

# BEYOND VISUALIZATION

KIRELL BENZI, PH.D

# Generative art

Art created by an autonomous process defined by the artist

Often algorithmic, it can draw inspiration from nature

Can also be data-driven

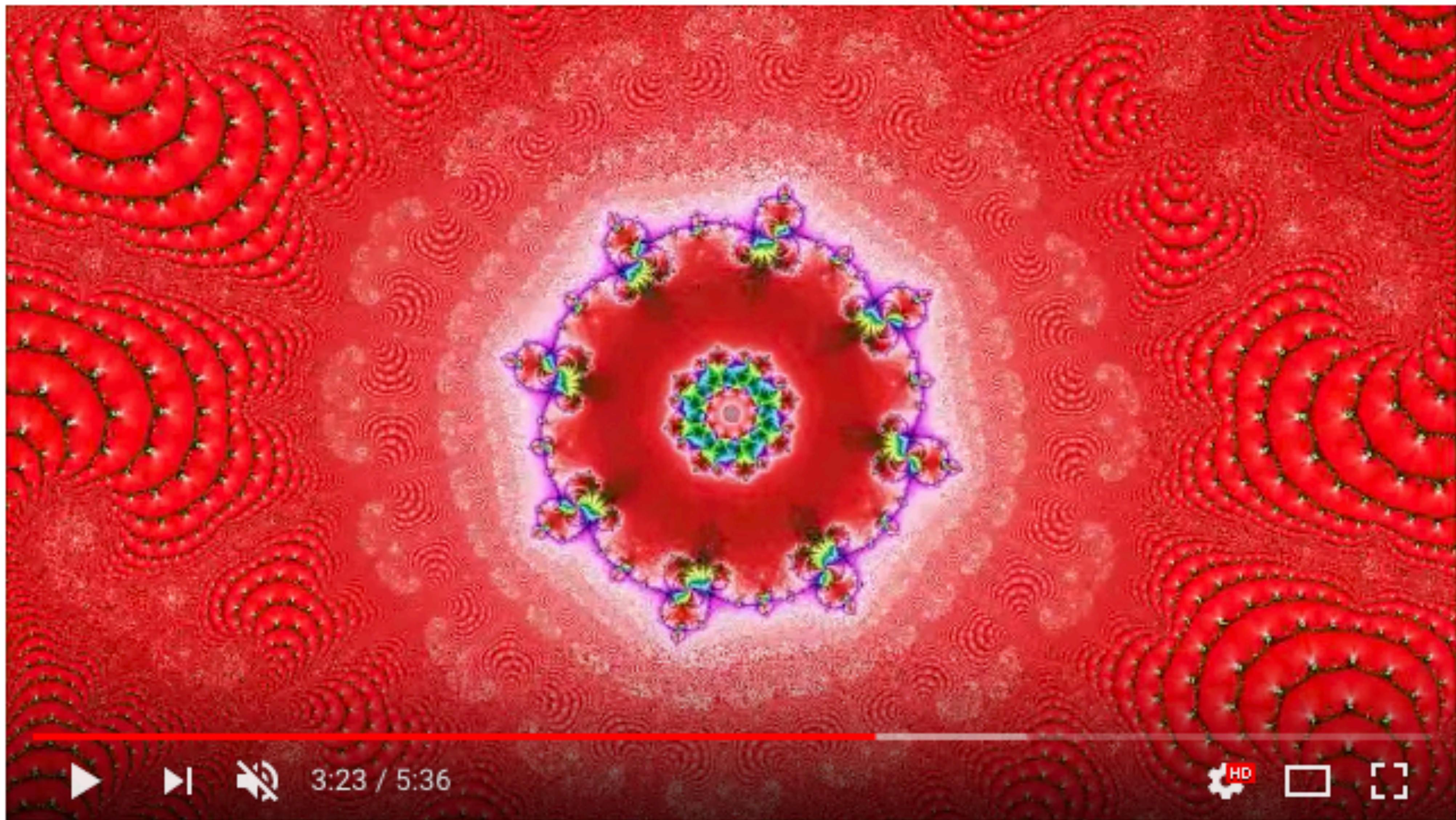




**[Rowan Mersh]**



**[Rowan Mersh]**



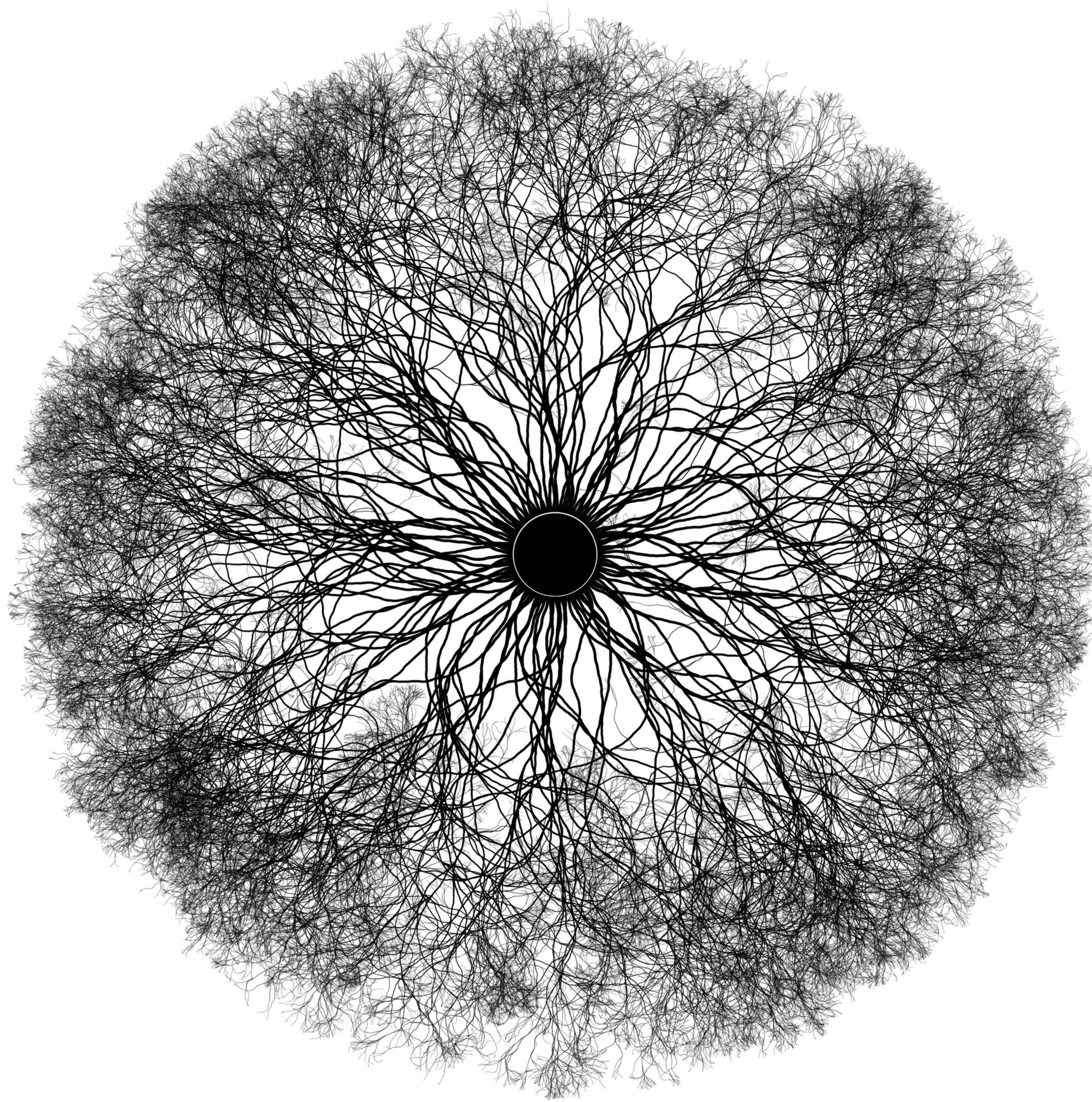
The Hardest Mandelbrot Zoom in 2017 - New record, 750 000 000 iterations!

