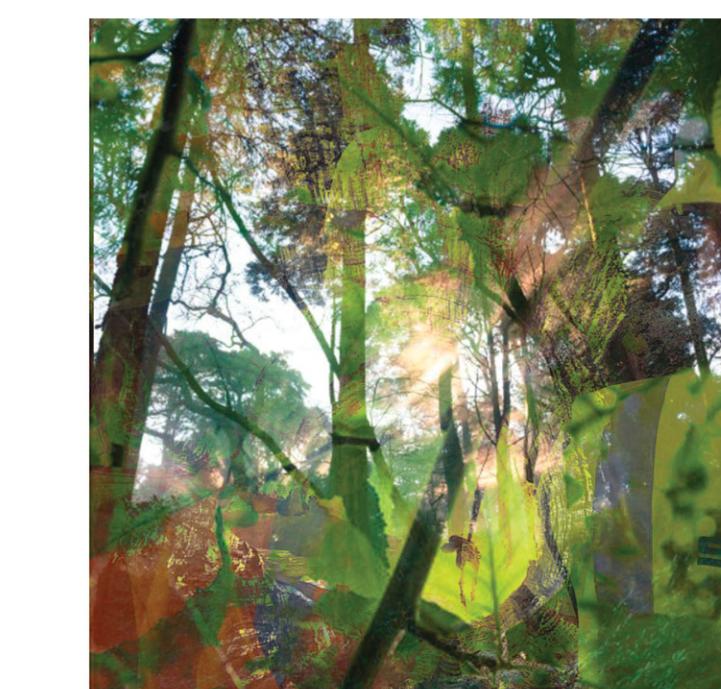
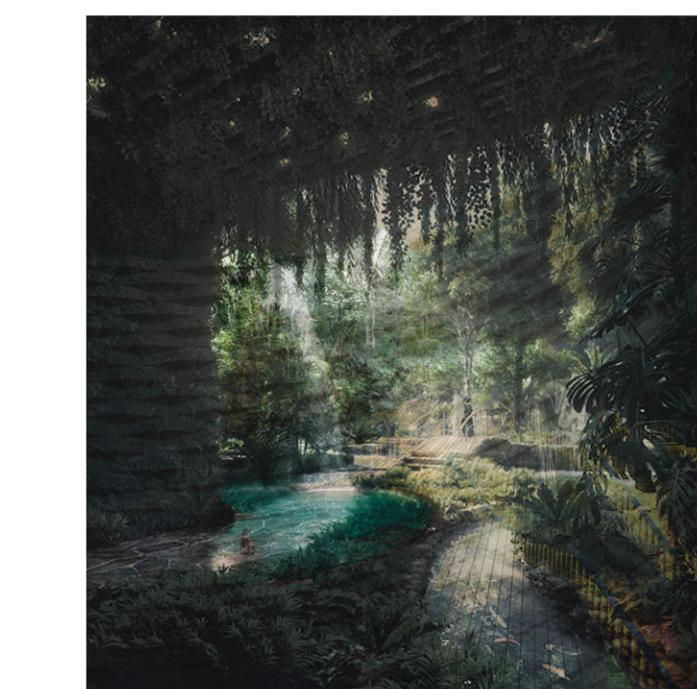
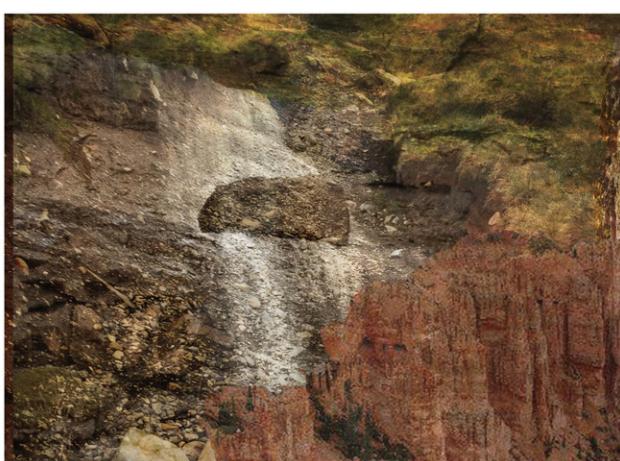
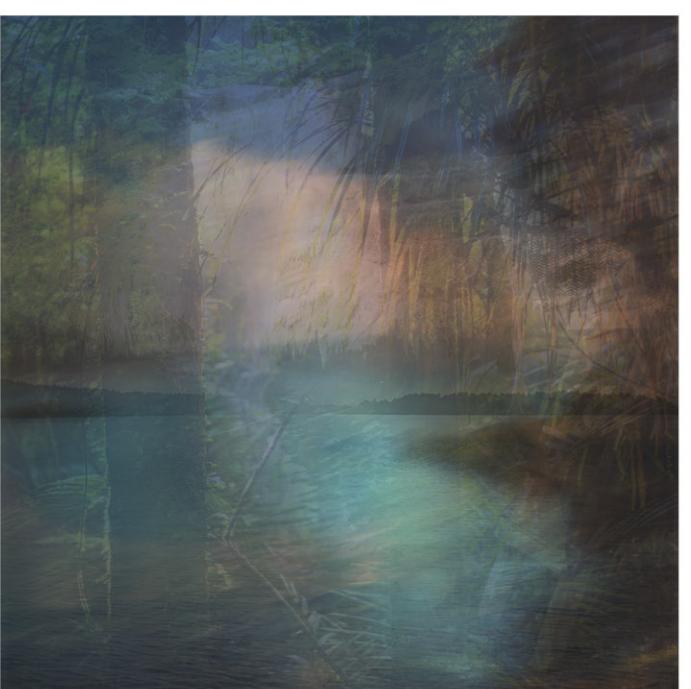
ATMOSPHERIC



ATMOSPHERIC



ATMOSPHERIC



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Topic of conversation: [leave](#)

Concepts around index of leave

Alice's brain: [Alberti and Vitruvius](#)

▼ [Body](#)

Concepts and their affairs

nature

[Explore](#) / [Find](#)

1099 results

 0.301 *Williams, Daniele Barbaros Vitruvius of 1567*

[context](#) [copy](#)

nature of the planets.

[context](#) [copy](#)

This way is found with the aid of art, by means of which nature is conquered in those things in which nature conquers us.

[context](#) [copy](#)

Art, as far as it can, imitates nature.

[load more ...](#)

 0.176 *Alberti, On the Art of Building in Ten Books 1988*

[context](#) [copy](#)

We notice that Nature also delights in the hexagon.

[context](#) [copy](#)

That Nature is composed of threes all philosophers agree.

[context](#) [copy](#)

Is art or Nature, for instance, responsible for the following?

[load more ...](#)

 0.149 *Alberti, 10 books of architecture 1755*

[context](#) [copy](#)

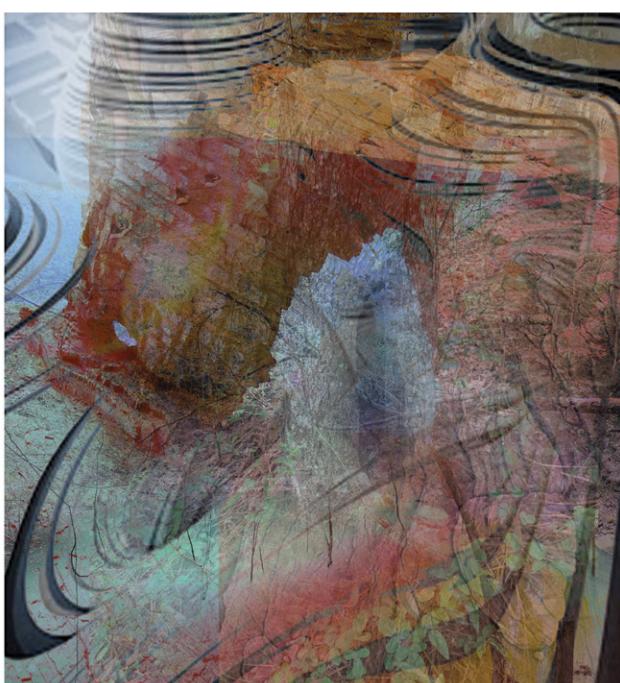
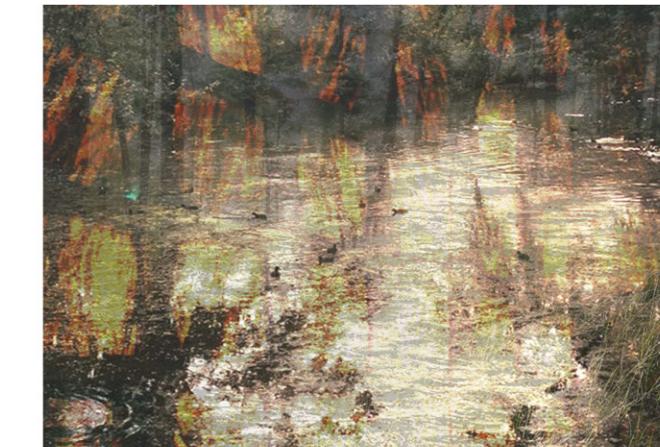
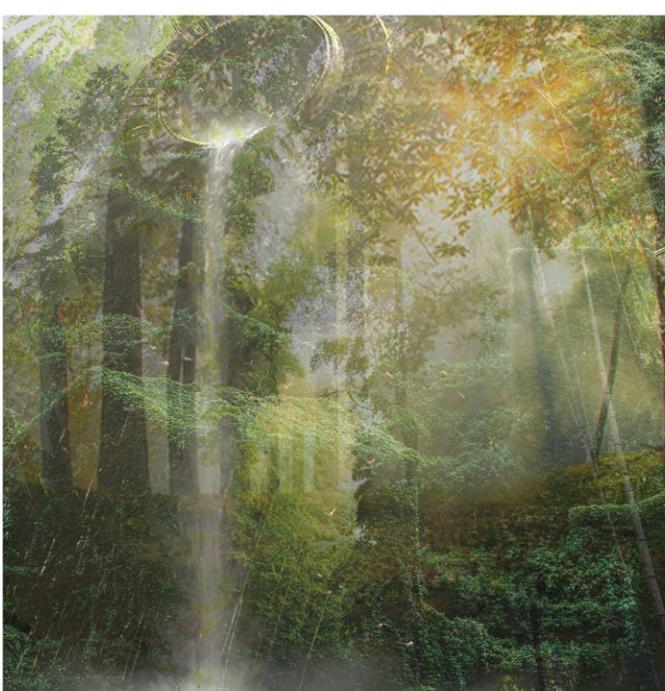
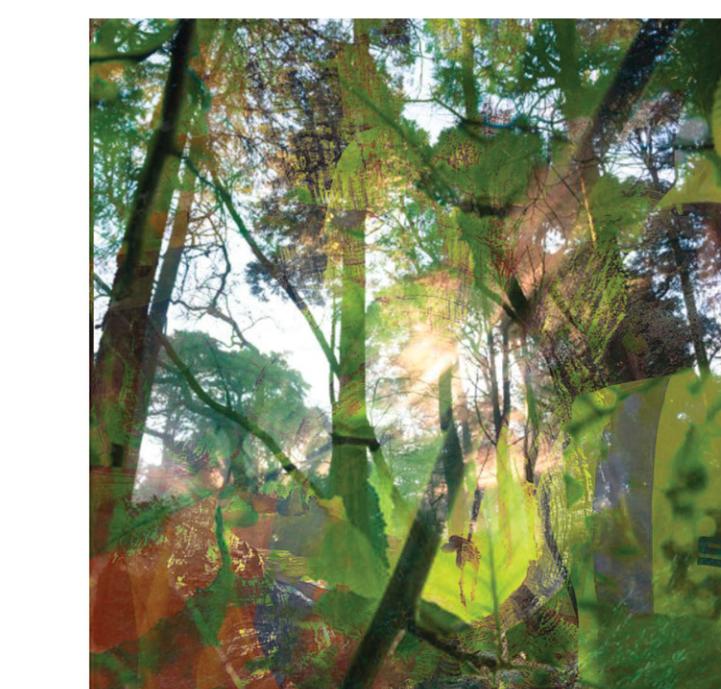
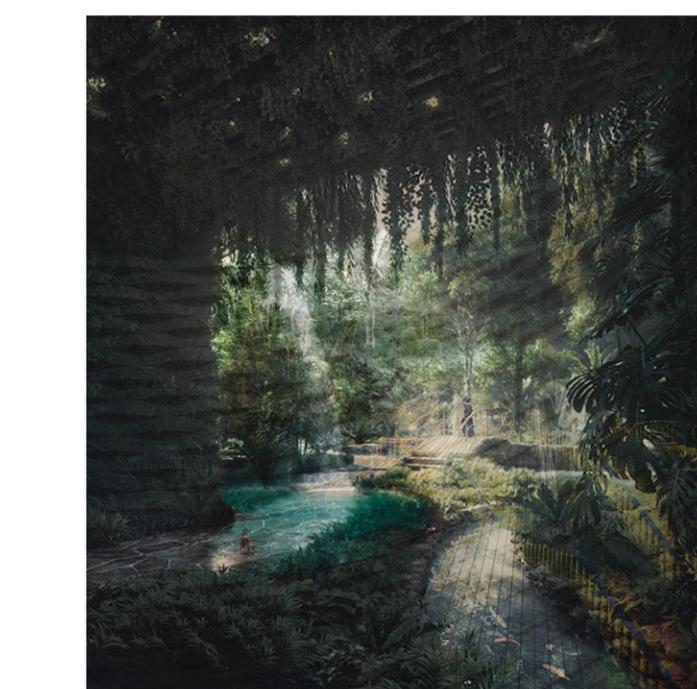
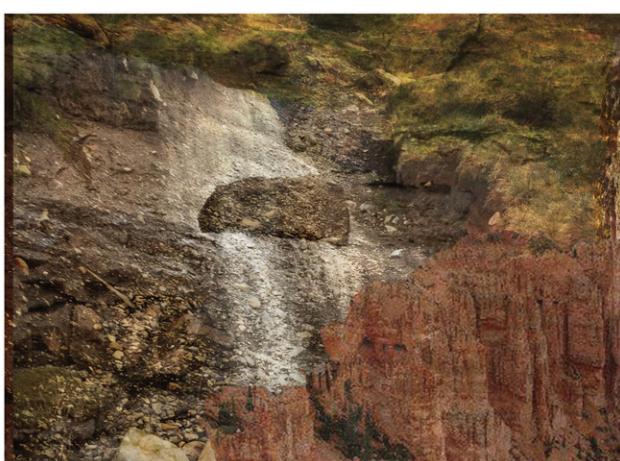
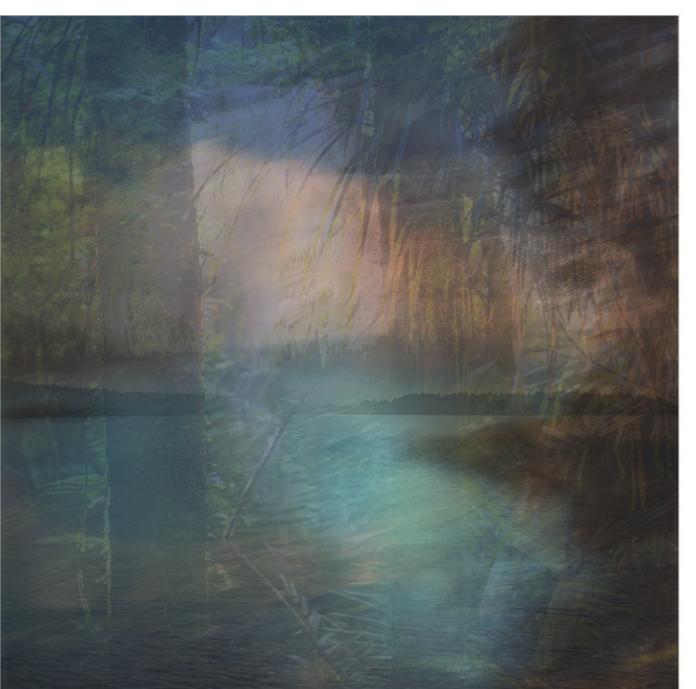
Of Works of a publick Nature.

[context](#) [copy](#)

