

# **ARTIFICE - AI workshop**

Data, Algorithm & Computation, Creativity

**Janet Huang**

**2023.10.11**

# About Me



## Janet Huang

Assistant Professor, TU/e	(2020.09-Now)
PostDoc, TU/e	(2018.12-2020.08)
Research Scientist, KAIST	(2018.07-2018.10)
PhD, National Taiwan University	(2018.06)

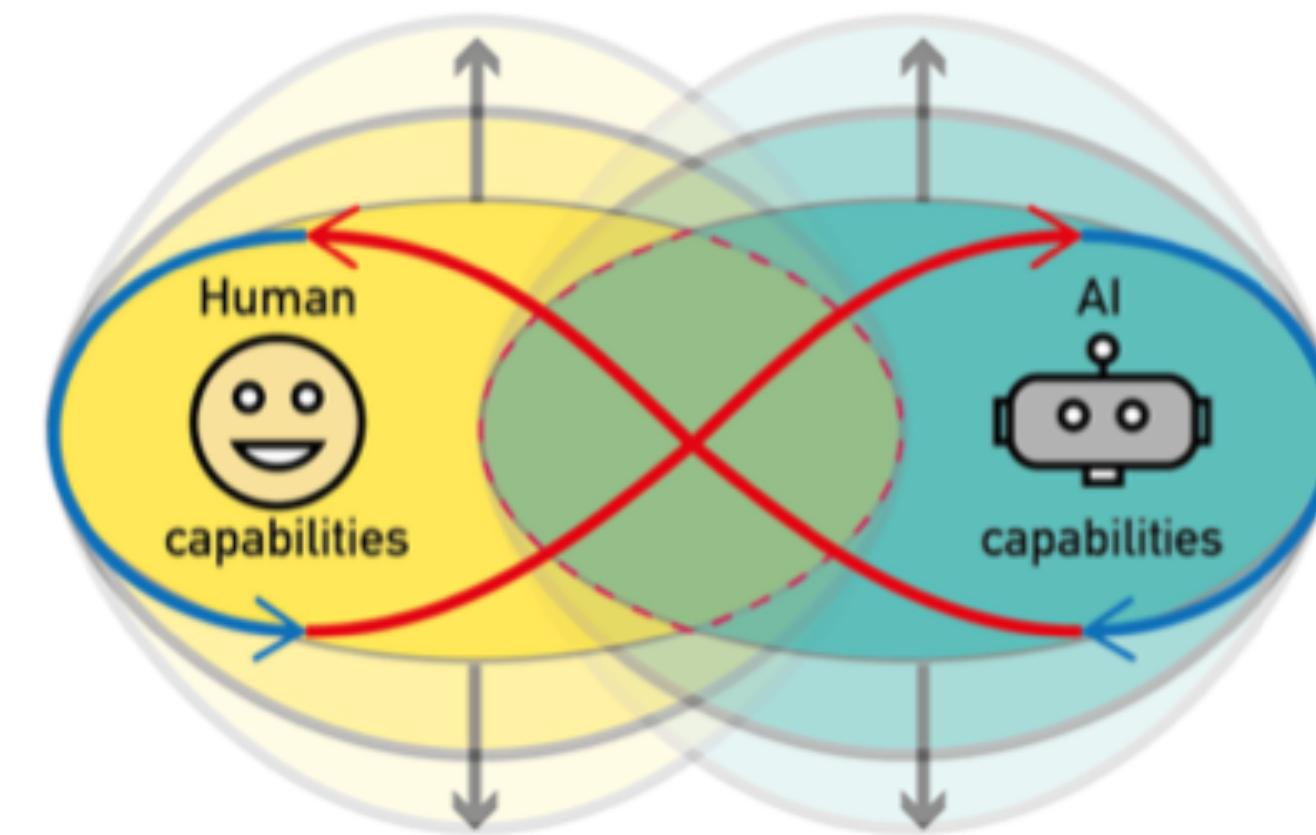
### Research Topics:

Human-AI Co-Learning, Computer-Assisted Learning, Creativity Support Tools, AI Toolkits for Design, CSCW, Crowdsourcing

With a mixed background in human-computer interaction (HCI) and Artificial Intelligence (AI), I **design and build interactive systems** that **supports people to gain knowledge, develop skills, and accomplish complex creative tasks.**

My research focuses is to explore **how human and AI can collaborate together and become a better team.**

## Human-AI Co-Learning



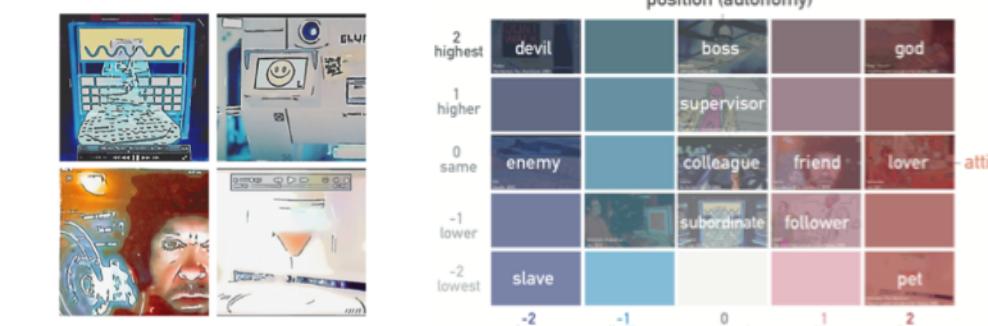
Mutual Understanding

Mutual Benefit

Mutual Growth

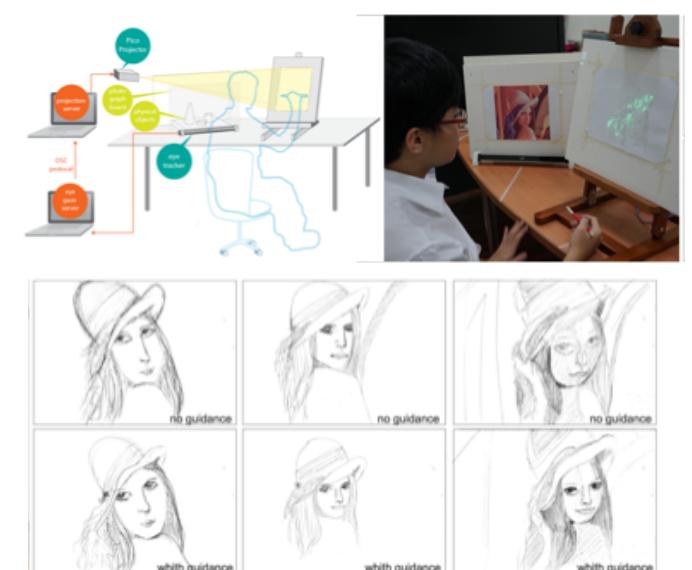
### (I) Interaction Patterns for Human-AI Co-Learning

- investigate interaction patterns from Sci-fi movie and contribute a social role matrix for voice conversion design



### (II) Innovative Human-AI Co-Learning Applications

- (i) Co-Learning for Productivity
- (ii) Co-Learning for Creativity



writing, drawing, music creation, music co-performance

# Objectives of this AI workshop

- Understand how to turn your idea into practice
  - Understand how to use tools for supporting consolidating your idea
  - Understand how to use tools/libraries/algorithms for supporting prototyping with data and AI
- Build an AI (i.e., an image/audio/pose classifier) based on your own data
- Build an AI (i.e., an object detector) with a pre-trained model to recognize 80 everyday objects
- Design/build an entire system, as a blueprint, for realizing your project idea

# Workshop Structure

- **Session 0:** Reflect on your mini assignment **(15 mins)**
  - build an image classifier using Teachable Machine
- **Session I:** Design your AI agents **(25 mins)**
  - MS-COCO dataset
  - thingCV tool
  - exercise 1: design your agent with AI canvas

- **Session II:** Build your own thingCV
  - introduction to p5.js, ml5.js and Data Foundry **(10 mins)**
  - exercise 2: object detector **(data foundry, p5.js, ml5.js) (30 mins)**

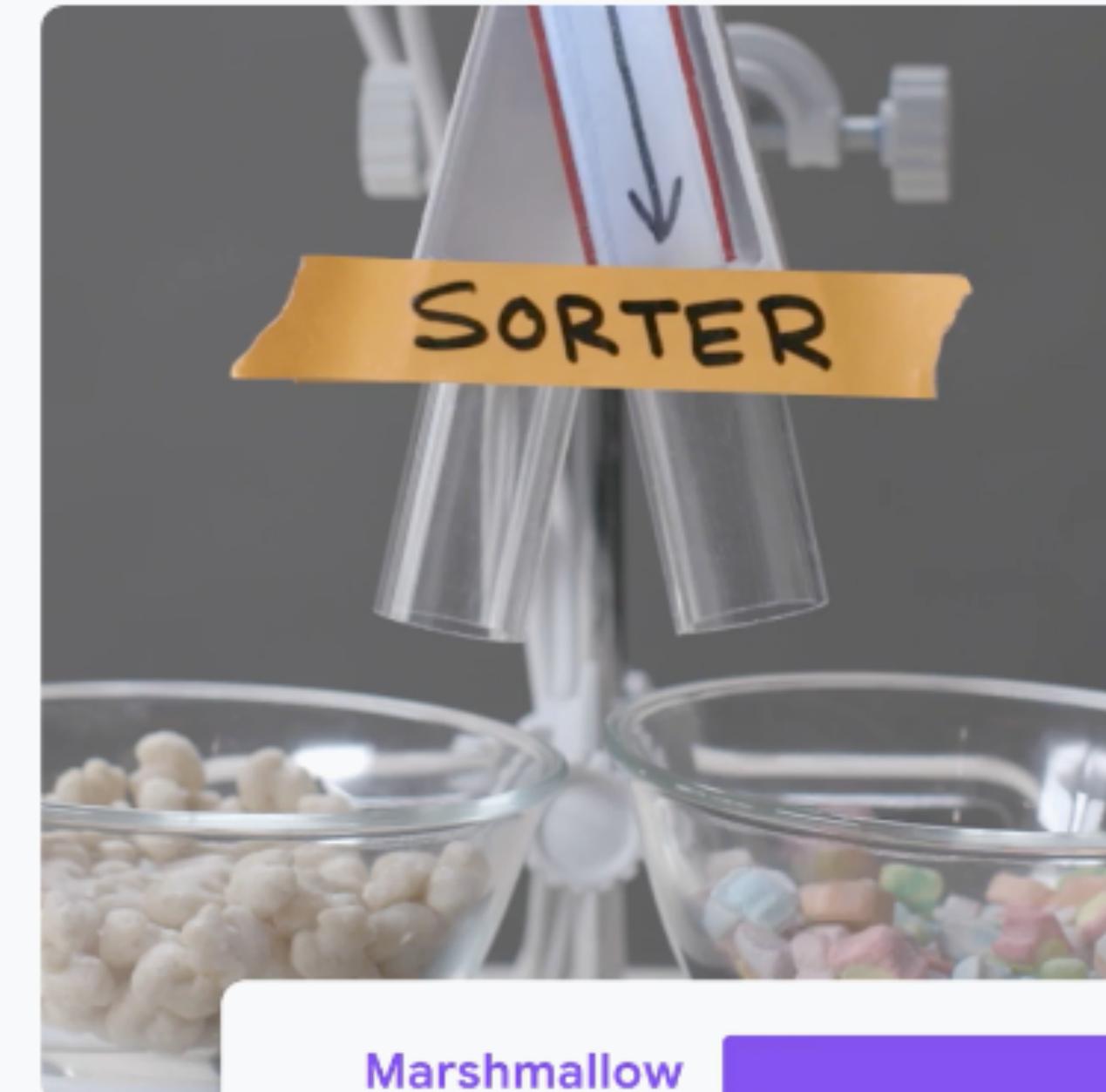
- exercise 3: store your data in DF **(data foundry, IoT dataset) (20 mins)**
- exercise 4: data visualization **(d3.js, data foundry) (20 mins)**
- **Recap**