# Creative coding

Use code to generate art

Used in audio-visual shows,  
like VJing, art installations

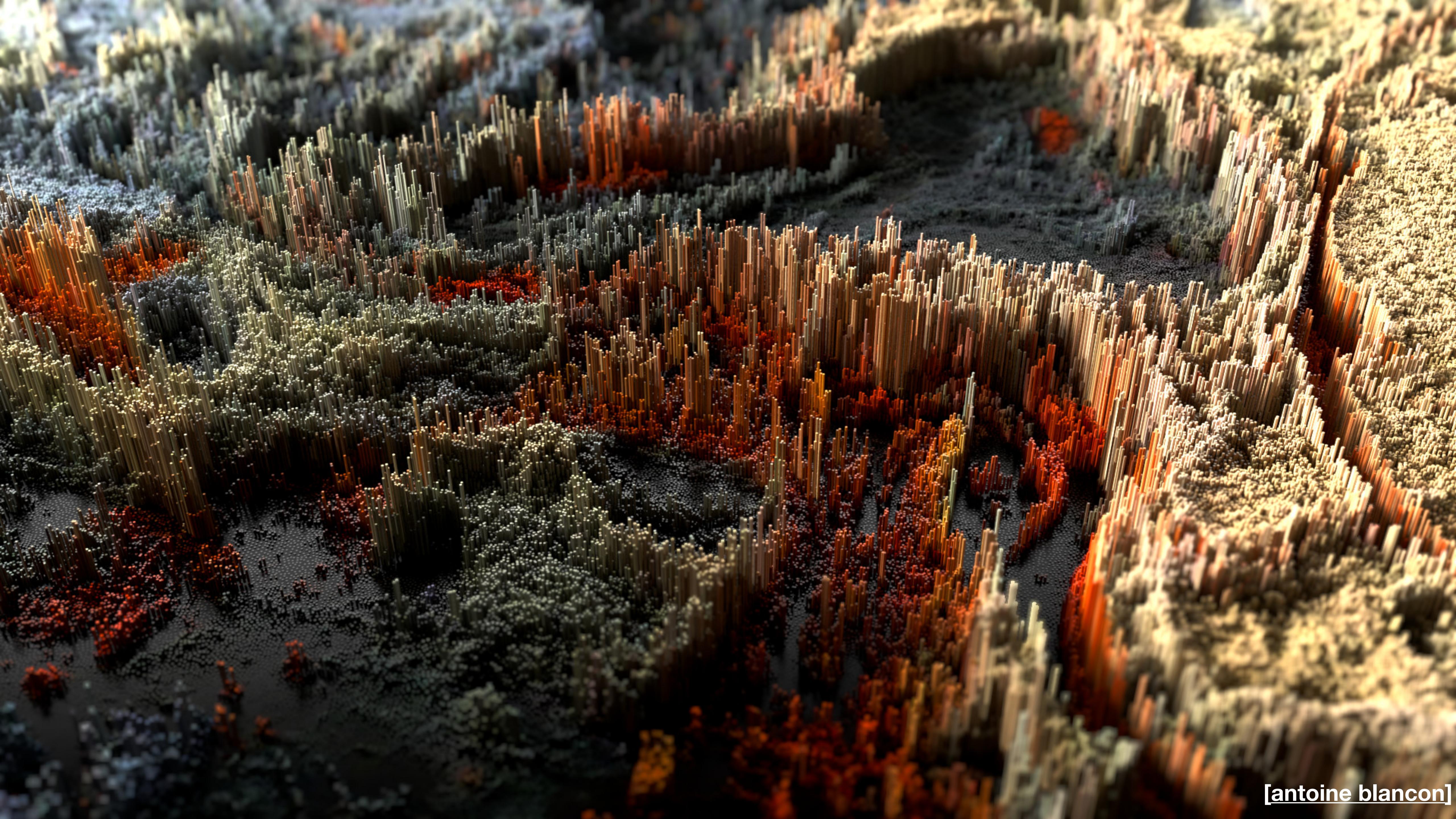




[artfromcode]



[Rectangle World]



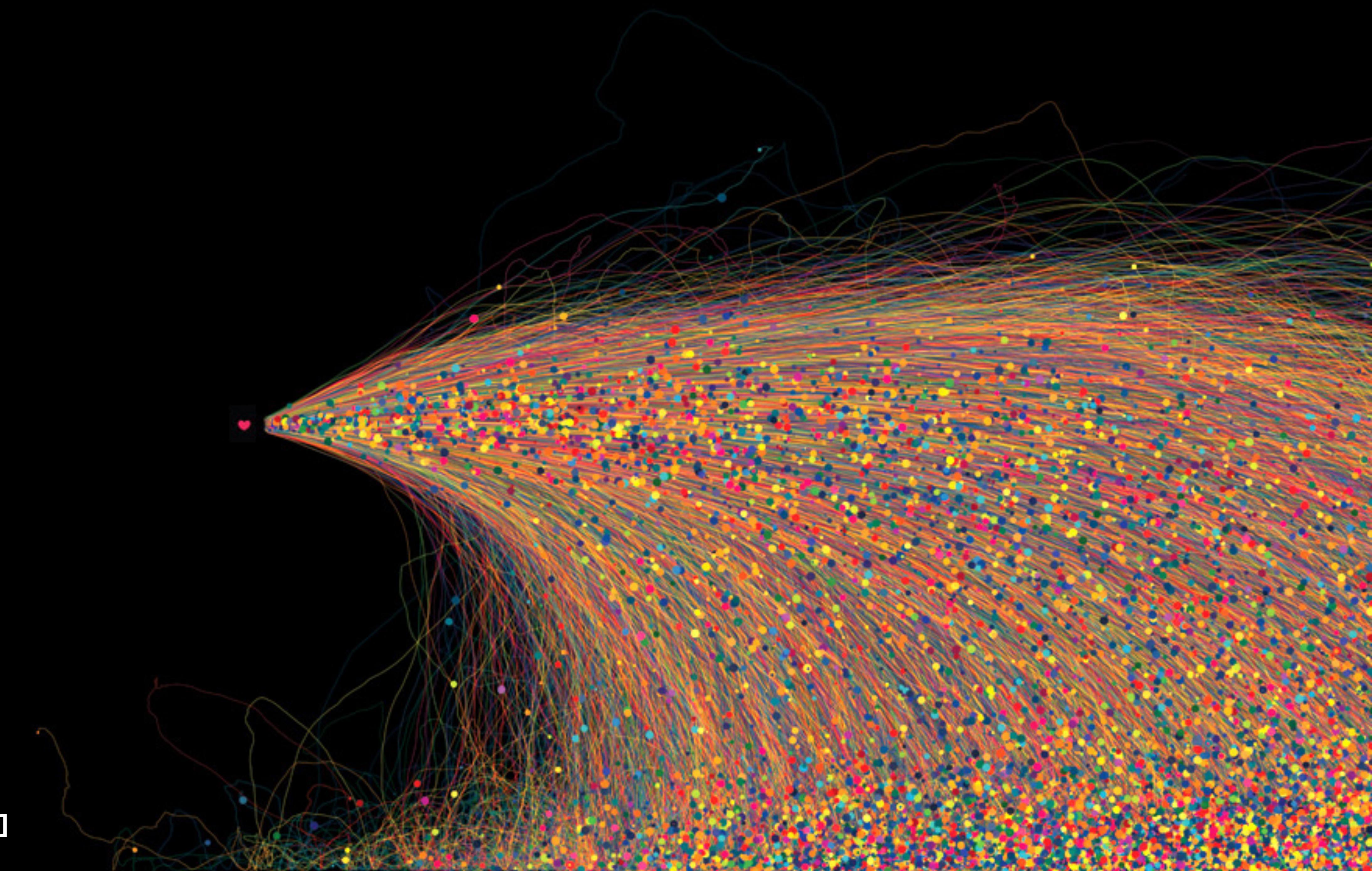
[antoine blanc0n]

