

Carlos Castellanos | School of Interactive Games & Media | Rochester Institute of Technology



# Current Topics in Interactive Development - IGME 480

RIT

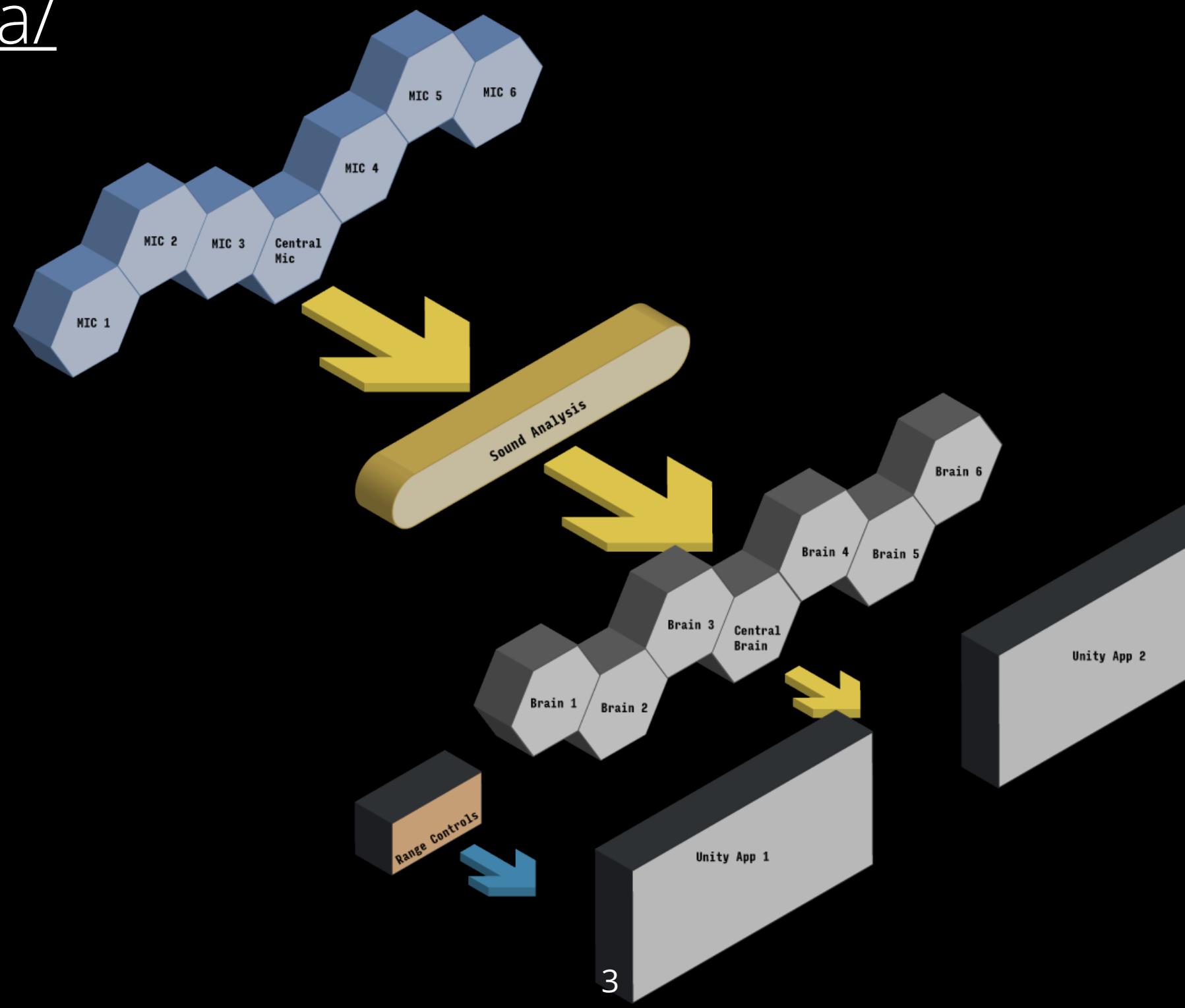
# Machine Learning (Pt. 1)

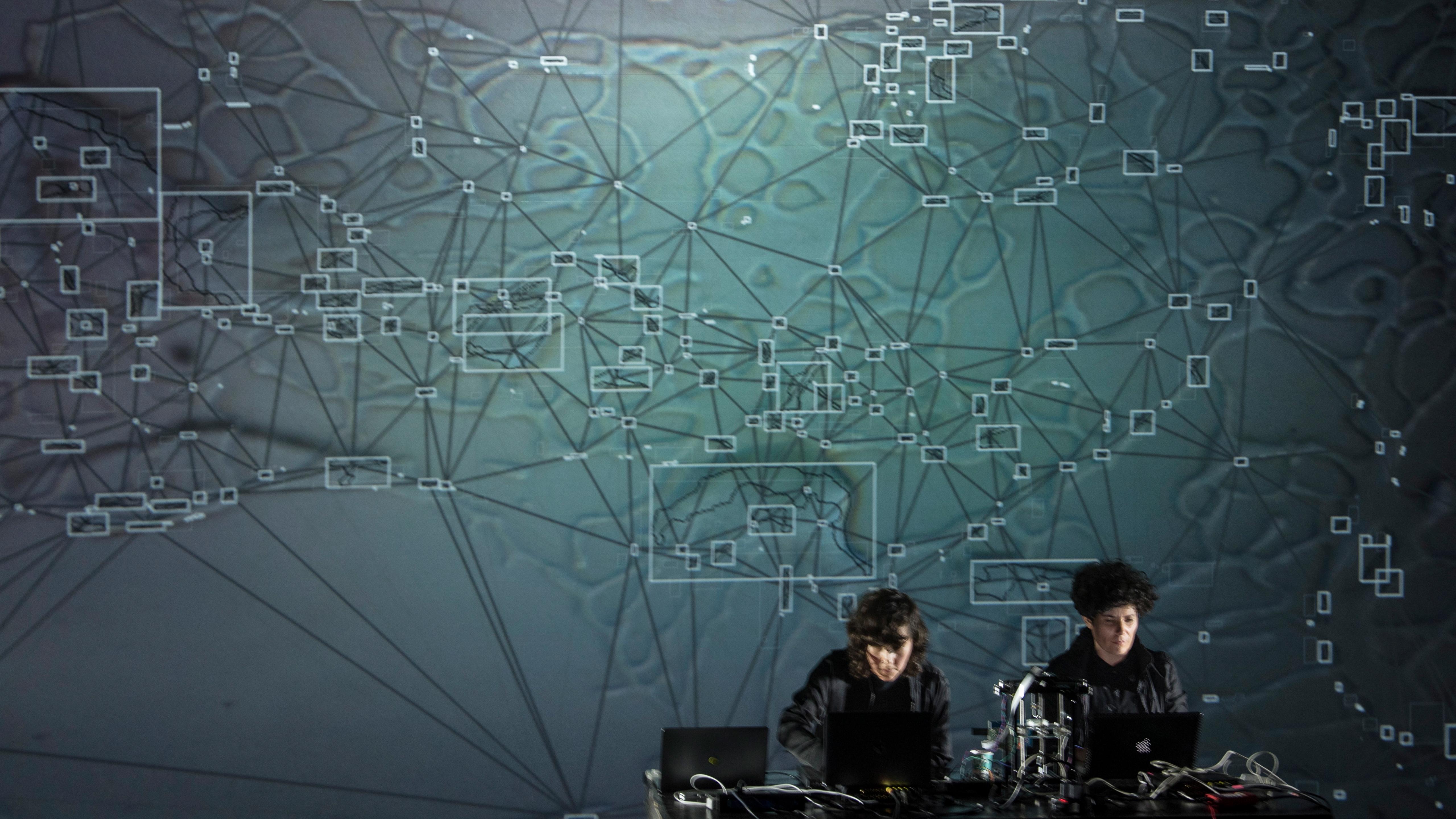
Neural Networks, Machine Learning and the Arts