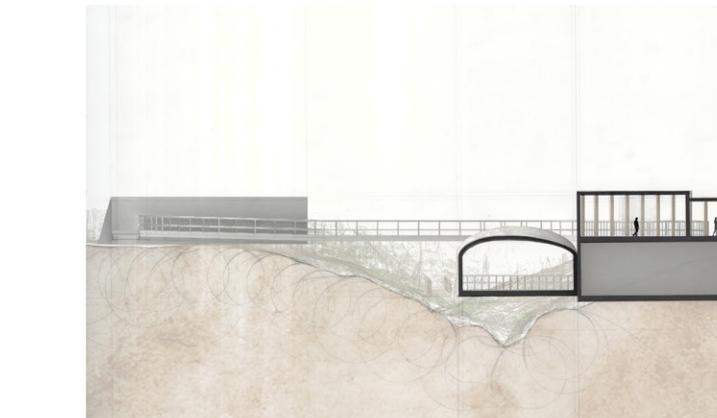
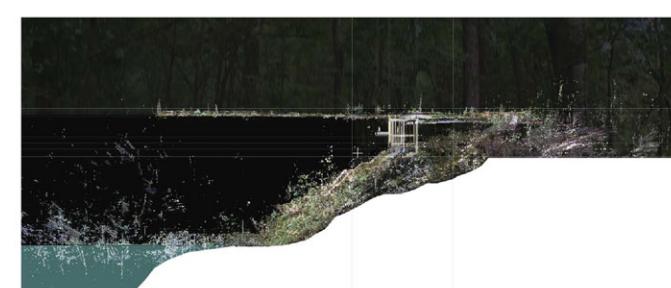
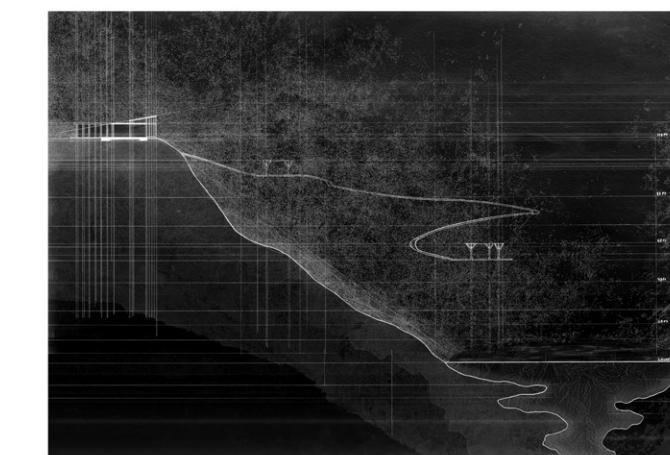
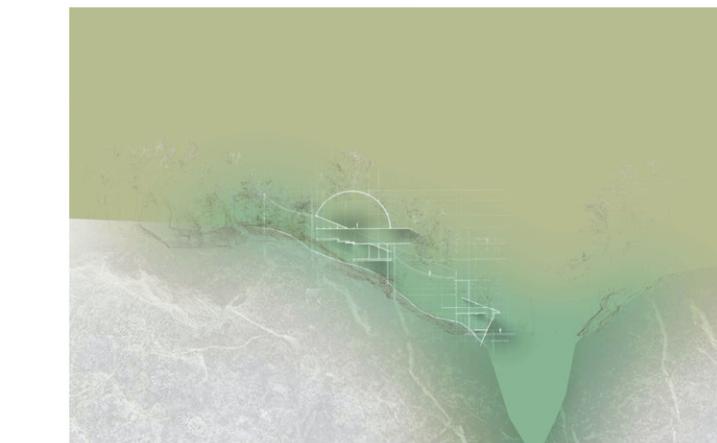
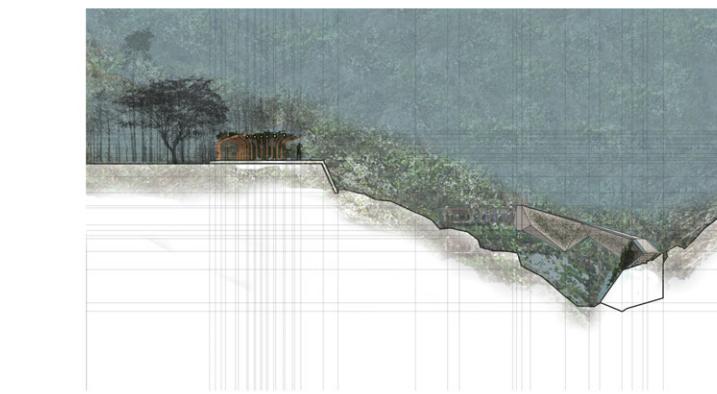
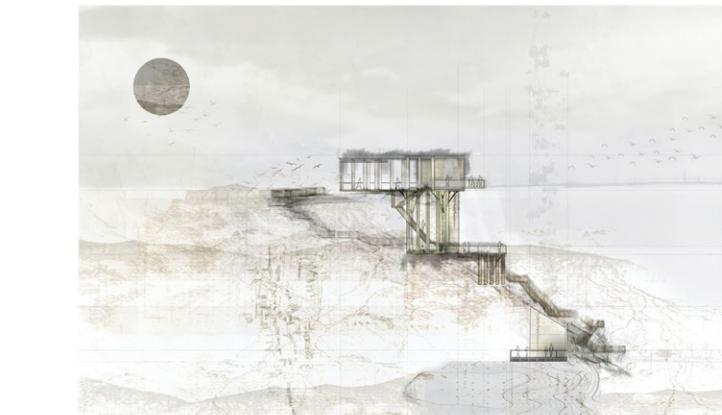
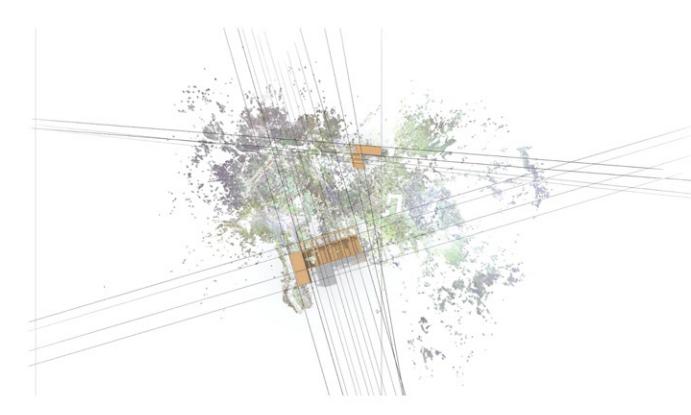
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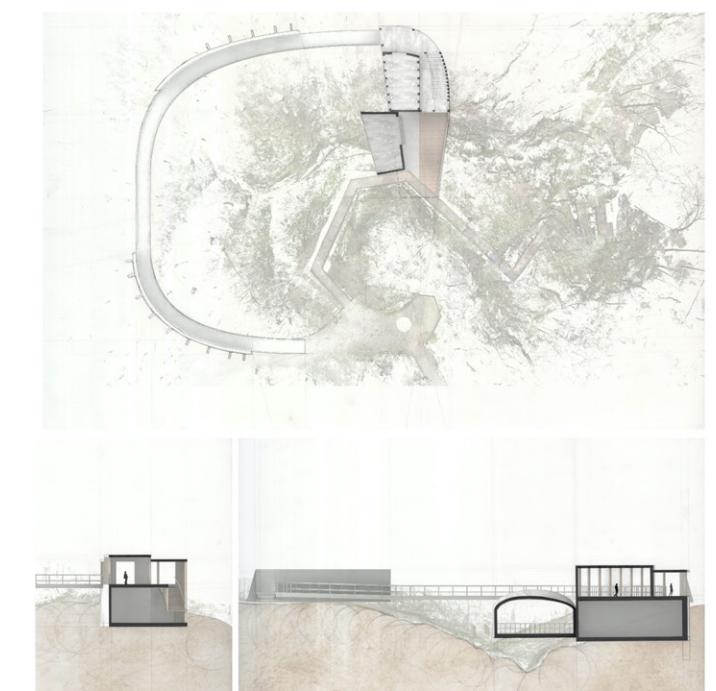
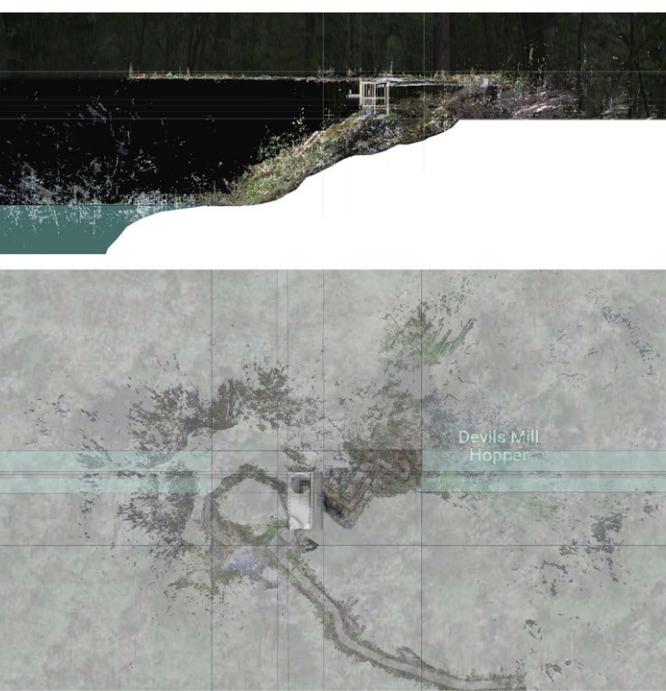
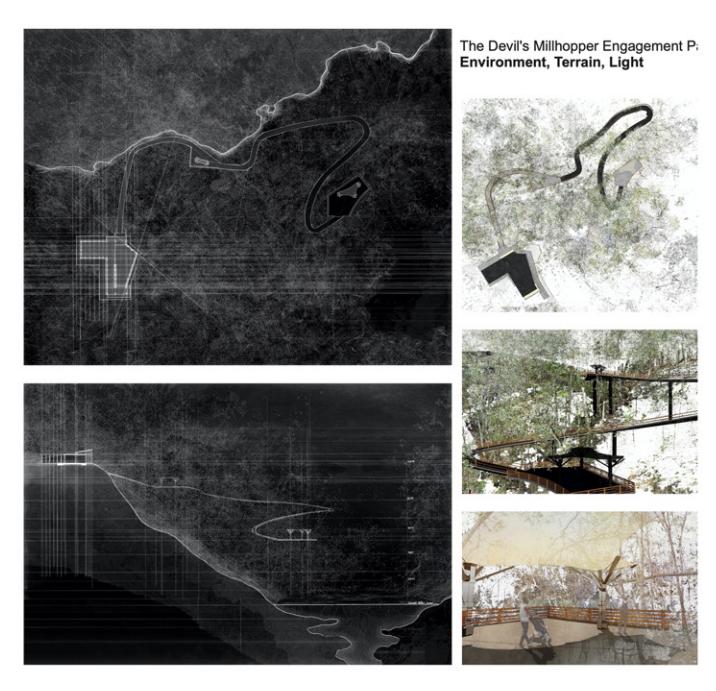
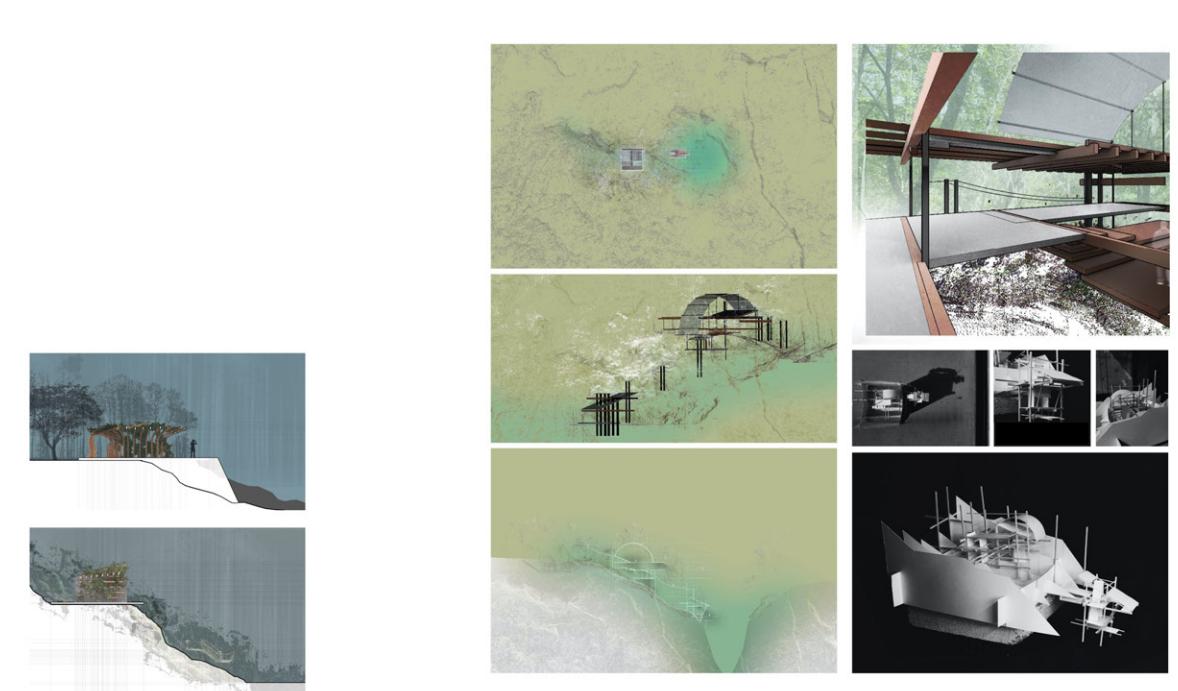
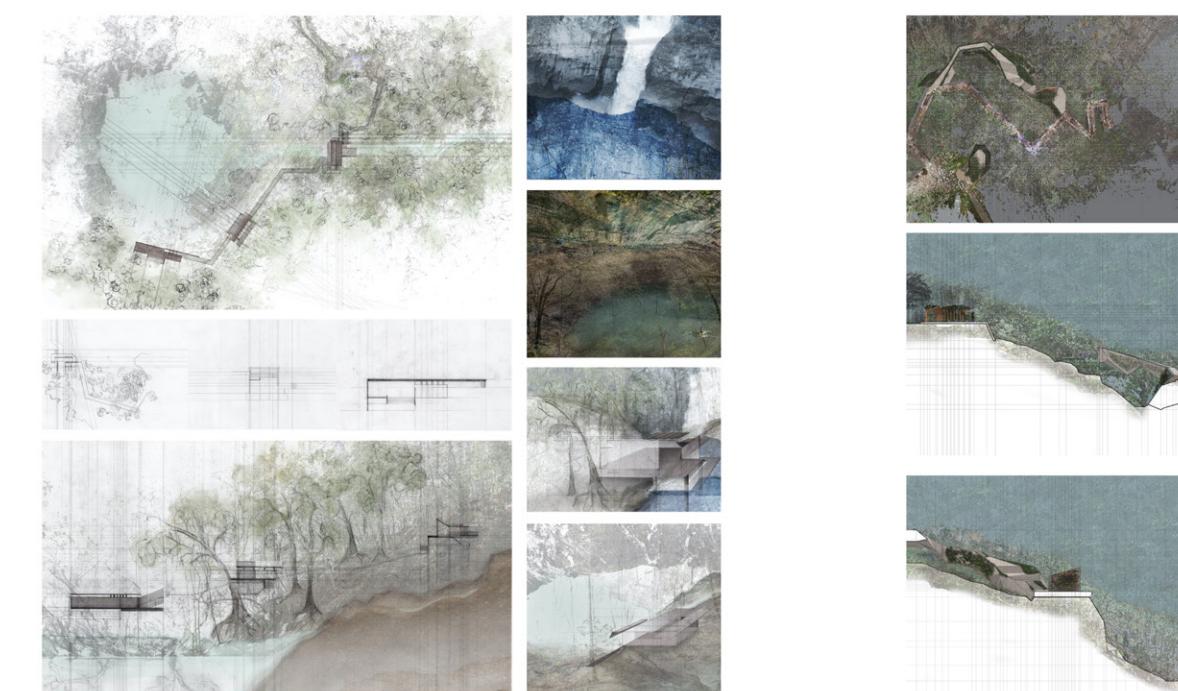
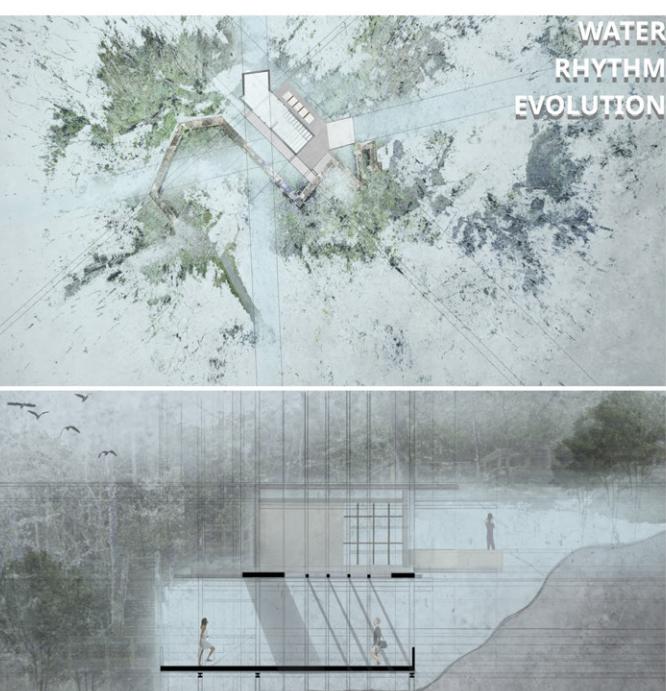
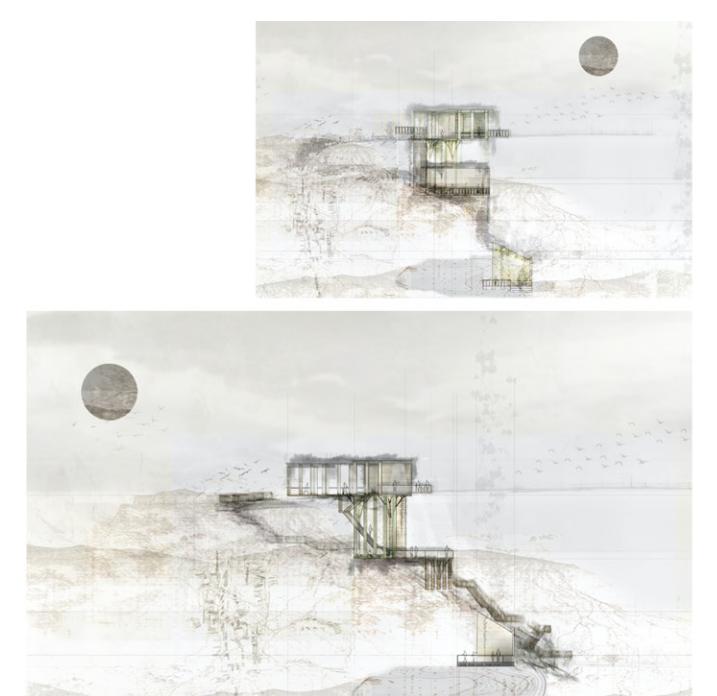
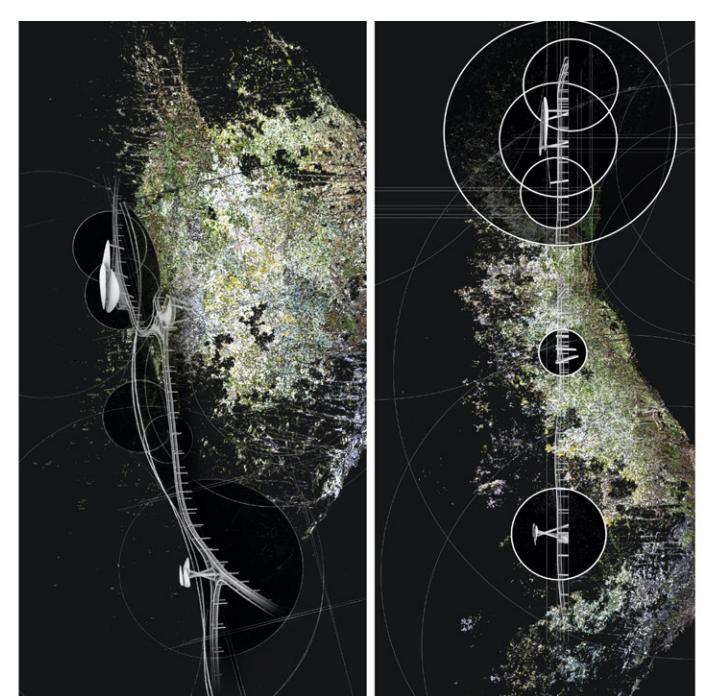
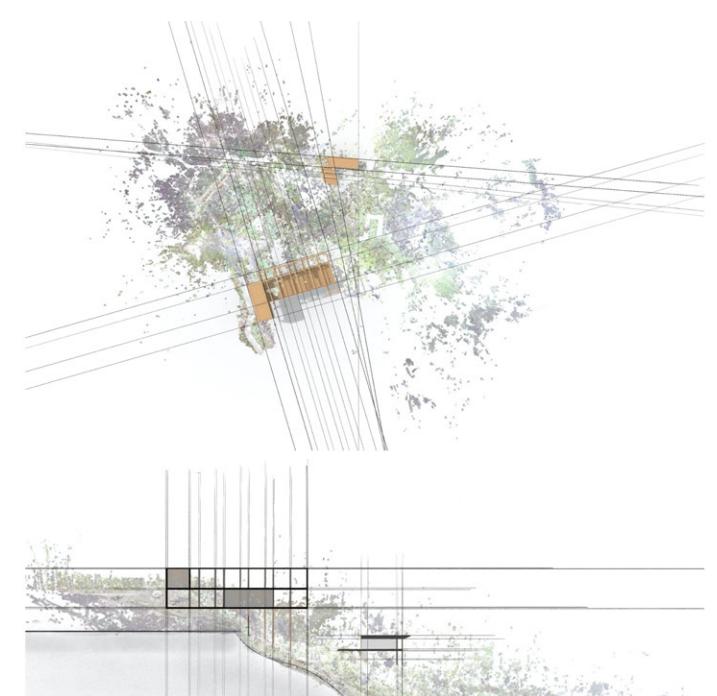
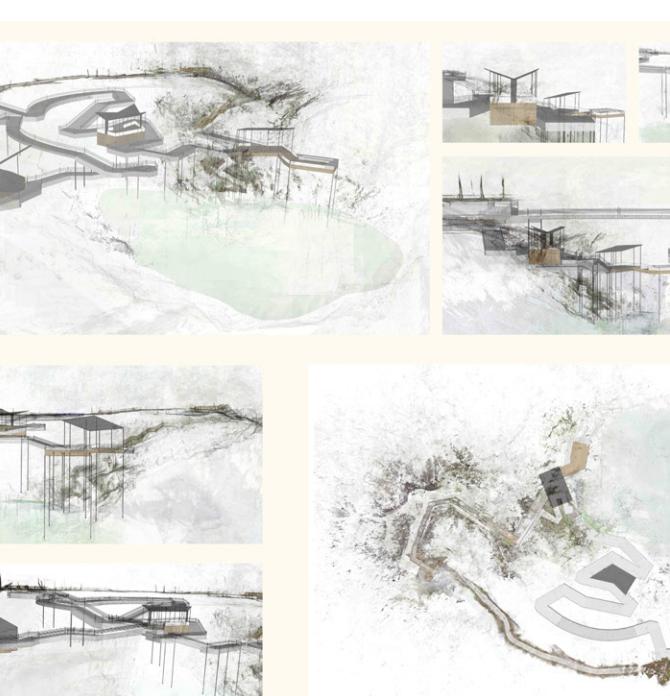
PROGRAM



ATMOSPHERIC



CURATING SPACE



DETAILED SPACE

with Diana Alvarez-Marin



number	max. 20 / min. 10 motivated students
dates	Mondays, 15:00 – 17:00
introduction	Monday, 19.02.2018
place	Chair for CAAD, HIB, Floor E 16, unless announced differently
tutors	Diana Alvarez-Marin, Karla Saldaña Ochoa

A City of Indexes is not exactly definable in geometric terms. In order to engeder it, one must consider n-dimensions, out of which none is correct nor false. In fact, all of them coexist simultaneously in a non-Euclidian condition, where (when) here is not a point in space, but rather a point and all its possible trajectories, reachable within a few digitations. Today, computers and computer networks provide this kind of mobile and instant operability, increasing our reach of action as citizens of a City of Indexes. The aim of this course is to introduce the concept and implications of the abundance of information in our pre-conceived ideas of the city, in order to challenge the notions of models, computation, big data, complexity, analysis and so on, which are relevant to the fields of architecture and urban design.

Each one of us carries a personal computer in our pockets. As we move through the city, we produce, collect, share, store, leave traces of our daily activities. In parallel to this, a myriad of online platforms such as Open Street Maps, Google Maps, Google Earth and Bing populate the web presenting assumptions of a top-down, objective representation of the world, which we would like to question. Yet, what if we could be able to project our own perception and experience of the city on top of this generic common ground? Could we know which our favourite neighbourhoods in a city would be, even before having ever been there and without having read any touristic guides? **We would like to invite you to explore the city of Zurich in this indexical manner.** At first, we will dig into the bigness of these generic-mapping services by cropping randomly thousand of satellite images. We will identify "spatial brands" of the city and by accessing these spaces physically and collecting local data; we will experience and qualify them from an individual perspective, creating our own personal databases. The space of encounter between these different views is an opportunity to challenge these fixed views of what the city could be, a conversation from the generic to the specific, from the objective to the subjective. Lastly, we will train machines to understand how these brands can be adapted to your personal accounts of the city. **This will be your personal City of Indexes.**

Throughout this tutorial we will learn coding fundamentals on Wolfram Mathematica, through crawling algorithms, API implementation, generic image analysis, self-organizing maps and machine learning algorithms, in as much as geocoding and geographic information tools. This is an open invitation to become computer literate and be able to make questions to the Big Plenty about anything (a city?), at any time, in any place.

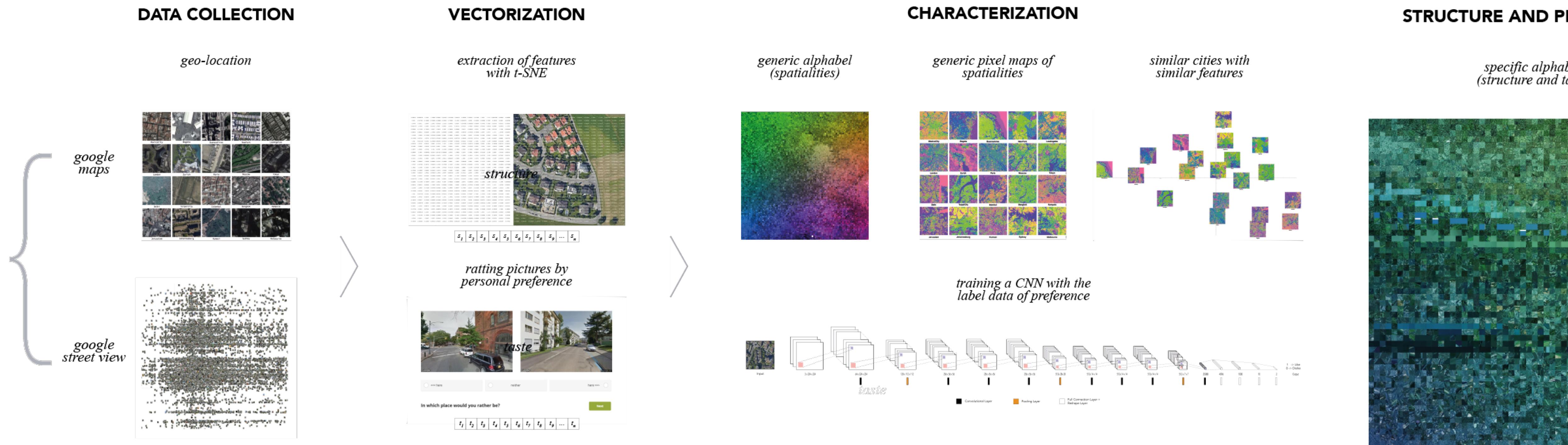
/ ITA

Institute of Technology in Architecture
Faculty of Architecture / ETH Zurich

CAAD Professur Hovestadt
ETH Zürich

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Alvarez-Marin D., Saldana K., 2019, Learning From Cities: Indexical Constitutions with the Big Plenty, Arxiv.