# Data art

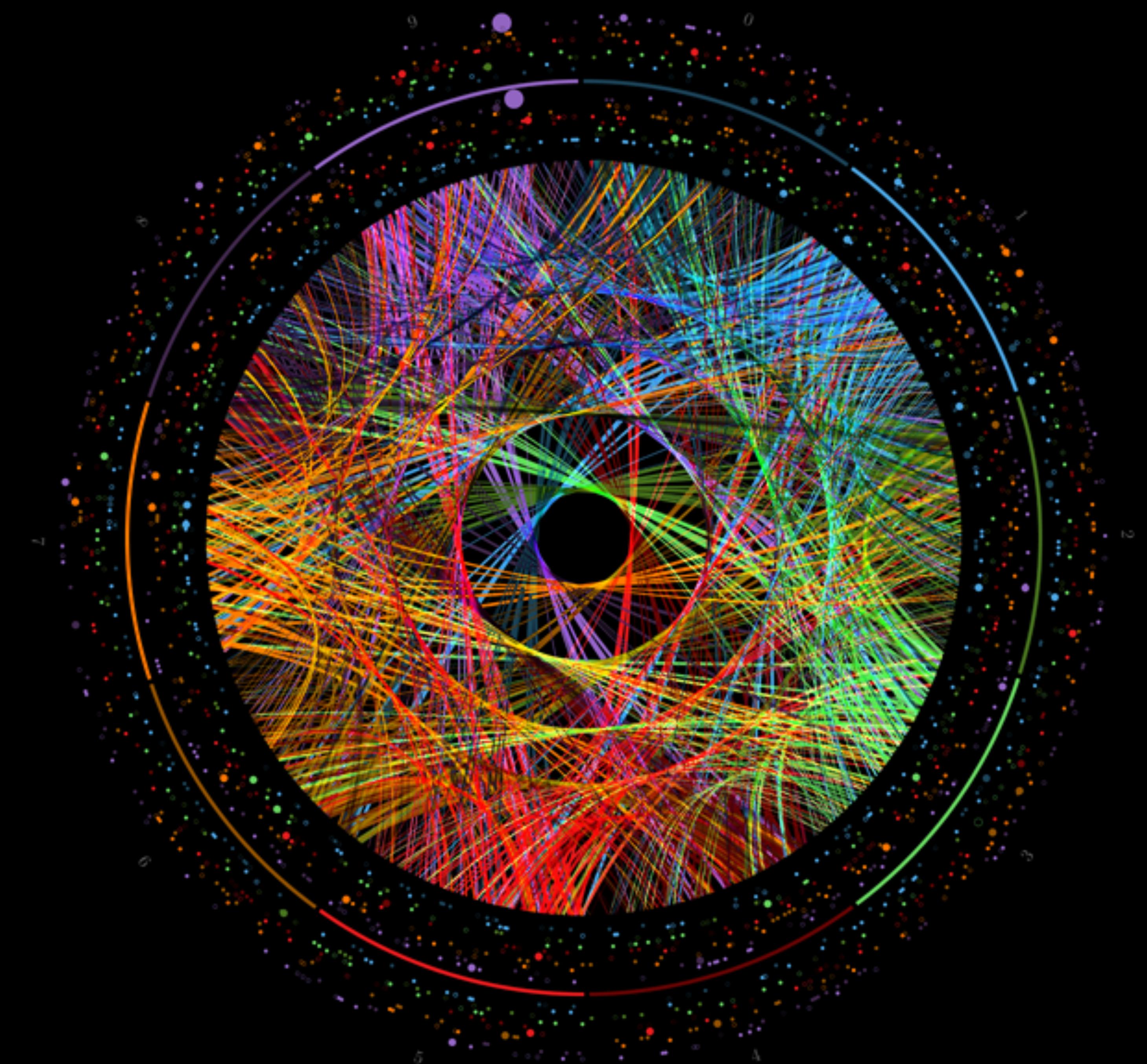
Creation of artistic artworks and aesthetic shapes from complex datasets

Allows to transform data into: [images, videos, sounds, animations](#)

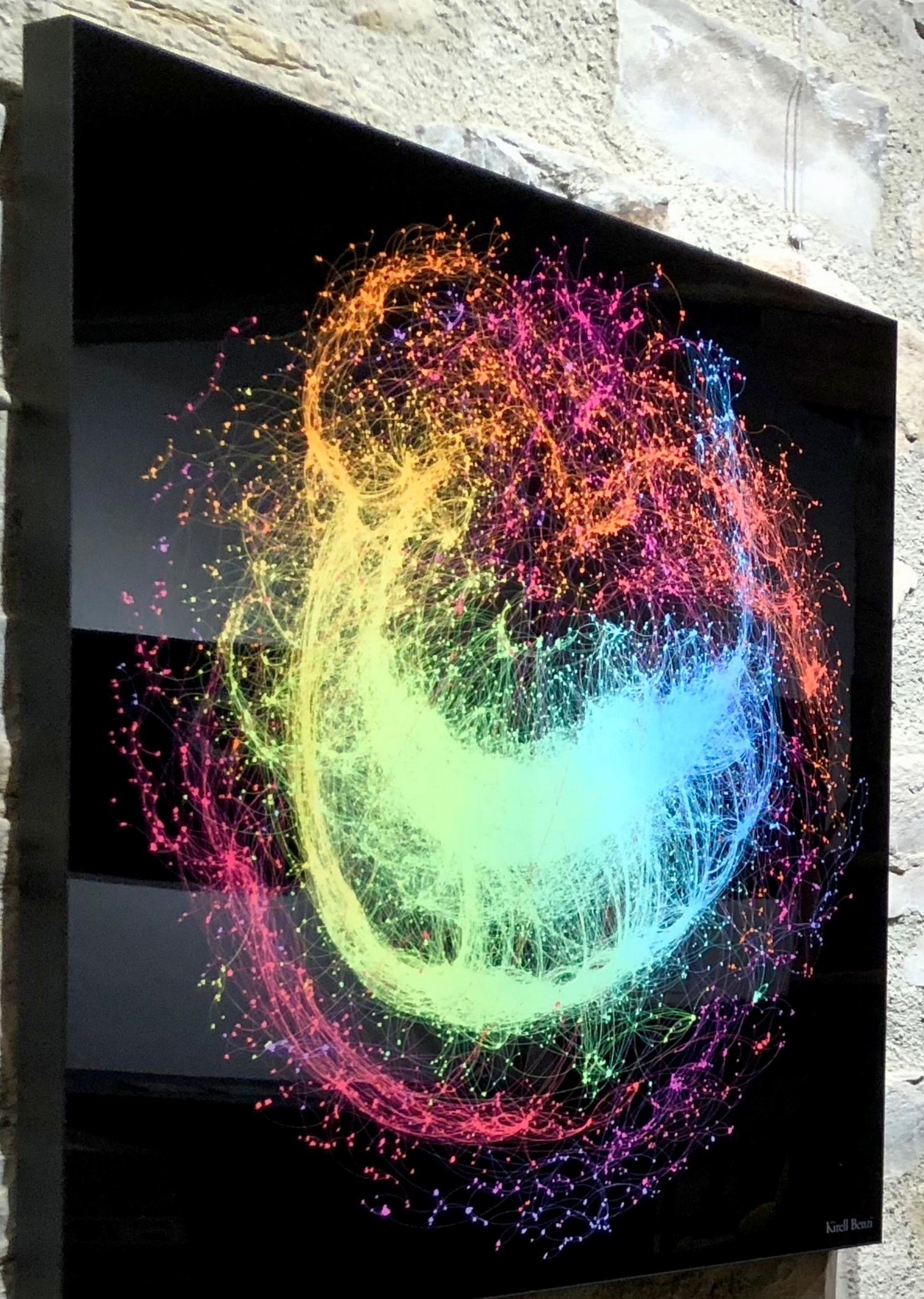
Based on algorithms, it has a scientific, factual component wrapped in a creative, artistic vision