*Pockets Full of Memories* (2001-07), George Legrady

- KIMA (Dario Villanueva & Analema Group)
  - Custom particle system driven by 7 neural networks which interpret audio input from 7 microphones to visualize an avant-garde choir piece.
  - Uses Wekinator
  - <http://www.alolo.co/kima/>





## INTERSPECIFICS

Ontological Machines

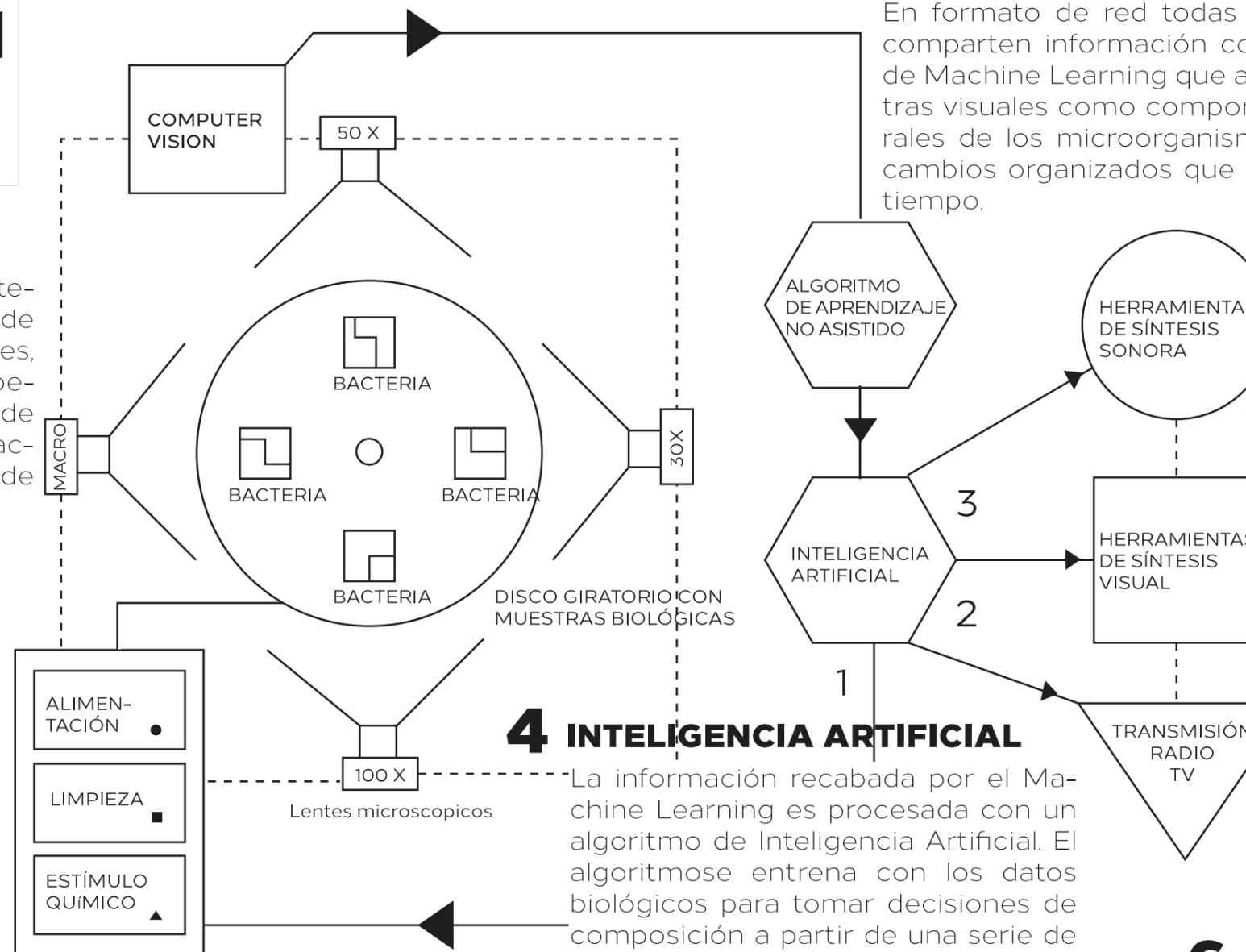
# COMUNICACIÓN ESPECULATIVA

## 2 VISIÓN ARTIFICIAL

El área de Computer Vision está integrada por una colección de lentes de microscopio de distintos alcances, cada uno conectado a una Raspberry Pi programada con librerías de OpenCv en python para hacer tracking de sus movimientos y arreglo de formas.

## 1 MANTENIMIENTO BIOLÓGICO

Módulo central del sistema donde el organismo recibe mantenimiento. Aquí se alimenta, limpia y estimula al microorganismo que se encuentra habitando medios como microcircuitos y platos de petri. Se utiliza un Raspberry pi como plataforma para llevar acabo los procesos de dirección del sistema y Arduino para el control electrónico de las partes mecánicas.



## 3 RECONOCIMIENTO DE PATRONES

En formato de red todas las Raspberries comparten información con un algoritmo de Machine Learning que analiza las muestras visuales como comportamientos generales de los microorganismos y reconoce cambios organizados que se repiten en el tiempo.

## 4 INTELIGENCIA ARTIFICIAL

La información recabada por el Machine Learning es procesada con un algoritmo de Inteligencia Artificial. El algoritmo entrena con los datos biológicos para tomar decisiones de composición a partir de una serie de herramientas programáticas que le permitirán decidir en tiempo real qué tipo de proceso audiovisual puede componer a partir de la información que los organismos le otorgan. El algoritmo se programará en Python con librerías de Numpy y redes Neuronales.