# Session 0: Teachable Machine

# Teachable Machine

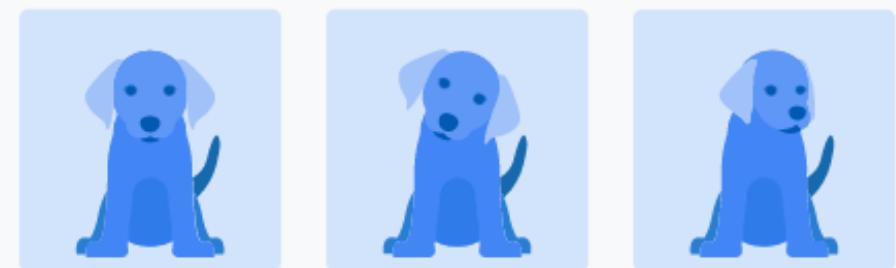
**Train a computer to recognize your own images, sounds, & poses.**

A fast, easy way to create machine learning models for your sites, apps, and more – no expertise or coding required.

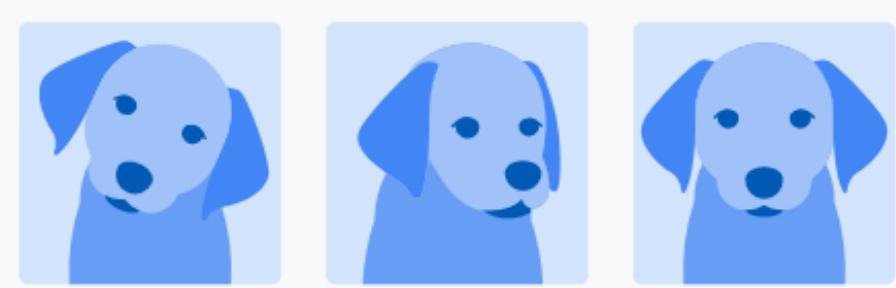
[Get Started](#)

# Teachable Machine

Class 1



Class 2



## 1 Gather

Gather and group your examples into classes, or categories, that you want the computer to learn.

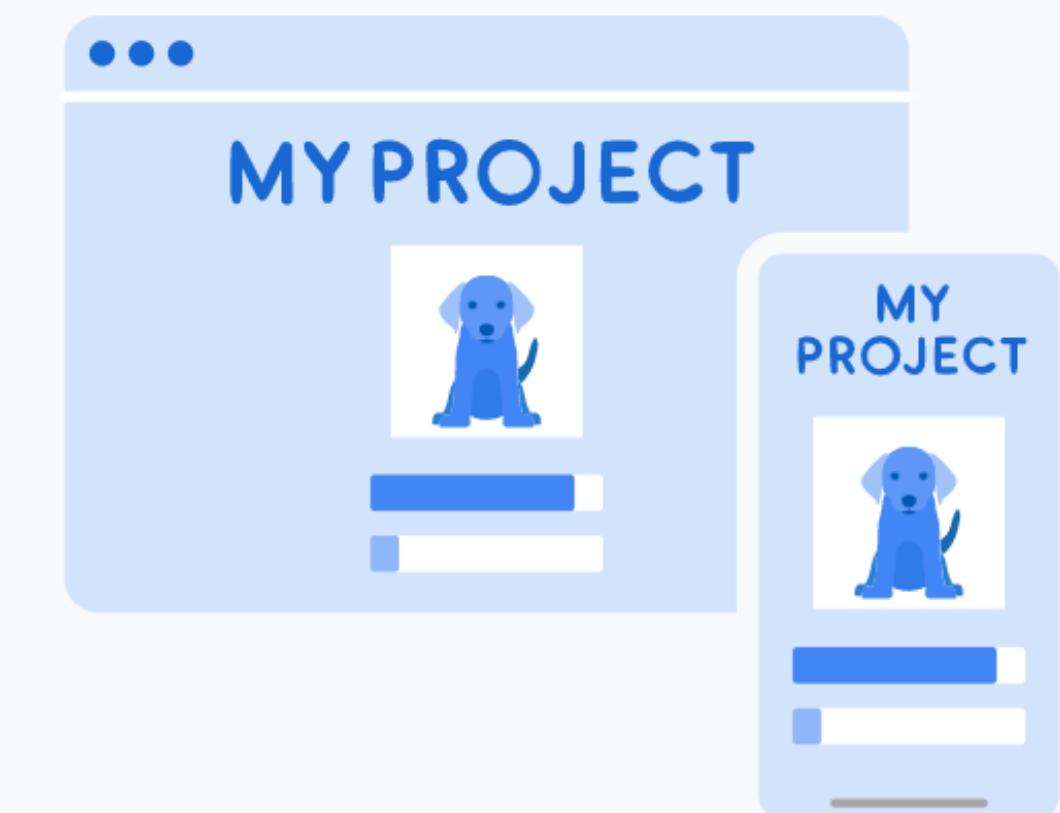
## 2 Train

Train your model, then instantly test it out to see whether it can correctly classify new examples.



## 3 Export

Export your model for your projects: sites, apps, and more. You can download your model or host it online for free.



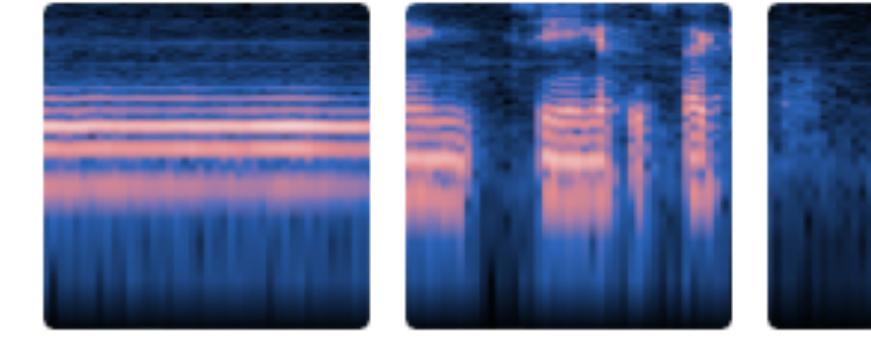
## **Warm-up Exercise: (5 mins)**

Play with the model trained from your peers



### **Image Project**

Teach based on images, from files or your webcam.



### **Audio Project**

Teach based on one-second-long sounds, from files or your microphone.



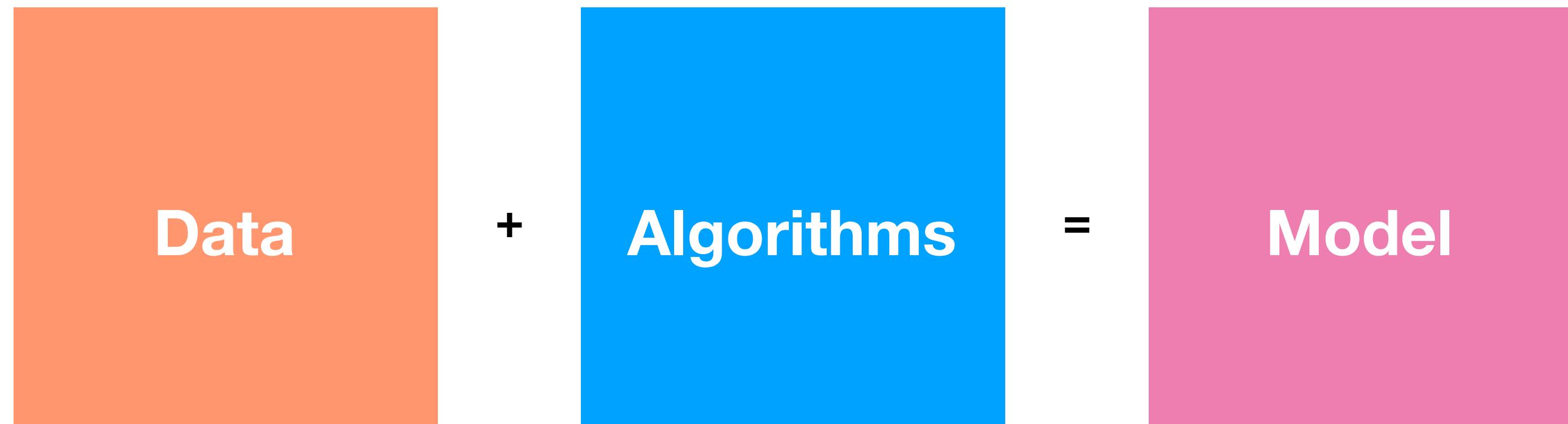
### **Pose Project**

Teach based on images, from files or your webcam.

**Share your reflection with us!**

# AI: What is inside?

- Data
  - raw data vs labels (i.e., human annotation)
- Feature
- Parameters
- Algorithms
- Model



Opportunities to consider  
“perception differences”  
encoded in data

a lot of focus on explaining  
“algorithmic reasoning”

