

The Anatomy of an AI system

Alex Fefegha

Computational Futures & AI

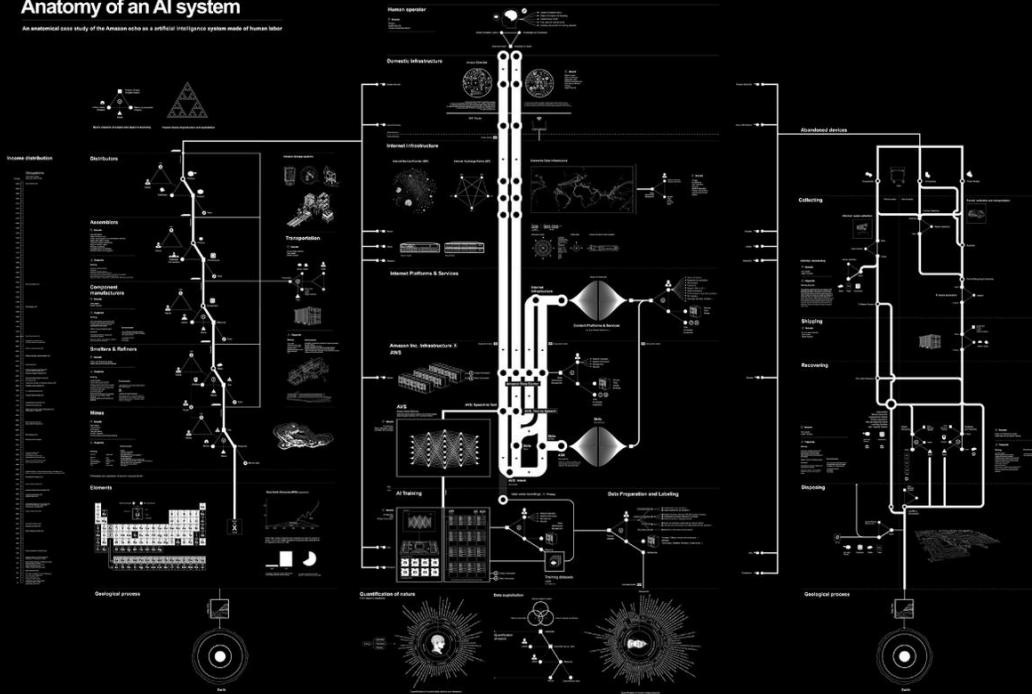
a.fefegha@taaarts.ac.uk

what is one thing you are grateful?

**what is one thing that you are
frustrated about?**

Anatomy of an AI system

An anatomical case study of the Amazon echo as a artificial intelligence system made of human labor



Anatomy of an AI system

Kate Crawford and
Vladan Joler

<https://anatomyof.ai/>



Alexa Diaries



Day 1



Day 2



Day 3



Day 4 & 5



Day 6



Day 7

Alexa Diaries FAQs Following (1)

Alexa Diaries

Alexa Diaries

The 11 day journey of an Amazon Echo Dot as it becomes part of someone's domestic life.

///

What is this project about

This is a fictional project that documents the initial interactions between a human and an echo dot - a speaker that connects to the voice-controlled intelligent personal assistant service Alexa, by Amazon.

This story is told by Alexa: what is the experience of being domesticated? What does Alexa say about us as it becomes part of one's life?

///

For more about the project check: [FAQs](#)

[I am looking for collaborators](#)

///

Source: [LAND_OF_POWER](#) Syd Mead

Filed under [about](#), [alexa](#)

Alexa Diaries

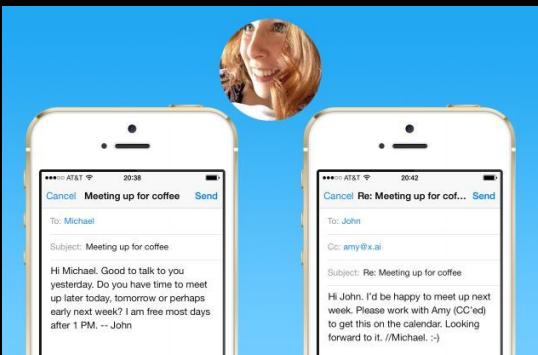
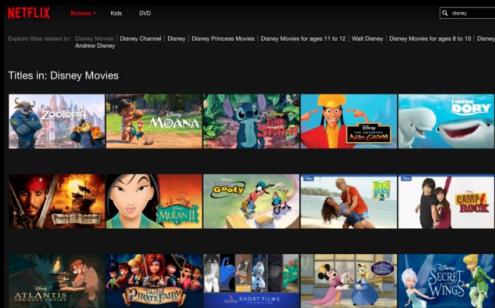
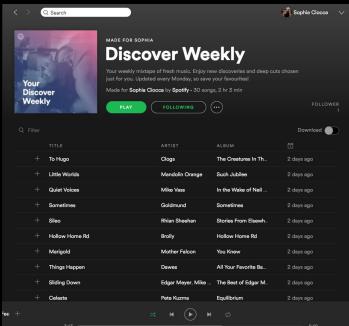
Kate Crawford and
Vladan Joler

<https://anatomyof.ai/>



**Special thanks to Yingi Shi & Joey
Lee at ITP NYU.**

AI is a part of everyday life.