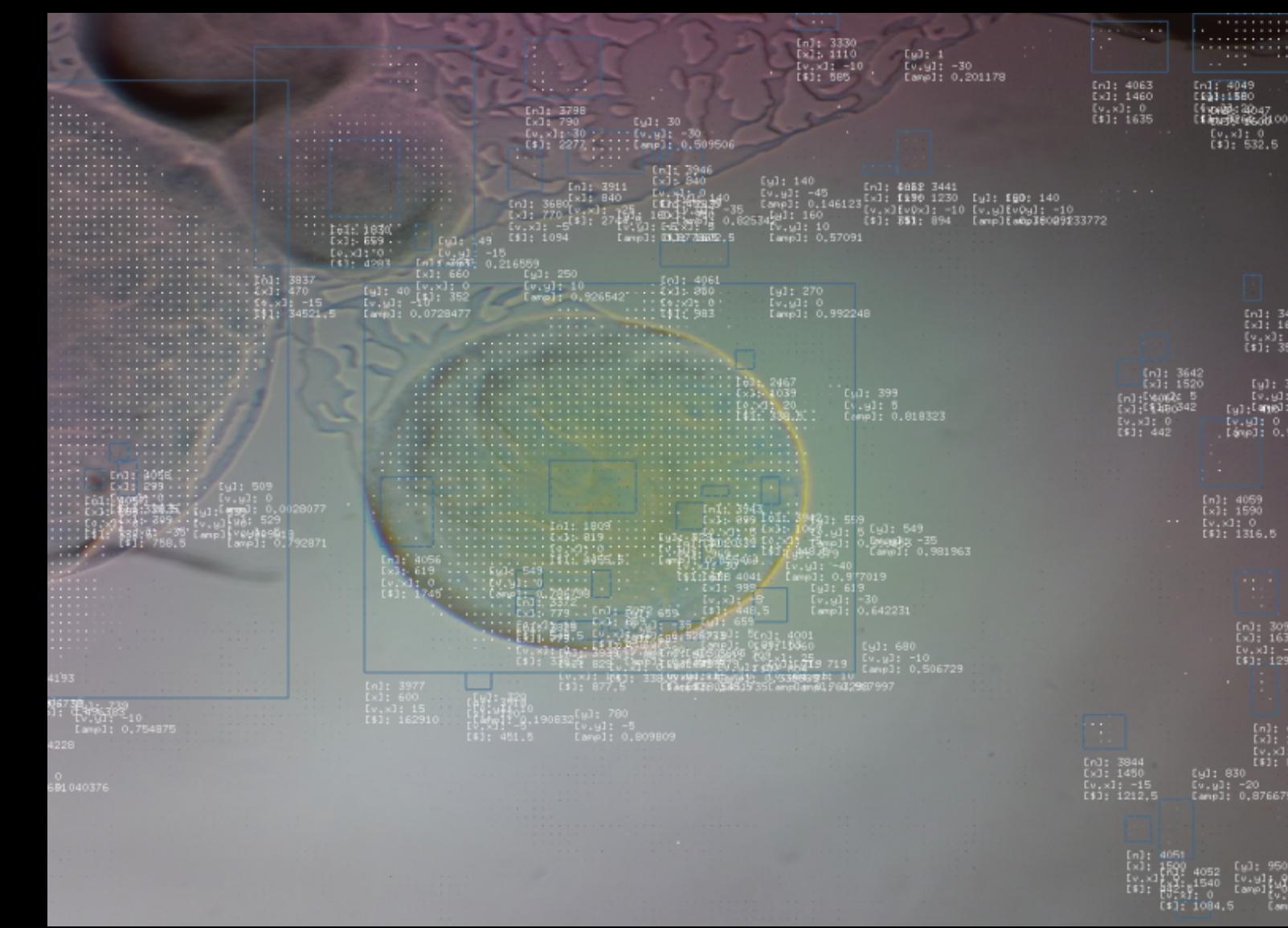
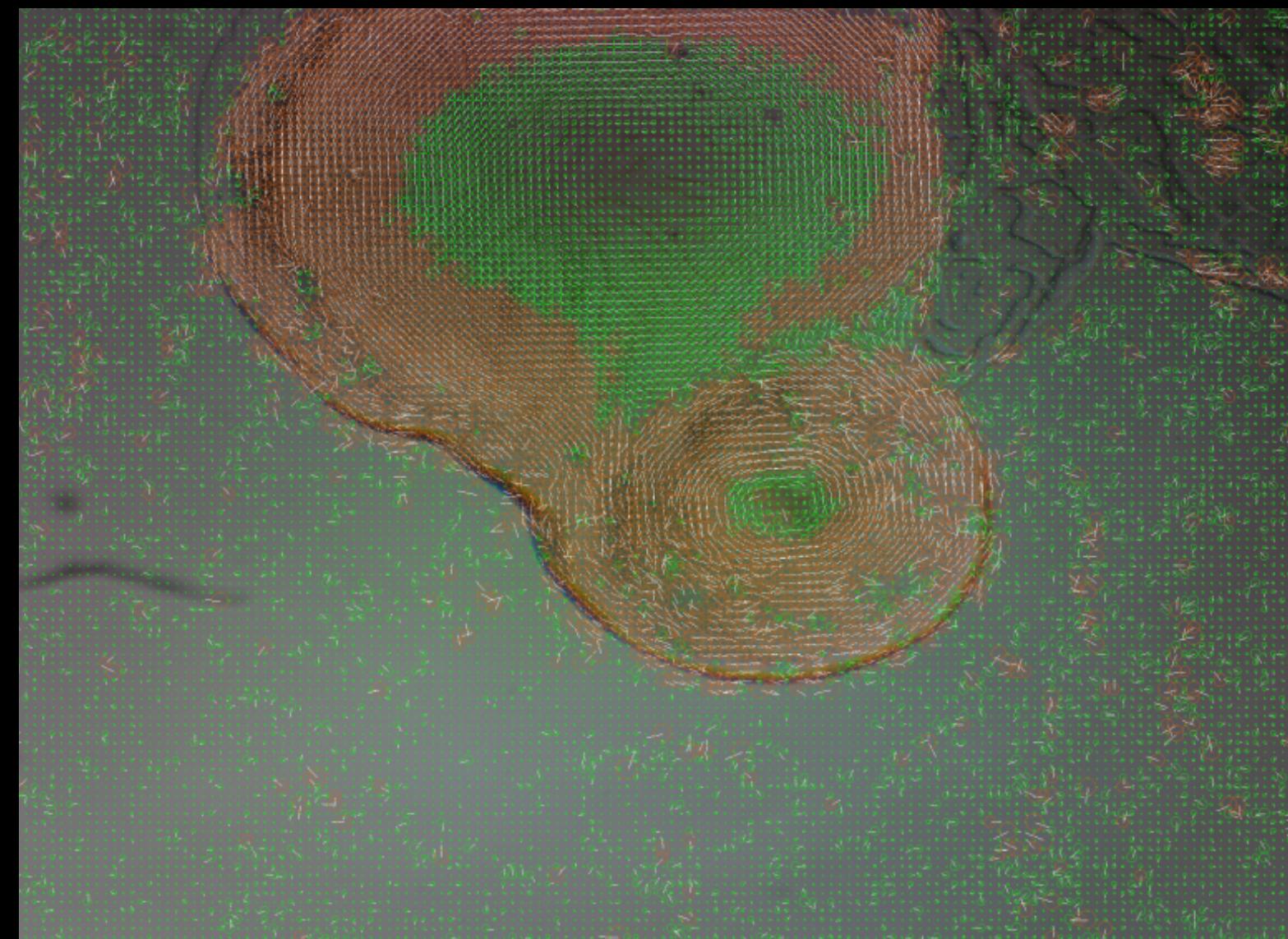
## 5 GENERADOR AUDIOVISUAL

El generador audiovisual es un módulo donde la Inteligencia Artificial tiene la libertad de componer utilizando lenguaje de programación tanto de imágenes generativas como sonido. Utiliza OpenFrameworks como plataforma central para la construcción visual y SuperCollider para la parte de sonido. Este módulo es completamente construido por la experiencia de la Inteligencia Artificial quien en su proceso co-evolutivo en conjunto con los microorganismos será capaz de producir una pieza generativa continua.

## 6 TRANSMISIÓN

La pieza resultante de este proceso será transmitida en tiempo real a través de servidores de forma que los espectadores puedan seguir el proceso evolutivo del sistema.