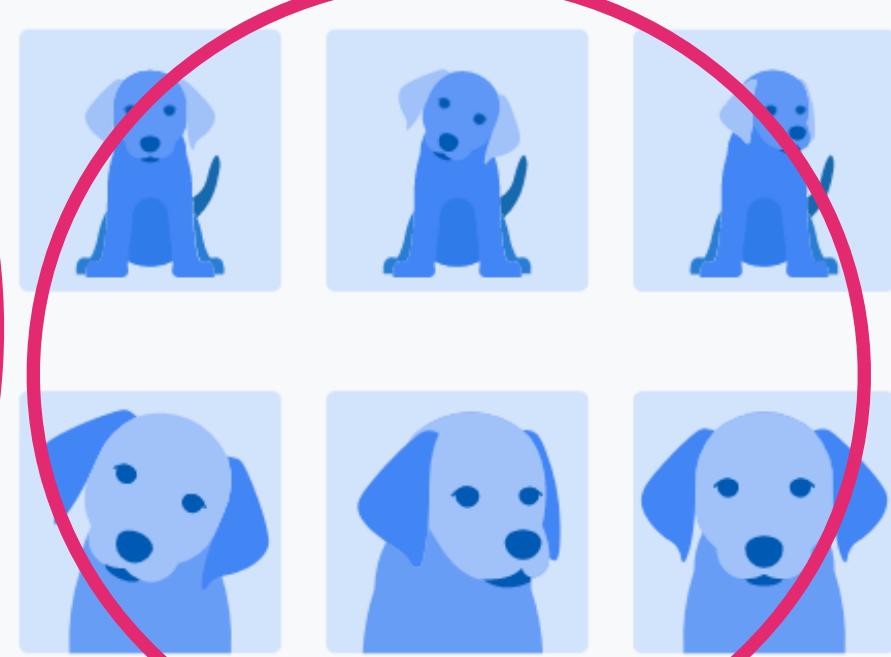
Machine Intelligence

# Teachable Machine

(class) labels

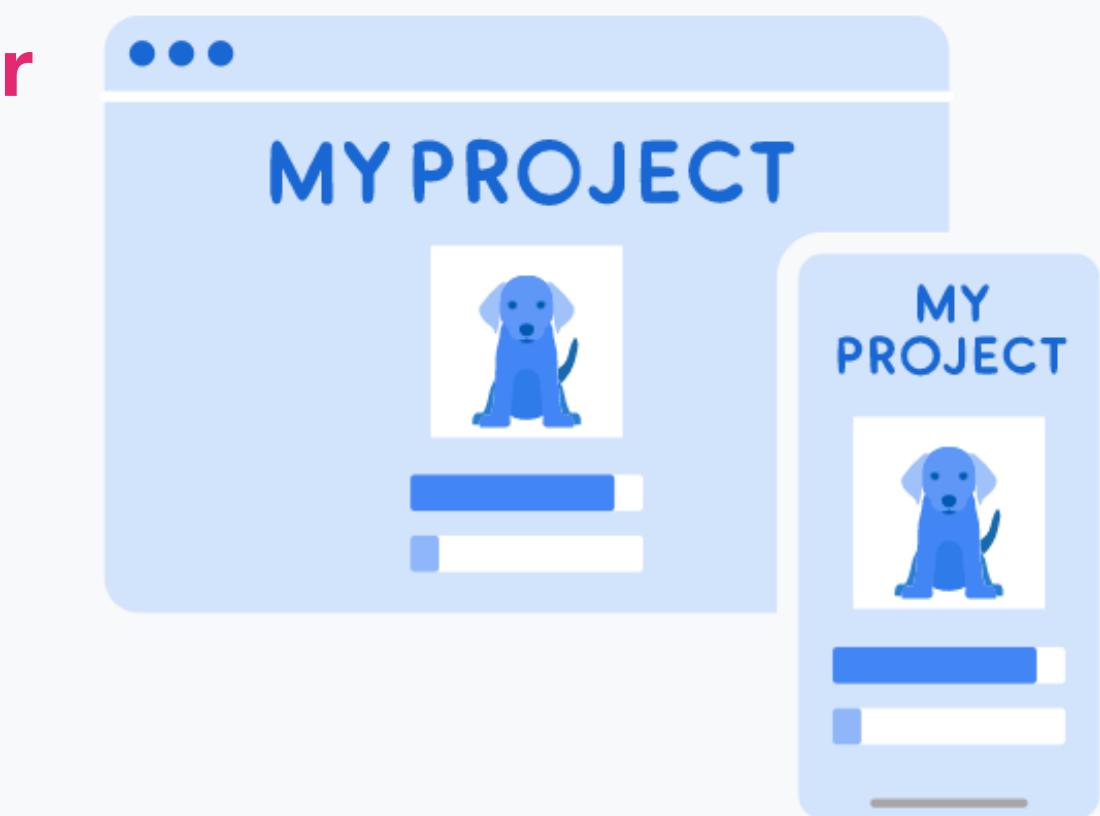
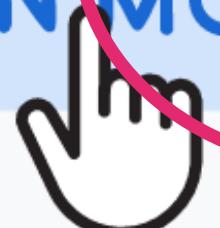
Class 1  
Class 2

Raw data (unlabeled data)



(image, audio, or pose) classifier

TRAIN MODEL



## 1 Gather

Gather and group your examples into classes, or categories, that you want the computer to learn.

## 2 Train

Train your model, then instantly test it out to see whether it can correctly classify new examples.

## 3 Export

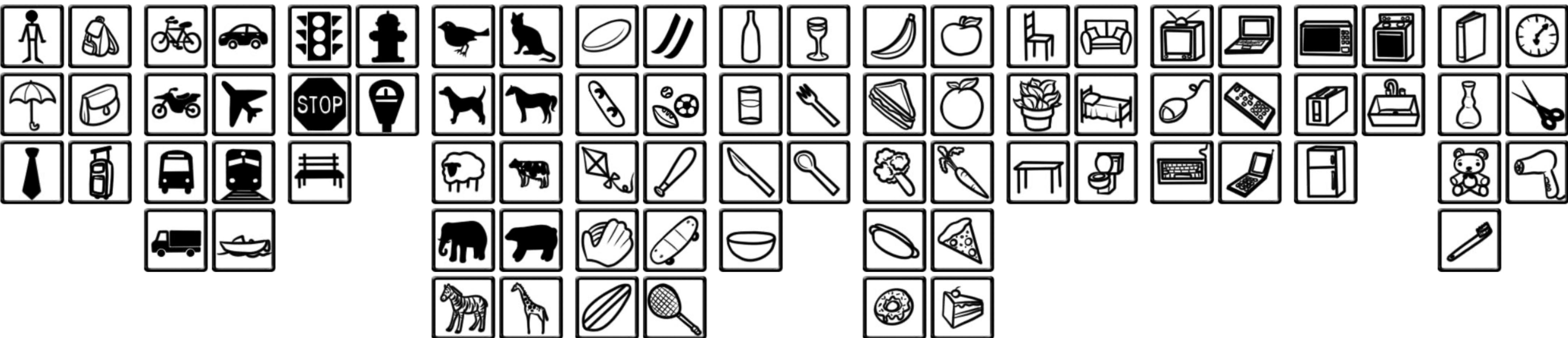
Export your model for your projects: sites, apps, and more. You can download your model or host it online for free.

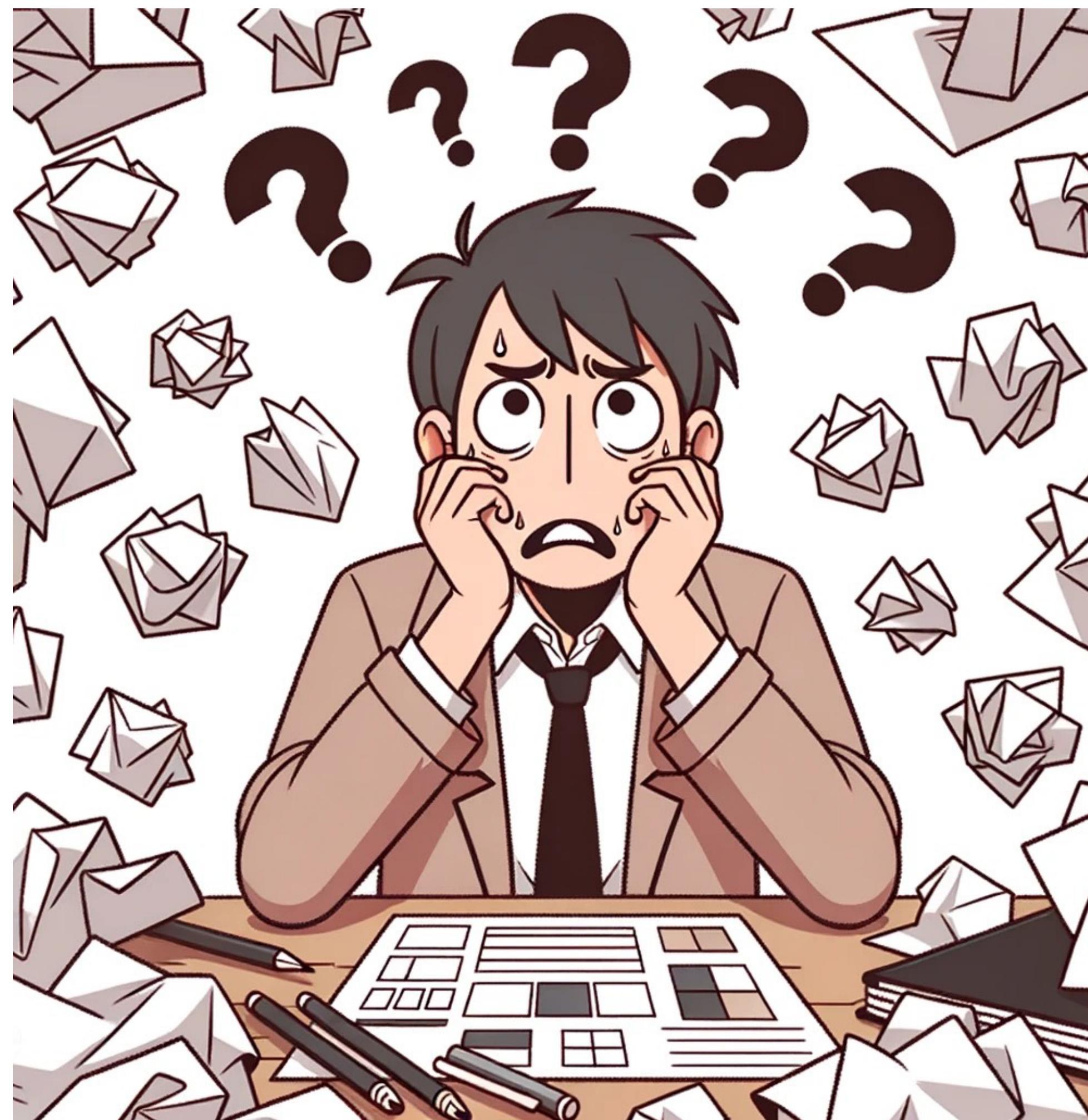
algorithm: “transfer learning”