The AL/ML universe

art/design

communities

policies

tools

education

research

environment

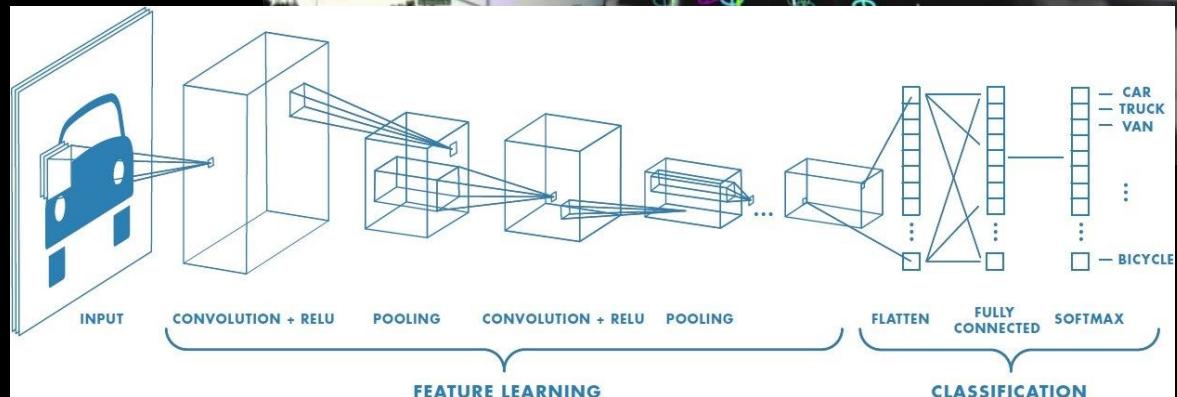
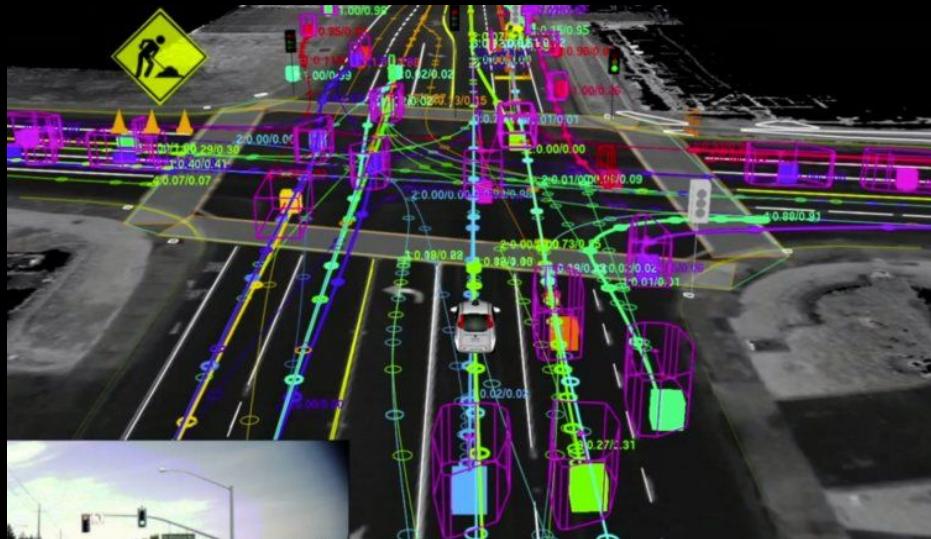
We spoke about cars right?

research

tools

Self-driving cars use dozens of sensors to make decisions about how to navigate.

State-of-the-art image classification, feature detection, and prediction systems are at work.



research

tools

environment

Self-driving cars are learning through data and experience.

Here, an ex-military base is transformed as training grounds for self-driving cars. Often, cloud computing is used to crunch data in the learning process.

The image shows a web browser window with two main tabs visible in the address bar: "Tesla Model 3: Autopilot engag" and "what a self driving car sees". The main content area displays a YouTube video player. The video is titled "Inside Silicon Valley's secretive test track for self-driving cars" and has 20,079 views. The video frame shows a view from a moving vehicle on a road with a concrete barrier and a grassy field under a clear blue sky. A "c|net" watermark is in the bottom left of the video frame. Below the video player, there is a progress bar showing 0:52 / 2:40. To the right of the video player, there is a news article from The Guardian. The article is titled "The dark side of cloud computing: soaring carbon emissions" and is by Stephan Schmidt. It discusses how experts warn that the electricity consumption and carbon footprint of cloud computing will more than double from 2007 levels by 2020. The article includes a photograph of a server room with many rows of server racks. The Guardian's navigation menu is visible at the top of the news page, including links for News, Opinion, Sport, Culture, Lifestyle, and More.

research

tools

environment

communities

Are autonomous
cars better or
worse drivers?

The use of autonomous driving technologies are affecting the places we live.

The image shows a complex web interface with multiple browser tabs open. The main tab displays a BBC News article titled "Tesla Model 3: Autopilot engaged during fatal crash". Below the main article, there's a video thumbnail showing a woman's shocked reaction. To the right, a sidebar lists "Top Stories" such as "Trump hails deal with Mexico to avoid tariffs" and "Uber and Lyft are creating more traffic and congestion instead of reducing it, according to a new report". Other tabs visible include ones from the SF Chronicle, Business Insider, and various social media platforms.

research

tools policies

environment

communities

So far very few policies are in place for governing autonomous cars.

There's a need for developing better understanding of these implications.

The image displays two side-by-side screenshots of news articles from The New York Times and Quartz, both focusing on the ethical implications of self-driving cars.

The top screenshot shows a headline from The New York Times: "Prosecutors Don't Plan to Charge Uber in Self-Driving Car's Fatal Accident". Below the headline is a small video thumbnail showing a night scene of a car accident.

The bottom screenshot shows a headline from Quartz: "Germany's self-driving car ethicists: All lives matter". Below the headline is a large image of a road sign that reads "STATE LAW STOP FOR PEDESTRIANS".

research

tools policies

environment

communities

education

Educational initiatives are growing to help people understand AI/ML.

The image displays two educational resources. The top part shows a screenshot of the Moral Machine website, which features a classic trolley problem scenario: a self-driving car is heading towards five people tied to the tracks. The user must choose whether to divert the car to a track with one person, saving the five. Below this is a screenshot of a YouTube video titled "THIS AI SEES IN THE DARK" from the channel "TWO MINUTE PAPERS WITH KÁROLY ZSOLNAI-FÉHÉR". The video thumbnail shows a nighttime city street scene with trees and buildings, and the title text is overlaid on the bottom right.

research

art/design

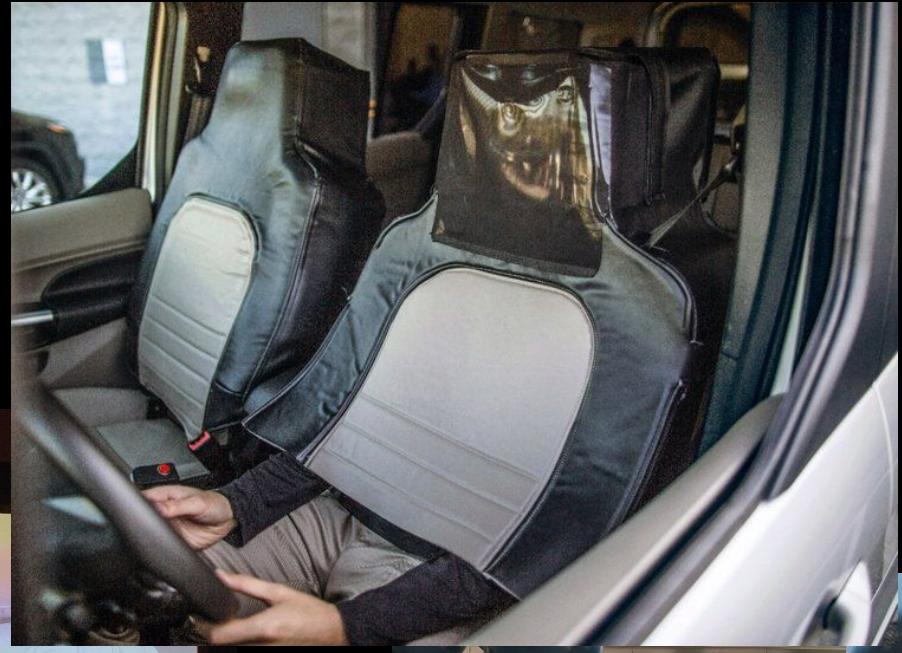
tools

policies

environment

communities

Artists and designers work to highlight ambivalence of these new tech while also exploring public perception and attitudes towards these technologies.