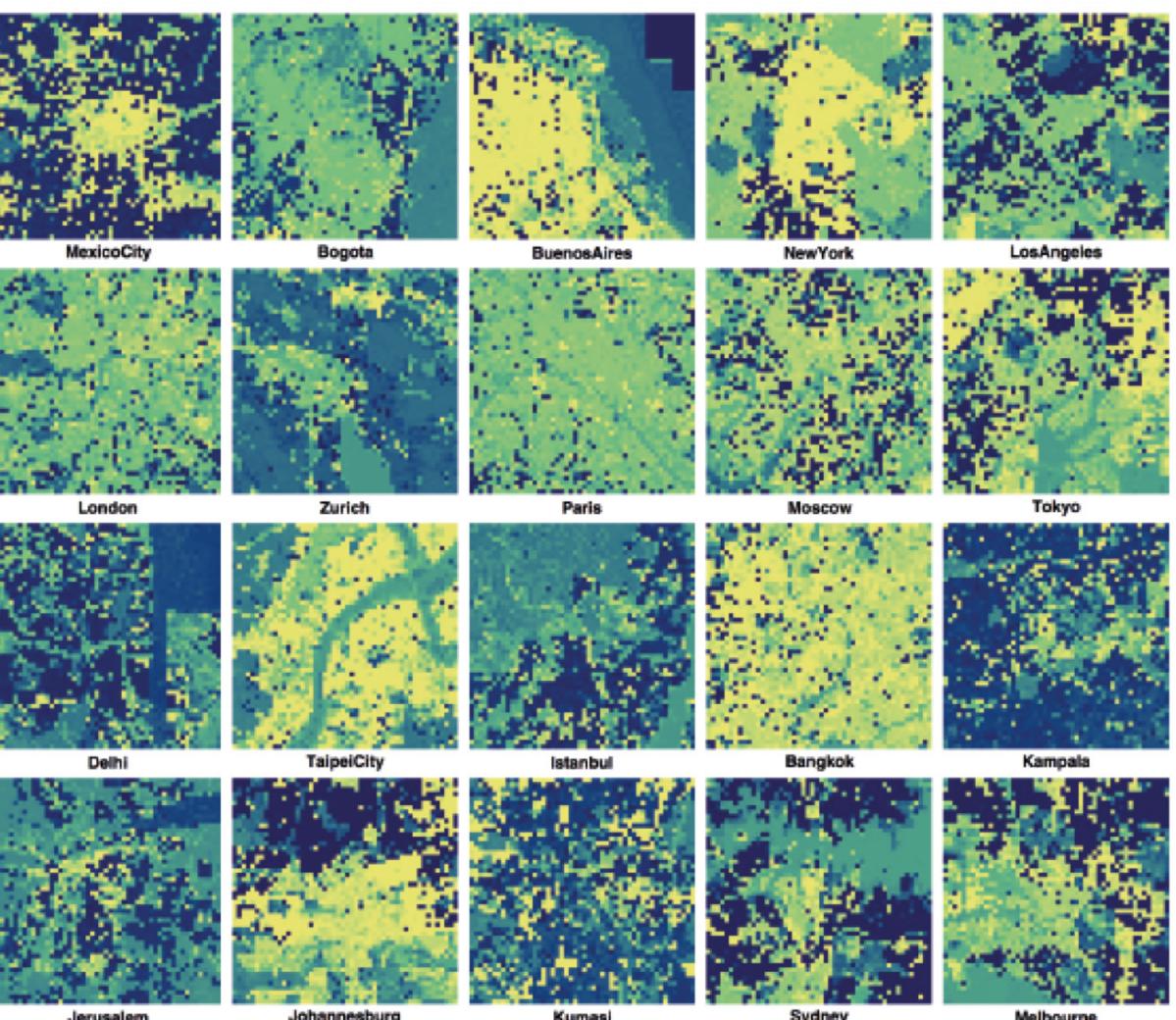


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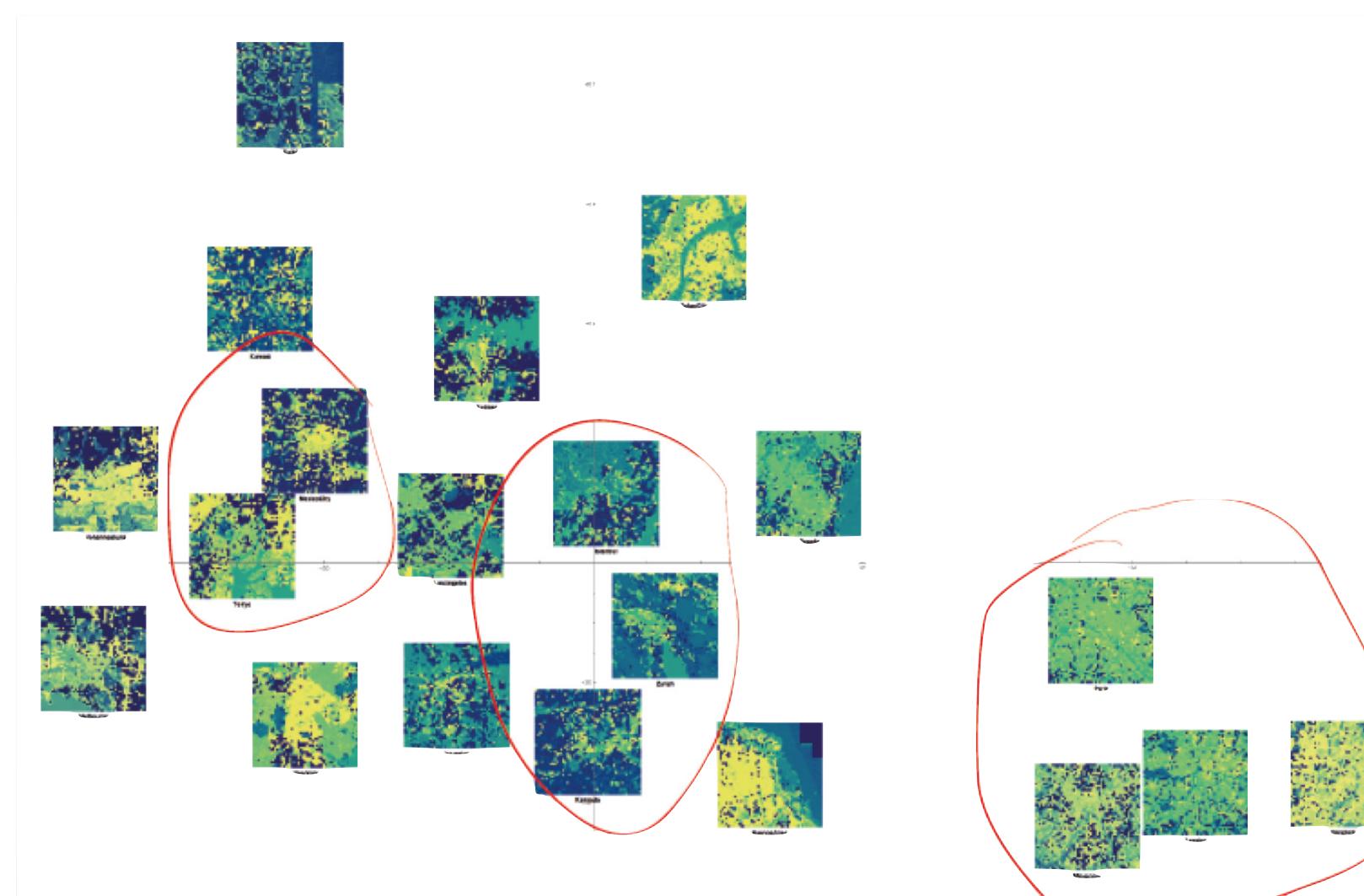
MAPS OF LIKEABILITY

*specific pixel maps based
on Odyseus preference*



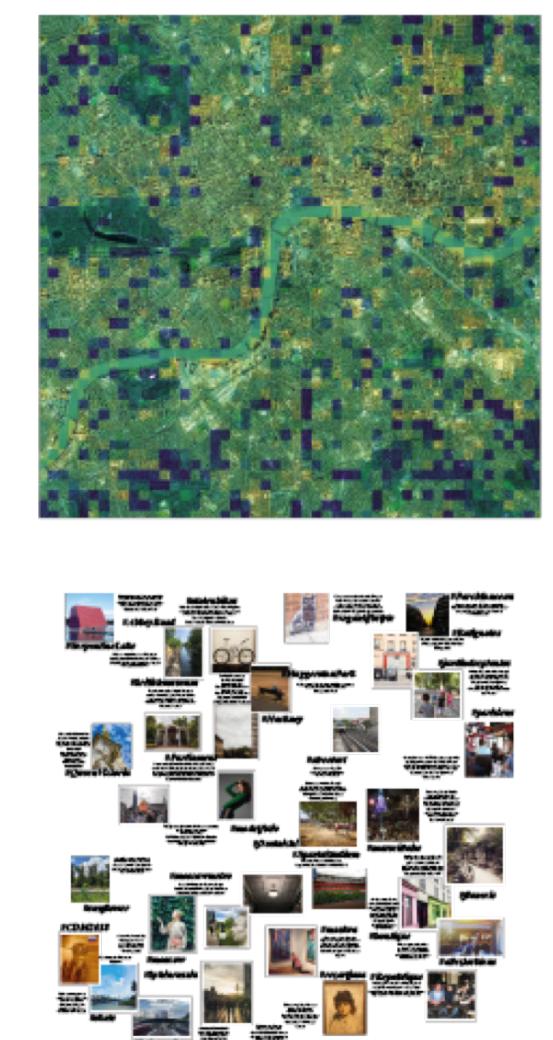
CLUSTERS OF PREFERENCE

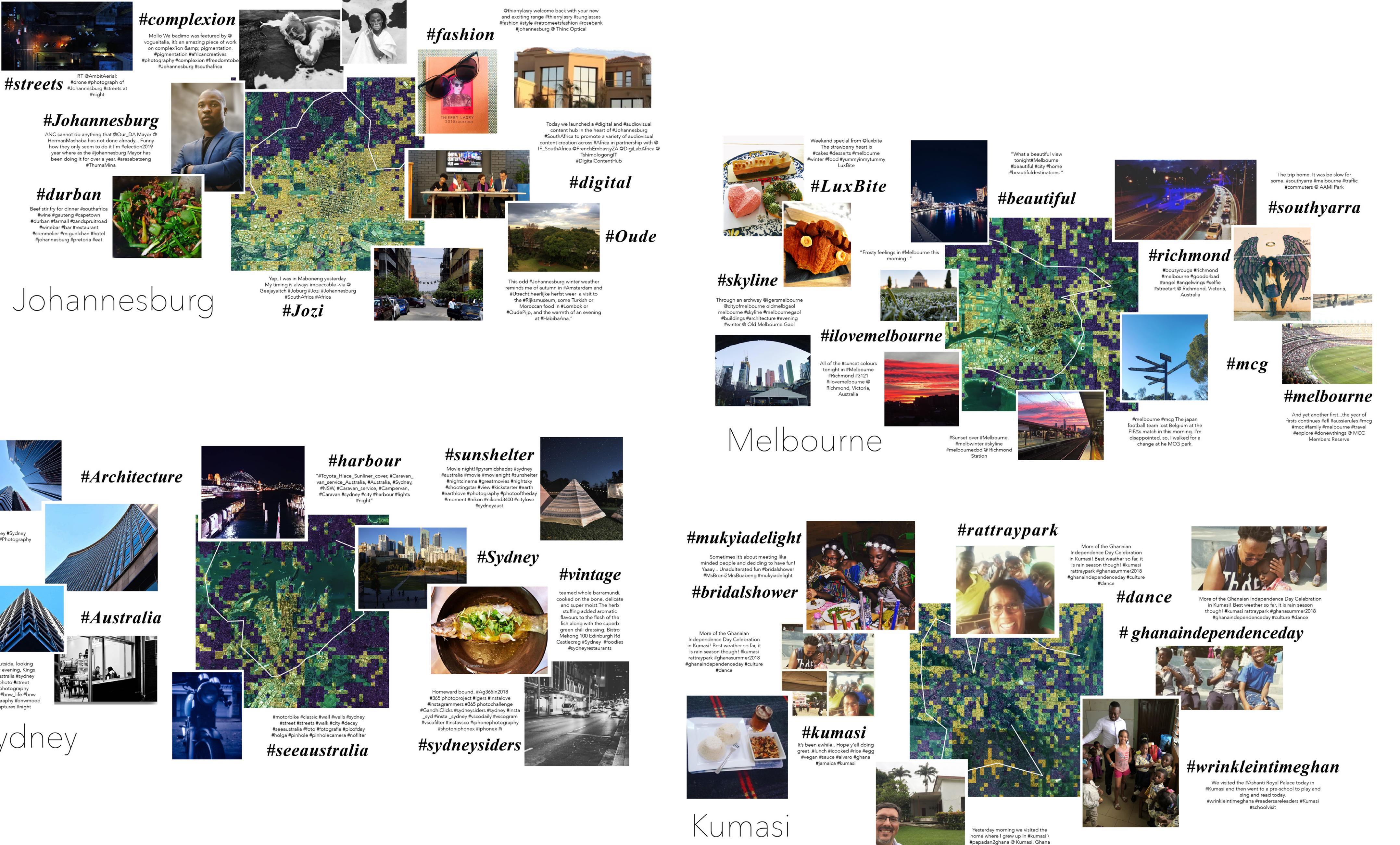
*specific clusterings based
on Odyseus preference*



CITY OF INDEXES

*a city can be render in a
multiplicity of manners*





Bugün Emirgan'dan bir hatıra.
#ibrahim94aliph #istanbul
#photography #nature #sea
#bosporus
#emirgan #colorful #flag
#bayrak #andscape #artistic
#sky #ship
#galata #picoftheday

#emirgan



#Istanbul



Sıradaki parça uymayanlara gelsin

#istanbul #engelköy
#müslümlügürses #öltükare
#istanbuldayasam
#aguzelisstanbul #fanlatistik
#huzur #istanbuldaşır
#istanbuldayasam

Günaydın

Keyifli pazarlar
#kafve #turkishcoffee #oogaz
#ikanlica #turbanistanbul
#happyiyaday #tashcoffee
#bosporus #aa #amazingview
#mycapture
#anyakala

#kanlıca



#istanbulbayan



#tuğyan

#BazKadınlarSeytandır

#yaparsınAşkım #ren #corlu

#istanbul #uzla #tuğyan

#gökler #gökler #gökler

#klima #SONDAKICA #CANLI

#fıla #ODTU #WorldCup

#istambulbayan

#tuğyan

#kadıköy

#kadıköyescort

#KandilliIskele

"yi perşembelerde değerli arkadaşlarımlar
#istanbul #bestmemories @ Bebek "
Gündüz Tarifi
#streetphotography #istanbul
#bosporus #bebek #ferry #sunny
#summer2018 #istanbul #turkey
#turkey #streetphoto @ Bebek Sahili

#BebekSahili



Istanbul

#BebekSahili

#KandilliIskele

#emirgan

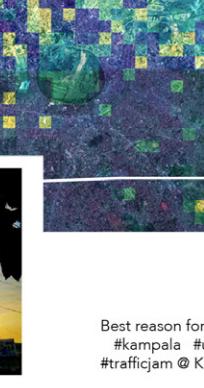
#İstanbul

#Kadıköy

#İstambulbayan

#Kadıköy

Kampala





A sunflower in a very heart of Moscow! Looks veeeery Russian actually :) sunflower #moscow #russia #city #paradise #nature

#sunflower

#CDM2018



Early morning street surfing #carver #oracle #kate #urfskate #longboard #sport #extreme #moscow #moscow2018 #russia

#skate

#belorusskaya

MOSCOW

#moscowmetro

Lamp #art #interior #interiordesign #moscowmetro #belorusskaya #streetart #streetleaks #streetlife #streetphoto



Seems like I need the same green wall in my flat #greenhorn #summer #moscow #eveningwalks

Na zdoroviy ! #Moscow #CDM18

#moscow

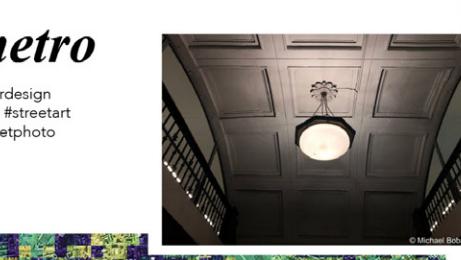


#skate

#belorusskaya

#kyhinrussia

#streetart #streetleaks #streetlife #streetphoto #streetphotographer #streetphotography #streetstyle #sport #traveling #ways #moscow #belorusskaya



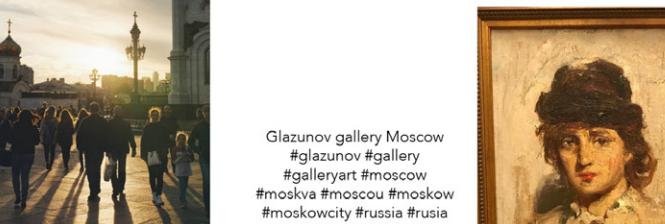
#moscow



#SpartaStadium
#MundialTelemondo #Moscow #SpartakStadium @Dianirin #COL #ENG

#TretyakovskyMuseum

A bust of Leonid Brezhnev among many Soviet monuments behind the New Tretyakovsky Museum in Moscow



#rezartjasa

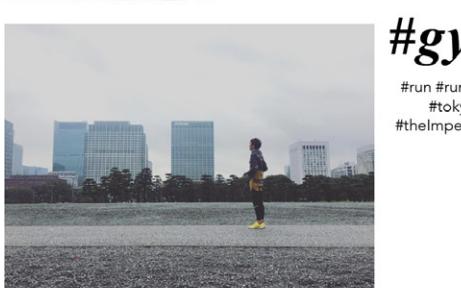
Glazunov gallery Moscow #glazunov #gallery #moscow #moscou #moscow #moskovity #rusia #rusa #rezartjasa à Bolotnaya Square



Great to return to Tsubameya Ginza to try their steak - this was from Minamoto. Yum! And motto ishii Supremely delicious. More selections for steak are offered during dinner



Love to live the lovely Tokyo life. Why? Read it in my interview (sorry it's in Dutch, but long live the translate machines). All credits to @biancateops #akihabara #electrictown #nljapan #dutchintokyo #japan #tokyolife #loveit @ NLIJapan



#run #running #nike #nikerunning #tokyo #japan #gyakusou #theImperialPalace: Tokyo Imperial Palace



#goldfish #real #tokyo #artaquarium @ Nihonbashi

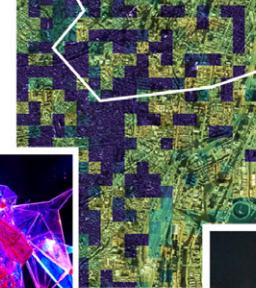
Tokyo



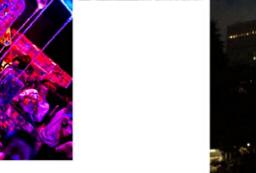
Weygu grill in Tokyo #food #foodporn #japanesefood tokyo #Instagram #The Prince Gallery Tokyo Kioicho, A Luxury Collection Hotel



#tokyolife



#run #running #nike #nikerunning #tokyo #japan #gyakusou #theImperialPalace: Tokyo Imperial Palace



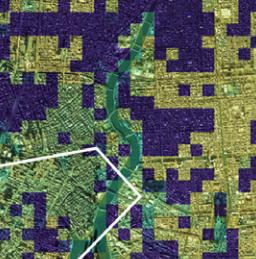
#gyakusou

#tokyovalley valley #japanalley #akihabara #nightlife #nightphoto #nightphotography #visitjapan #tokyo #tokyotravel #japan #japantravel #travelphotography #wonderlust #travelbug [Ellipsis]



#foodporn

El #trendelacosta a la salida de la estación Borges, en cámara super lenta by samsung #galaxyS9 #ren #train #travel #viaje #ferrocarril #alway #ciudad #city #day #nature



#tokyoskytree

lan- approve-implement and then they grow for x no of years to be effective. till then eat drink sleep dust. #delhi #ncr #gogreen



#imperialpalace

Borges, en cámara super lenta by samsung #galaxyS9 #ren #train #travel #viaje #ferrocarril #alway #ciudad #city #day #nature

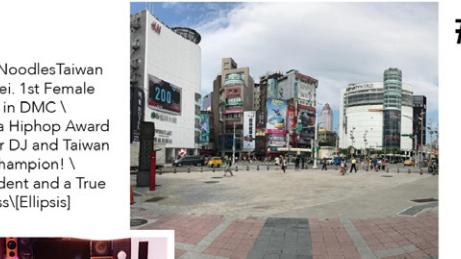


#prettyinpink

#tokyovalley valley #japanalley #akihabara #nightlife #nightphoto #nightphotography #visitjapan #tokyo #tokyotravel #japan #japantravel #travelphotography #wonderlust #travelbug [Ellipsis]

#HibiyaPark

This is #DNCpolice Taiwan from Taipei, 1st Female finalist in DMC \ history, China Hiphop Award Most popular DJ and Taiwan DMC Champion! \ Teacher, student and a True Empress! [Ellipsis]



#Taipei



#moskva



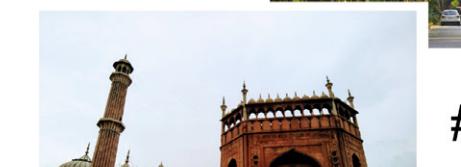
#rezartjasa



#architectural



#love



Munni Begum received new clothes and she simply loved them #LifeatMKT #Idage #dubai #london #centent #causes #socialwork #frigo #ongroffindeli #nonprofit #causes #charity #4charity #changemakers #goodtogive #giving #philanthropy #RT #Delhi #evening #sun #tower #urban #travel #traveling



#JamaMasjid



#Hindustan



#Dehli

"In another country, people would have taken to the streets by now. But as citizens sorely lacking any sense of collective civic good, we think money can shield us from these problems." #Delhi

#ximenting



#Taipei



#naka



#matcha



#matcha



#gogreen



#JamaMasjid



#Hindustan



#Dehli

"In another country, people would have taken to the streets by now. But as citizens sorely lacking any sense of collective civic good, we think money can shield us from these problems." #Delhi

#powderandpowder



#Taipei



#matcha



#matcha



#matcha



#matcha



#matcha



#matcha



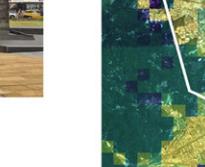
#matcha

"In another country, people would have taken to the streets by now. But as citizens sorely lacking any sense of collective civic good, we think money can shield us from these problems." #Delhi

#ntch



#Taiwan



#matcha



#matcha



#matcha



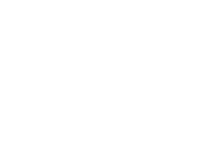
#matcha



#matcha



#matcha



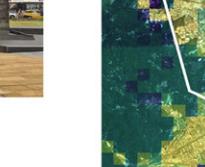
#matcha

"In another country, people would have taken to the streets by now. But as citizens sorely lacking any sense of collective civic good, we think money can shield us from these problems." #Delhi

#ntch



#Taiwan



#matcha



#matcha



#matcha



#matcha



#matcha



#matcha



#matcha

"In another country, people would have taken to the streets by now. But as citizens sorely lacking any sense of collective civic good, we think money can shield us from these problems." #Delhi