# Session I: Design your AI agents

# Task: Design Your AI Agents

Pickup one object and redesign it as an AI agent in a IoT ecosystem



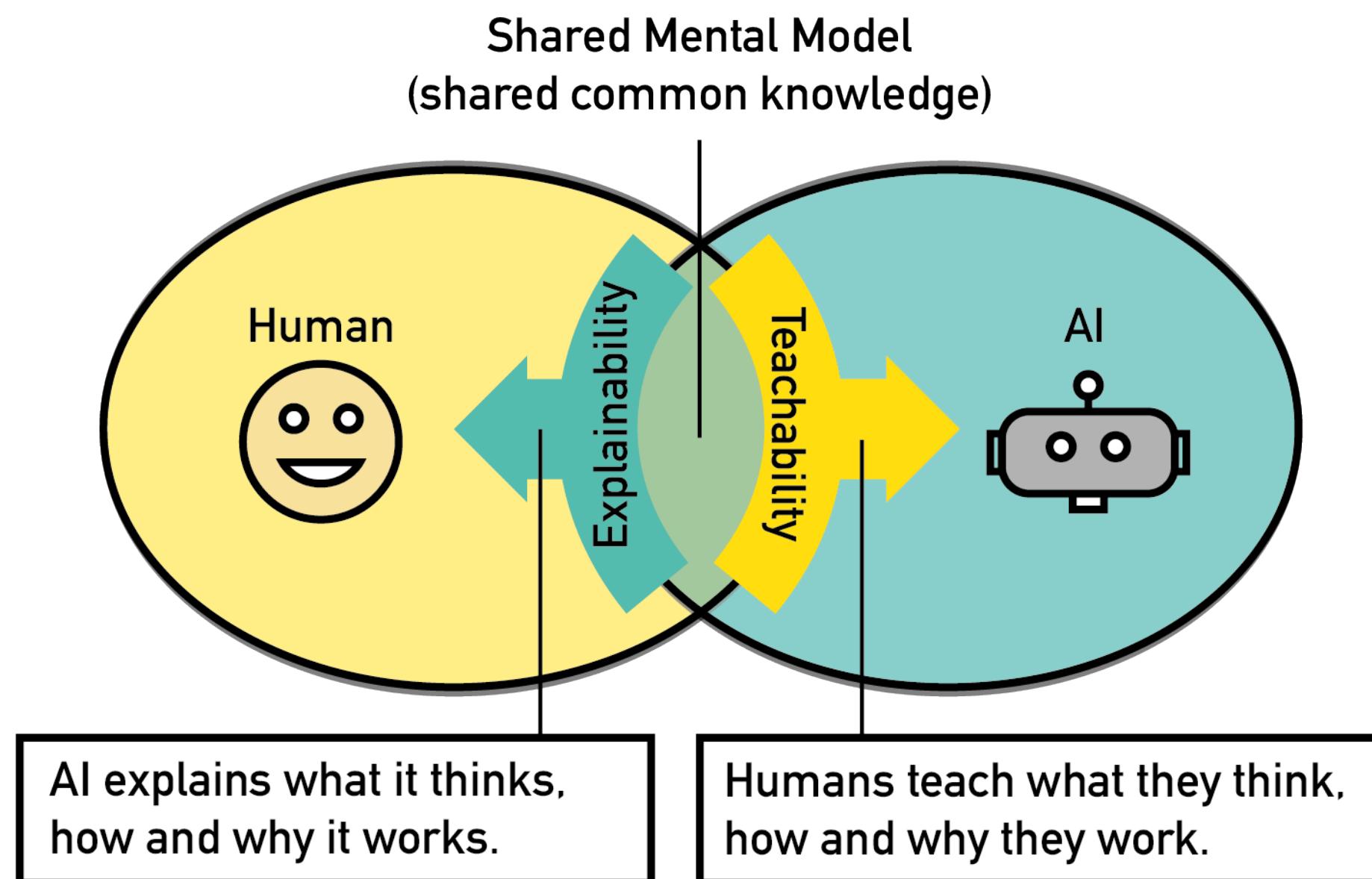


Prompt: Illustration of a designer with a worry face, surrounded by crumpled design sketches, symbolizing his confusion and uncertainty about his work. Created by DALL-E 3

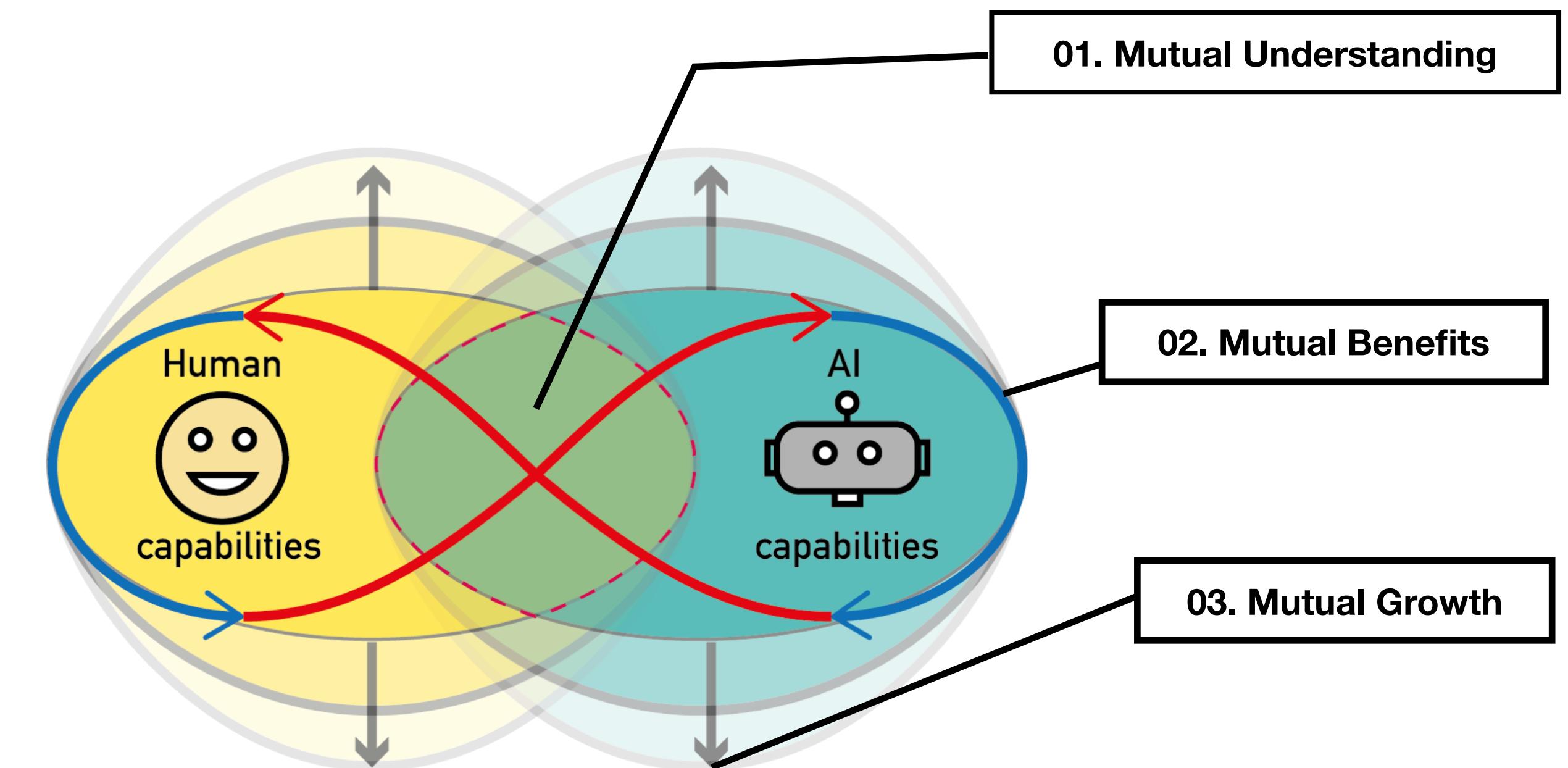


Prompt: Illustration of a female designer with a concerned expression, holding her head in her hands, amidst a chaotic workspace filled with design drafts and tools. Created by DALL-E 3