[Harris & Kamvar]



[Ilies Vasile and Kryzinski]



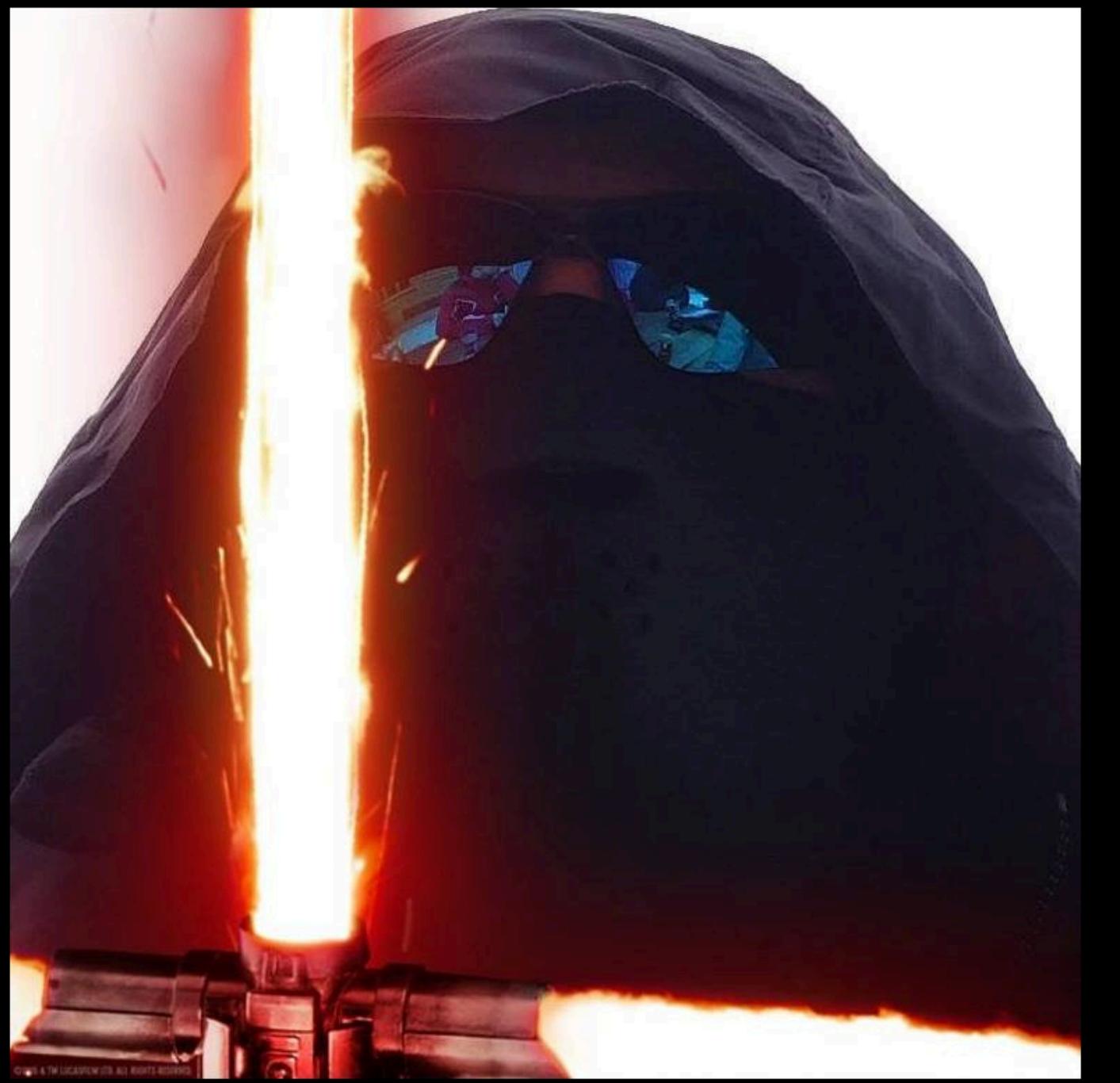
# AI art (neural style)

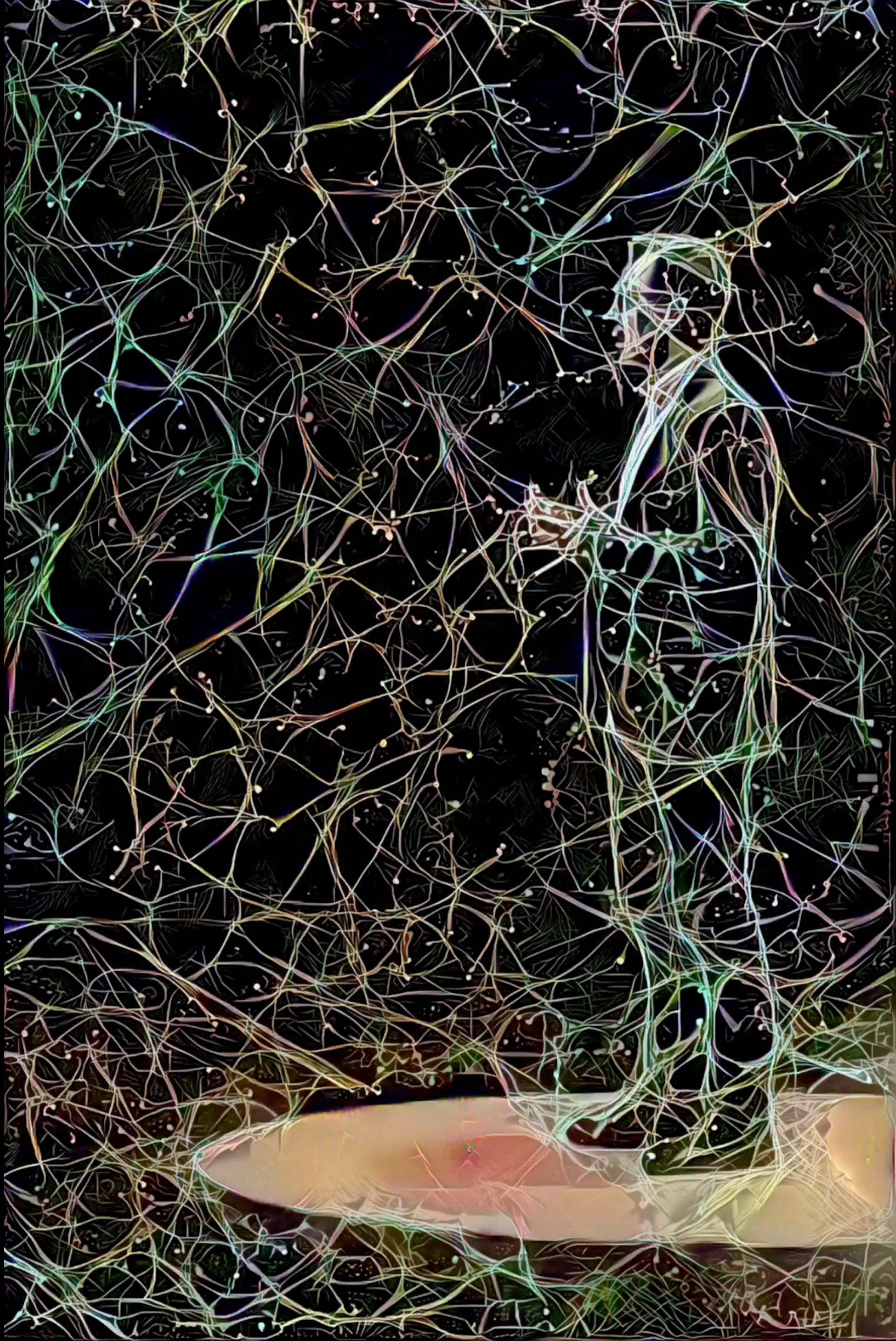
Created by the machine (generally deep neural networks) from an input dataset