*Speculative Communications (2017), Interspecifics*





**Led by a pattern recognition machine able to observe and identify repeated  
coordinated actions in living cultures**

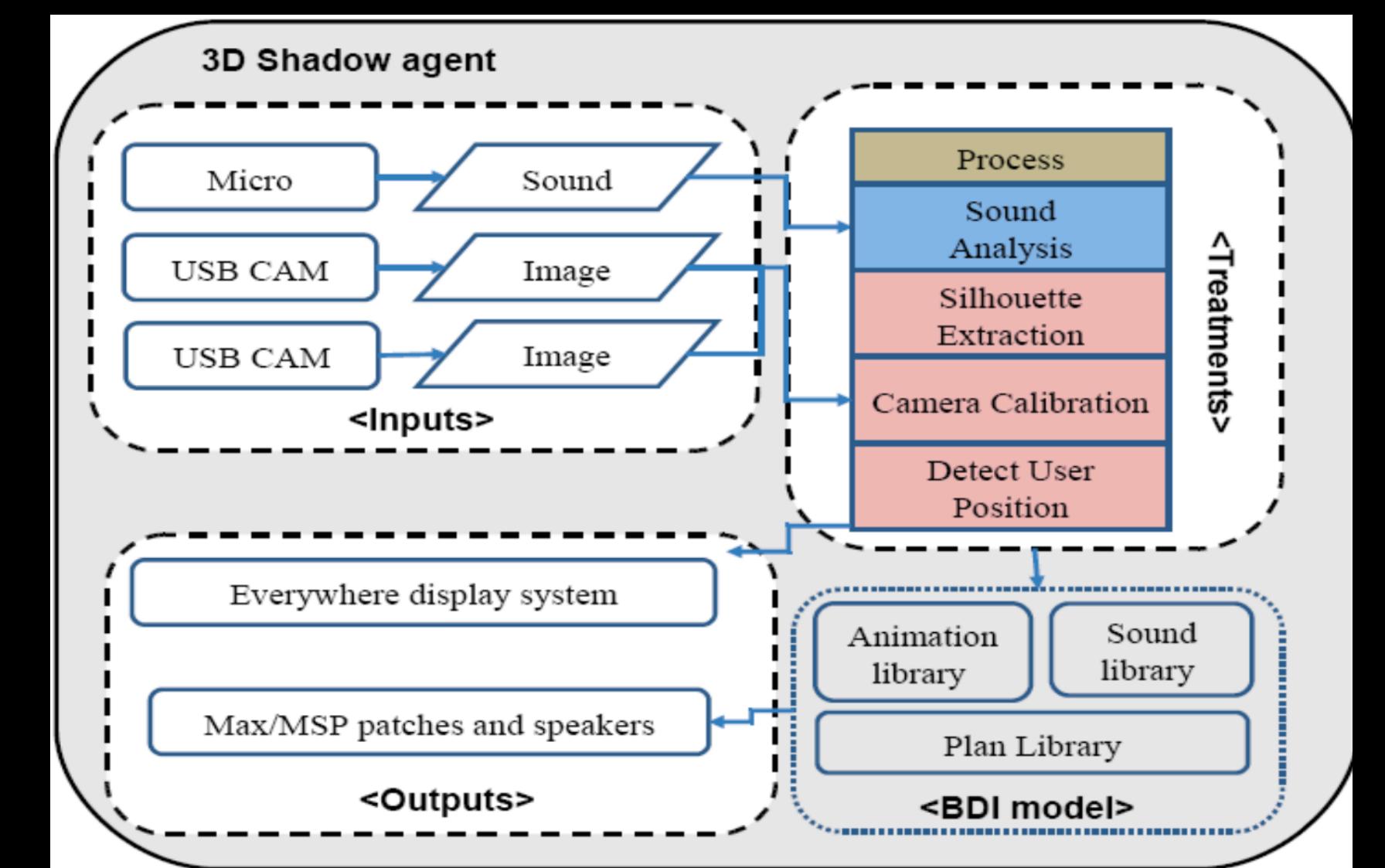
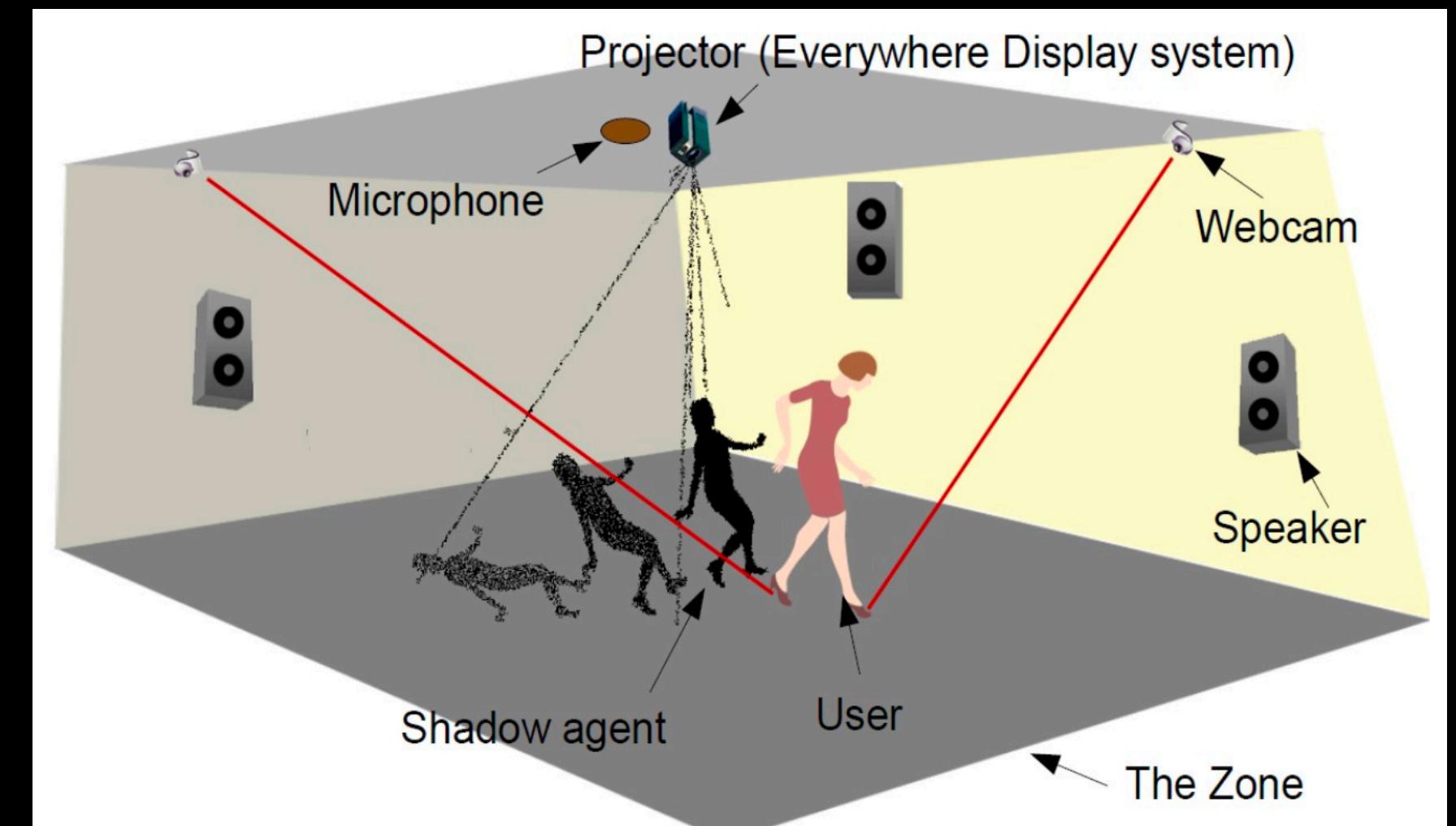
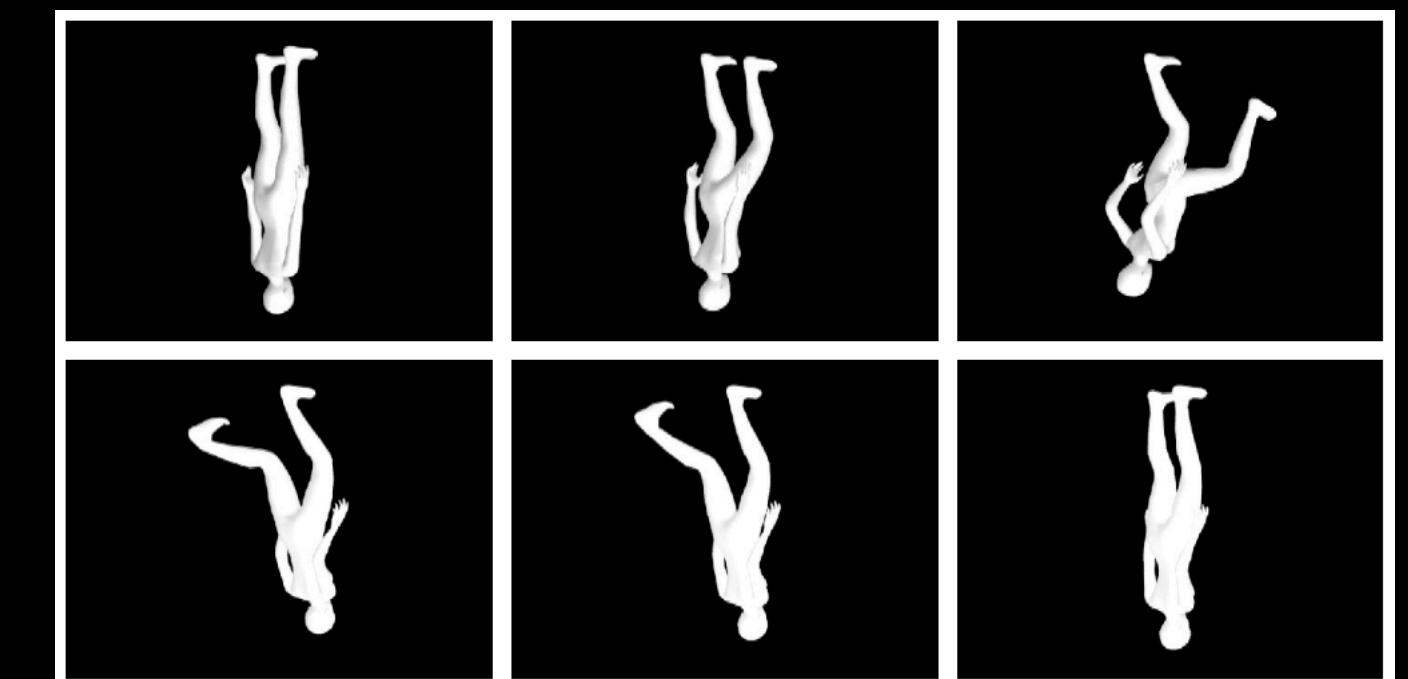
- *Evolving Sonic Environment* (2005-07), Usman Haque & Robert Davis
- an acoustically-coupled analog neural network, consisting of a society of devices whose behavior collectively changes in response to the pitch ascendancy or descendancy that each one detects.
- no computers or digital devices of any kind
- Based on the work of cyberneticist [Gordon Pask](#).
- <https://www.haque.co.uk/evolvingsonicenvironment.php>