#ntch



#Taiwan



#matcha



#matcha



#matcha



#matcha



#matcha

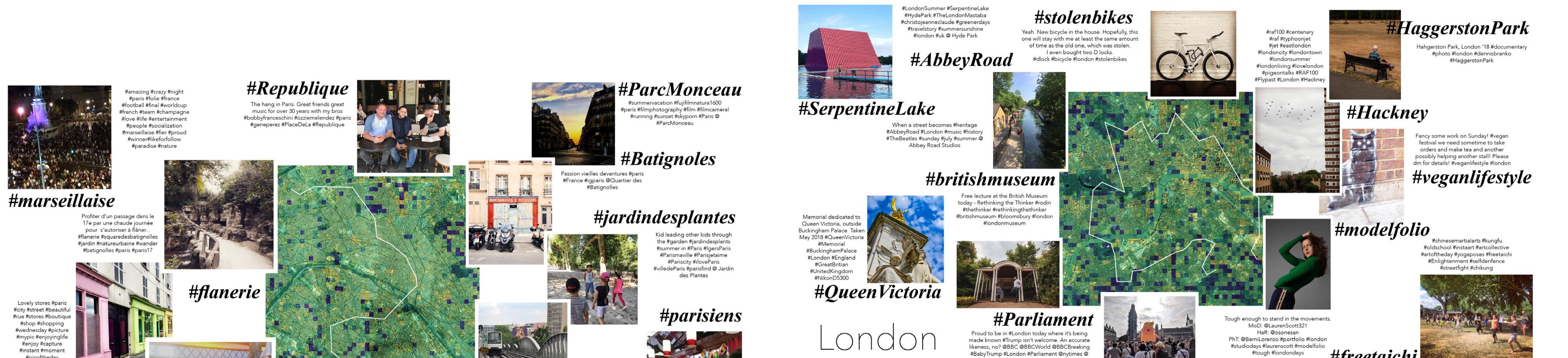
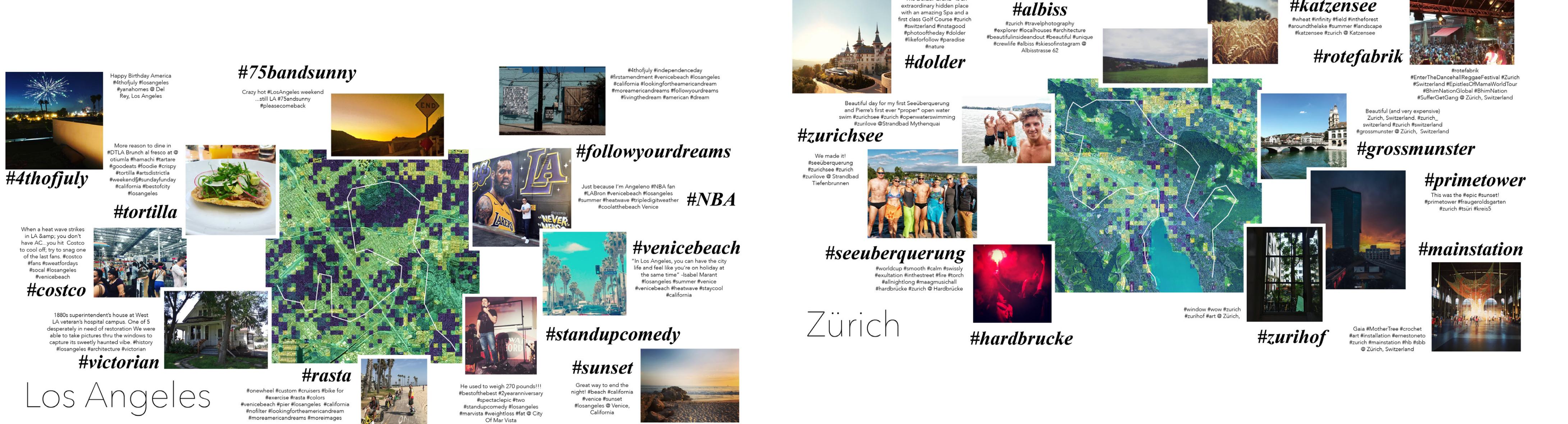
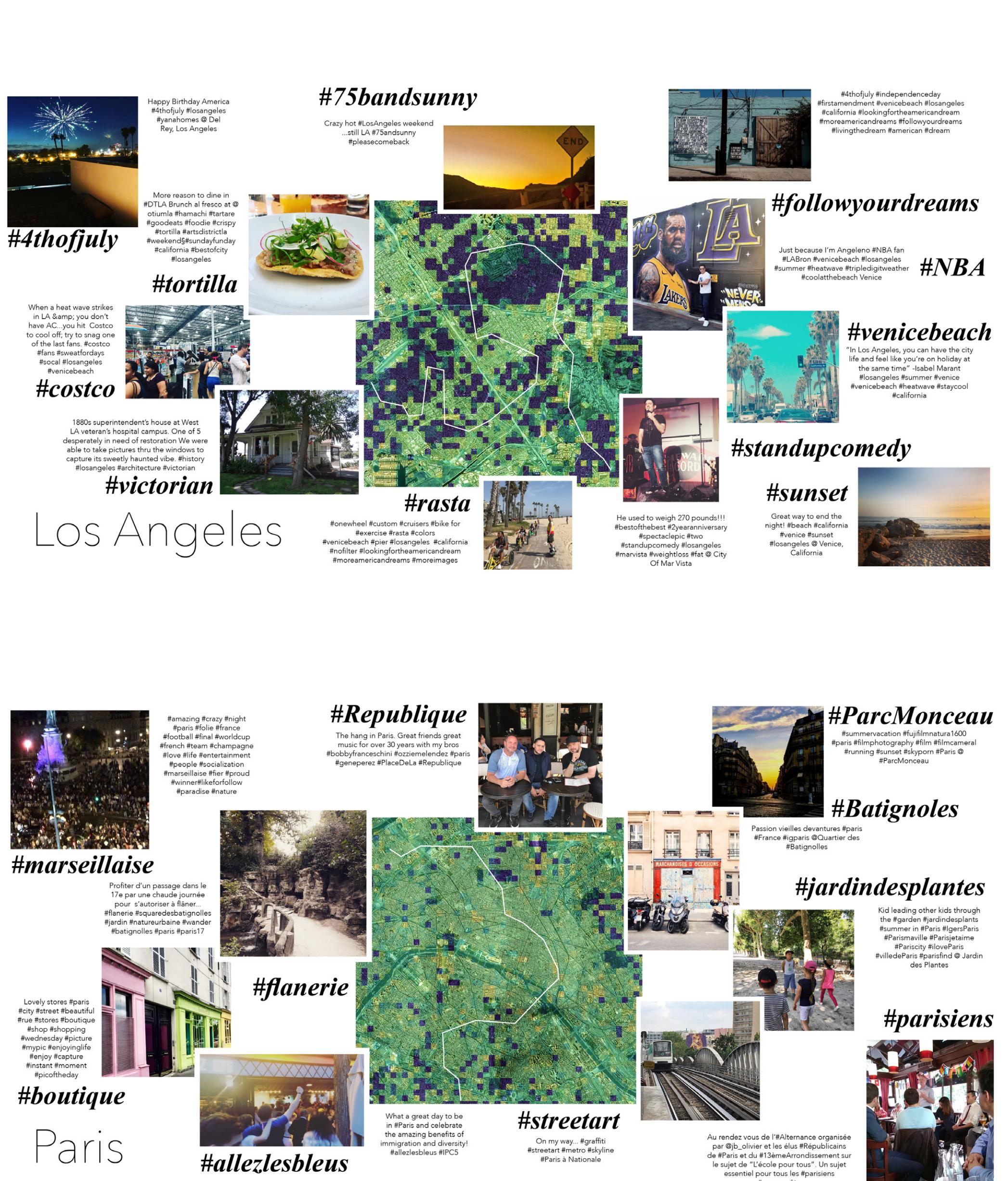


#matcha

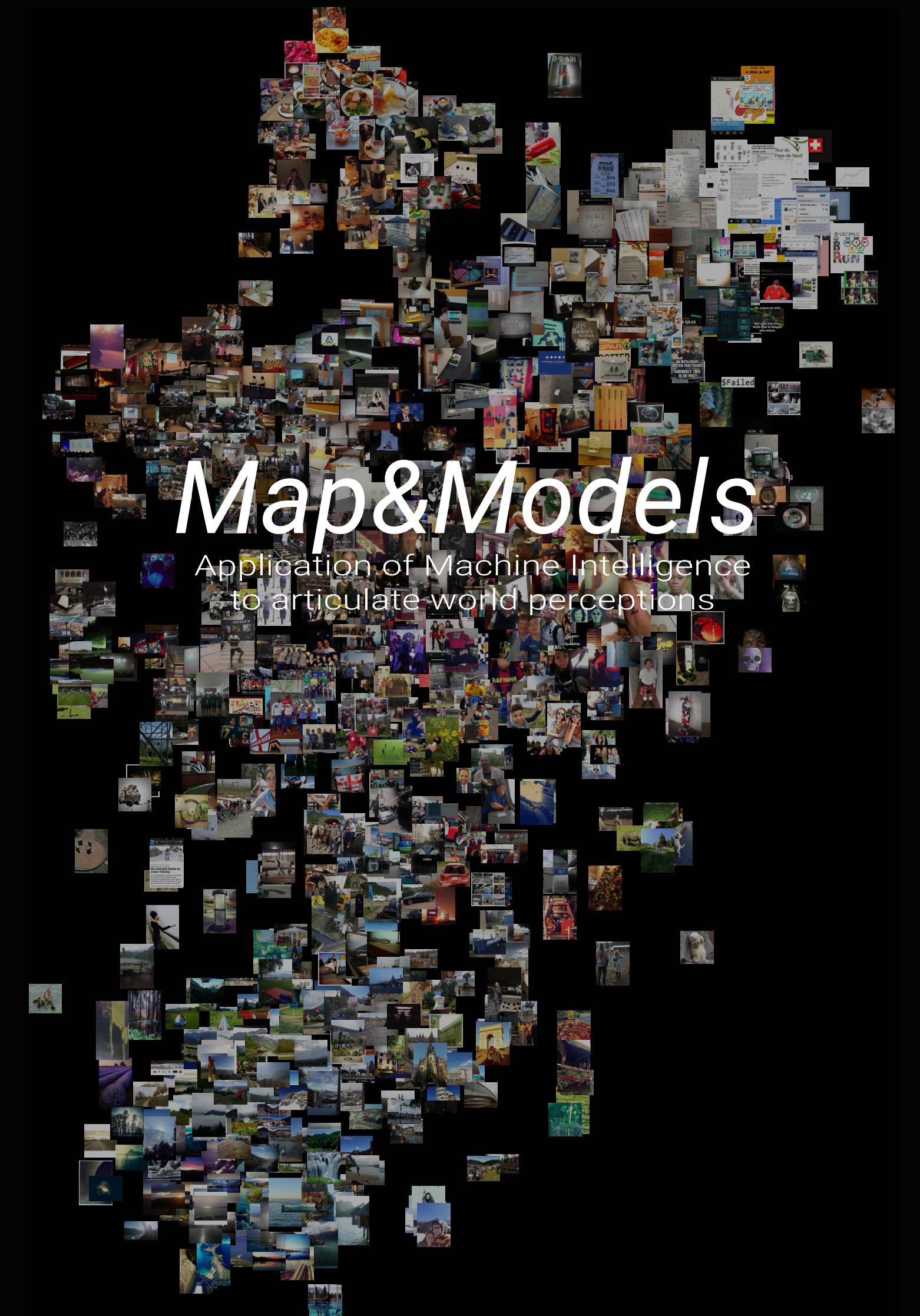


#matcha

"In another country, people would have taken to the streets by now. But as citizens sorely lacking any sense of collective civic good, we think money can shield us from these problems." #Delhi



with Zifeng Guo



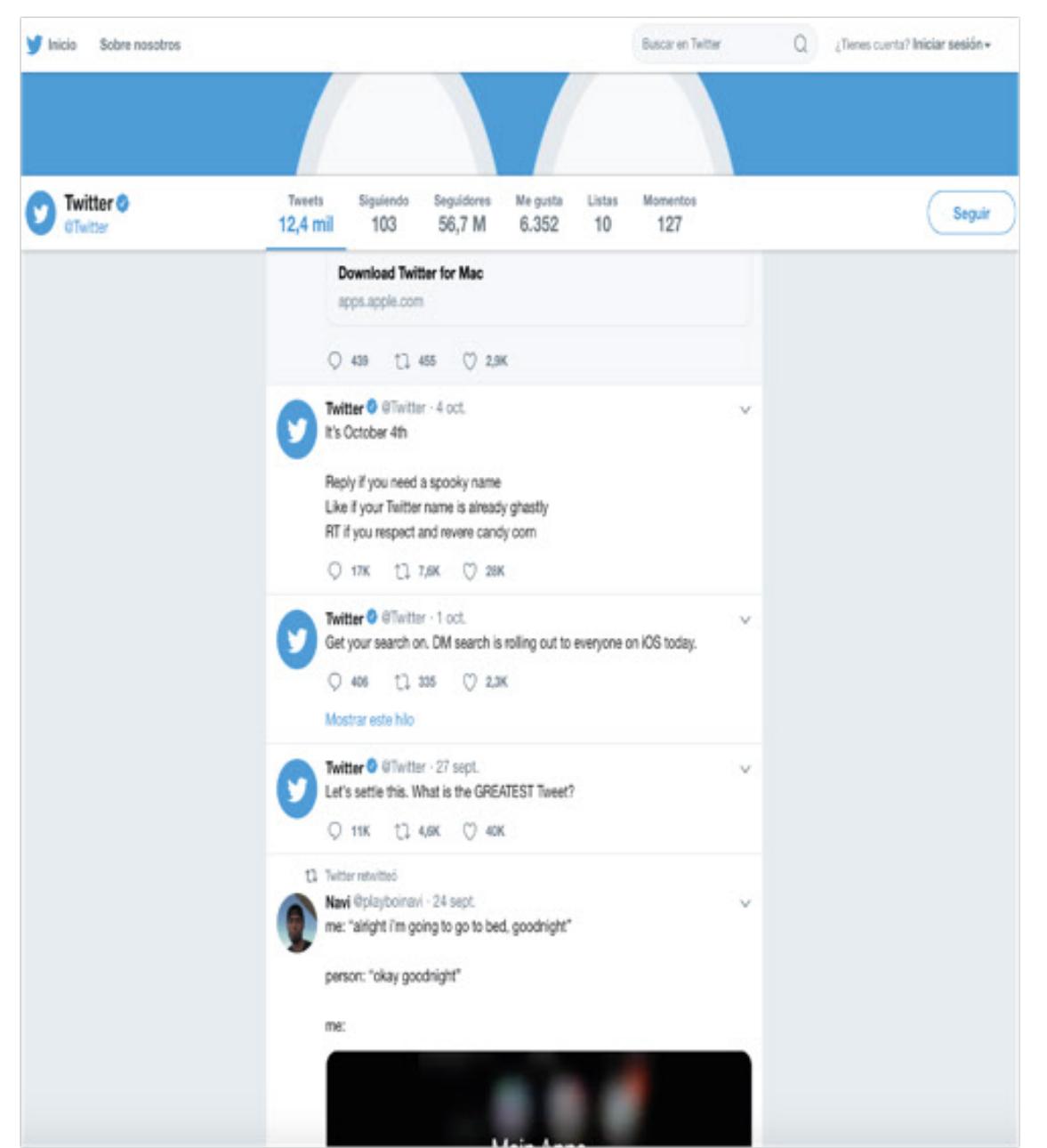
/ ITA

Institute of Technology in Architecture
Faculty of Architecture / ETH Zurich

digital Professur Hovestadt
architectonics ETH Zürich

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



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#BALENCIAGA1955Triples #BALENCIAGA1955 #BALENCIAGA 1955 #1955Triples #Triples #巴黎世家 #重稿粉 #代理 #微商 #xiamen #shanghai #hangzhou #guangzhou #beijing #hk #fujian
#HongKong #china.1178805784546668544->beijing #北京 #北京区 ##
今年大风大雨加持,117879477282185216->里是重〇〇〇
This is changing
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#Wukan.1177961685911132161->忘·平出席人民英雄敬献花篮〇〇〇

#中国 #北京 #烈士 #纪念日 #China #Beijing #MartyrsMemorial #艾文中文.1177909429330685953->Répétition générale aérienne avant le 1er octobre à Pékin, fête nationale chinoise, 70em anniversaire
从北京传来的好消息! #
#China #Beijing #China #Beijing #HongKong #NationalDay
#October1st #中国 #中国 #北京.1178662847825342464->如果我〇〇〇对斗争、献身精神和辛勤工作〇〇〇合起来。可以称之为〇〇〇中国。〇〇〇始者和劳动者〇〇〇这个国家〇〇〇到最高地位而〇〇〇献身精神的献身精神。中国七十周年快乐! #China #70thNationalDay #Beijing.1178700380084957186->China has quietly more than doubled its deployment of mainland security forces in Hong Kong, according to foreign envoys and security analysts, in the most dramatic move yet by Beijing to prepare for more Hong Kong Protests.1178700380084957186->NOAA20 viewed heavy #smog over #Beijing, #China, on Sunday, Sept. 29, 2019. The Chinese government has been working to control pollution levels for their 70th anniversary celebration, but emissions are blowing in from surrounding regions. Learn more: https://go.usa.gov/vXGAA.1178699532817195013->We believe this will benefit both countries' people and the world."

#China hopes that #Beijing and #Washington will resolve their #TradeWar "with a calm, rational attitude," Vice Minister of Commerce Wang Shouwen said ahead of #TradeTalks.1178637654825443329->A cuartos de final del #ATP 500 de #Beijing !

@juancabal y @RobertFarah_ dejaron en el camino a Stefanos Tsitsipas y Wesley Koolhof por 6-3, 0-6 y 16-14.

You collected data in two formats

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Curly Dhyana
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#BALENCIAGA1955Triples #BALENCIAGA 1955 #BALENCIAGA 1955 #1955Triples #Triples #巴黎世家 #重稿粉 #代理 #微商 #xiamen #shanghai #hangzhou #guangzhou #beijing #hk #fujian
#HongKong #china.1178805784546668544->beijing #北京 #北京区 ##
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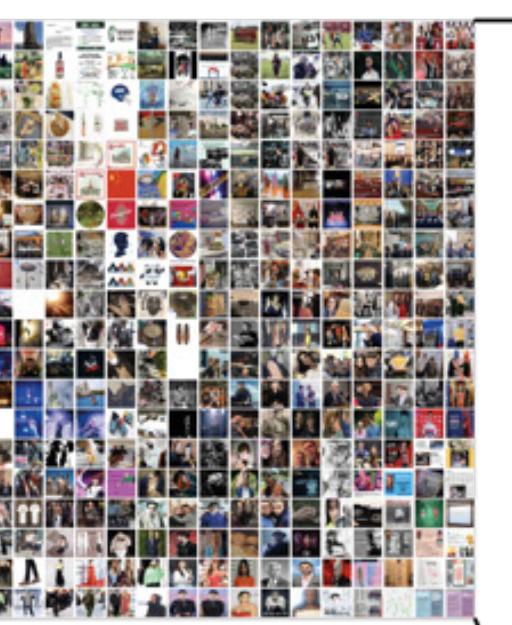
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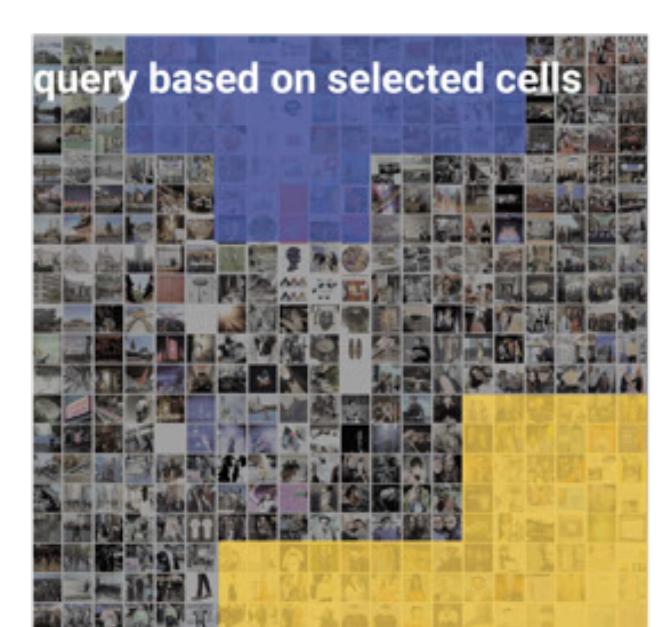
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Define your project, and start the crawling process



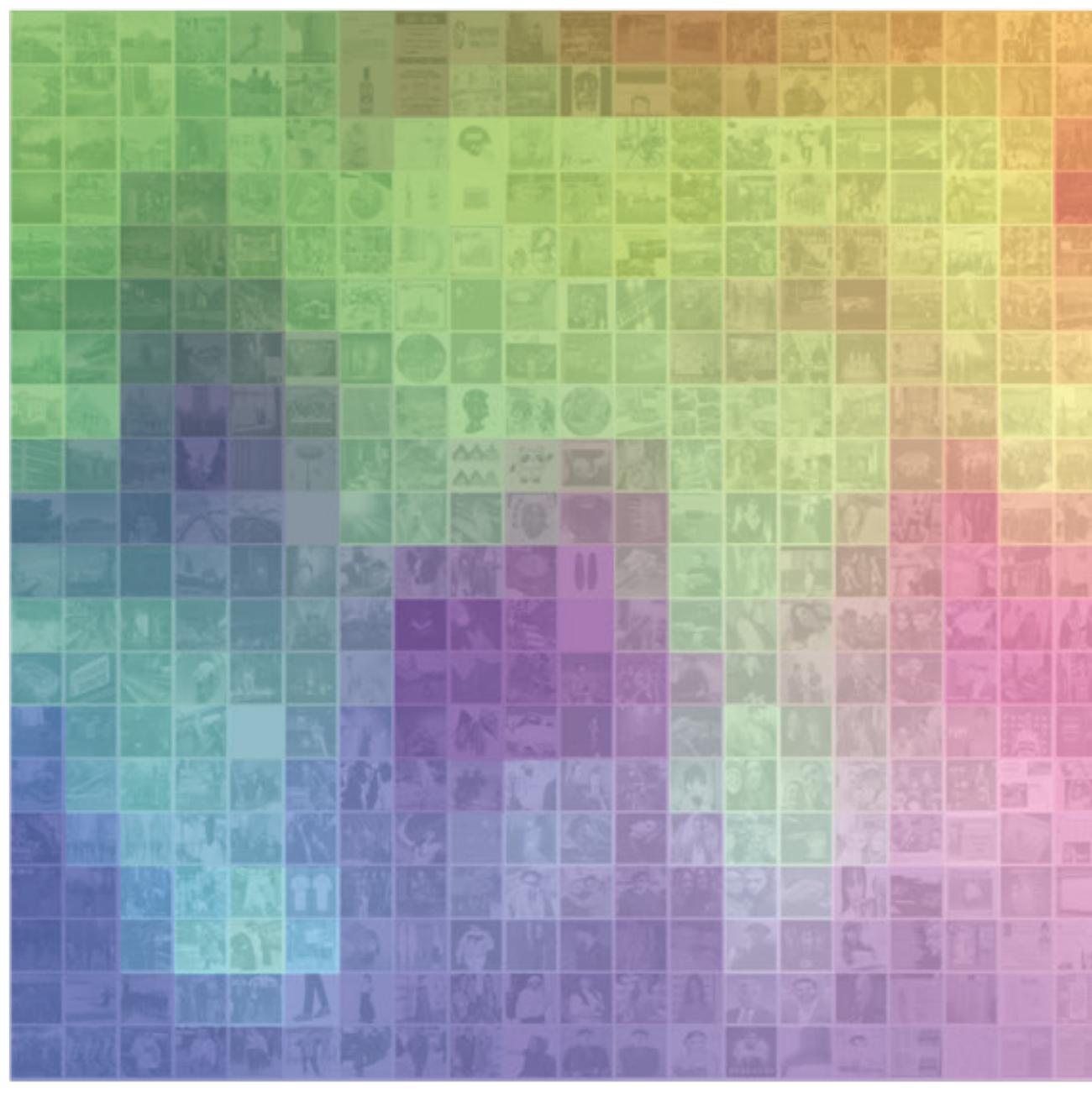
query based on specific question
Match-ing cells based on your per-sonal query ?