Started to be popular with Google deep dream

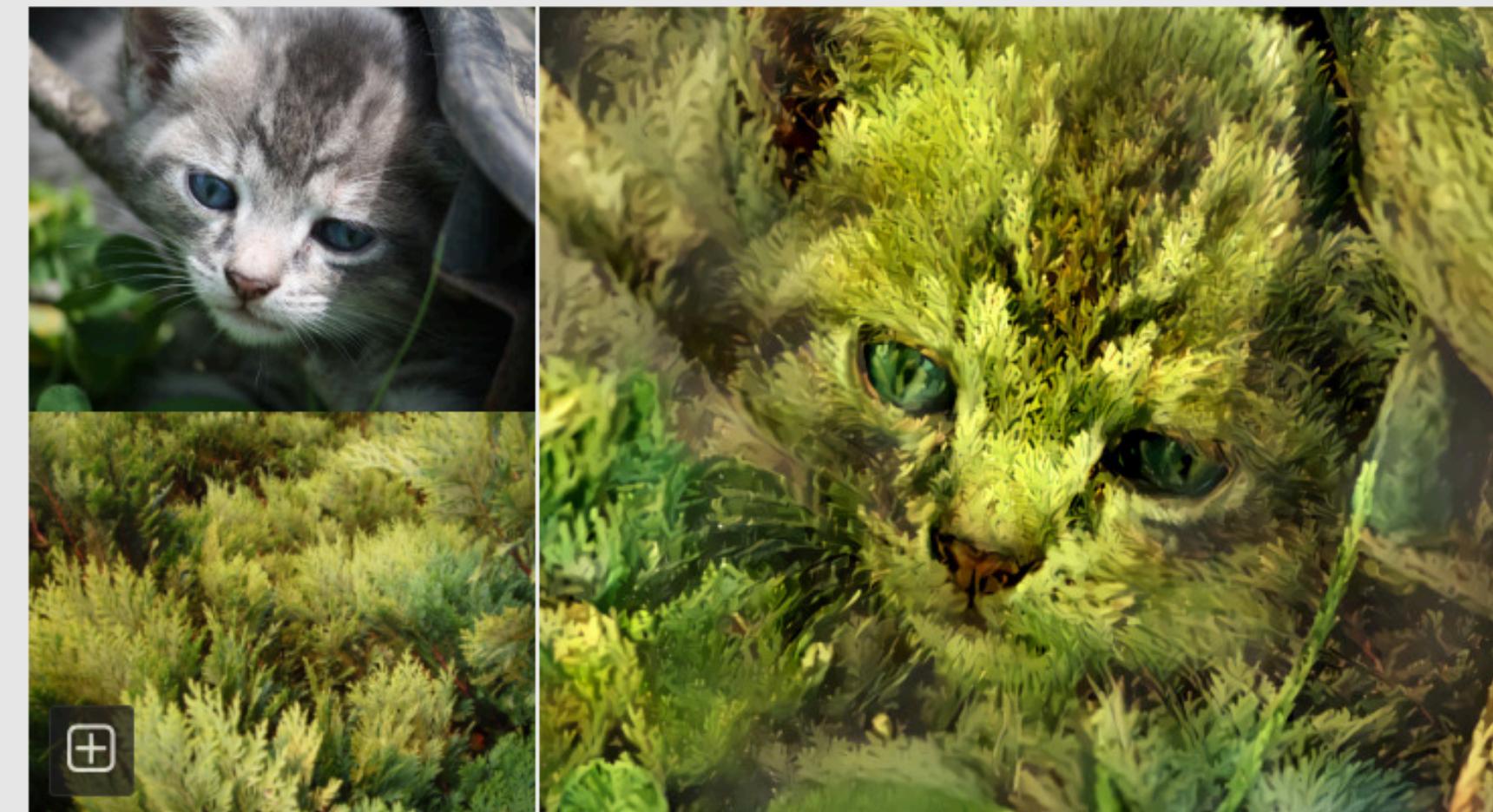


[Google DeepDream]





[Kirell Benzi]

[Trending](#) [Latest](#) [Best](#)[Top Dreamers](#)[Today](#) [Week](#) [Month](#) [All time](#) [Editor's choice](#)**CreatureSH**

5 days ago

104

**Sh4d0wStrike**

5 days ago

89



# Magenta

Magenta is Google's open source deep learning music project. They aim to use machine learning to generate compelling music. The project went open source in June 2016 and currently implements a regular RNN and two LSTM's.

**GitHub:** <https://github.com/tensorflow/magenta>

**Great, because:** It can handle any monophonic midi file. The documentation is good, so it's relatively easy to set-up. The team is actively improving the models and adding functionality. For every model Magenta has provided a training bundle that is trained on thousands of midi files. You can start generating new midi files right away using these pre-trained models.

**Challenges:** At this point, Magenta can only generate a single stream of notes. Efforts have been made to combine the generated melodies with drums and guitars – but based on human input, as of yet. Once a model that can process polyphonic music has been trained, it could start to create harmonies (or at least multiple streams of notes). This would indeed be a mighty step on their quest for the generation of some compelling music.

**Sounds like:** The piece below is generated by Magenta from the 8th note onward. Here they use their attention model with the provided pre-trained bundle.



# DeepJazz

The result of a thirty-six-hour hackathon by Ji-Sung Kim. It uses a two layer LSTM that learns from a midi file as its input source. DeepJazz has received quite some news coverage in the first six months of its existence.

**GitHub:** <https://github.com/jisungk/deepjazz>

**Great, because:** Can create some jazz by being trained on a single midi file. The project itself is also compelling proof that creating a working computational music prototype using deep learning techniques can be a matter of hours thanks to libraries like Keras, Theano & Tensorflow.

**Challenges:** While it can handle chords, it converts the jazz midi to a single pitch and single instrument. It would take a few more post-processing steps for the deep learning created

# Tools and libraries

# Processing

Processing is a flexible software sketchbook and library for learning how to code within the context of the visual arts.

Java-based

Started in 2001, it is very popular in the community

Interactive programs with 2D, 3D or PDF output

OpenGL integration for accelerated 2D and 3D

Multiplatform



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Welcome to Processing 3! Dan explains the new features and changes; the links Dan mentions are on the [Vimeo](#) page.