# SHADOW AGENT

2008, Philippe Pasquier, Eunjung Han, Kirak Kim, Keechul Jung

- Shadow as medium
- shadow agent interacts with the human user by using pre-defined context-sensitive plans.
- BDI (Belief, Desires, Intentions) agent architecture



- *Petit Mal* (1993-95), Simon Penny
  - a robot that has “seizures”
  - design inspired by subsumption architecture
  - reactive/embodied approach to human-computer interaction
  - “un-optimized” and “under-engineered”
  - Penny stresses the culturally situated nature of intelligent agents, which he feels is often missed by mainstream AI researchers because of their emphasis on the abstract over the concrete.
  - “it is a fallacy to assume that the characteristics of an agent are in the code and are limited to what is explicitly described in the code. In fact, the opposite is much closer to the truth” (Penny 1997, pp. 105).

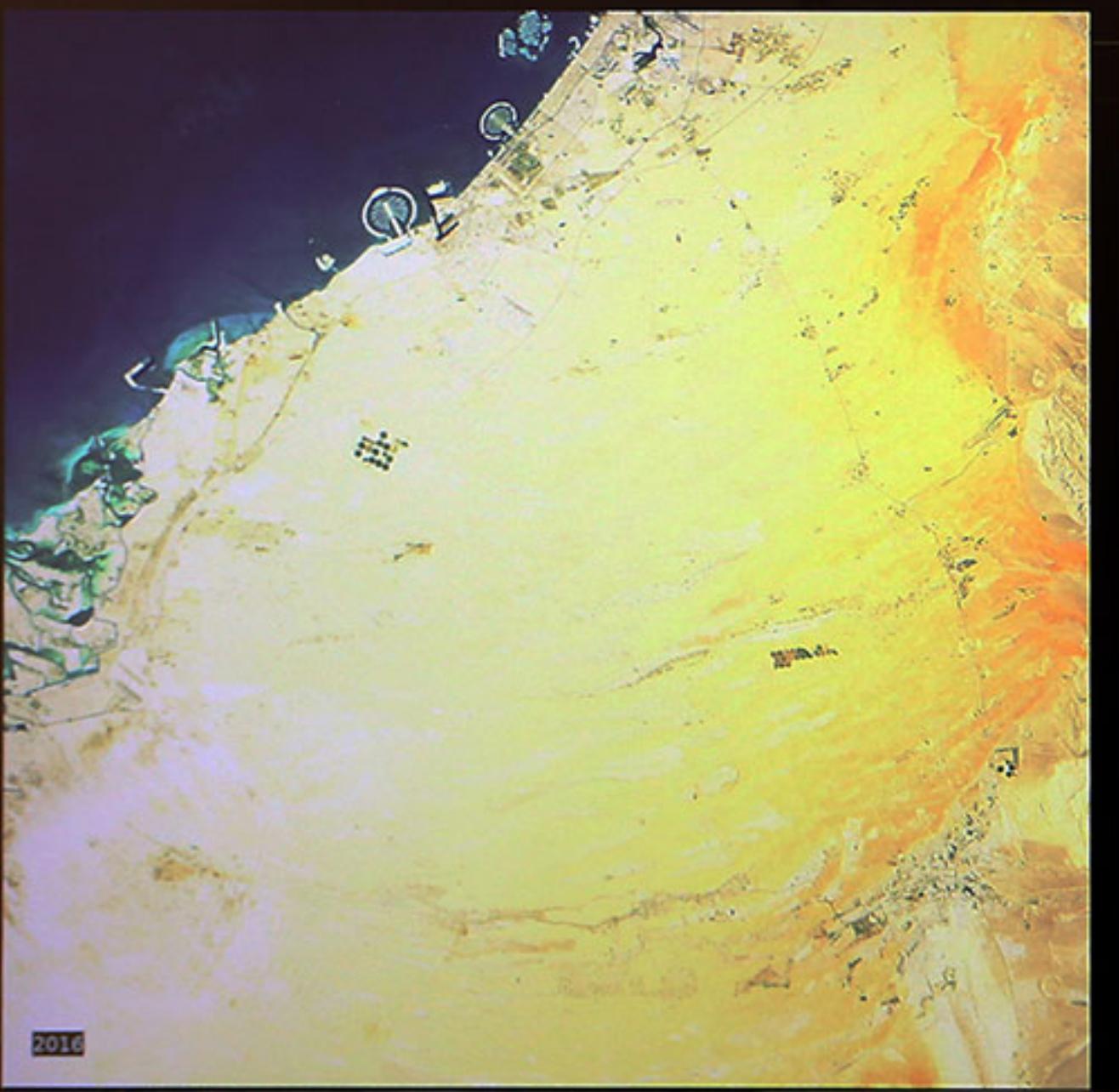






*Deep Swamp* (2018), Tega Brain



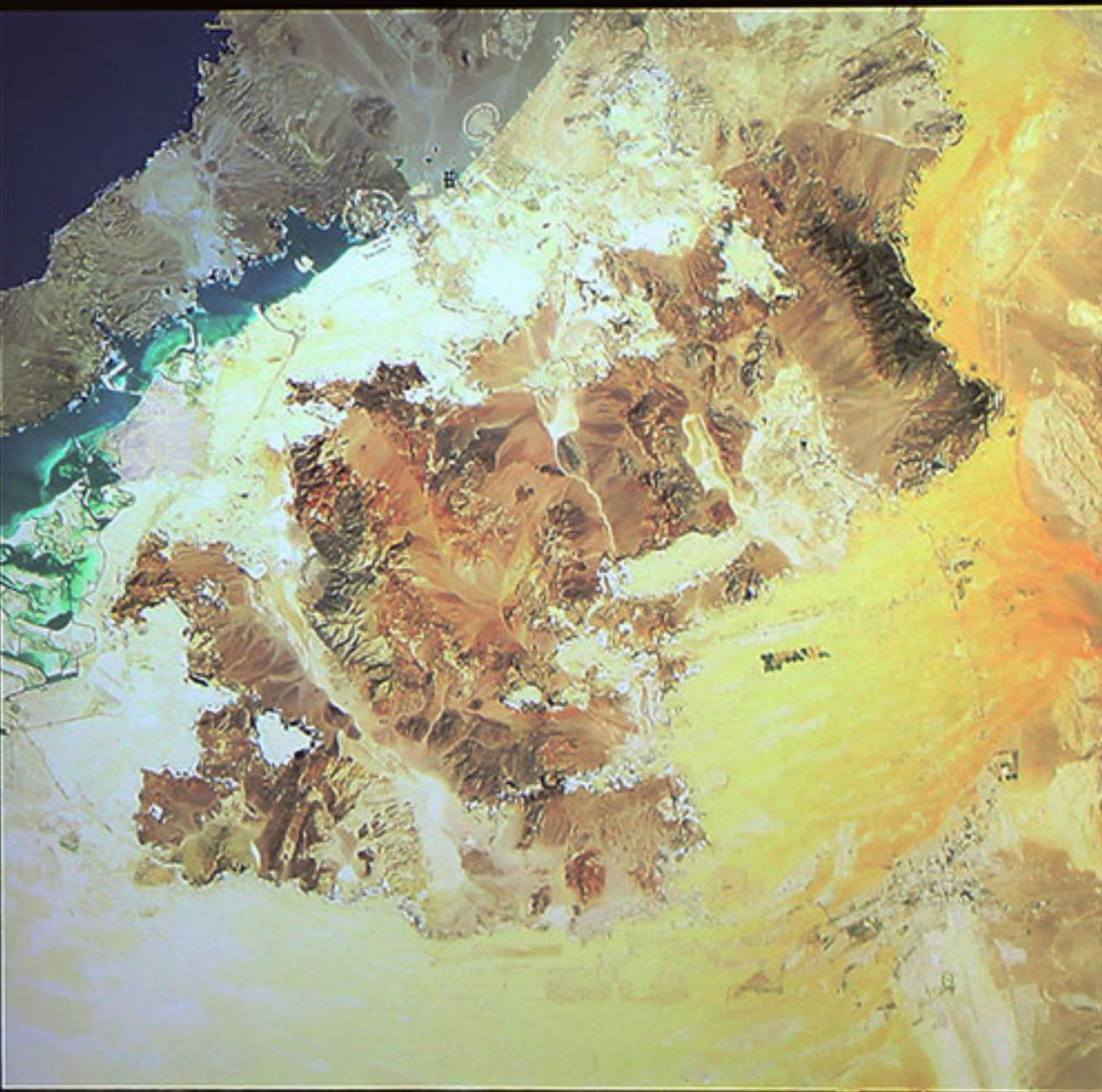
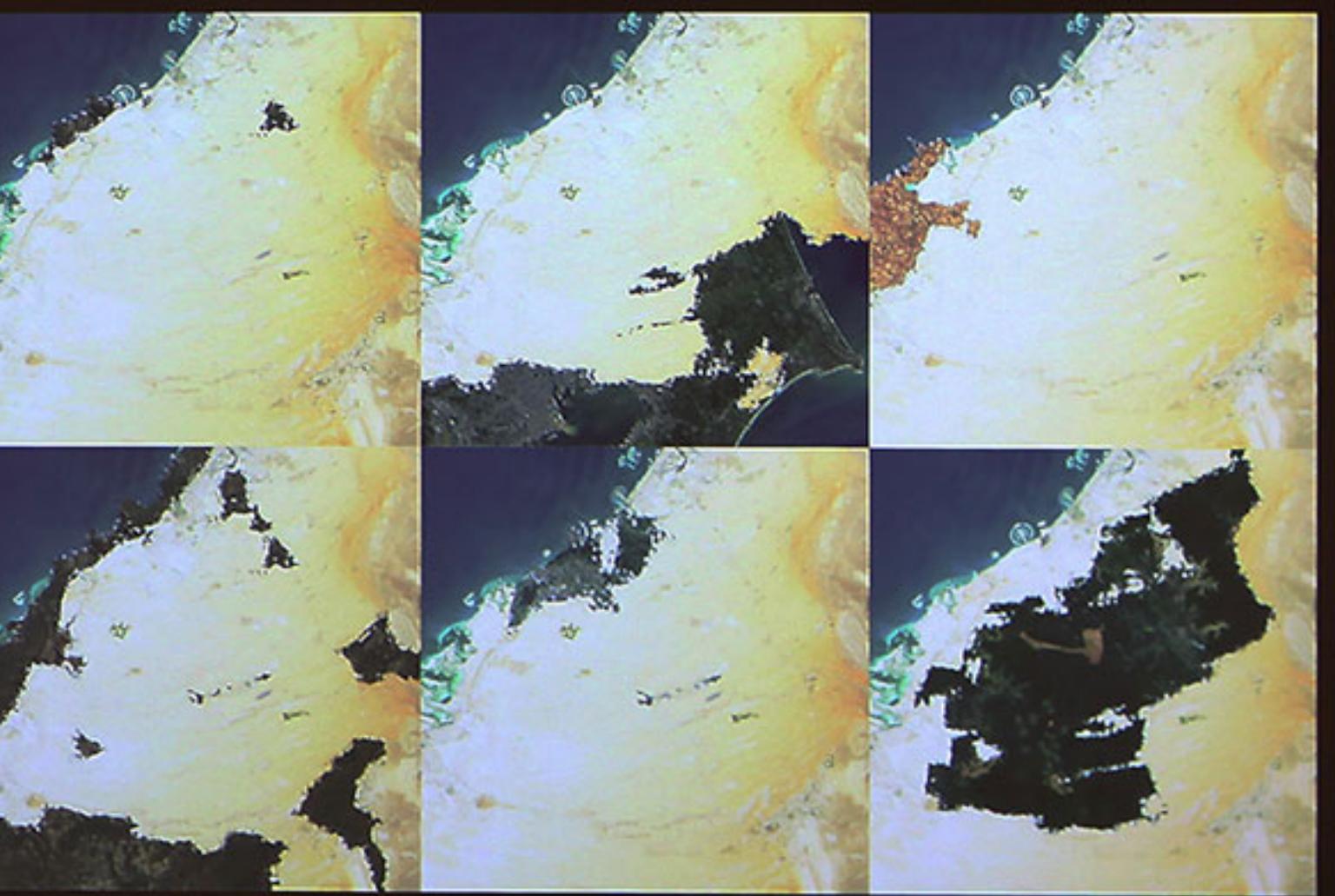