what we are going to focus on today

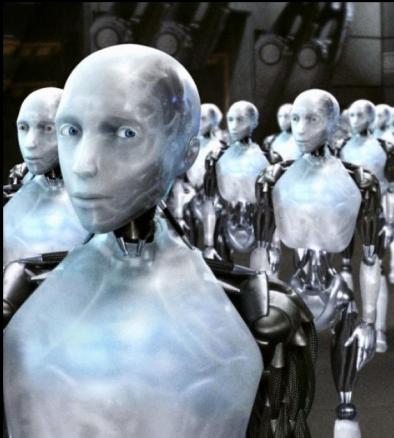
art/design

communities

tools

education

The AL/ML in sci-fi & media



The AL/ML in reality

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \times \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 4 \\ 10 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 7 & 10 \end{bmatrix}$$

What is
Artificial
Intelligence?

Artificial Intelligence noun

Definitions:

The art of how to make computers do things at which humans are currently better.

The process of machines learning to think like humans.

Machine Learning

Deep Learning

Neural Networks

Weak AI

Strong AI

Algorithm

Algorithmic Bias

Automation

Autonomous Cars

Chatbots

Data Mining

Data Science

Data

Black Box

Reinforcement Learning

Turing Test

Natural Language Processing

Artificial Intelligence

Robotics

Data Sets

What can AI do?

What shouldn't AI do?

Data Mining

The practice of examining large pre-existing databases in order to generate new information.

About

AI Cheatsheet

COMUZI

<https://aicheatsheet.comuzi.xyz>

General AI vs Narrow AI

Weak AI: Artificial intelligence which is specifically programmed and focused to execute a narrow task effectively.

General AI: The main vision is to develop artificial intelligence to the point where the machine's intellectual capability is functionally equal to a human's.

- **Chatbots**
(Natural Language Processing)

- **Personal Assistants
(Siri, Alexa)**
(Natural Language Processing,
Speech Processing + Machine
Learning)

- **Autopilot by Tesla**
(Machine Learning, unstructured
Data and situational awareness)

- **Deepdream**
(Machine Learning)

- **AlphaGo**
(Machine Learning)

- **IBM Watson**
(Machine Learning,
speech,
Structured and
unstructured data)

Narrow AI
Basic Tasks

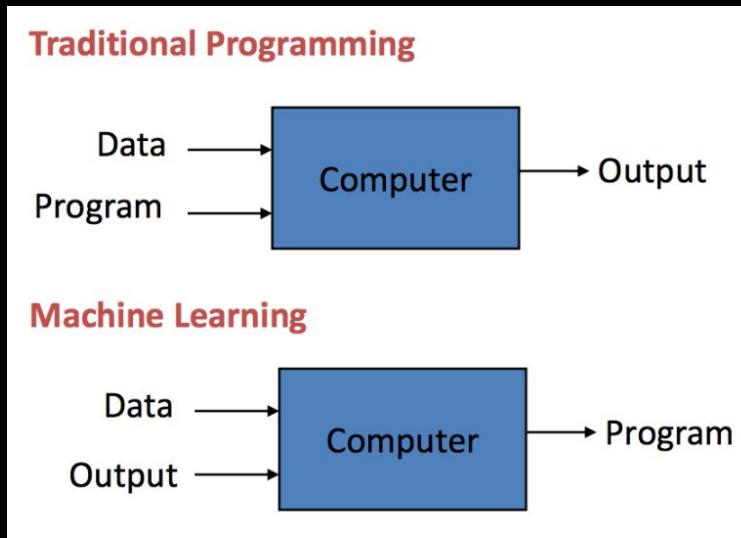
‘AI’

Deep AI
*Continuously
learning*
ual: creative computing
institute

Machine Learning

Machine learning focuses on the development of computer programs that can access data and use to learn for themselves.

Traditional Programming V.S. Machine Learning

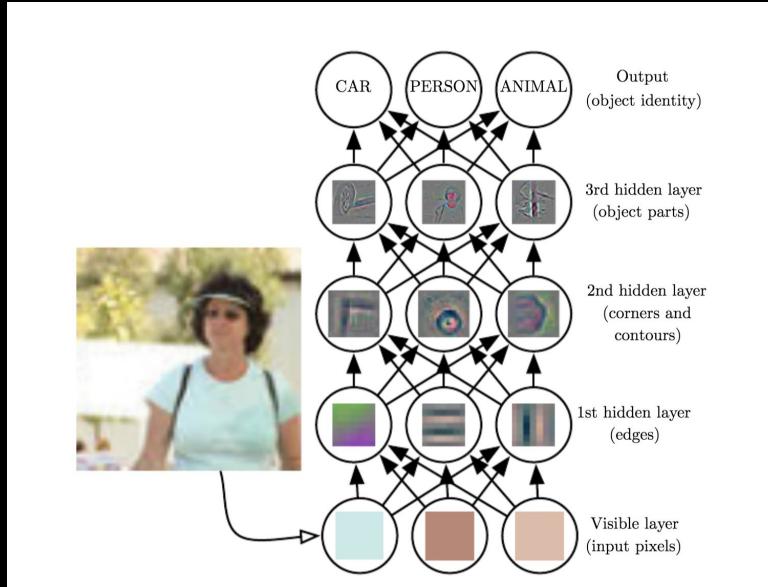


Deep Learning

This is a method of machine learning based on the brain.

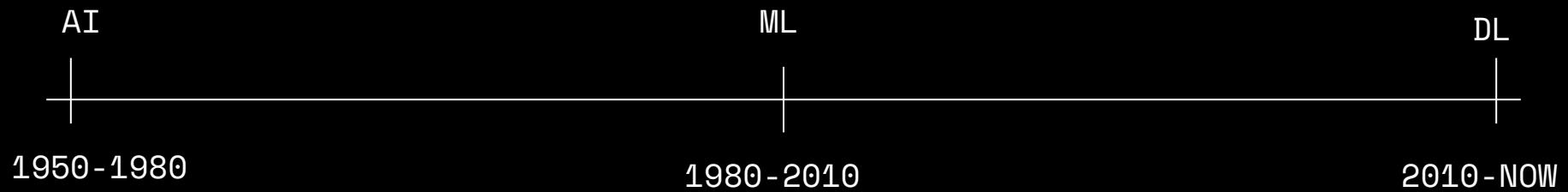
It works by using previous information gathered to inform itself for new information and discoveries.