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[Particle Flow](#)  
by NEOANALOG



[Objectifier](#)  
hv Biørn Karmann

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Processing is a flexible software sketchbook and a language for learning how to code within the context of the visual arts. Since 2001, Processing has promoted software literacy within the visual arts and visual literacy within technology. There are tens of thousands of students, artists, designers, researchers, and hobbyists who use

# p5.js

## JS evolution of Processing in the browser

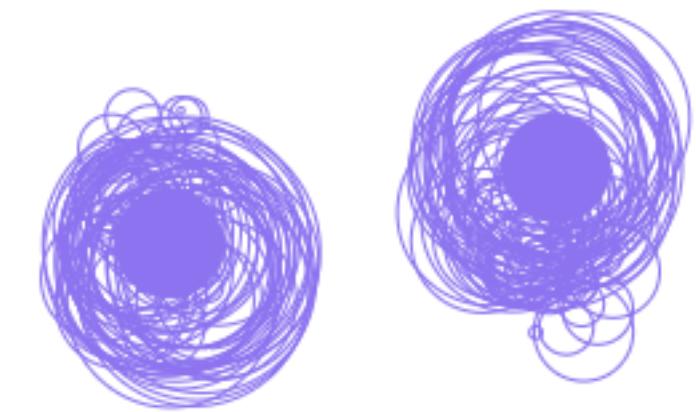
### Nice, cleaner API

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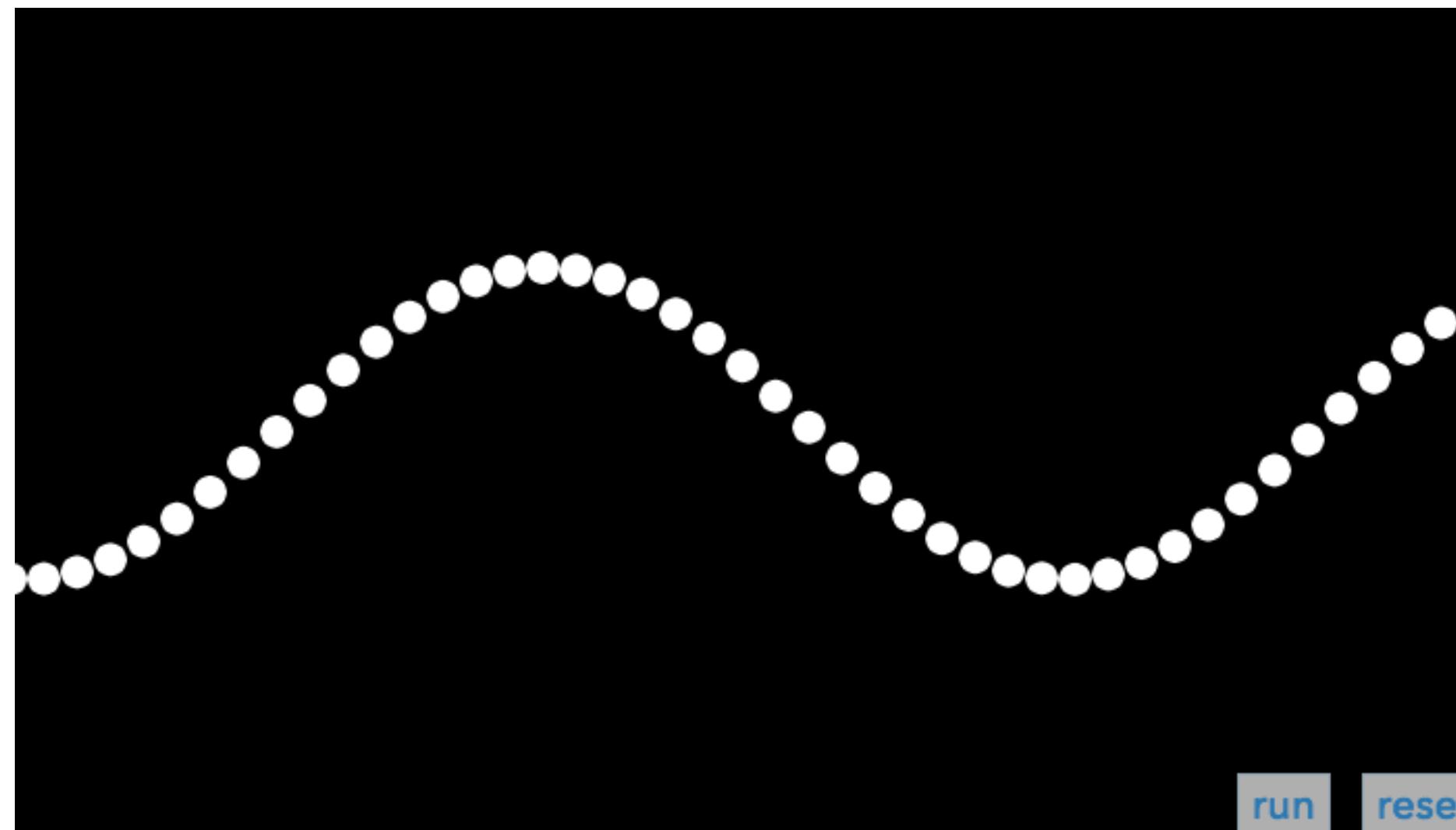
[Hello!](#) p5.js is a JavaScript library that starts with the original goal of [Processing](#), to make coding accessible for artists, designers, educators, and beginners, and reinterprets this for today's web.

Using the original metaphor of a software sketchbook, p5.js has a full set of drawing functionality. However, you're not limited to your drawing canvas, you can think of your whole browser page as your sketch! For this, p5.js has addon [libraries](#) that make it [easy to interact](#) with other HTML5 objects, including text, input, video, webcam, and sound.

p5.js is a new interpretation, not an emulation or port, and it is in active development. An official editing environment is coming soon, as well as many more features!