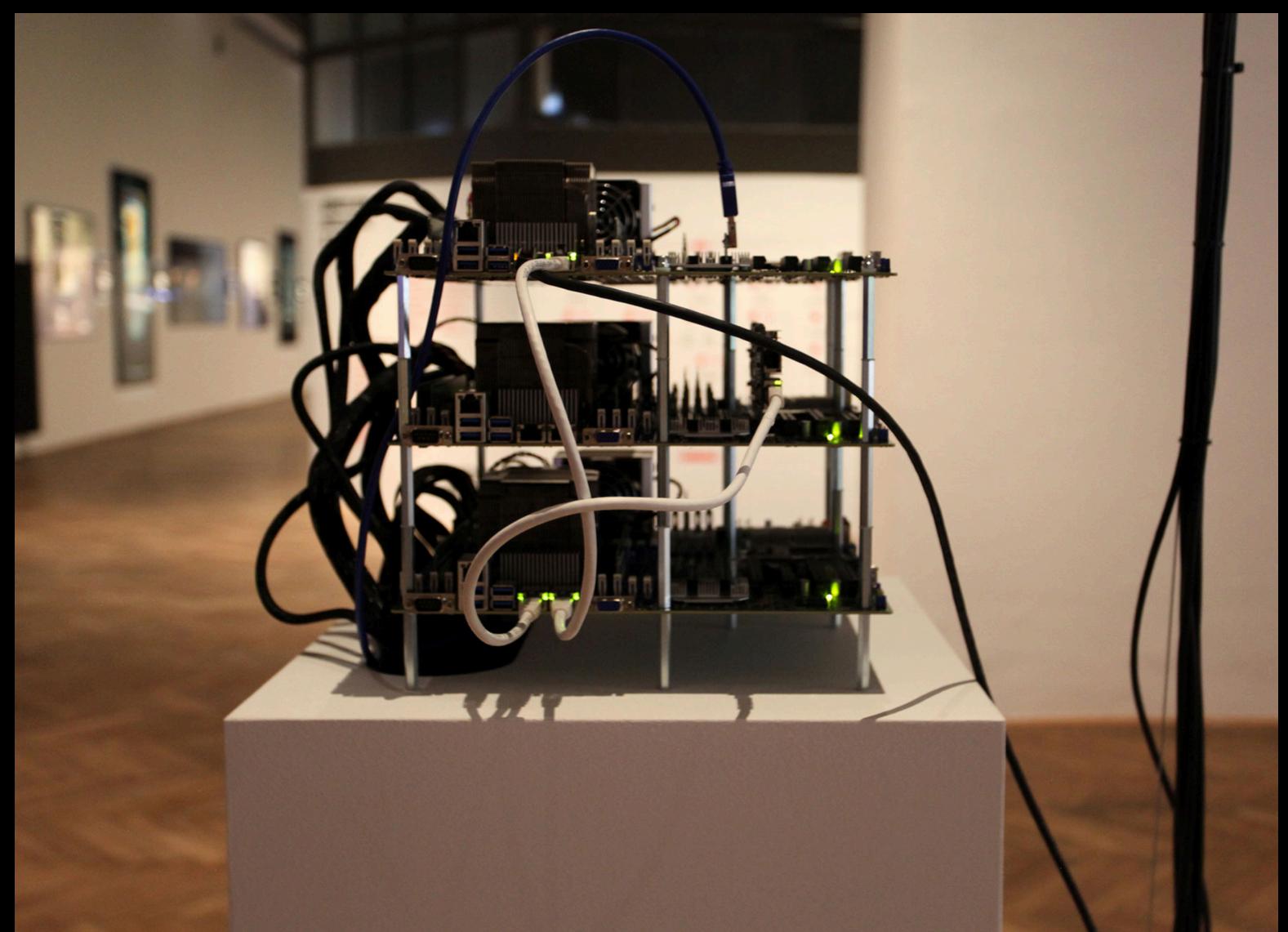
## CASE: Dubai, UAE

### REGION MODIFICATION OPTIONS

#### CASE DATA:

Location: 25.07 lon, 54.94 lat  
Land Use: Urban areas  
Population: 3.13 million  
Density: 116/km<sup>2</sup>  
GDP (2018): EUR31,200 per capita  
CO<sub>2</sub>e: 23.3 metric tons per capita  
Average temperature: 31-36°C  
Annual rainfall: 94mm  
Endangered Species Count: 21  
Urbanisation, air and water pollution, freshwater consumption  
Remote stressors: industrial pollution, supply-chain emissions, plastic/e-waste, mining, deforestation, over-fishing, warming