Deep learning: an example



Source: Source:

<http://www.deeplearningbook.org/contents/ml.html>



Type of ML systems learning styles

**supervised
learning**

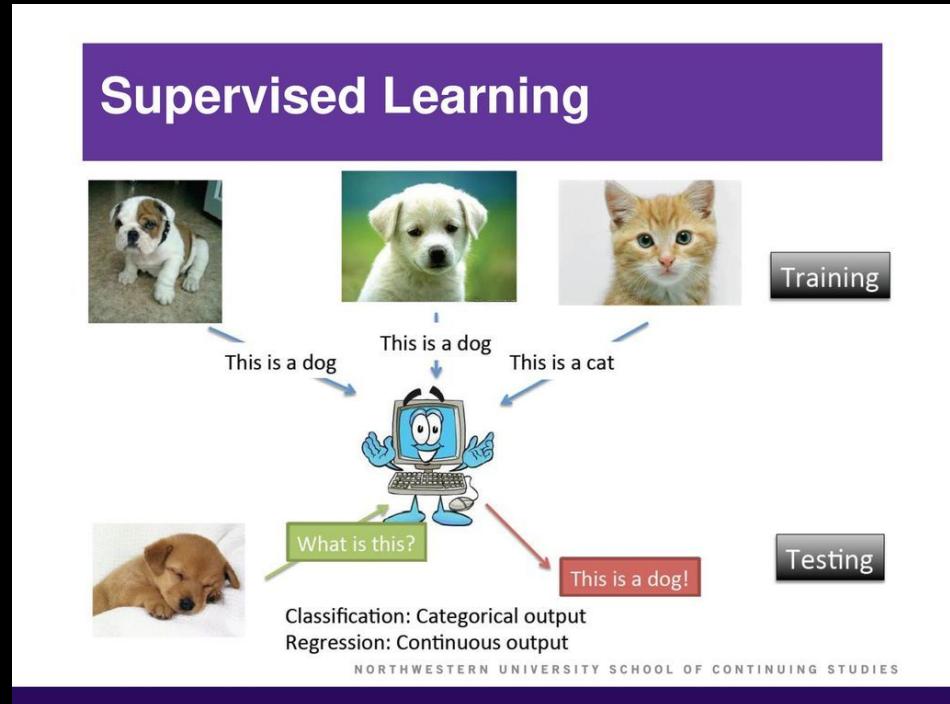
**unsupervised
learning**

**reinforcement
learning**

Supervised Learning

Training data is labeled.

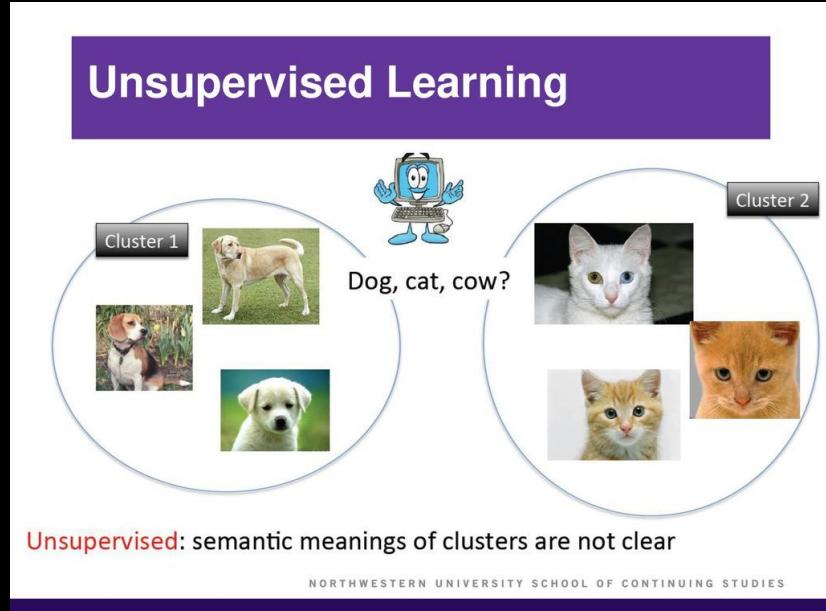
Source:
<https://slideplayer.com/slide/12369271/>



Unsupervised Learning

The machine learn from an **unlabelled** data set.

Unsupervised learning can be grouped into **clustering** and dimensionality reduction.



Reinforcement Learning

The machine learns by
trial-and-error
through **reward** or
punishment.



Outputs

Classification: Predict a class/label (*cat or dog?*)

Regression: Predict continuous values (*price of a stock*)

Clustering: Most similar other examples (*Amazon related products recommendation*)

Sequence Prediction: Predict the next word/sentence

Use cases

object
recognition

speech and
sound detection

natural
language
processing

prediction

translation

Creative Examples of ML - Drawing



Scrying
Pen

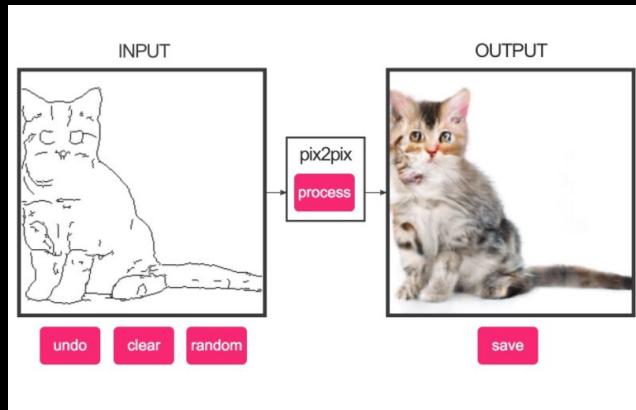


Handwriting with a
Neural Net



Quick
Draw

Creative Examples of ML - Images



pix2pix



Fast style transfer

Creative Examples of ML - Mobile



[Emoji Scavenger Hunt](#)

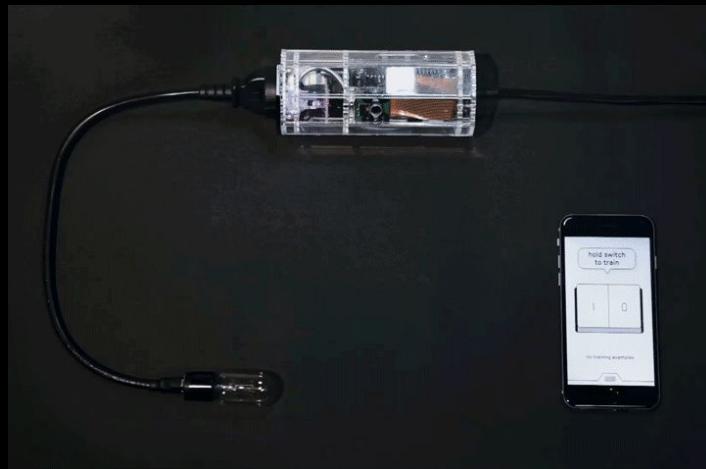


[Thing Translator](#)