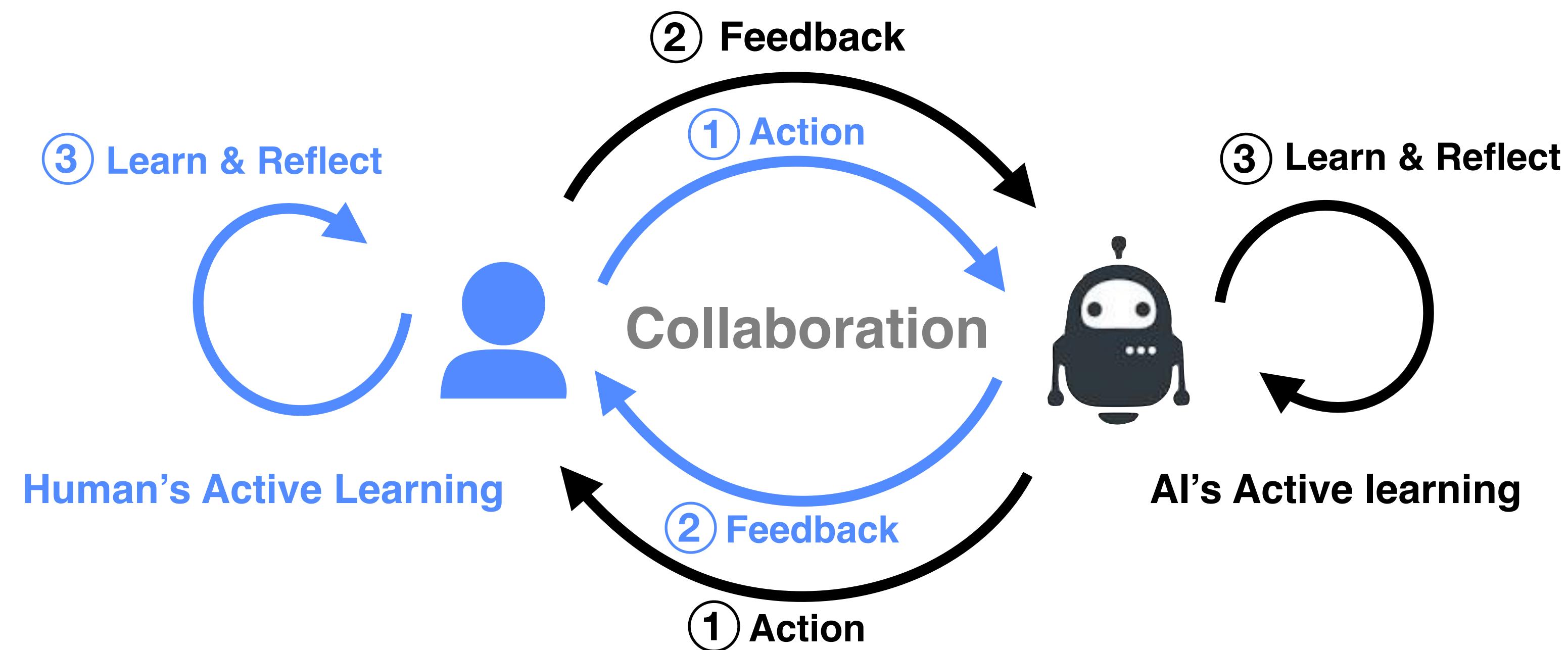
## Human-AI Interaction



## Human-AI Co-Learning

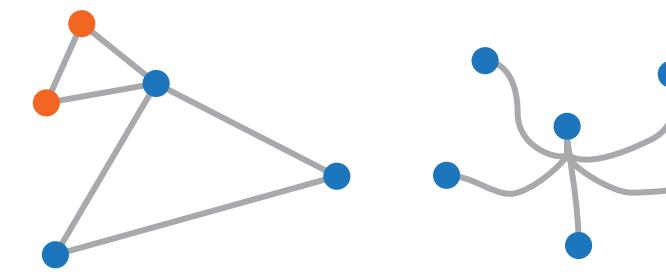


# Human-AI Collaboration Framework

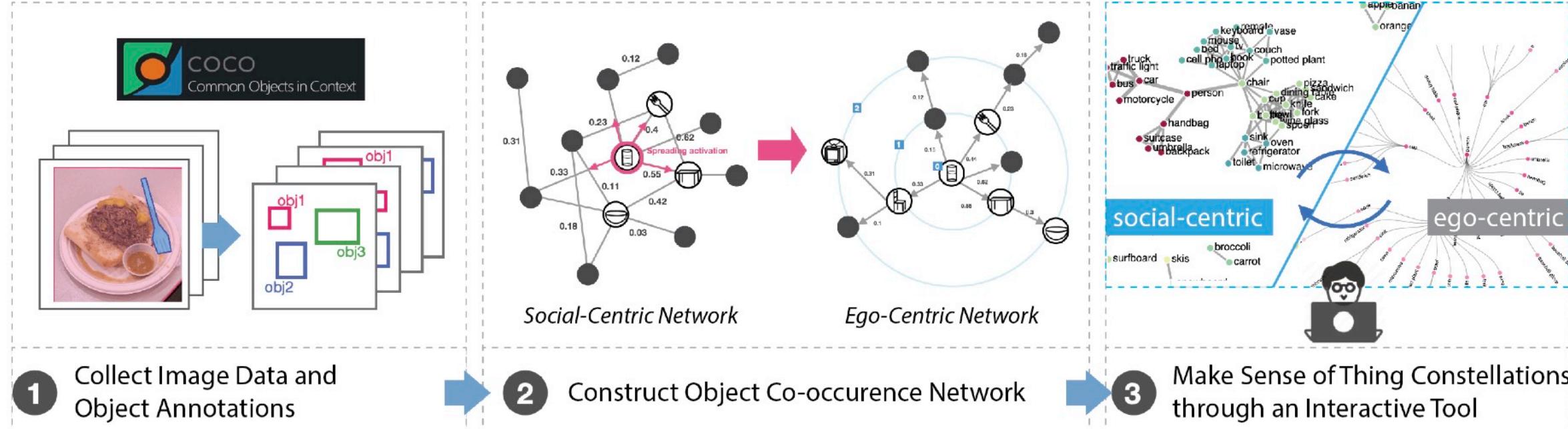


# Thing Constellation Visualizer

# Exploring Emergent Relationships of Everyday Objects



# Data-Driven Design Exploration



# Data-driven pattern + Human interpretation

# Contributions

This work presents Thing Constellation Visualizer (ThingCV), a new approach and tool that empowers designers to use alternative perspectives to revisit everyday practice and contributes new insights from two workshops on in-depth understandings of emergent relationships among objects.

The approach, tool, and insights will contribute to **the future design of IoT ecosystems.**

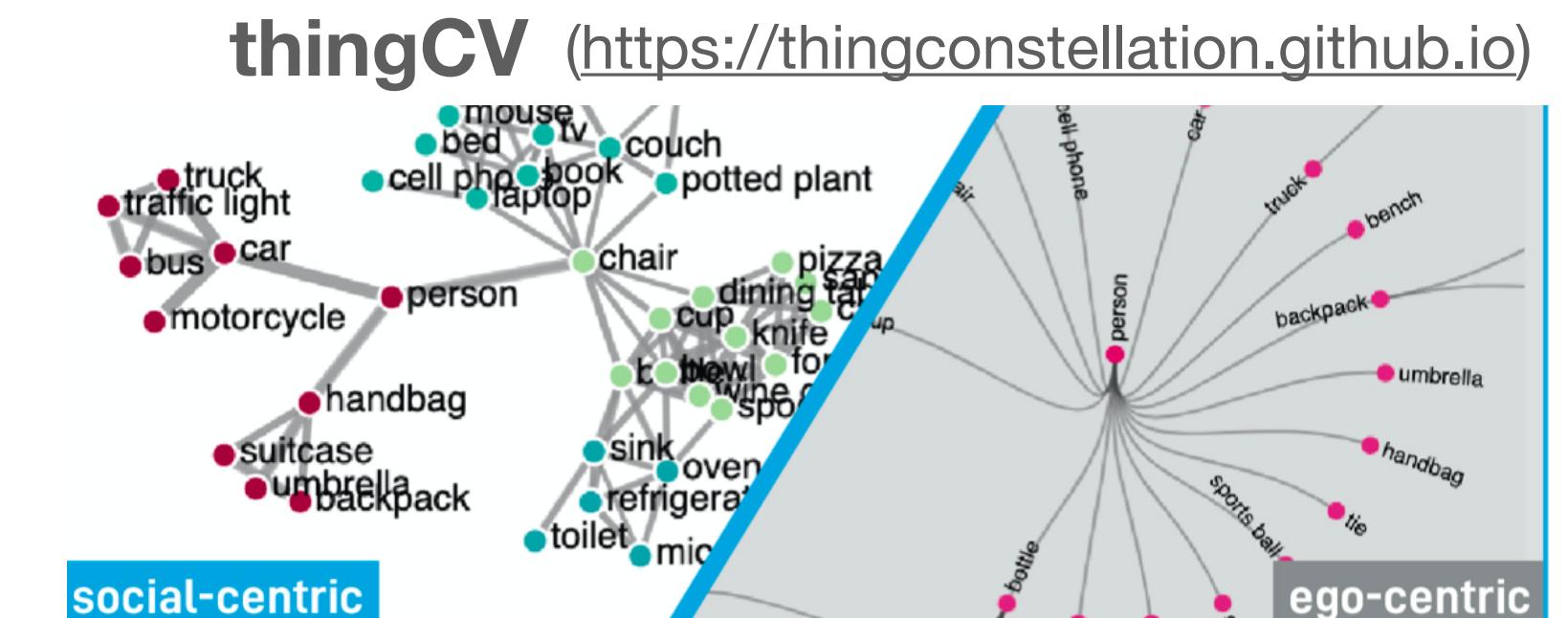


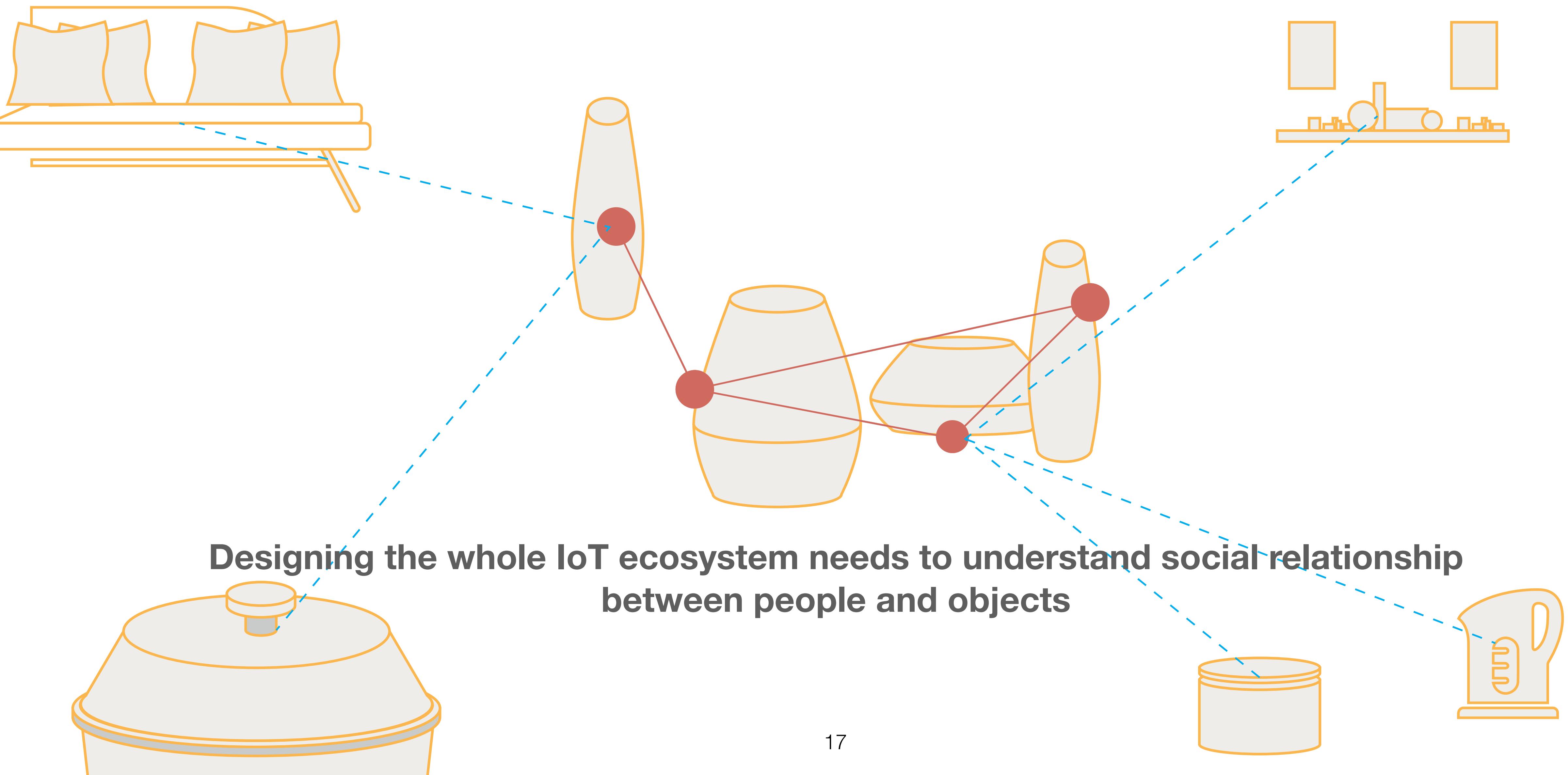
# Janet Huang

## TU Eindhoven



Yi-Ching (Janet) Huang, Yu-Ting Cheng, Rung-Huei Liang, Jane Yung-jen Hsu, and Lin-Lin Chen. 2021. Thing Constellation Visualizer: Exploring Emergent Relationships of Everyday Objects. Proc. ACM Hum.-Comput. Interact. 5, CSCW2, Article 479 (October 2021), 29 pages. DOI:<https://doi.org/10.1145/3479866>