# Example



Color  
Constants  
Conversion  
DOM

Data  
Environment  
Events  
IO

Image  
Lights, Camera  
Math  
Rendering

Shape  
Structure  
Transform  
Typography

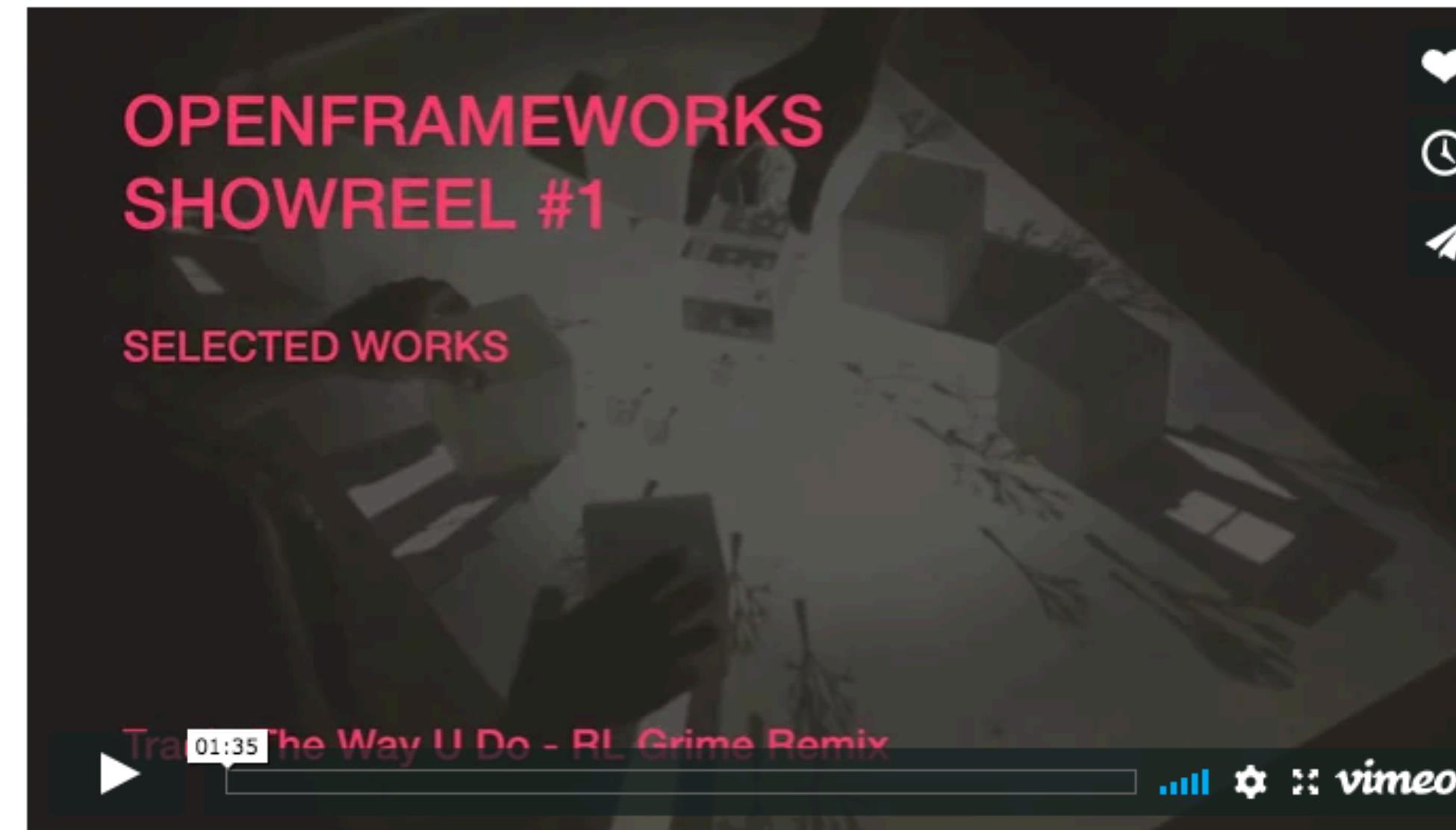
# openFrameworks



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openFrameworks is an open source C++ toolkit for creative coding.

## download

Grab the most recent release (0.9.8) and follow the setup guide to get openFrameworks running.

## documentation

Reference for openFrameworks classes, functions and addons. You can also check the tutorials section.

## forum

The forum is a place to meet other people working with openFrameworks. It's a place to share your work, or find help solving problems.



## OF Showreel

Recommended

Autoplay next video

# Cinder



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*Cinder is a C++ library* for programming with aesthetic intent - the sort of development often called *creative coding*. This includes domains like graphics, audio, video, and computational geometry. Cinder is cross-platform, with official support for macOS, Windows, Linux, iOS, and Windows UWP.

Cinder is production-proven, powerful enough to be the primary tool for professionals, but still suitable for learning and experimentation.

Cinder is released under the [2-Clause BSD License](#).

## Professional C++ library for creative coding

### More robust but less beginner-friendly



#### STANDALONE APPLICATIONS

Platform-native windowing and event handling

#### SCREENSAVERS

Native macOS and Windows screensavers

#### INTERNET I/O

Load media via HTTP and FTP natively

#### PLATFORM-SPECIFIC APIs

Convenient access to power management, display and network adapter iteration

#### XML & JSON PARSERS

Built-in object oriented XML & JSON parsing API

#### FULL I/O ABSTRACTION

Seamless I/O from flat files, memory, resources and networks

#### C++ CORE

Designed around idiomatic C++11 features such as `shared_ptr`

#### UI EVENTS

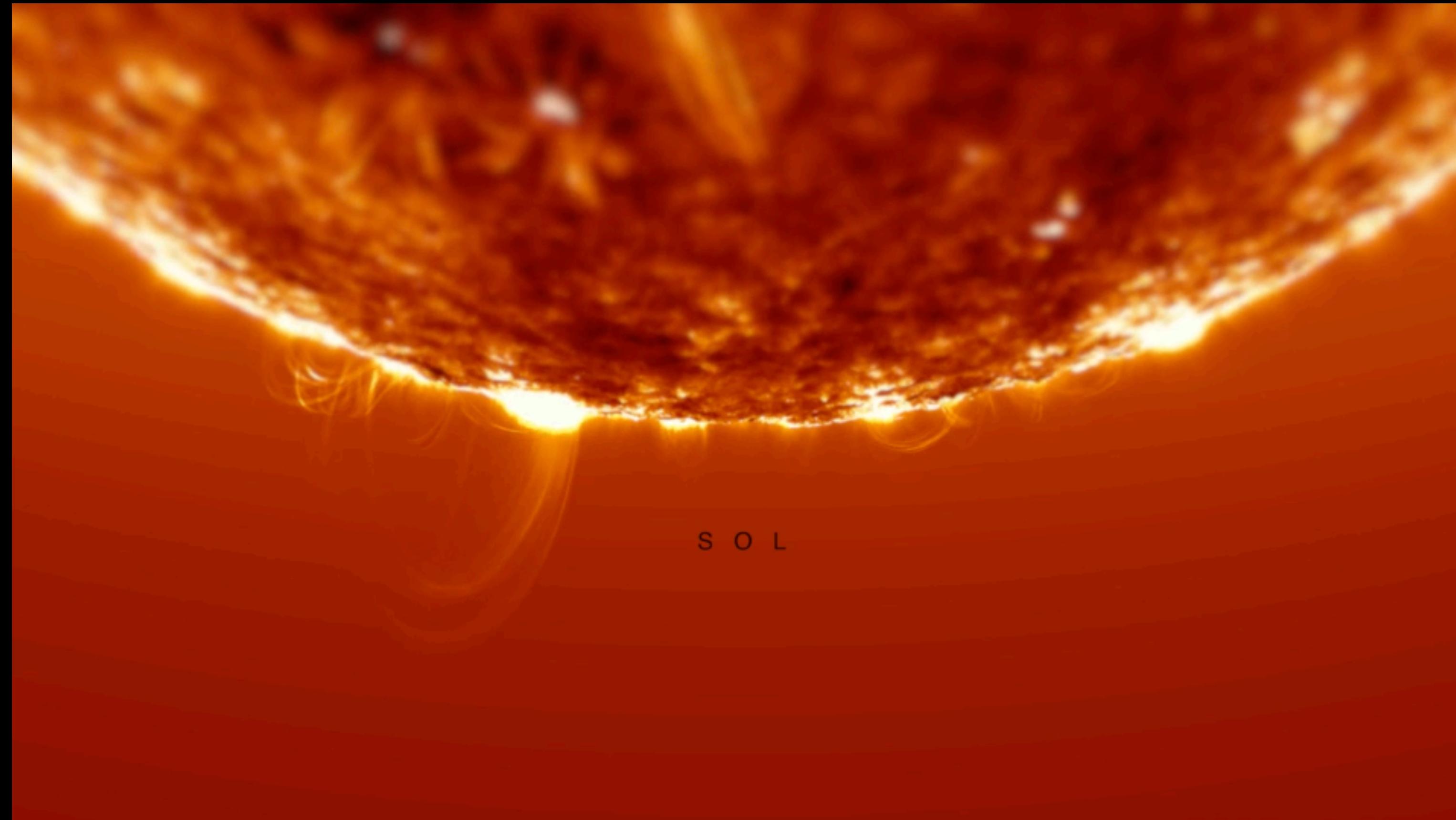
Full keyboard, mouse (including scroll wheel), window, and file drag and drop