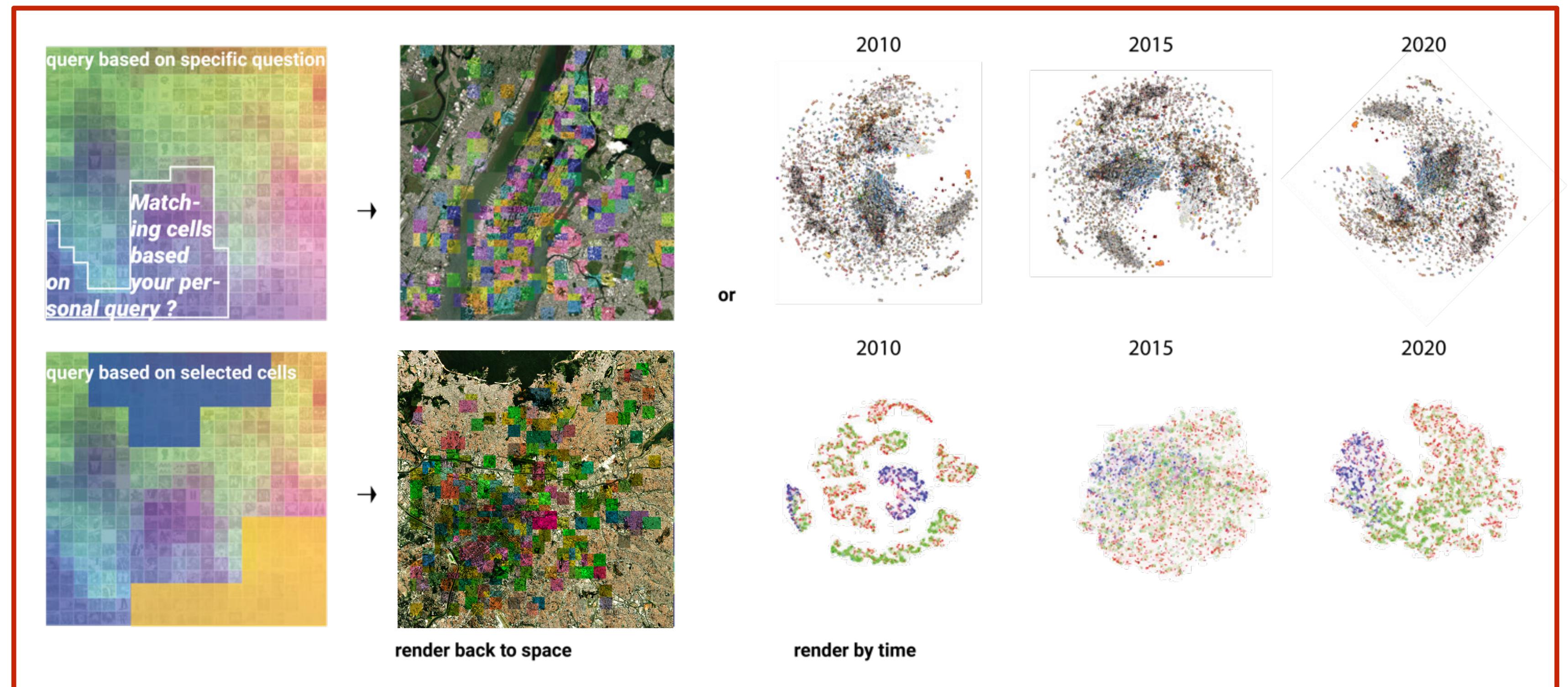
query based on selected cells
Choose one way of filtering the SOM



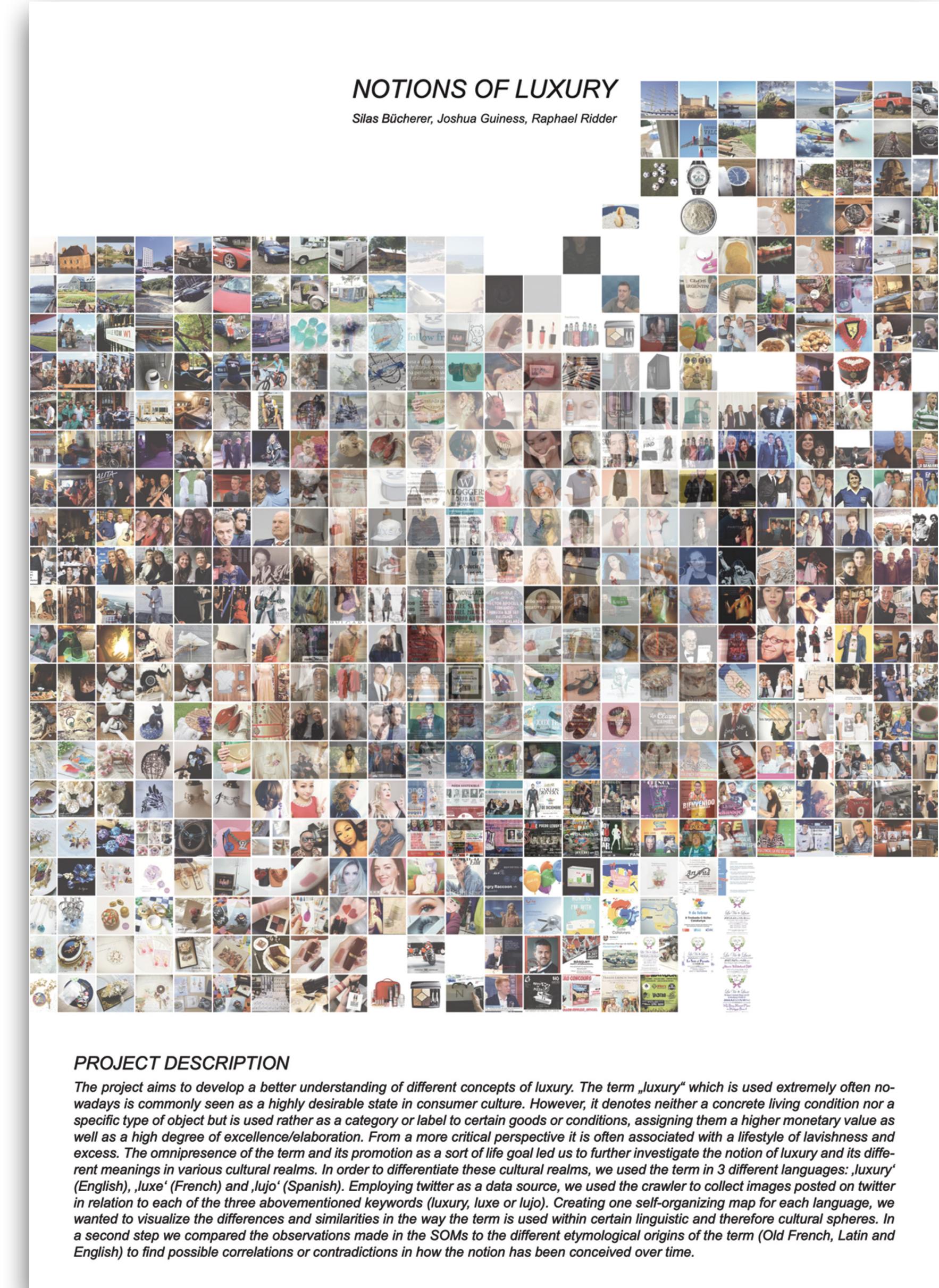
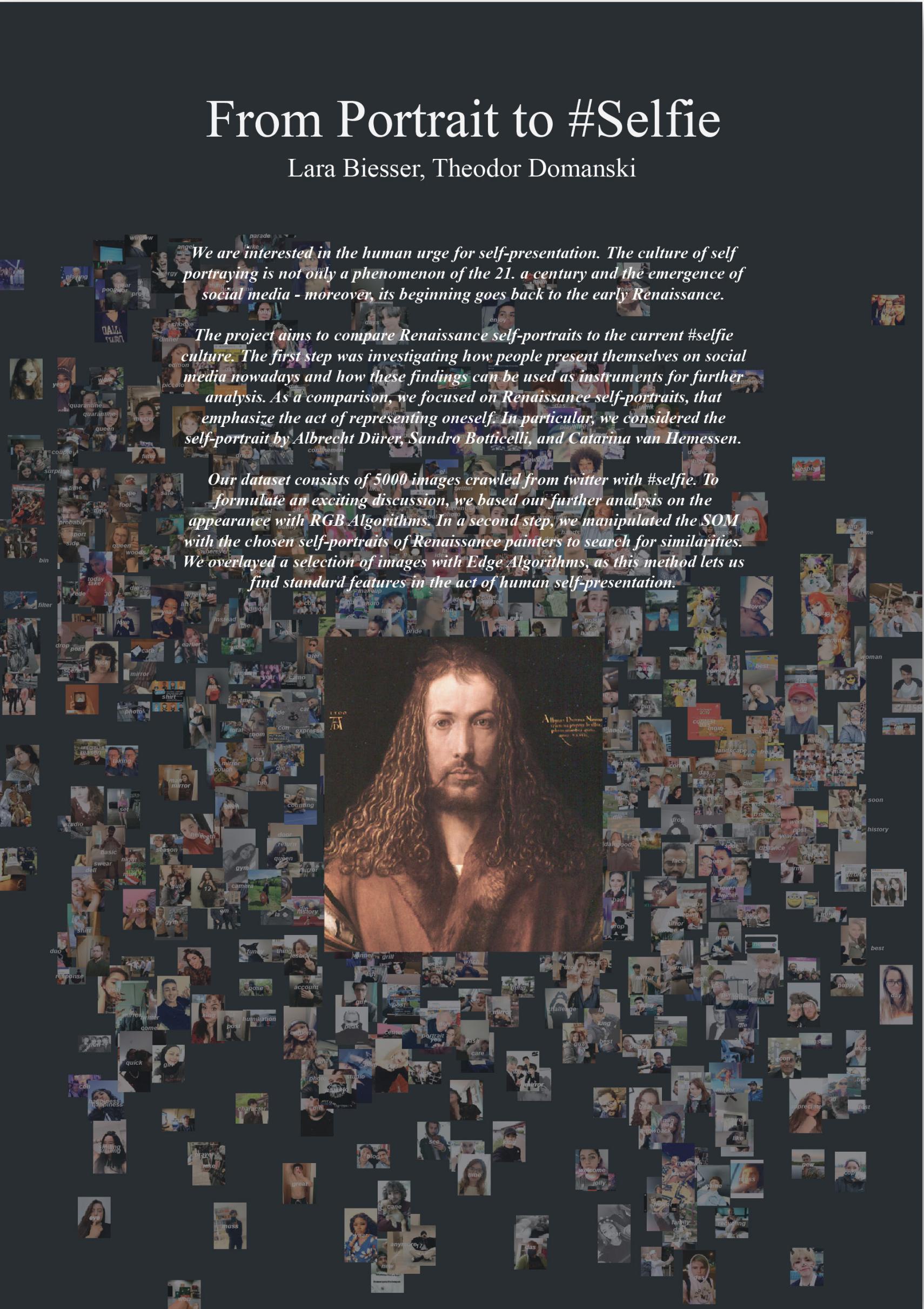
Train and render the SOM

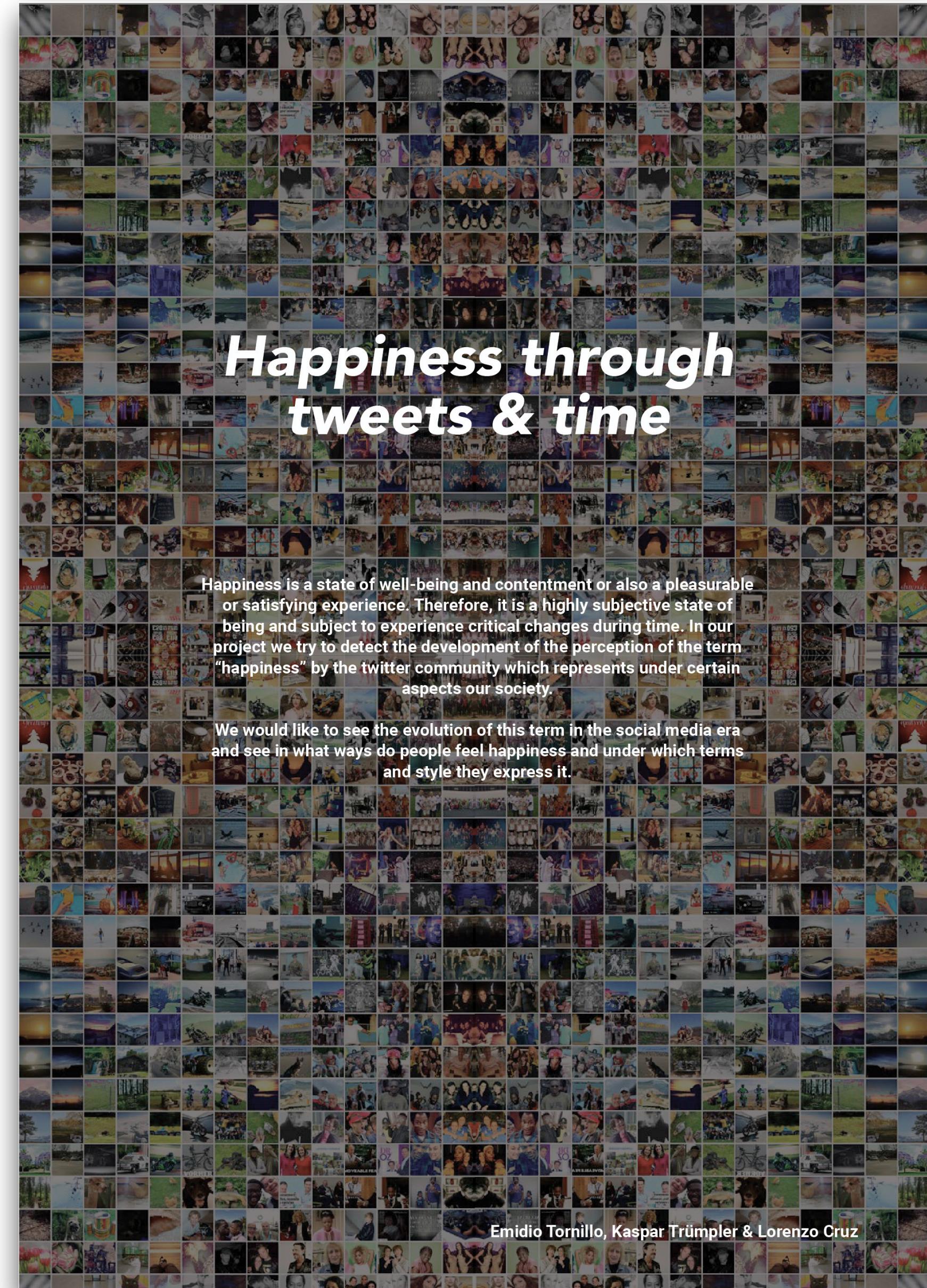
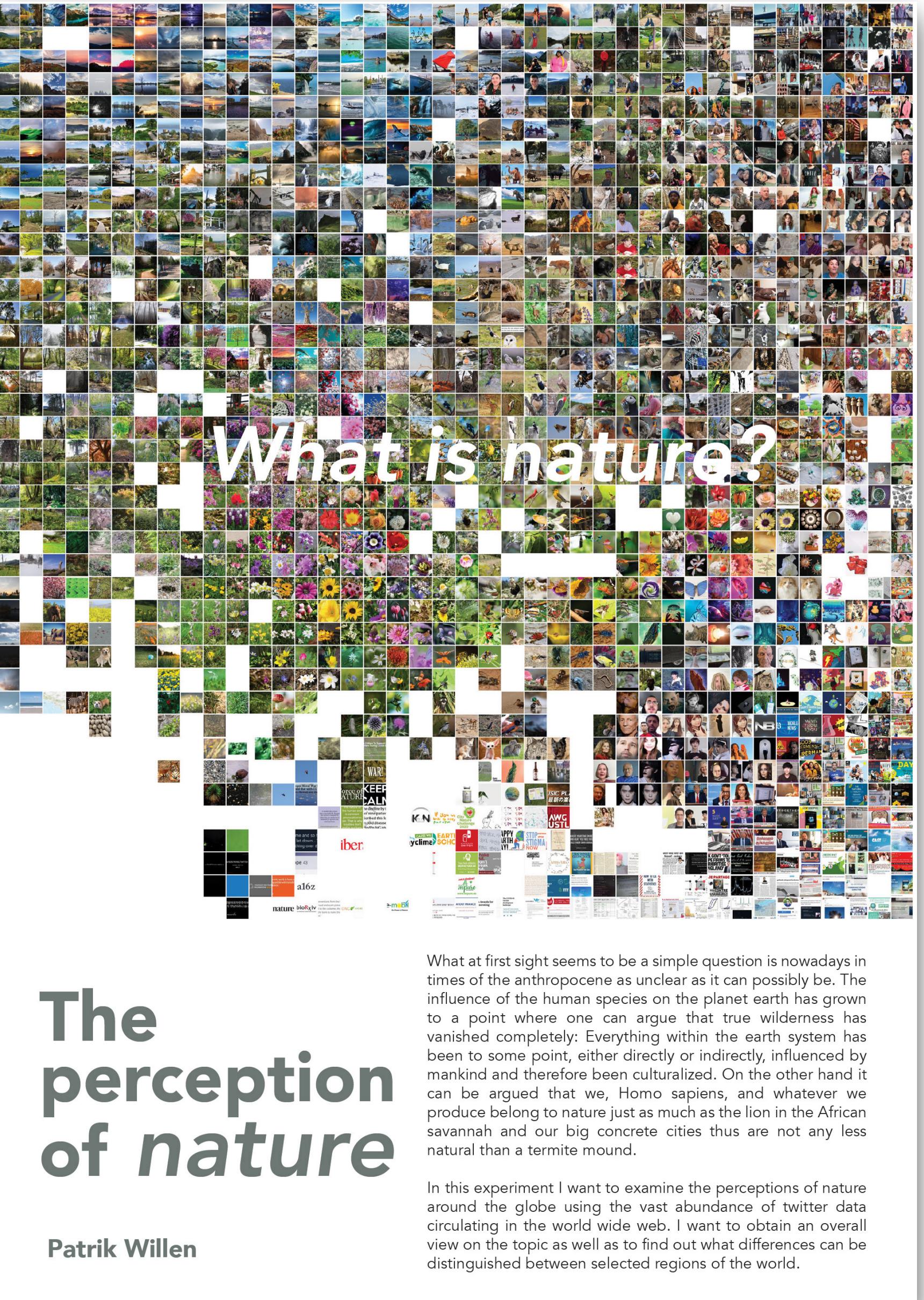


Render the SOM by its weights, assigning colors to each cell

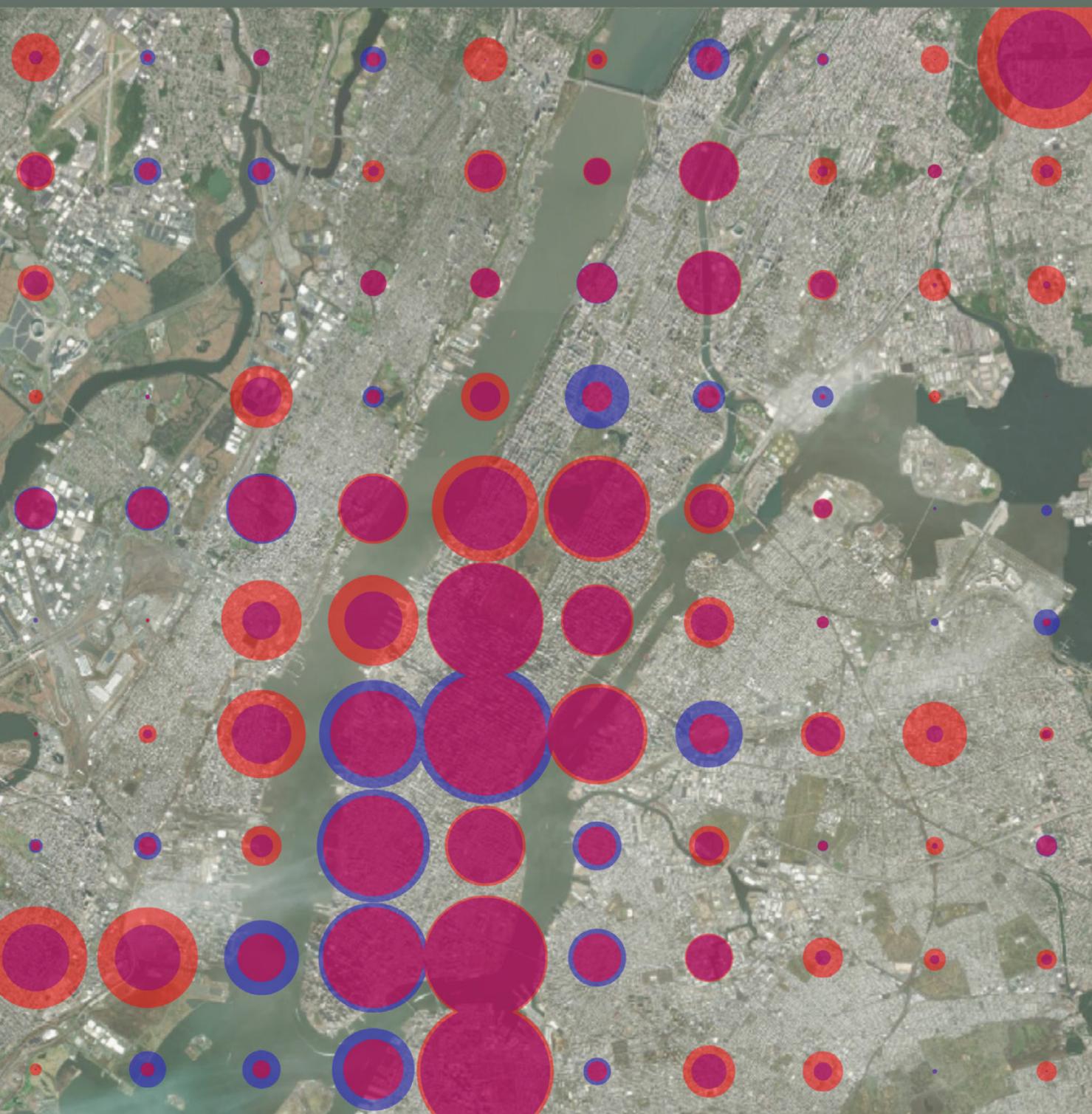








user-geosveillance



Geographic pattern of twitter-posts: Around March 2020, many western cities elaborated extreme restrictions on their economies and inhabitants due to covid19. If the population followed these restrictions, a shift in spatial behavior should have taken place. Compared to 2019, fewer people would be expected e.g., in touristic or business areas, whereas the residential areas should show an increase in occupation. This assumption can be examined by comparing the amount of twitter-posts on the same location in two specific time slots around 2019 and 2020. Through geo-location of these posts, each of them can be traced back to its belonging area, expressed by a grid point. Furthermore, its content can be examined by extracting and analyzing particular elements of a location.