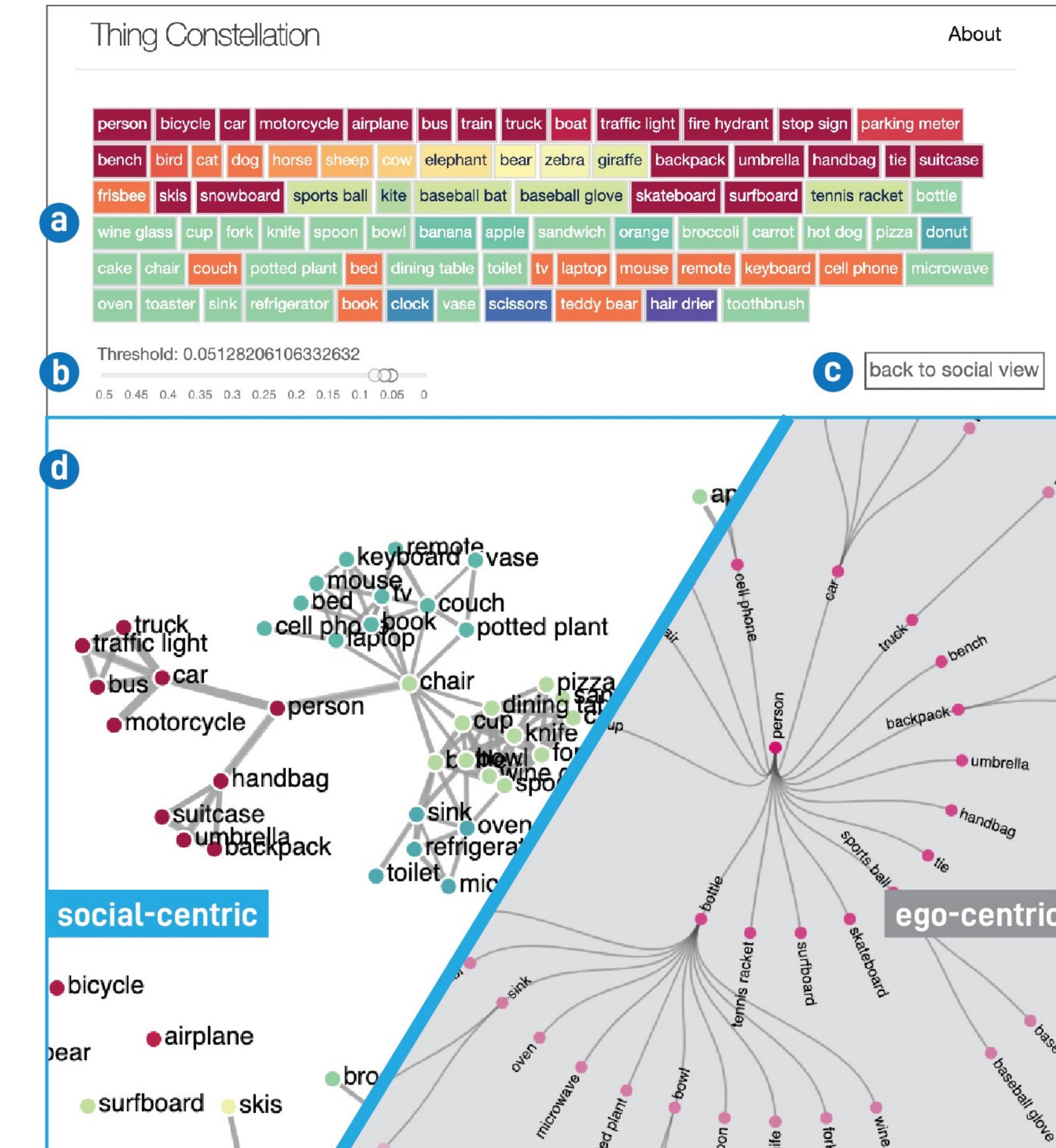




## Challenges

- The emergent relationship is **hidden and barely recognized** by people. It requires **experienced designers or experts** to **extract patterns from empirical data** through an iterative sense-making process.
- As the **volume and complexity of data** increases, it is challenging even for experts to extract patterns **without appropriate support**.
- Prior work mainly focus on a single object or a few objects, limited tools support researchers to study **IoT ecosystems**.

# Thing Constellation Visualizer



a Object Panel

- objects in the same community are filled with the same colors.
- click any object to zoom into ego-centric view.

b Threshold Slider

- adjust threshold value to determine the density (i.e. numbers of links between nodes).

c Switch Button

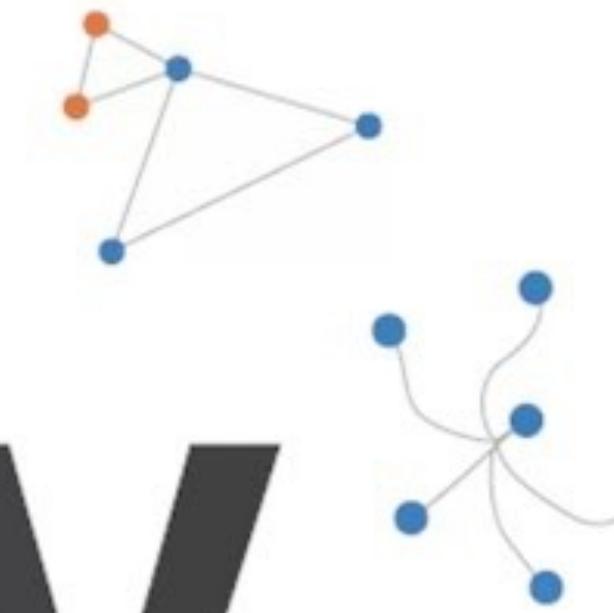
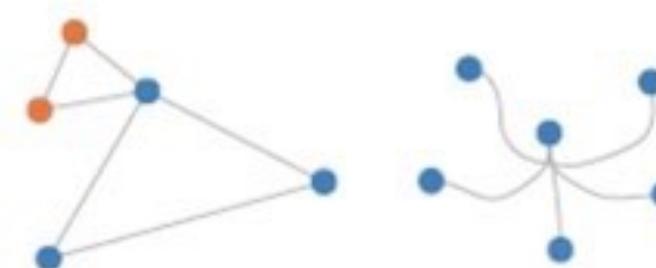
- switch two views under the same threshold value.

d Thing Constellation Visualisation

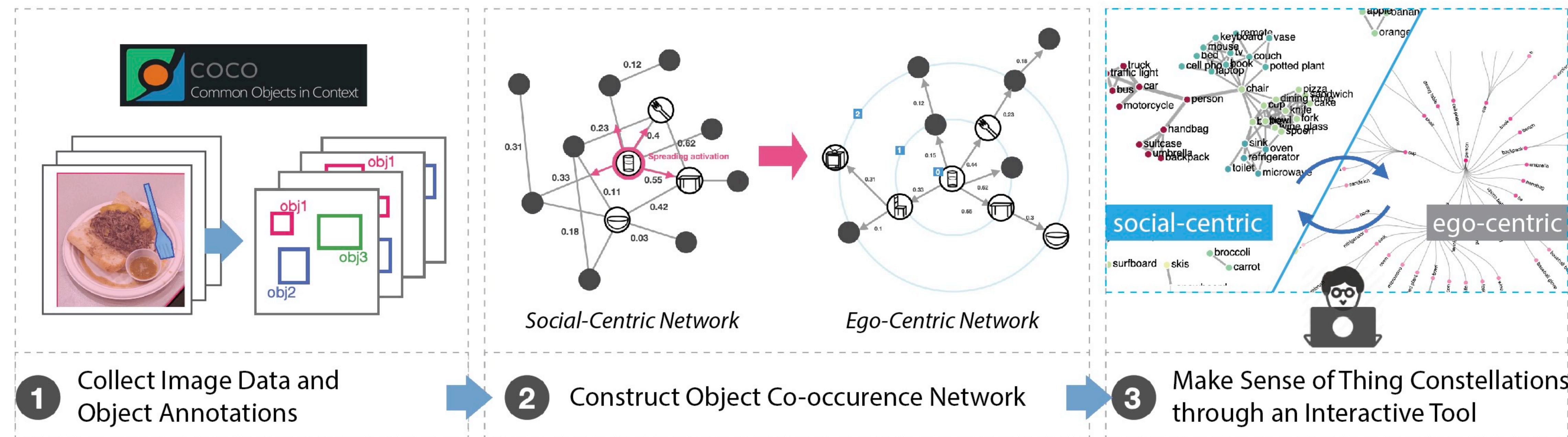
- based on the previous selections, here shows the result which can be social-centric or ego-centric constellation.