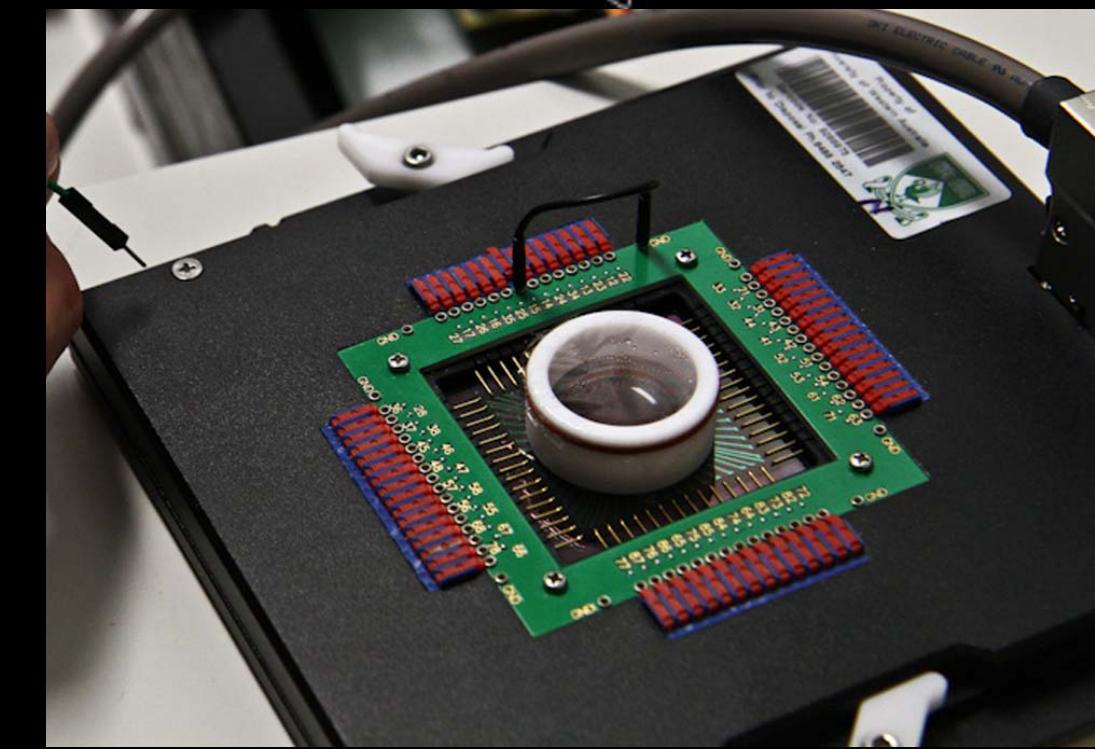
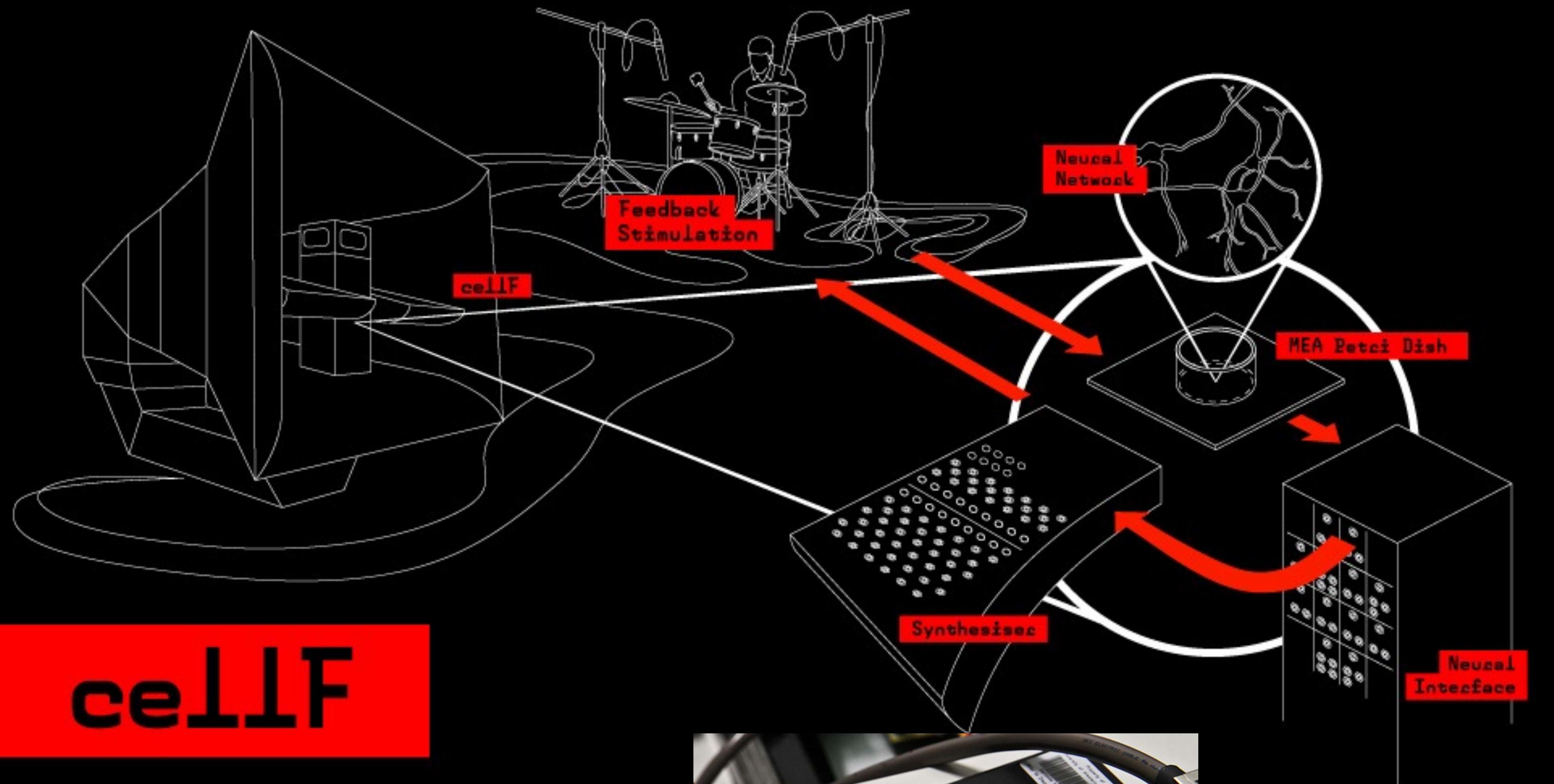


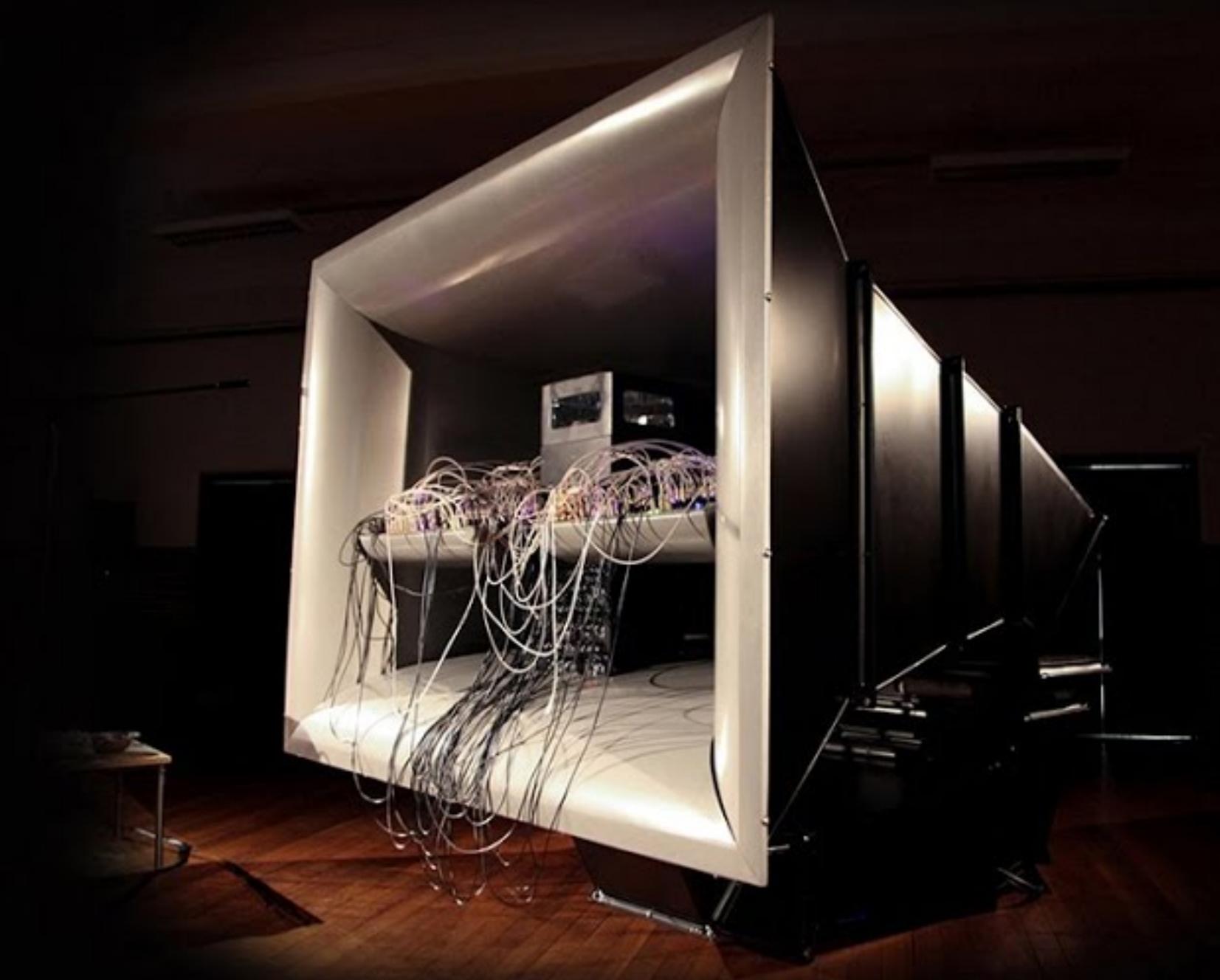


*Asunder* (2019-20), Tega Brain, Julian Oliver, Bengt Sjölén

## *CellF* - Guy Ben-Ary (2015-18)

- world's first neural synthesizer
- its "brain" is made of biological neural networks that grow in a Petri dish and controls in real time its "body" that is made of an array of analogue modular synthesizers that work in synergy with it and play with human musicians.
- neural network is bio-engineered from artist's own stem cells







*“We have two ears and one mouth so that we can listen twice as much as we speak.”*

Epictetus