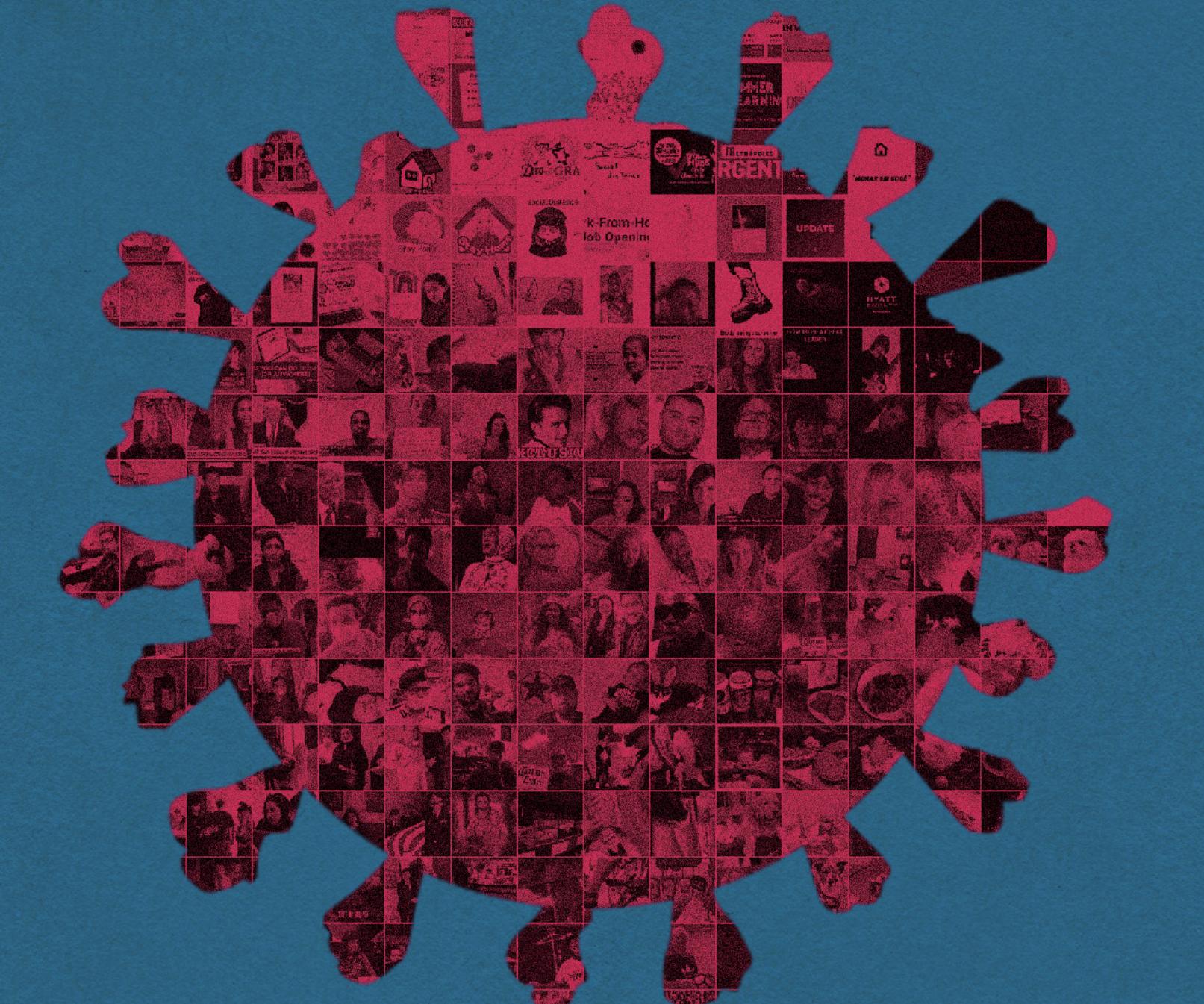
Michael Utiger, Murielle Morger

WHAT WE TALK ABOUT WHEN WE TALK ABOUT #COVID19

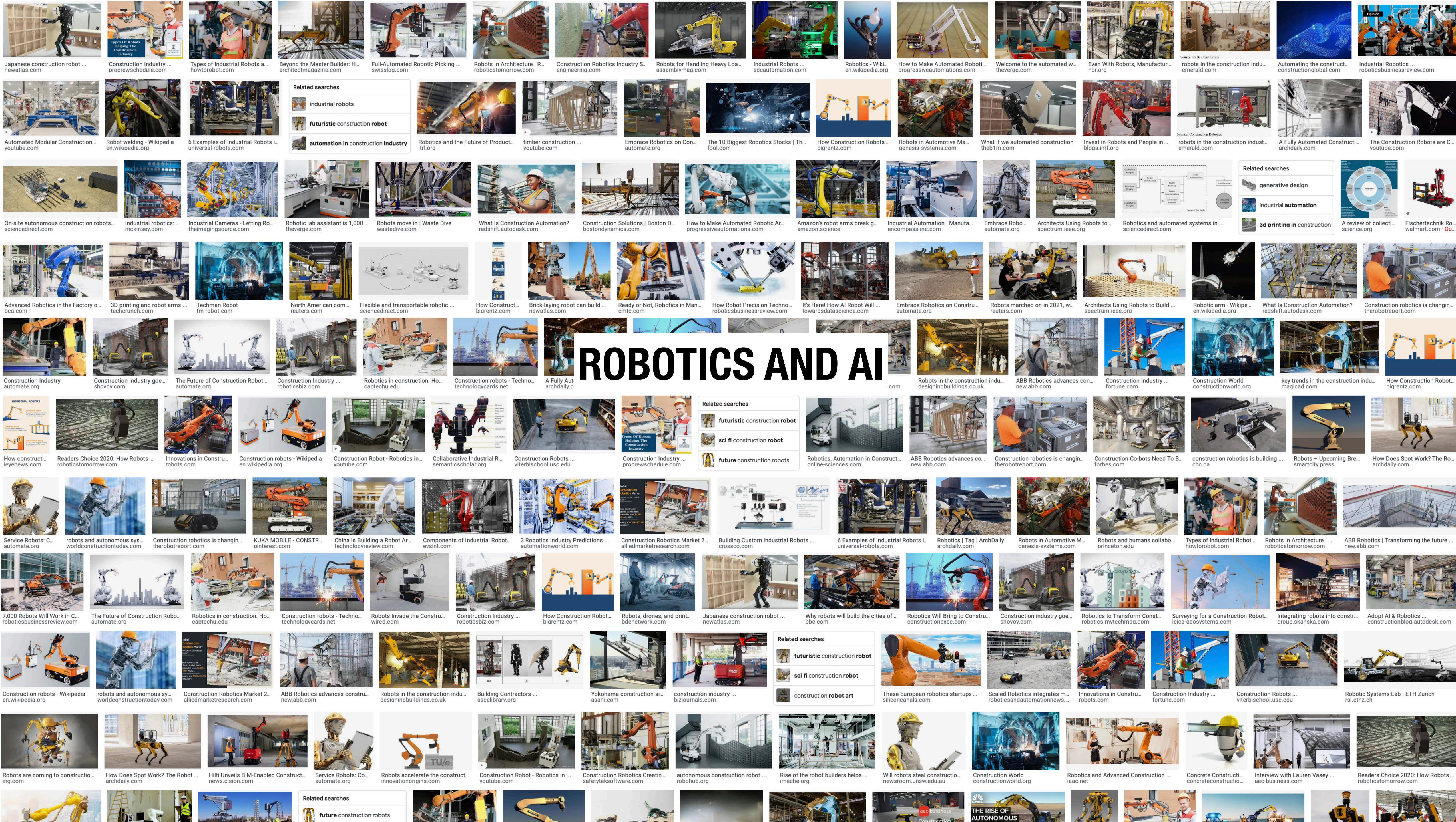
As many countries across the world announce lockdown in order to prevent the spread of COVID-19, social media groups and comments sections are becoming ground zero for intense arguments over whether such measures are warranted. As COVID-19 spreads in the U.S., social media platforms like Facebook and Twitter, which didn't exist or barely existed during past major outbreaks, are facilitating important

conversations about the virus, while at the same time allowing sensationalism and misinformation to spread.

In our project, we are trying to collect the tweets to analyse that what kinds of information are being discussed on the social media, and to figure out how people react to this crisis with its development.



Ruiqi Zhang & Wei You



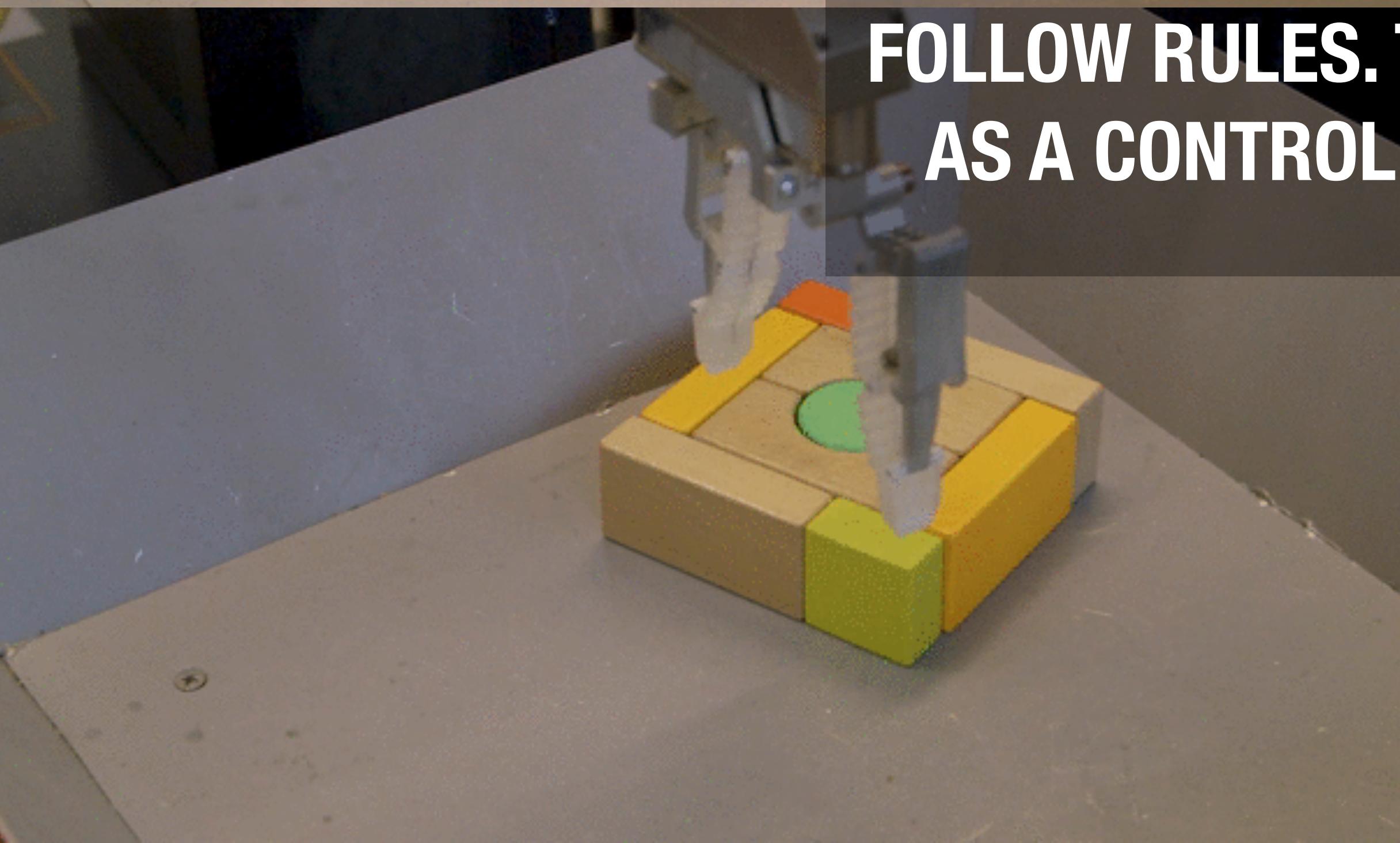
ROBOTICS AND AI

WHAT IS ROBOTICS?

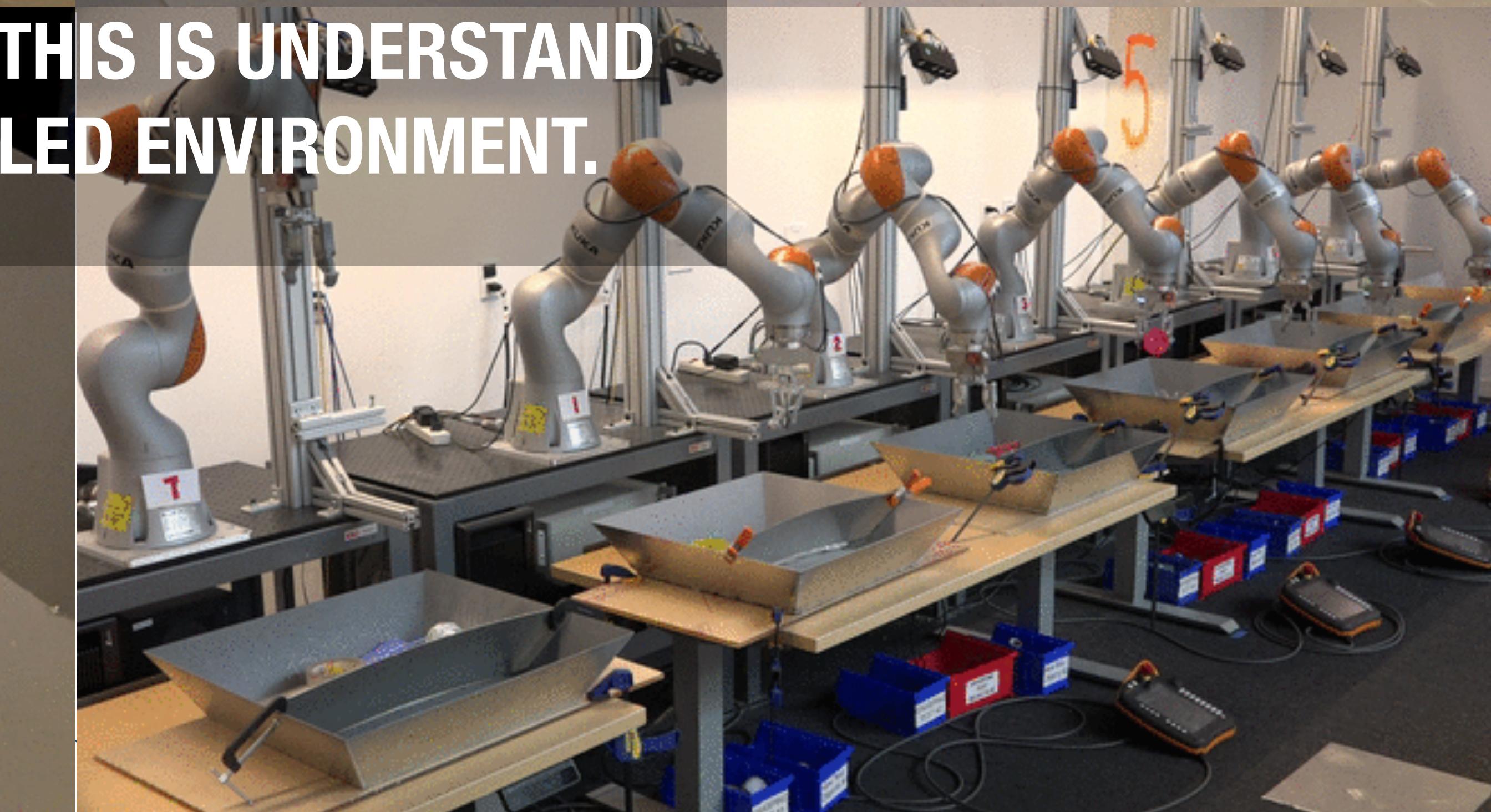
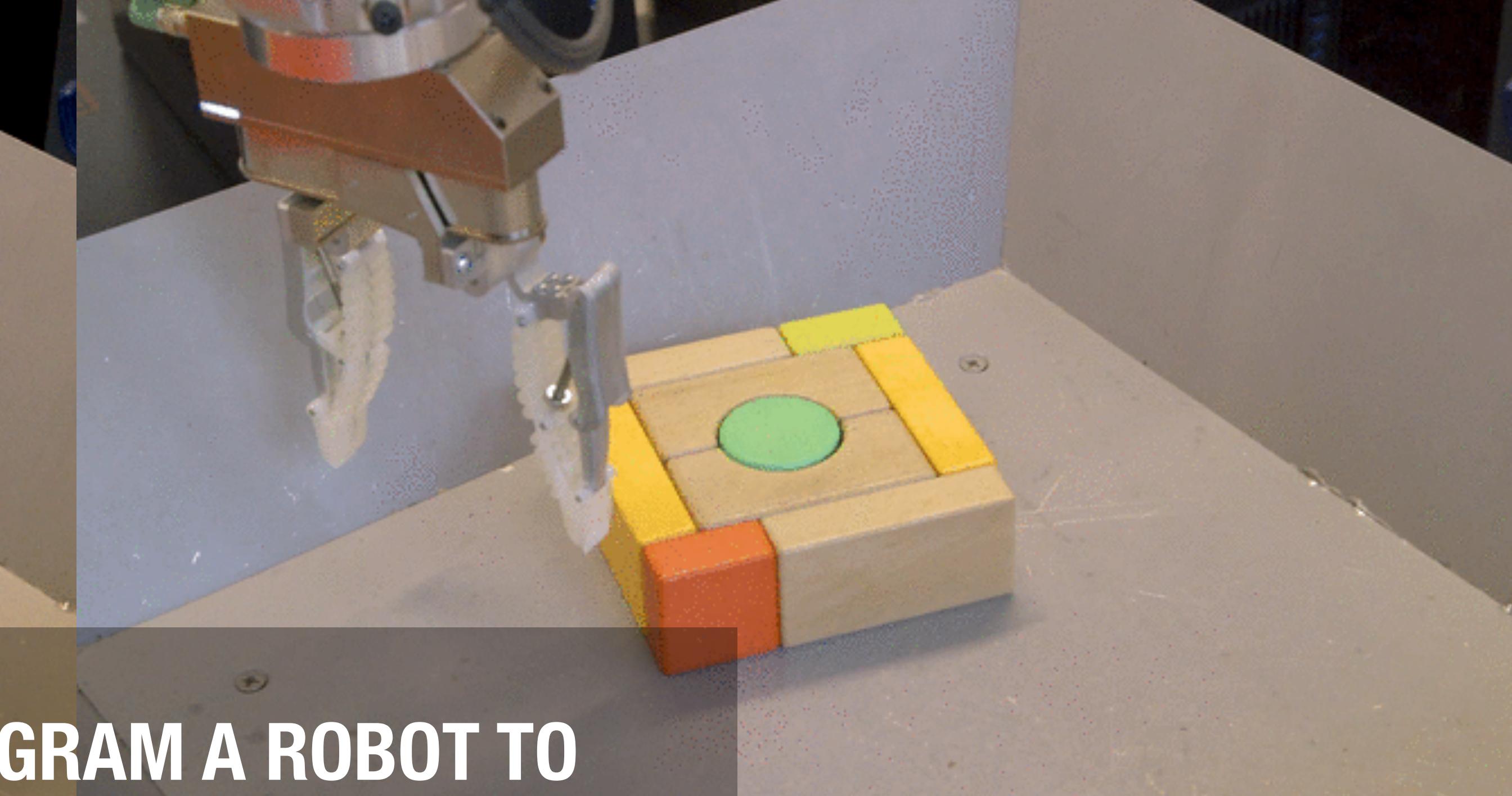
- The use of machines (robots) to perform tasks done traditionally by human beings.

- Is an interdisciplinary sector of science and engineering dedicated to the design, construction, and use of mechanical robots.

- Machines (hardware, robots) that react intelligently (software, AI) to their environments



YOU CAN PROGRAM A ROBOT TO FOLLOW RULES. THIS IS UNDERSTAND AS A CONTROLLED ENVIRONMENT.



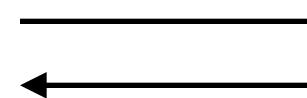
Turing, Alan (1950). "Computing Machinery and Intelligence," Mind, 59, 434-460 (reprinted in Feigenbaum and Feldman, 1963, and in Anderson, 1964).