# ThingCV

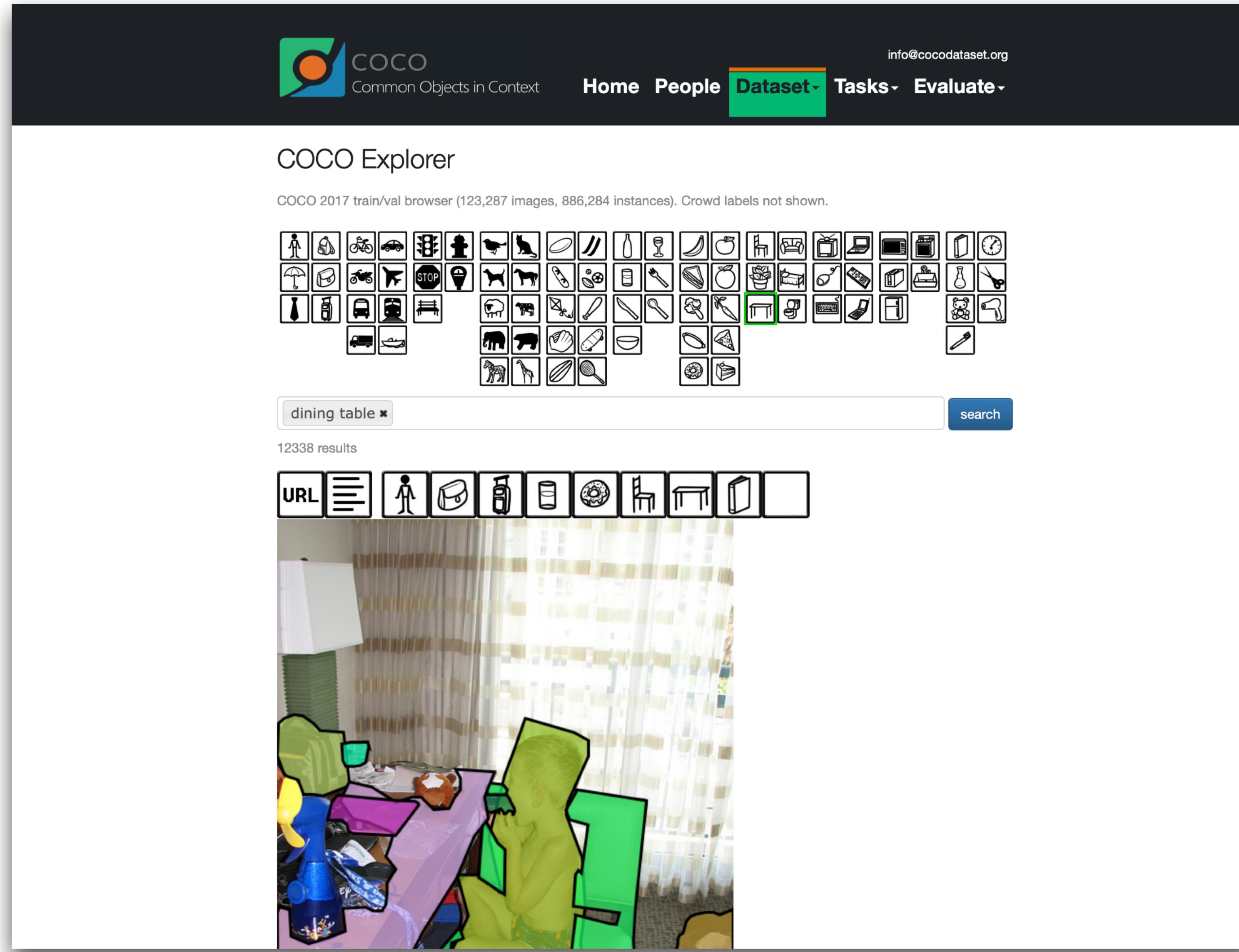
Thing Constellation Visualiser



# Data-Driven Design Exploration



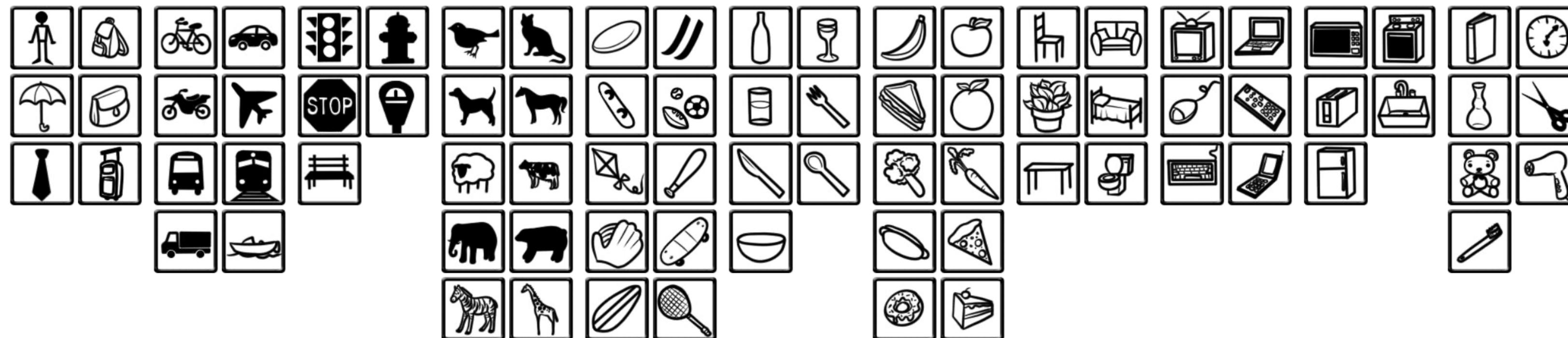
# Dataset inside thingCV: COCO dataset



<https://cocodataset.org/#home>

# Exercise 1: Design Your AI agents (20 mins)

- Every group/individual use 15 mins to
  - play with an **existing image dataset (i.e., COCO dataset)**
  - use **thingCV tool** to explore the ecosystem of everyday objects
  - **redesign 1 everyday object** from 80 objects, and think about how this object interact with people.



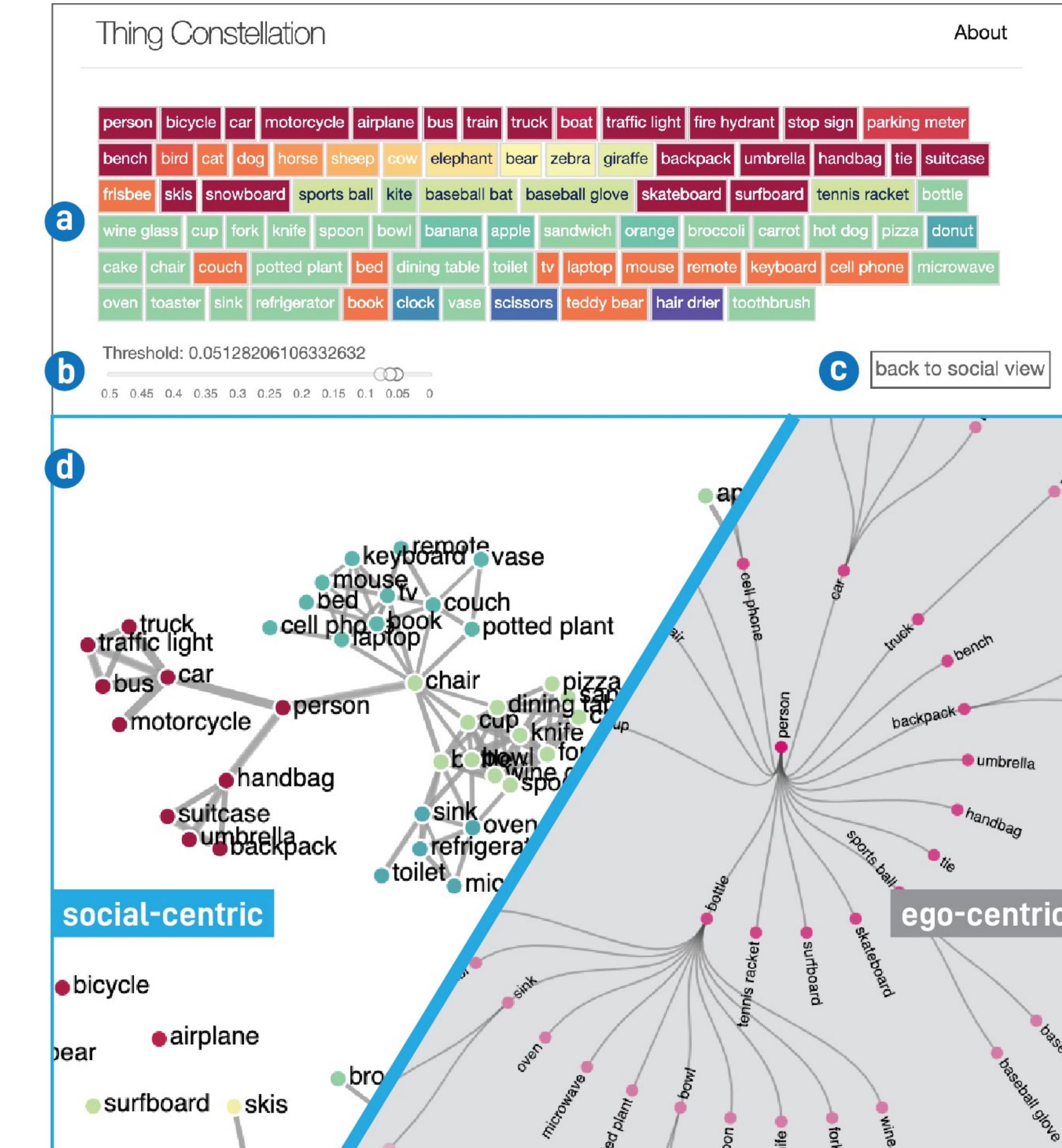
# AI Canvas

<b>Concept / Idea Description</b> Describe your idea in 2-3 sentences  <b>1</b>	<b>The Role of Human</b> What specific role does human play in your concept? What specific task does human perform?  <b>3</b>	<b>Input Data</b> Which data items does AI use? How many data does AI need?  <b>5</b>
<b>Contextual situations</b> When and where will the characters (i.e., target users, multiple stakeholder) use your concept? What is the context (i.e., place, environment, time, etc)  <b>2</b>	<b>The Role of AI</b> What specific role does AI play in your concept? What type of AI? What specific task does AI perform?  <b>4</b>	<b>Feature</b> What specific characteristic of the data? A feature is a measurable property of the object (data) you are trying to analyze. Features are independent variables that acknowledge inputs in your system.  <b>6</b>
		<b>Output Results</b> What is the result of your system? Is a binary answer or a numerical number? Or is a multiple-class answer?  <b>7</b>
		<b>Open questions / problems?</b> What AI still cannot do in your concept? Which aspects are still unclear for you in terms of your AI system?  <b>8</b>

# **Break**

# Session II: Build your own thingCV

# Thing Constellation Visualizer



a Object Panel

- objects in the same community are filled with the same colors.
- click any object to zoom into ego-centric view.

b Threshold Slider

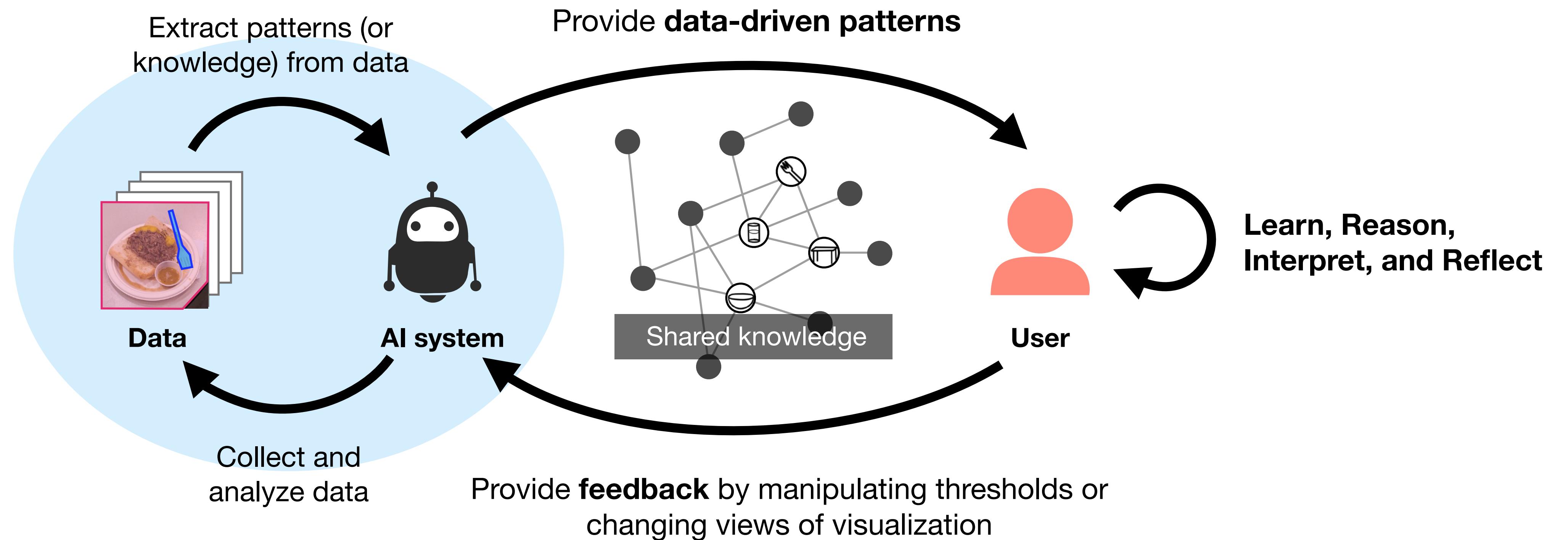
- adjust threshold value to determine the density (i.e. numbers of links between nodes).

c Switch Button

- switch two views under the same threshold value.

d Thing Constellation Visualisation

- based on the previous selections, here shows the result which can be social-centric or ego-centric constellation.