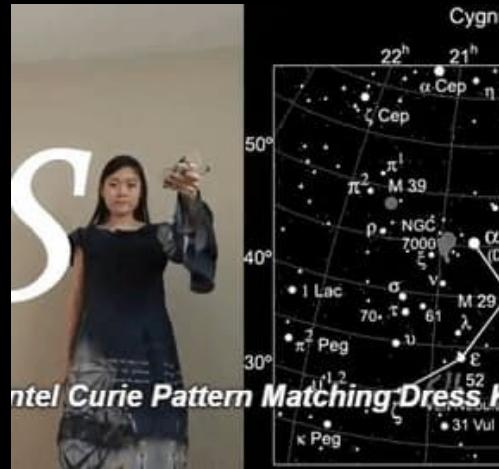


[Giorgio Cam](#)

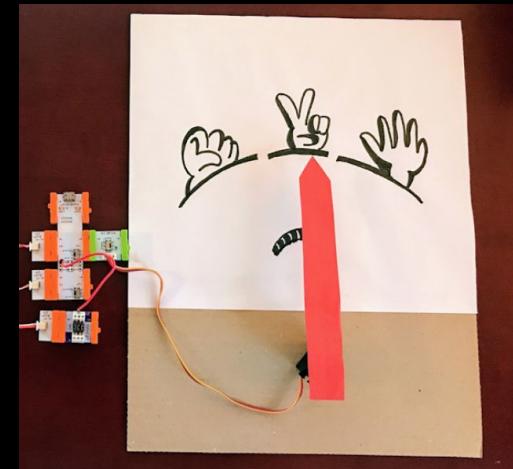
Creative Examples of ML - Physical Computing



Objectifier Spatial Programming



Arduino 101 - Intel Curie Pattern Matching Dress



Rock-Paper-Scissors Machine

How do we make this
stuff?



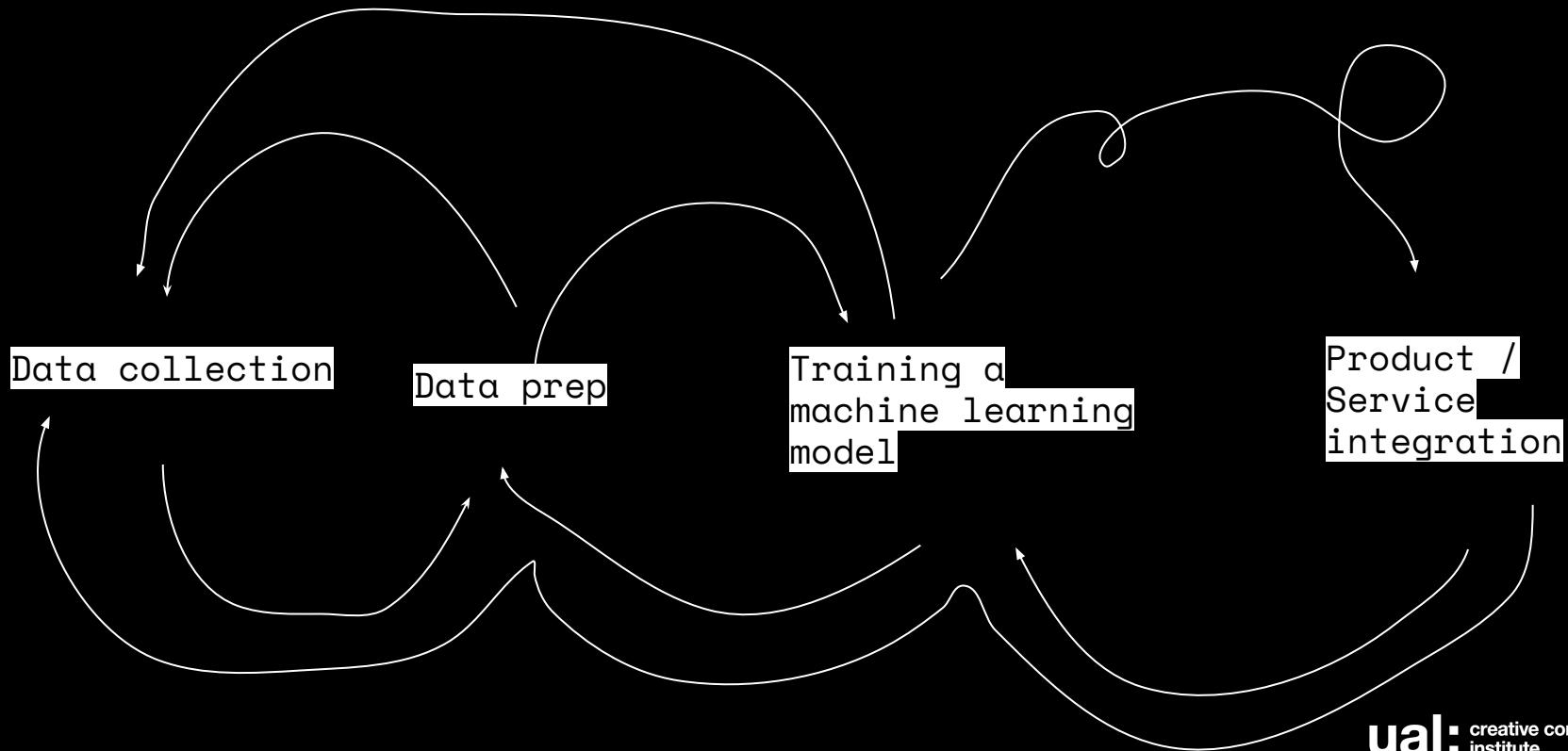
which is devoured in a
large quantity.

The Mysterious Life of Developers

Kantega

<https://www.youtube.com/watch?v=ocwnns57cYQ>

How the machine learning process works



1. Data Collection

A creative techie writes a script to automatically download all images of cats, dogs, and badgers from the internet.

2. Data Preparation

The creative techie uses a crowd tasking service to:

1. Confirm that the image is either a cat, dog or badger.
2. Tag the image with the animal type.
3. Crop the image of the animal to a square aspect ratio. The artist then resizes all the images to 64x64px

3. Training a machine learning model

The creative techie:

1. Uses a popular machine learning framework called **Tensorflow** in **python** to create a **neural network**. To create a neural network the artist, writes code that specifies **image processing** and data crunching methods that aim to pull out unique features for each animal type in the given images.
2. Iteratively refines and tests the model to achieve the highest accuracy.