"Turing test"

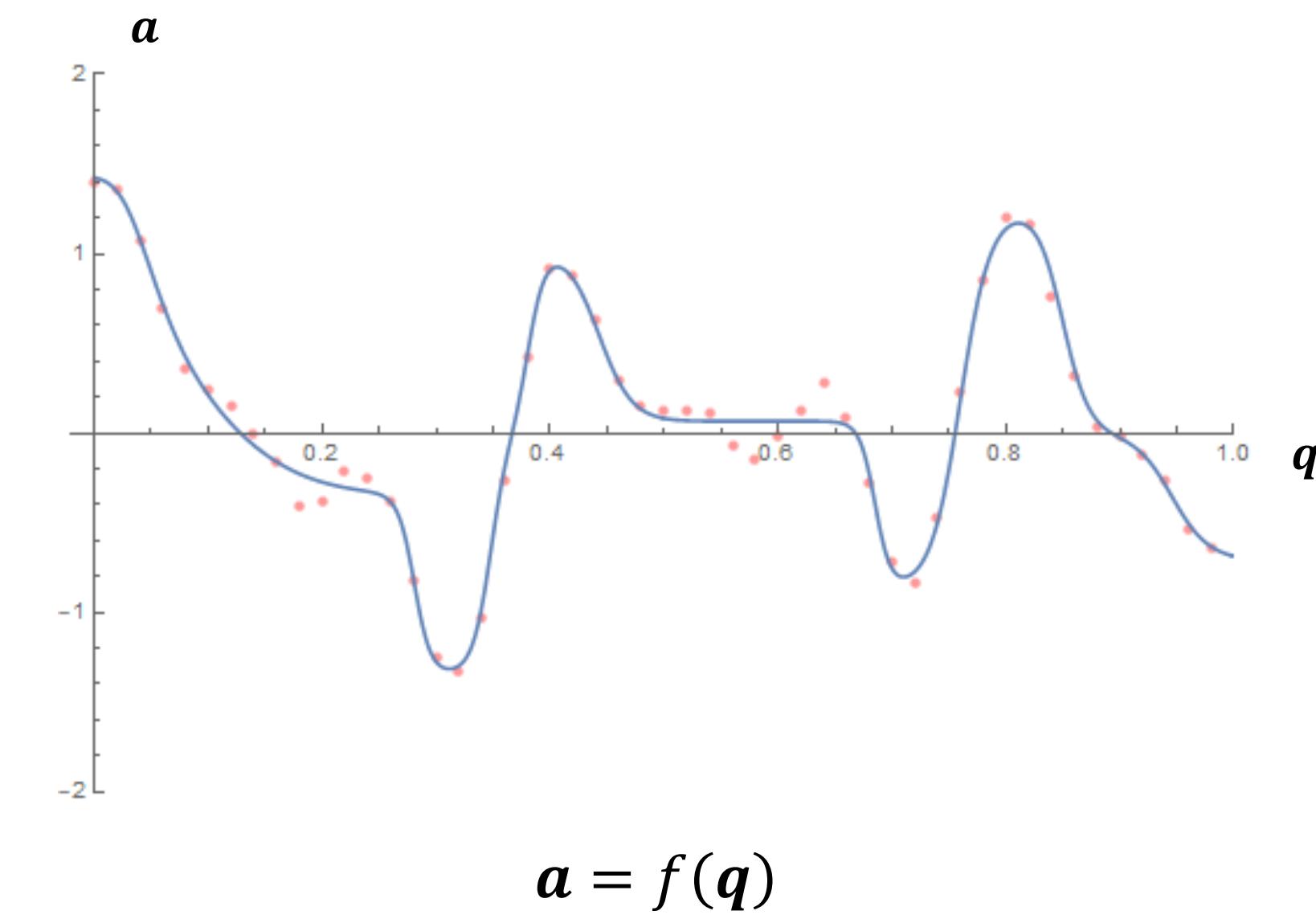
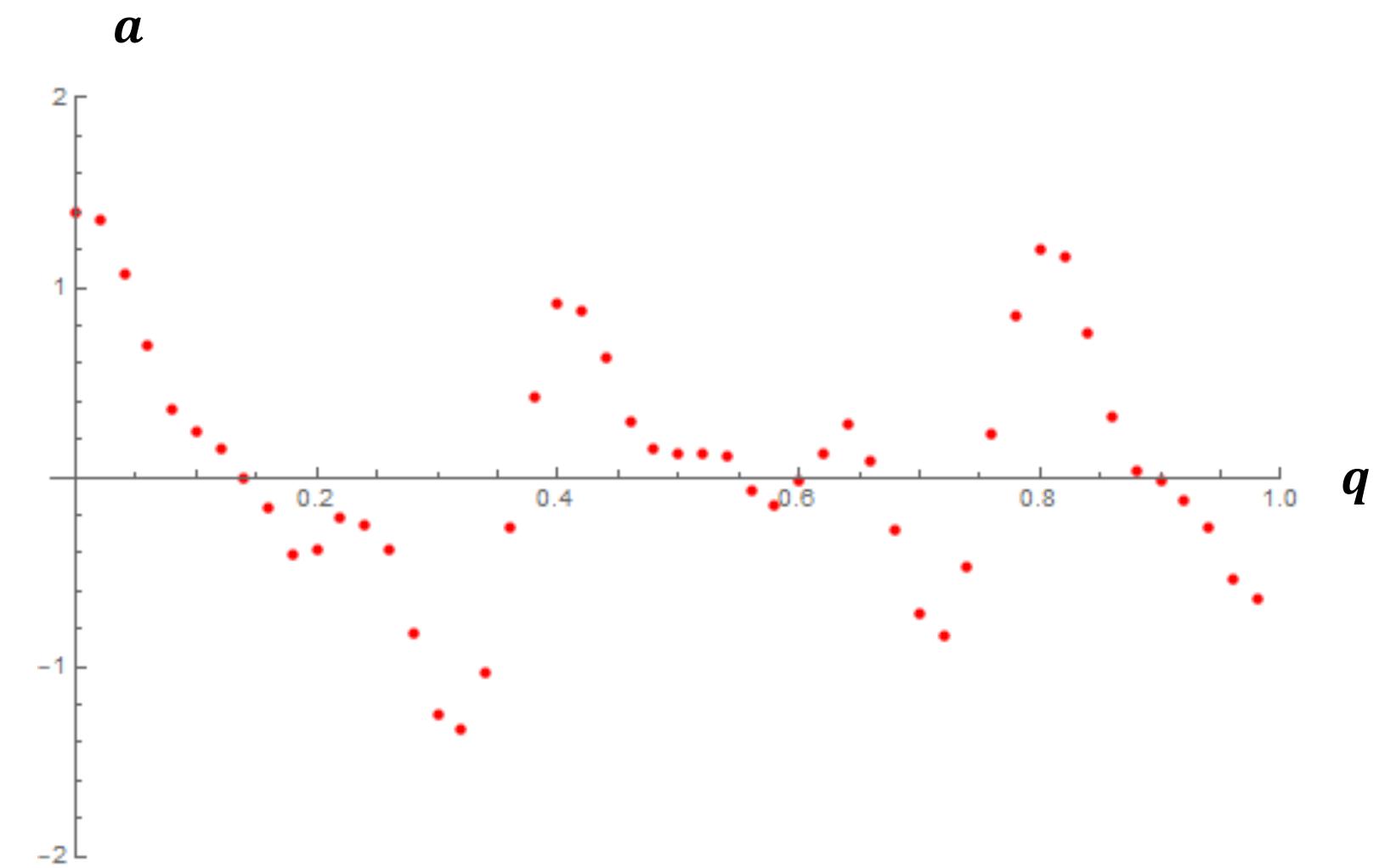
"It is played with three people, **a human (A), a human (B), and an interrogator (C)** who may be of either sex. The interrogator stays in a room apart from the other two. **The object** of the game for the interrogator is **to determine which of the other two is the human A and which is the human B**"

"What will happen when **a machine takes the part of A** in this game?"

Turing, Alan (1950). "Computing Machinery and Intelligence," Mind, 59, 434-460 (reprinted in Feigenbaum and Feldman, 1963, and in Anderson, 1964).

Question  **Answer**

"The question and answer method seems to be suitable for introducing almost any one of the fields of human endeavor that we wish to include"



ROBOT GRASPING

One-shot grasping often
leads to failed grasp attempts

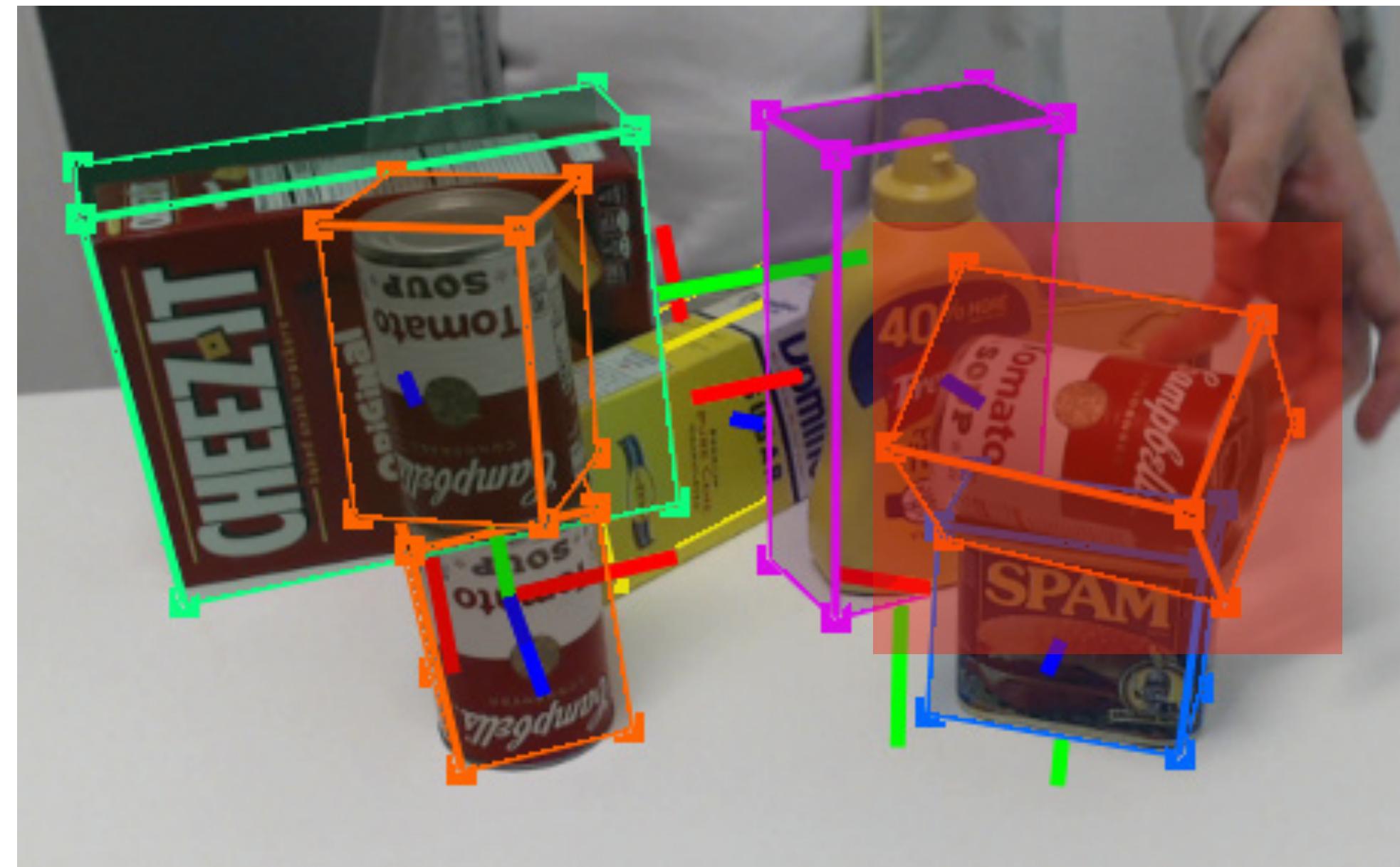


Successful Grasps

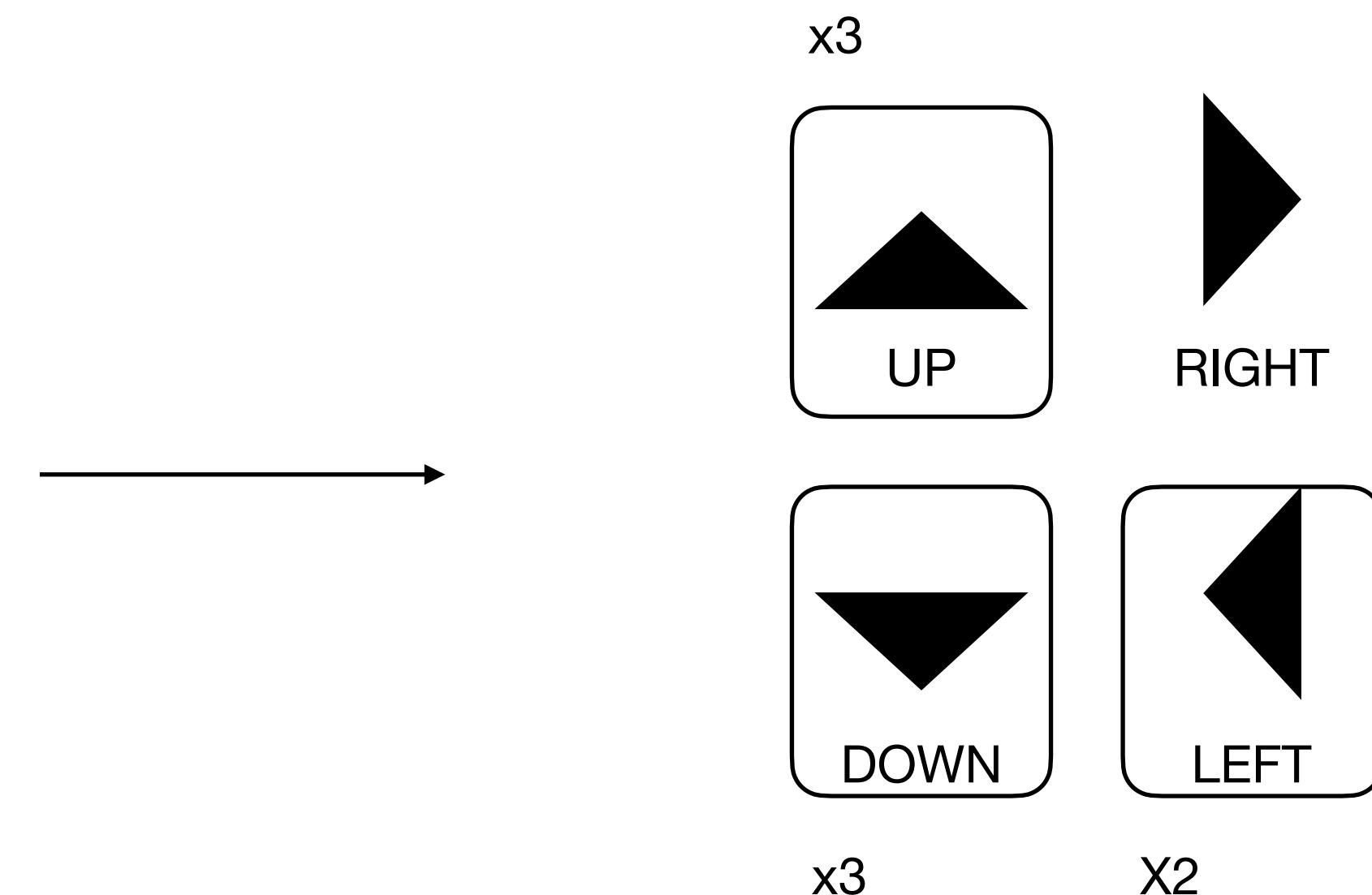
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Failed Grasps

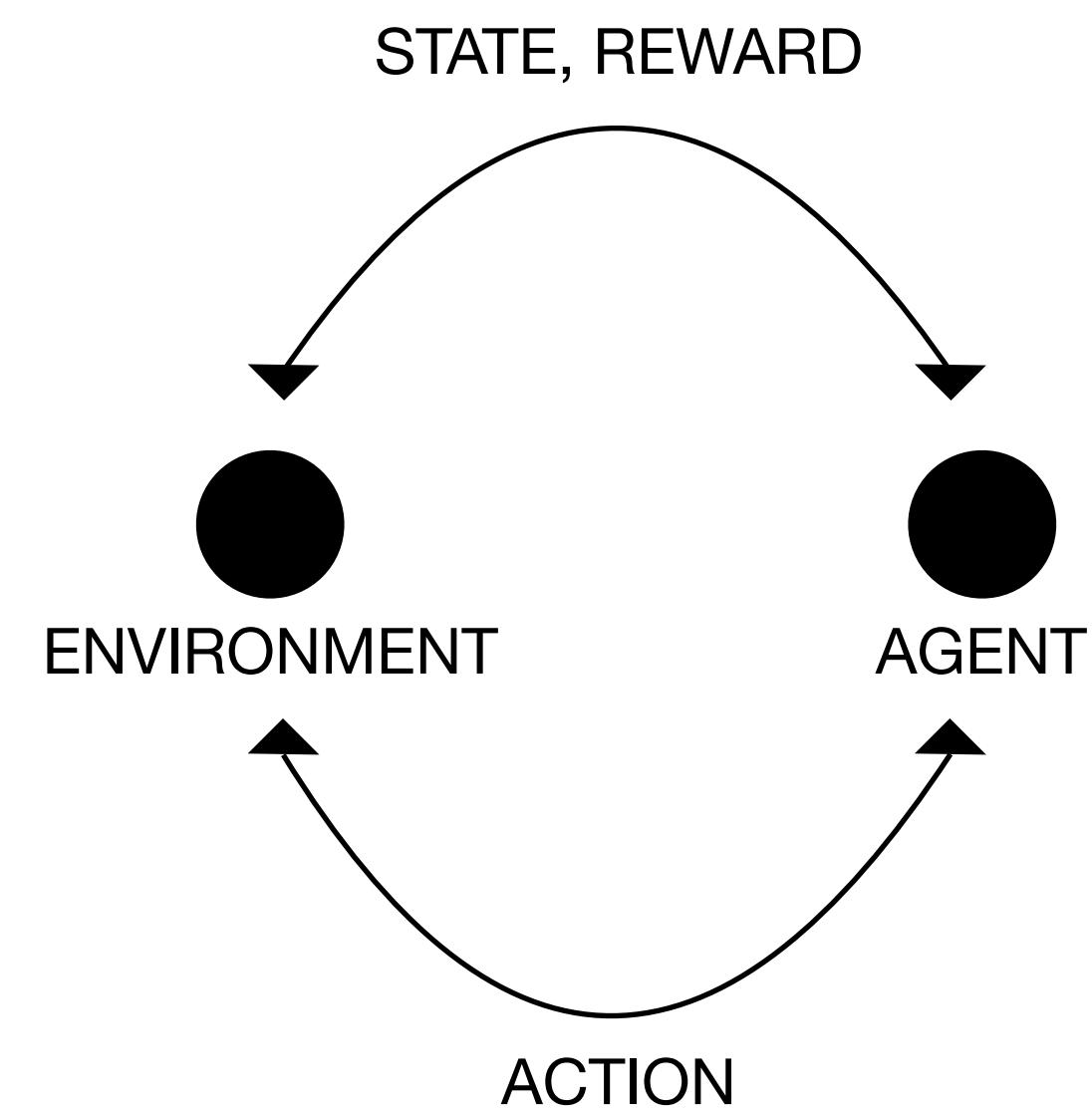
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Computer Vision

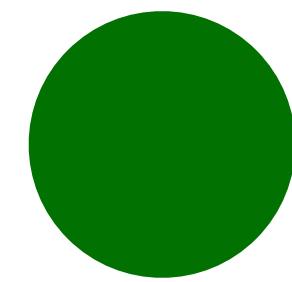


REINFORCEMENT LEARNING



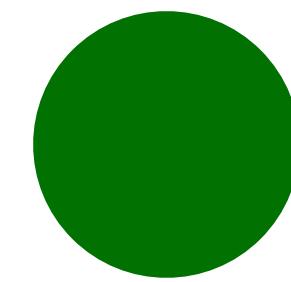
An area of machine learning in which software **agents** take **actions** in an **environment** in order to **maximize** the notion of **cumulative reward** with the object of completing a **specific task**

REINFORCEMENT LEARNING



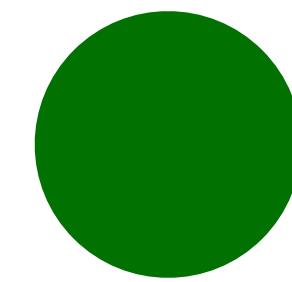
AGENT

Is an algorithm programmed to follow a particular task and compute a reward to reinforce desired behavior



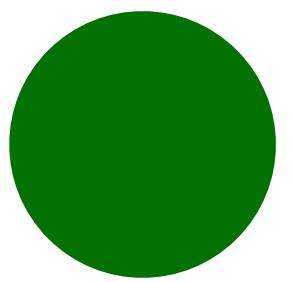
ENVIRONMENT

The world in which the agent will operate, the feedback from the environment it used for learning



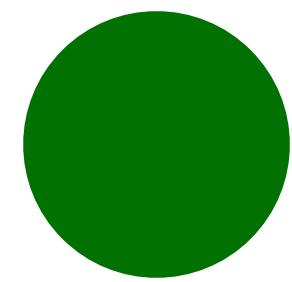
ACTION SPACE

The set of actions that the robot can take



POLICY

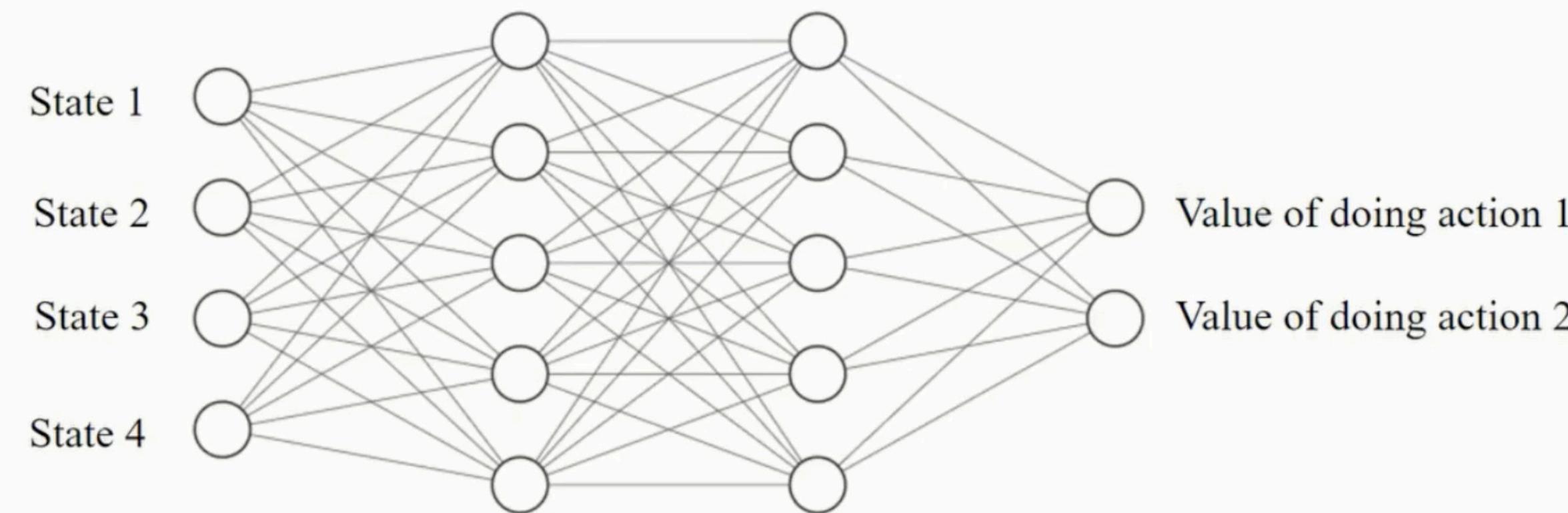
The strategy that a robot uses to decide which action to take next