#### MULTITOUCH

Consistent multitouch APIs for Windows 7+, iOS and macOS

#### COMMUNICATION APIs

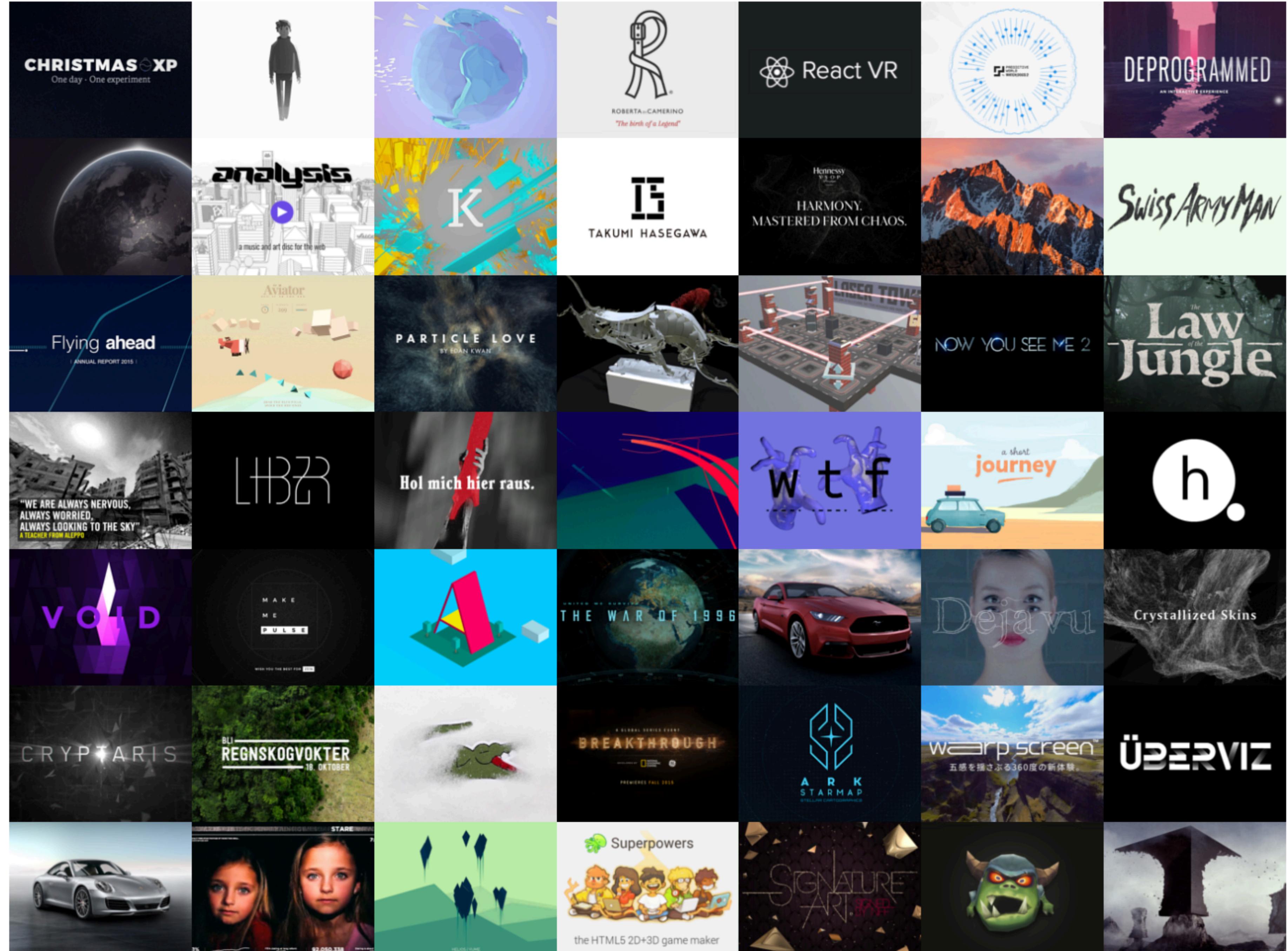
Serial port (enabling Arduino applications), OSC and TUIO



## Reactive Data Visualization at One World Observatory, NYC



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Close 

Importers Exporters

- 1 USA
- 2 Japan
- 3 China
- 4 Germany
- 5 Rep. of Korea
- 6 India
- 7 Italy
- 8 France
- 9 Netherlands
- 10 Spain

1st biggest importer in 2005

USA

Net weight

532,738,032,233 kg

Import value

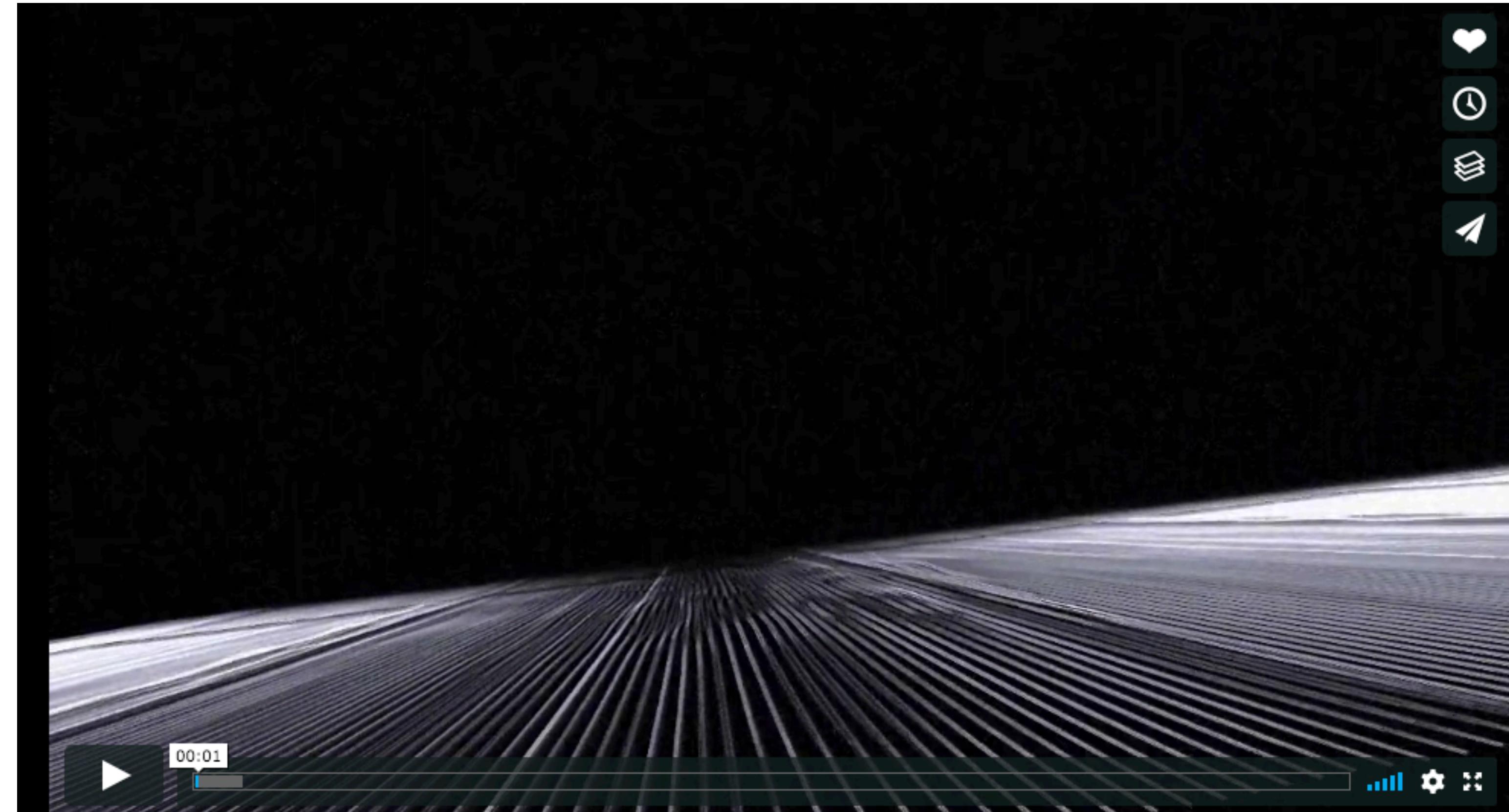
\$ 190,390,298,485



# TouchDesigner

Realtime visual  
development platform

Projection mapping, live  
music visuals, user  
interfaces, lights



# Houdini

Standard VFX tool

Node-based procedural 3D  
engine