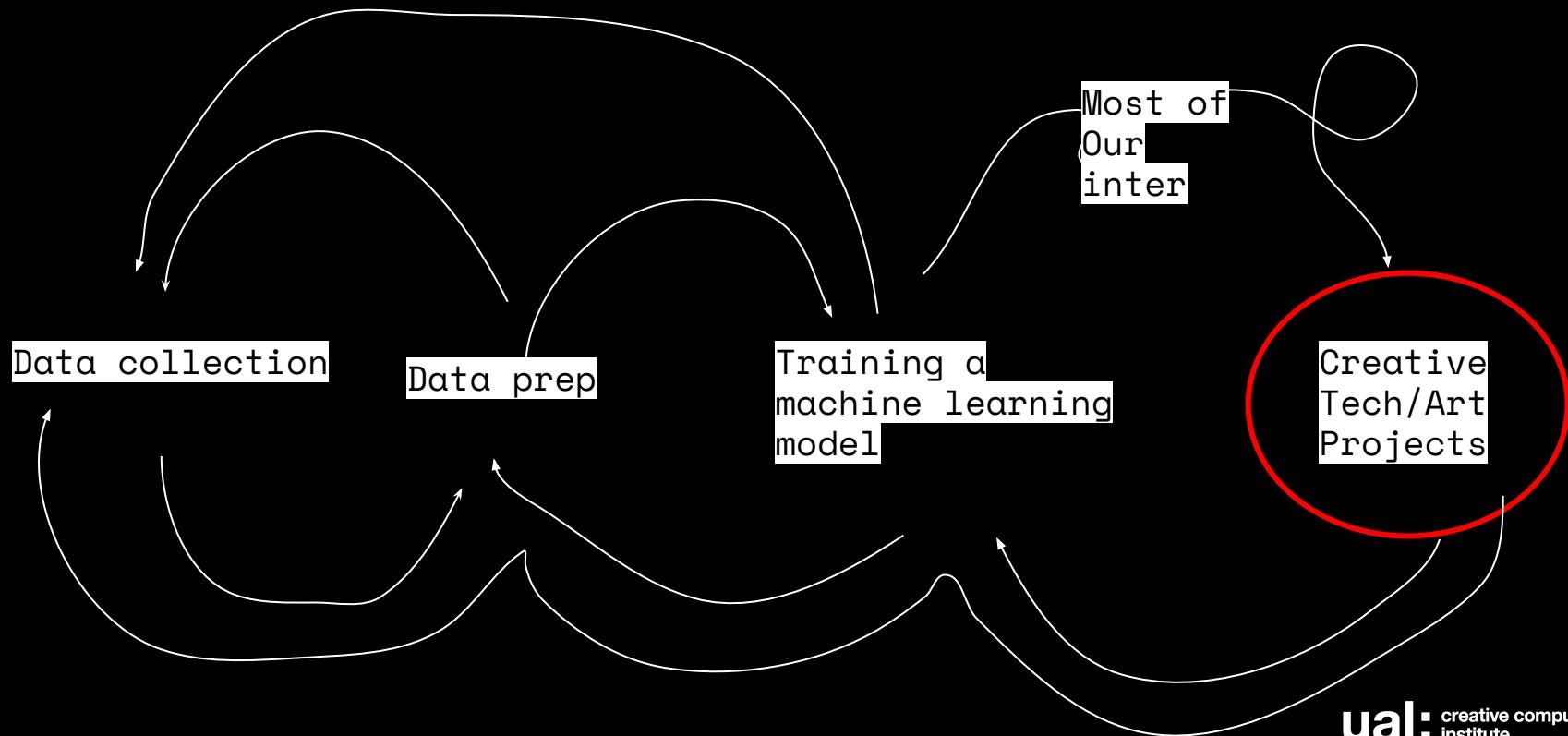
4. Product/service integration

The creative techie opensources this new pre-trained dog/cat/badger model.

This comes just in time since a client has been in great need of a method to differentiate between the animals in their shelters.

The creative techie is hired to create a web application that uses this model to label their shelter animals “cat”, or “dog” or “badger”.

How the machine learning process works



Today is a intro to Machine Learning
with ml5.js!

We can going to try out some code
today too!



Friendly Machine Learning for the Web

A neighborly approach to creating and exploring artificial
intelligence in the browser.

Friendly Machine Learning for the Web

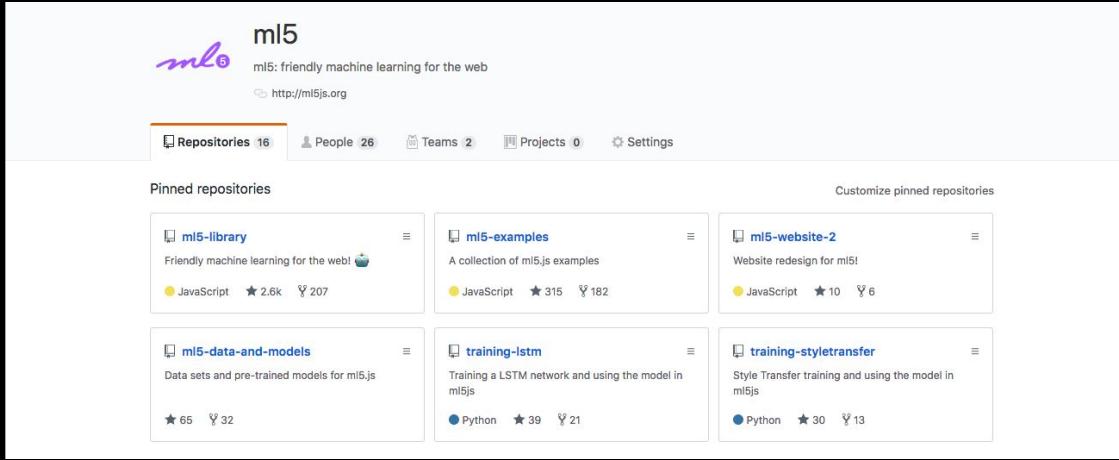
A neighborly approach to creating and exploring artificial intelligence in the browser.

Developing ml5 is not just about developing machine learning software, it is about making machine learning approachable for a broad audience of artists, creative coders, and students. The library provides access to machine learning algorithms and models in the browser, building on top of TensorFlow.js with no other external dependencies.

ml5.js is heavily inspired by Processing and p5.js.

ml5js.org





github.com/ml5js

 **TensorFlow**

Install Learn API Resources Community Why TensorFlow

Search Language GitHub Sign in

Overview Tutorials Guide Models Demos API

TensorFlow.js is a library for developing and training ML models in JavaScript, and deploying in browser or on Node.js

[See tutorials](#) [See the guide](#) [See demos](#)

Tutorials show you how to use TensorFlow.js with complete, end-to-end examples.

Guides explain the concepts and components of TensorFlow.js.

Live demos and examples run in your browser using TensorFlow.js.



How it works



Run existing models

Use off-the-shelf JavaScript models or convert Python TensorFlow models to run in the browser or under Node.js.