OBSERVATION SPACE

The output from the sensor: image, point cloud, etc

Reinforcement Learning: Deep Q-Learning

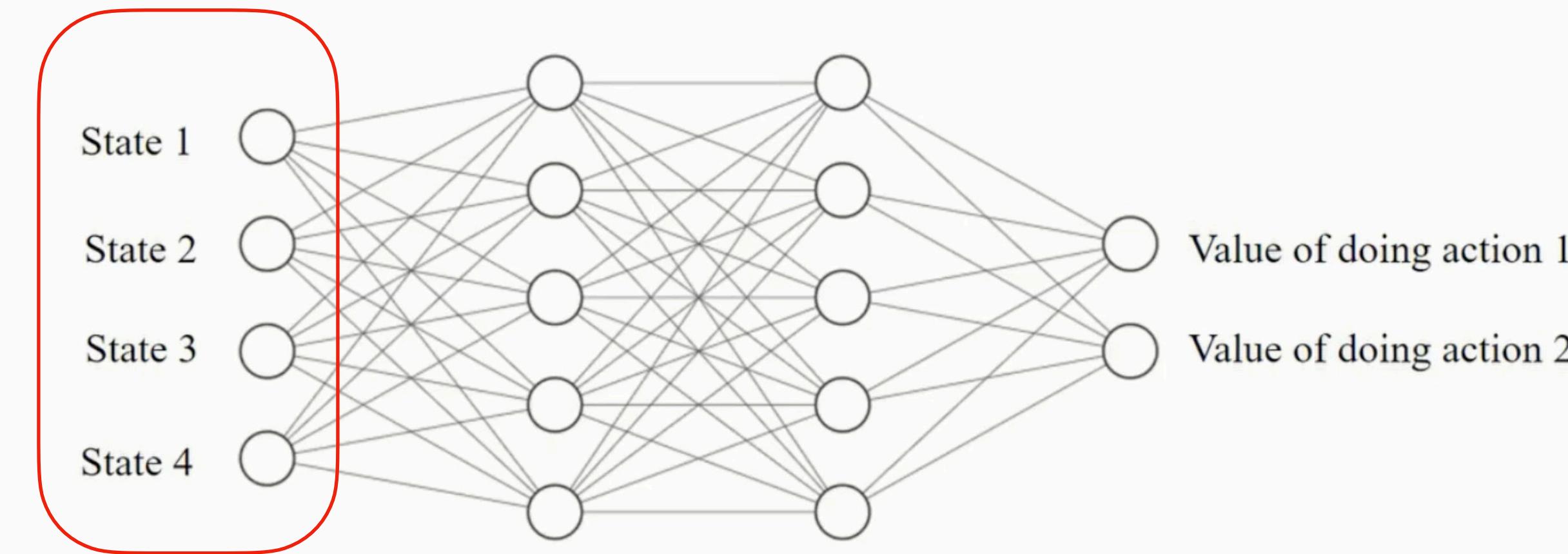


A typical objective of RL is to find an optimal policy, π^* , which maximizes the discounted sum of rewards:

$$\pi^* = \arg \max_{\pi: \mathcal{S} \rightarrow \mathcal{A}} \mathbb{E}_{\pi} \left[\sum_{t=1}^{\infty} \gamma^{t-1} r_t \right]$$

Reinforcement Learning: Deep Q-Learning

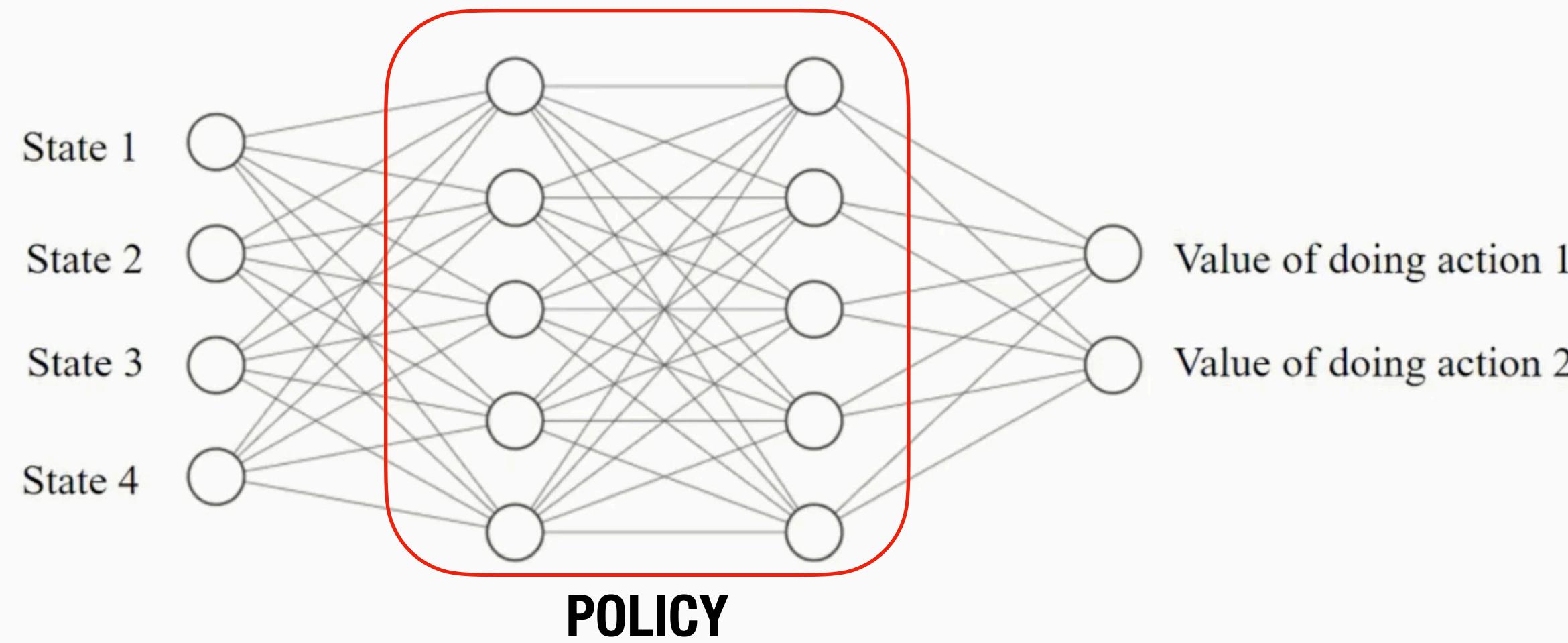
**ENVIRONMENT
OBSERVATION SPACE**



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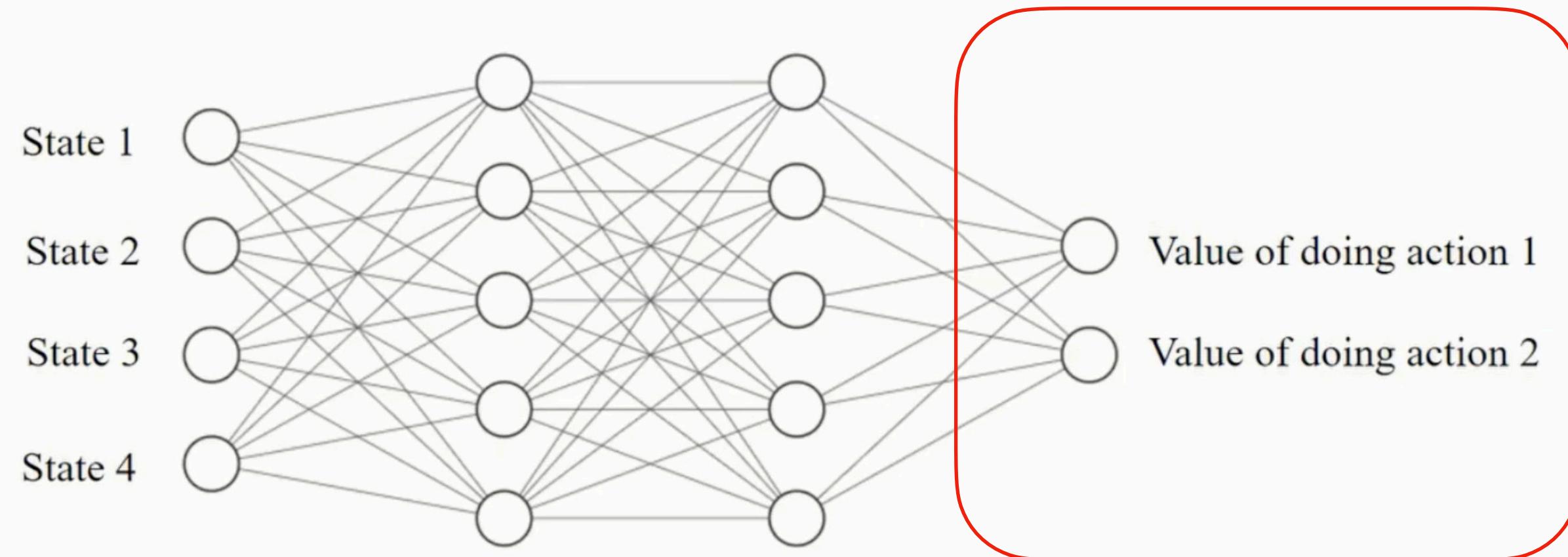
Reinforcement Learning: Deep Q-Learning



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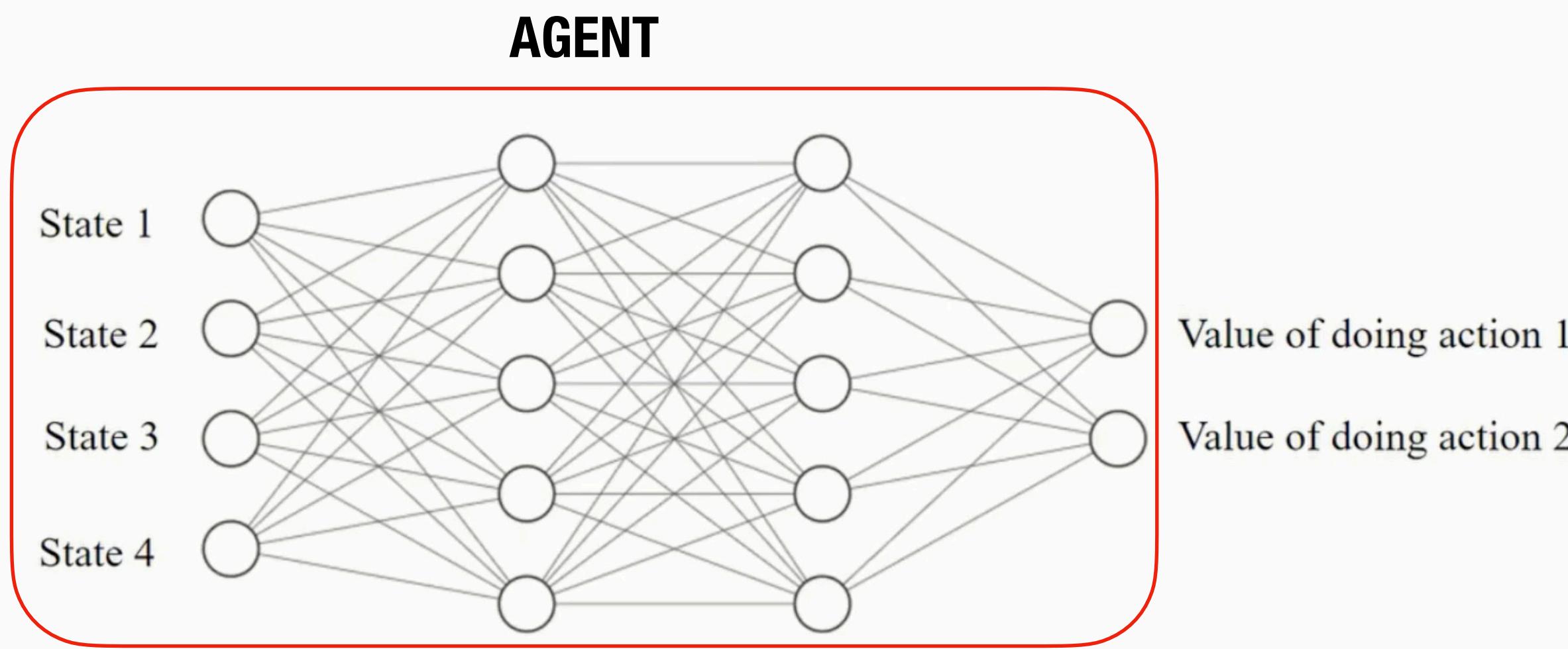
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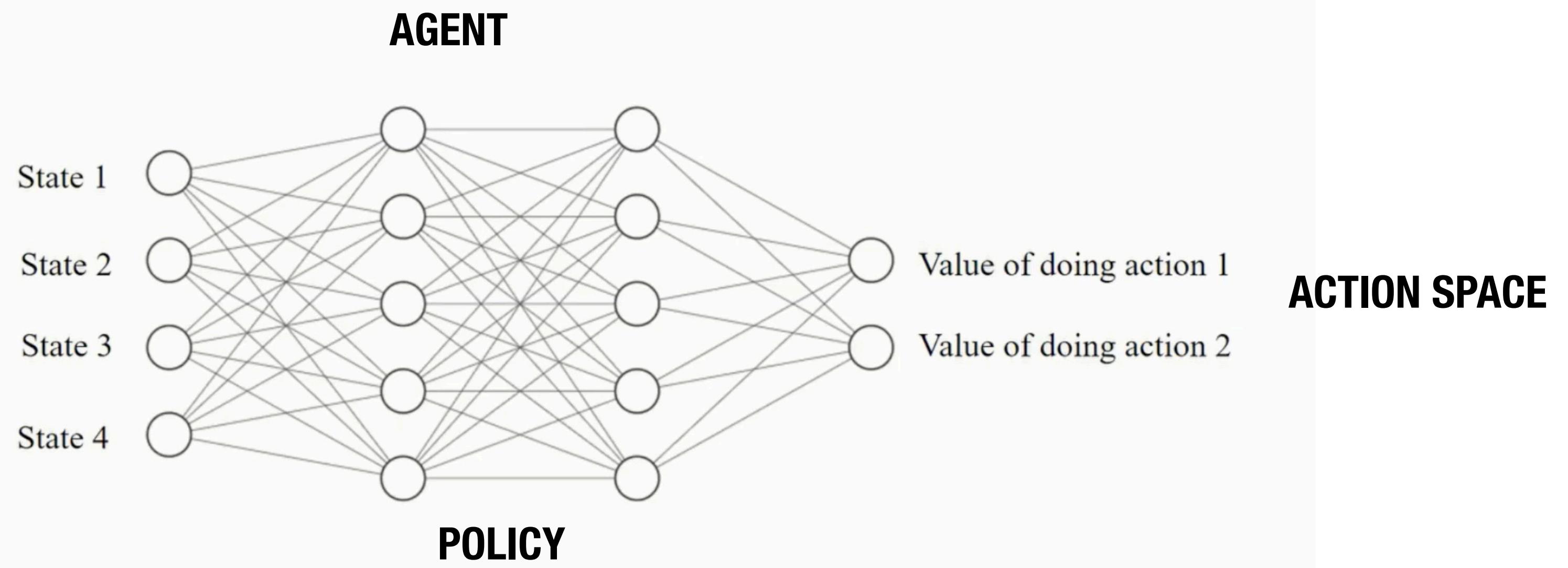


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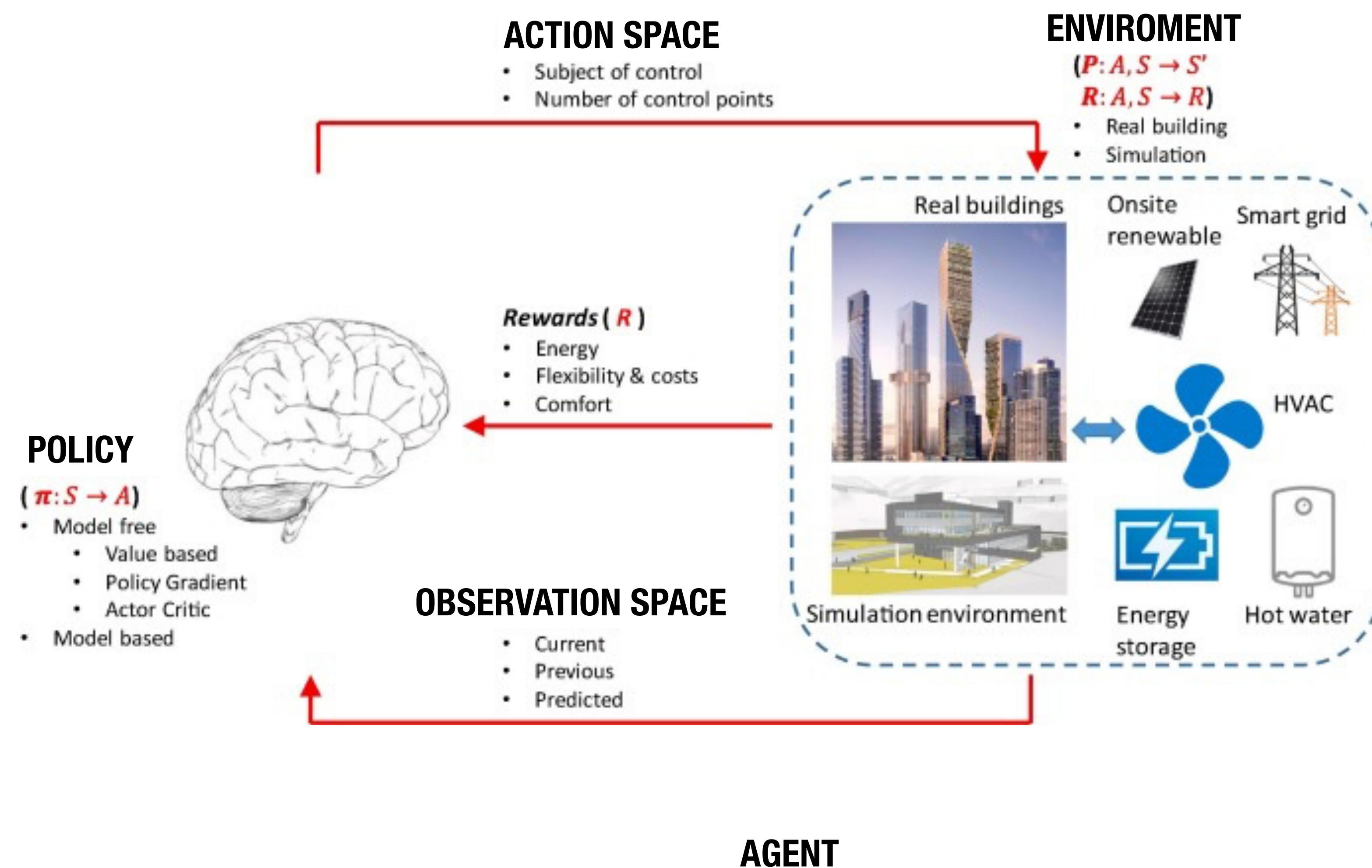
ENVIRONMENT OBSERVATION SPACE

Reinforcement Learning: Deep Q-Learning

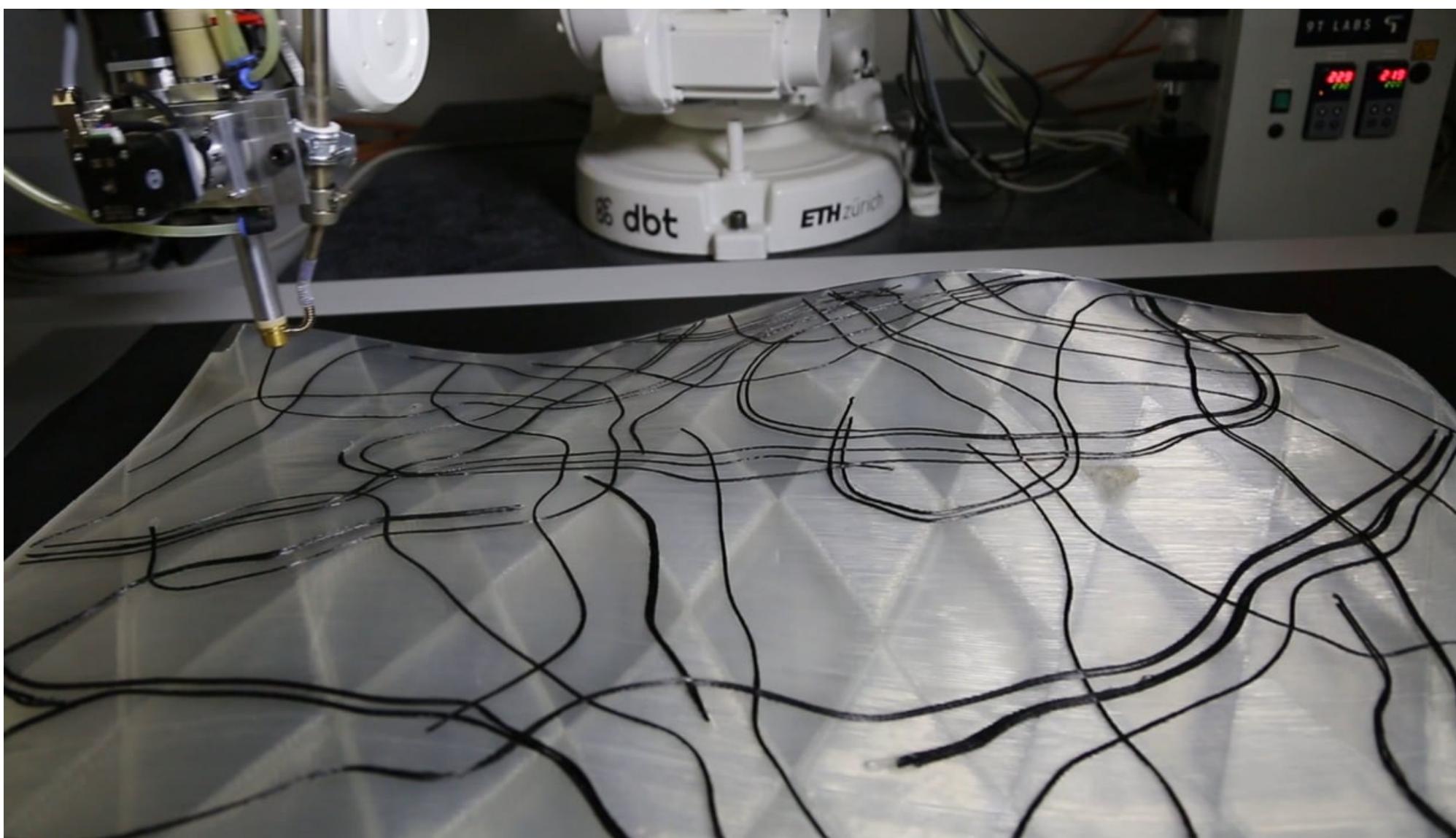


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<https://www.sciencedirect.com/science/article/pii/S0306261920305481>



Reinforcement learning algorithms have the potential to enable robots to acquire behaviors adaptively in their environment

How that it actually works?
We will code on Thursday with Charles!