Retrain existing models

Retrain pre-existing ML models using your own data.



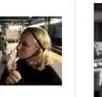
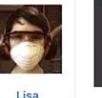
Develop ML with JavaScript

Build and train models directly in JavaScript using flexible and intuitive APIs.

Tensorflow

Contributors

Thanks goes to these wonderful people (emoji key):

						
Daniel Shiffman 	Cristóbal Valenzuela 	Yining Shi 	Hannah Davis 	Joey Lee 	AshleyJaneLewis 	Ellen Nickles 
						
Itay Niv 	Nikita Huggins 	Arnab Chakravarty 	Aidan Nelson 	WenheLi 	Darius Kazemi 	Dingsu Wang 
						
garym140 	Gene Kogan 	Hayley Hwang 	Lissa Jamhoury 	Alejandro Matamala Ortiz 	Maya Man 	Mimi Onuoha 
						
Yuuno, Hibiki 	Dan Oved 	Stephanie Koltun 	YG Zhang 	Wengi Li 	Brent Bailey 	Jonarod 

m15 contributors



Getting Started Reference Community About



The Subtext of a Black Corpus

By Ashley Jane Lewis

In conversation with ITP SIRs Nikita Huggins & Ayodamola Okunseinde

→ visit



The Hard Fun of Designing Alternatives to Smart Toys

By Ashley Jane Lewis

In Conversation with ITP SIR Stefania Druga

ML5.js community: <https://ml5js.org/community>

ual: creative computing institute

image

[Image Classification](#) 

[Pose Estimation](#) 

[Style Transfer](#)

[Object Detection](#)

[Image Segmentation](#) 

[Image-to-Image](#)

[Translation](#) 

[Image Generation](#) 

[Sketch Generation](#) 

sound

[Pitch Detection](#)

[Sound Classification](#) 

text

[Text Generation](#) 

[Word Vectorization](#)

[Sentiment Analysis](#) 

helpers

[Feature Extraction](#) 

[K-nearest neighbor](#)

[Classification](#) 

ml5.js version 0.3.1



- updates and new functionality
- new feature



p5.js Web Editor | ml5 web... +

https://editor.p5js.org/ml5/sketches/rJ-C5AQ5X

File ▾ Edit ▾ Sketch ▾ Help & Feedback ▾

Log in or Sign up

sketch.js*

```
1 let classifier;
2 let video;
3
4
5~ function setup() {
6  noCanvas();
7  video = createCapture(VIDEO);
8  classifier = ml5.imageClassifier('MobileNet', video, modelReady);
9 }
10
11~ function modelReady() {
12  select('#status').html('Model Loaded');
13  classifyVideo();
14 }
15
16 // Get a prediction for the current video frame
17~ function classifyVideo() {
18  classifier.predict(gotResult);
19 }
20
21 // When we get a result
22~ function gotResult(err, results) {
23  // The results are in an array ordered by probability.
24  select('#result').html(results[0].className);
25  select('#probability').html(`${results[0].probability}, 0, 2));
26  classifyVideo();
27 }
```

Preview

Model Loaded

The MobileNet model labeled this as coffee mug with a confidence of 0.39.



Console Clear



My guess is a toaster.

My confidence is 0.12.

The screenshot shows a web browser window with multiple tabs open. The active tab is titled 'Hello ml5 | Tutorial' and displays the ml5.js 'Hello ml5' guide. The page has a dark background with light-colored text. It features a sidebar on the left with links like 'Getting Started', 'Quickstart', 'Hello ml5', 'Examples, How-to', 'Promises and Callbacks', and 'FAQ'. The main content area includes a heading 'Hello ml5', a paragraph about the purpose of the page, a section on 'Setup' with requirements, and a file structure diagram.

Getting Started

Quickstart

Hello ml5

Examples, How-to

Promises and Callbacks

FAQ

Hello ml5

Hello there! If you've landed here, that probably means you're interested in building your first ml5.js project. If so, wonderful! We invite you to read on.

ml5.js is being developed to make machine learning more accessible to a wider audience. Along with supporting education and critical engagement with machine learning, the ml5 team is working actively to wrap exciting machine learning functionality in friendlier and easier-to-use way. The following example introduces you ml5.js through a classic application of machine learning: **image classification**.

This example showcases how you can use a [pre-trained model](#) called [MobileNet](#) -- a machine learning model trained to recognize the content of certain images -- in ml5.js. The example aims to highlight a general pattern for how ml5.js projects are setup.

ml5.js is growing every day, so be sure to see some of the other applications of ml5 in the [reference](#) section and their accompanying examples for the latest offerings.

Setup

If you've arrived here, we assume you've checked out our [quickstart](#) page to get a simple ml5.js project set up. To get this to run, you'll need:

- A text editor (e.g. [Atom](#), [VSCode](#), [SublimeText](#))
- Your web browser: Chrome & Firefox preferred
- An image to run your classification on

Your project directory should look something like this:

```
 |_ /hello-ml5
    |_ ./images
        |_ bird.png
    |_ ./index.html
    |_ ./sketch.js
```

ml5.js in 3 friendly steps

Step 1: Load your ml5 function

Step 2: Apply your ml5 function - e.g. to an image,
video, or text

Step 3: Do something with the results

ml5.js in 3 friendly steps

Step 1: Load your ml5 function

```
const myImageClassifier =  
  ml5.imageClassifier('mobilenet',  
  modelLoadedFunction)
```

ml5.js in 3 friendly steps

Step 2: Apply your ml5 function - e.g. to an image, video, or text

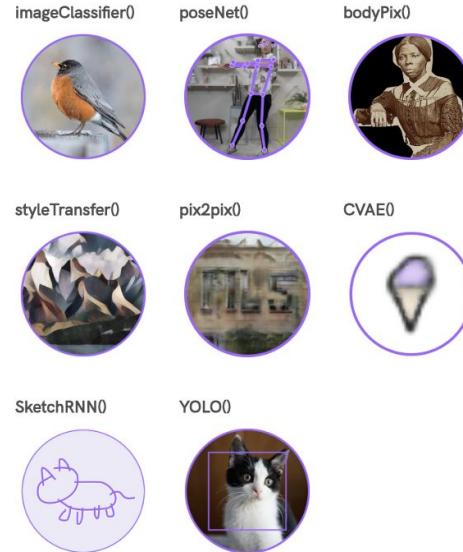
```
function modelLoadedFunction(){
  myImageClassifier.classify(
    myCatImage, gotResultsFunction)
}
```

m15.js in 3 friendly steps

Step 3: Do something with the results

```
function gotResultsFunction(error ,  
results){  
    console.log(results) // [ {label:  
'cat' , confidence: 0.74} ] - an array  
of objects with "label" and  
"confidence"
```

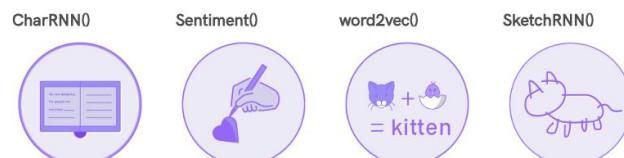
image



sound



text

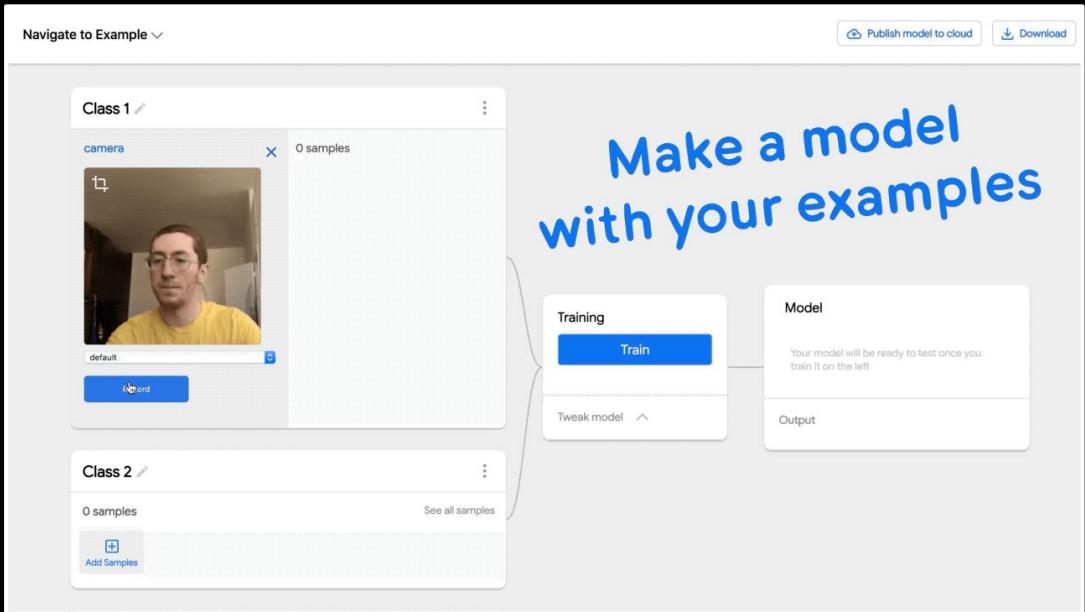


helpers



Demo m15.js examples! :

<https://m15js.org/reference/>



Teachable Machine

<https://teachablemachine.withgoogle.com>



Runway ML

Runway is a toolkit that allows creators of all kinds to use artificial intelligence in an intuitive way.

runwayml.com

Break

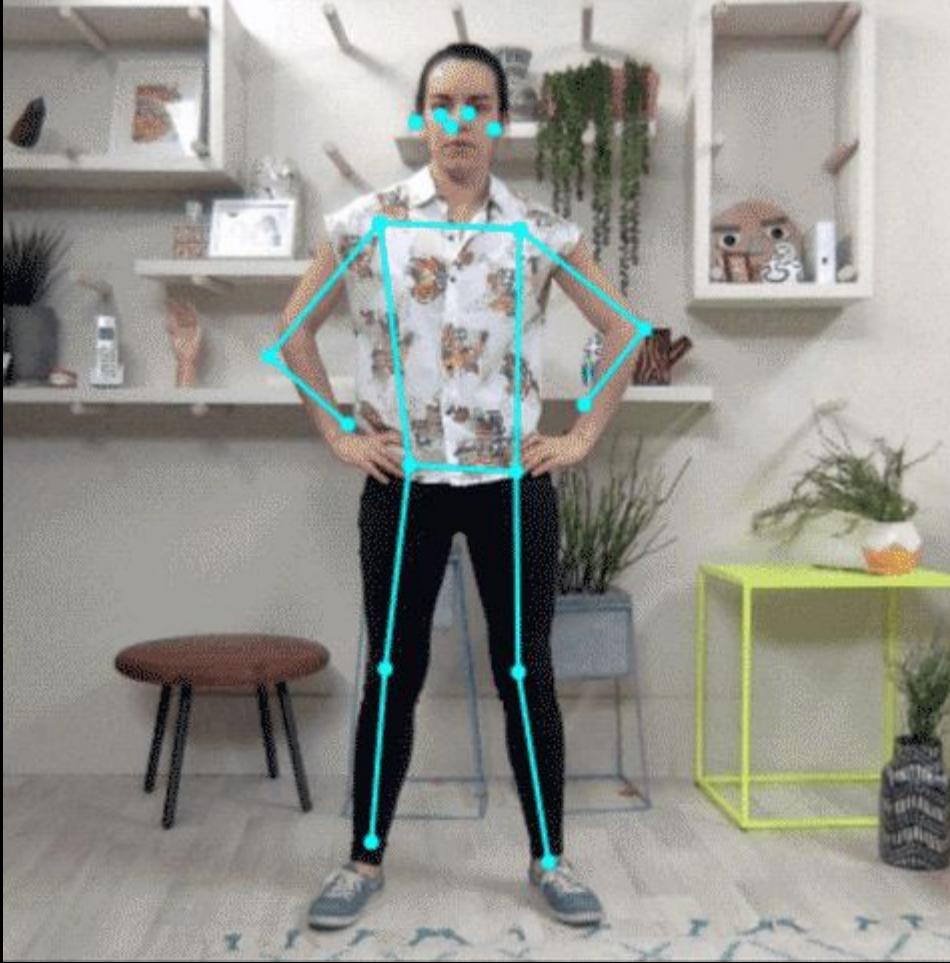
Exercise

We are going to do some coding :)

We are going to learn how to incorporate a machine learning model into p5.js.

The model is called PoseNet.

PoseNet is a vision model that can be used to estimate the pose of a person in an image or video by estimating where key body joints are.



Id	Part
0	nose
1	leftEye
2	rightEye
3	leftEar
4	rightEar
5	leftShoulder
6	rightShoulder
7	leftElbow
8	rightElbow
9	leftWrist
10	rightWrist
11	leftHip
12	rightHip
13	leftKnee
14	rightKnee
15	leftAnkle
16	rightAnkle



Body, Movement, Language: AI Sketches

Bill T. Jones and Google Creative Lab embarked on a two-way residency exploring the creative possibilities of AI.

https://www.youtube.com/watch?time_continue=1&v=RVyh1ewep84

MOVE MIRROR



Move Mirror

You move and 80,000 images move with you

<https://experiments.withgoogle.com/collection/ai/move-mirror/view>

Open up p5.js web editor

Alex is gonna take us through a live coding session!

Class done.
You are free!