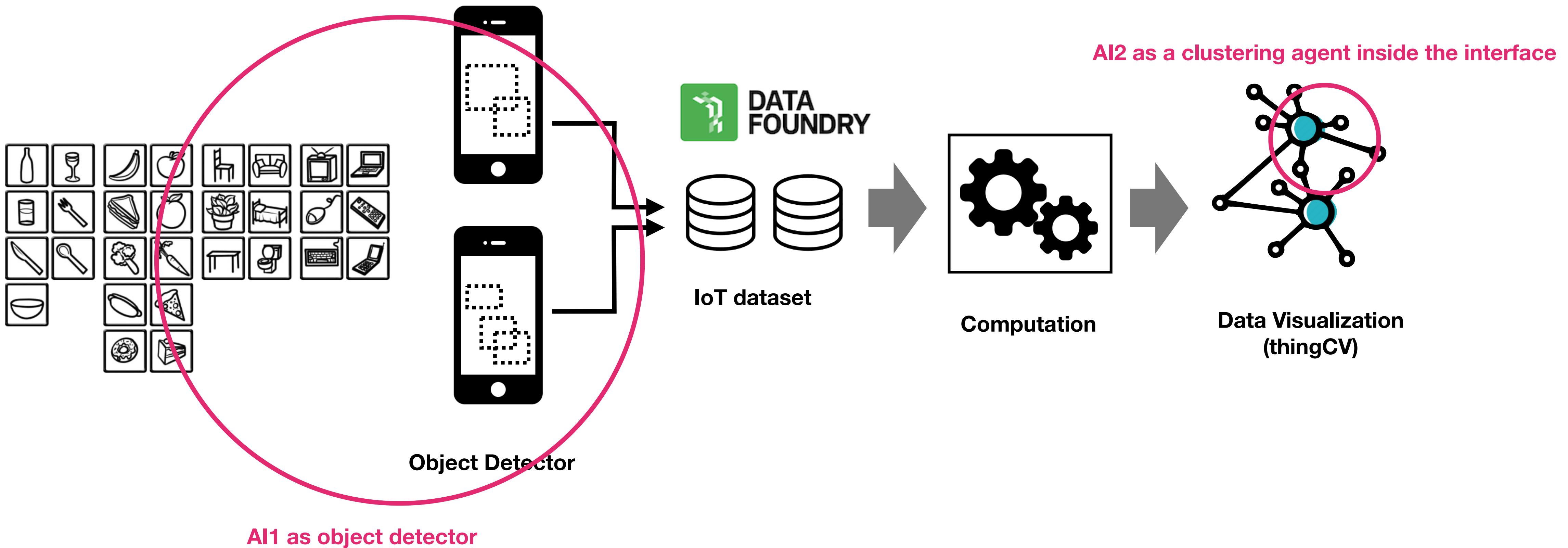
**Data-driven pattern** + **Human interpretation**

# AI Canvas

Object detector

<p><b>Concept / Idea Description</b></p> <p>Describe your idea in 2-3 sentences</p> <p><b>Support designers to design IoT ecosystem by enabling them to explore relationships among objects in everyday contexts</b></p>	<p><b>The Role of Human</b></p> <p>What specific role does human play in your concept? What specific task does human perform?</p> <ul style="list-style-type: none"><li>* <b>designers collect data and then fed into AI.</b></li><li>* <b>designers interact with data patterns by changing different views through an interface</b></li></ul>	<p><b>Input Data</b></p> <p>Which data items does AI use? How many data does AI need?</p> <ul style="list-style-type: none"><li>* <b>image data collected from phone</b></li></ul>
<p><b>Contextual situations</b></p> <p>When and where will the characters (i.e., target users, multiple stakeholder) use your concept? What is the context (i.e., place, environment, time, etc)</p> <p><b>Designers use this tool to understand emergent patterns through data captured on everyday contexts, and further use this tool to come up with future scenarios in which objects collaborate with each other</b></p>	<p><b>The Role of AI</b></p> <p>What specific role does AI play in your concept? What type of AI? What specific task does AI perform?</p> <ul style="list-style-type: none"><li>- <b>ThingCV will (1) extracts emergent patterns based on a large numbers of photos, (2) visualize the patterns, (3) enable human to play with data patterns through an interactive interface</b></li><li>- <b>Object detector identifies objects from a photo or a camera stream</b></li></ul>	<p><b>Feature</b></p> <p>What specific characteristic of the data? A feature is a measurable property of the object (data) you are trying to analyze. Features are independent variables that act like inputs in your system.</p> <ul style="list-style-type: none"><li>* <b>pixel colors (r,g,b), size of image</b></li></ul>
		<p><b>Output Results</b></p> <p>What is the result of your system? Is a binary answer or a numerical number? Or is a multiple-class answer?</p> <ul style="list-style-type: none"><li>* <b>One or more objects in a phone, each object is indicated by a bounding box, object category, and a confidence score</b></li></ul>

# System Workflow



# Object Recognition

## Classification



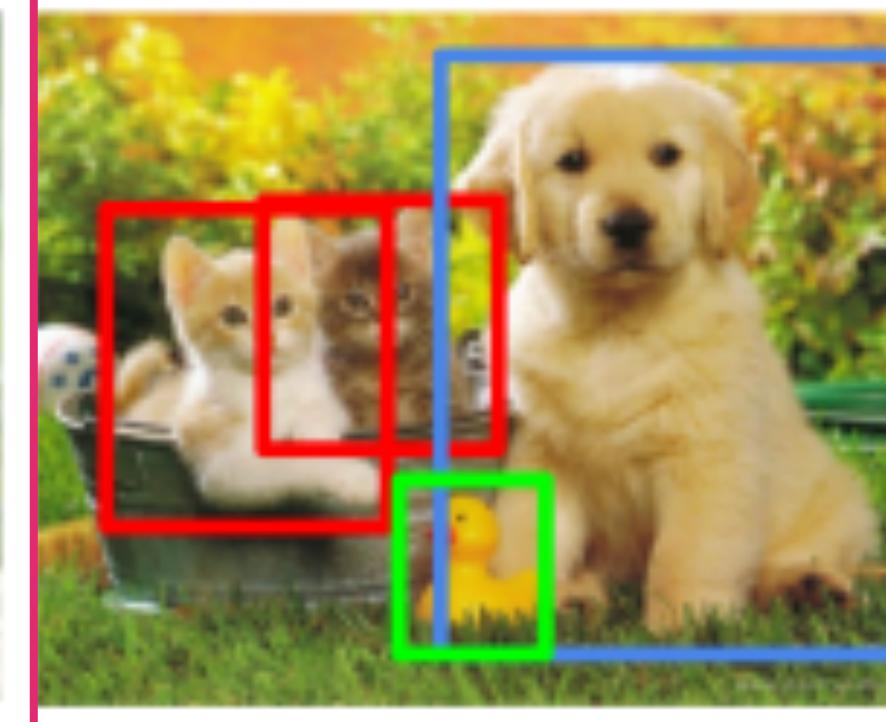
CAT

## Classification + Localization



CAT

## Object Detection



CAT, DOG, DUCK

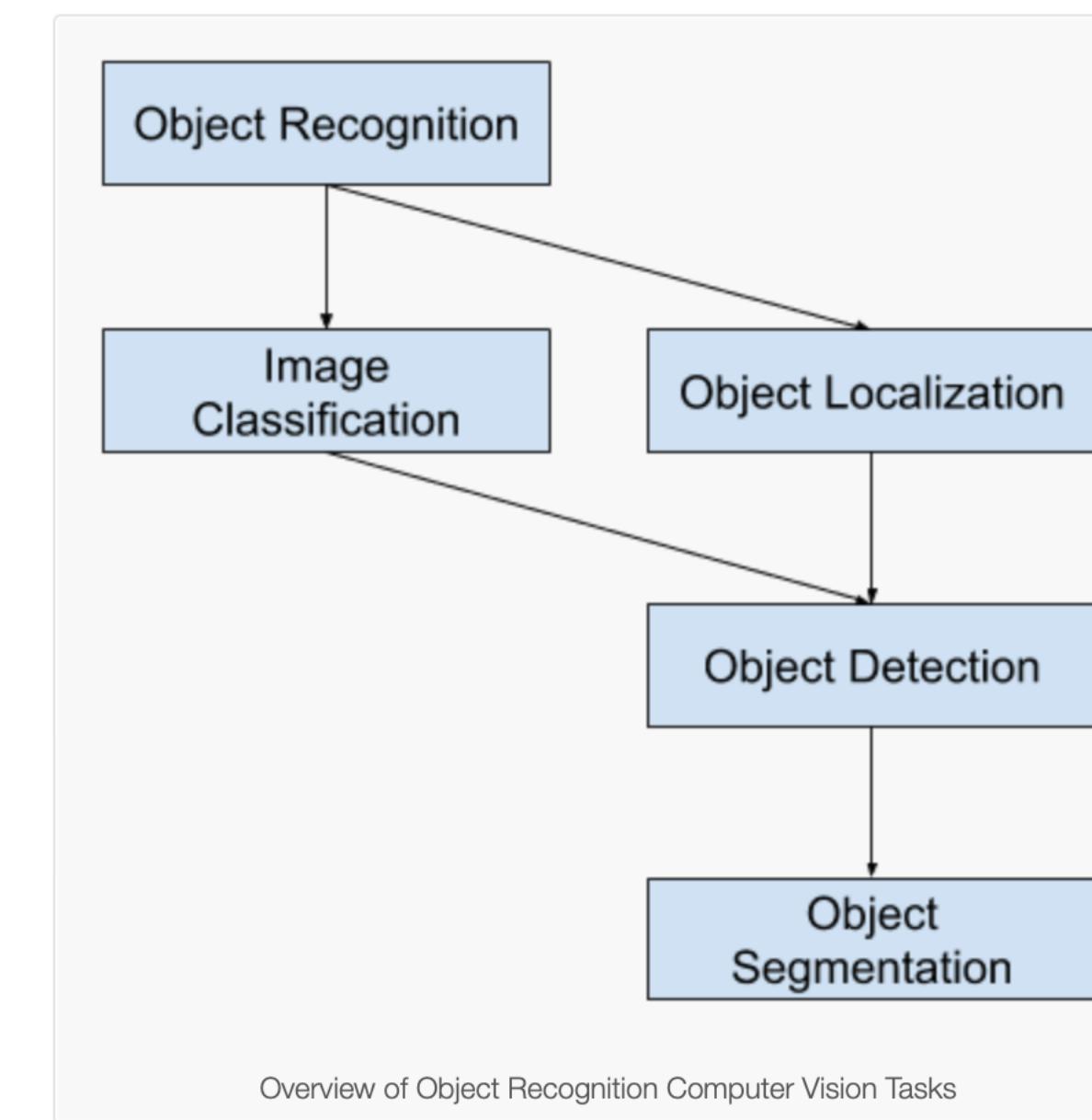
## Instance Segmentation



CAT, DOG, DUCK

Single object

Multiple objects



# Object Detector using ML5.js



```
const video = document.getElementById('video');

// Create a ObjectDetector method
const objectDetector = ml5.objectDetector('cocossd', {}, modelLoaded);

// When the model is loaded
function modelLoaded() {
  console.log('Model Loaded!');
}

// Detect objects in the video element
objectDetector.detect(video, (err, results) => {
  console.log(results); // Will output bounding boxes of detected objects
});
```

# p5.js

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## Hello!

## Search p5js.org

p5.js is a JavaScript library for creative coding, with a focus on making coding accessible and inclusive for artists, designers, educators, beginners, and anyone else! p5.js is free and open-source because we believe software, and the tools to learn it, should be accessible to everyone.

Using the metaphor of a sketch, 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, including HTML5 objects for text, input, video, webcam, and sound.

[Join the p5.js Discord!](#)

Start creating with the p5 Editor!

## Community

We are a community of, and in solidarity with, people from every gender identity and expression, sexual orientation, race, ethnicity, language,



# Friendly Machine Learning for the Web

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

# What ml5.js can do?

## image

ImageClassifier  
PoseNet      StyleTransfer  
BodyPix      pix2pix  
UNET      CVAE  
Handpose      SketchRNN  
Facemesh      ObjectDetector  
FaceApi

## sound

SoundClassification  
PitchDetection

## text

CharRNN  
Sentiment  
Word2Vec

## helpers

NeuralNetwork  
FeatureExtractor  
KNNClassifier  
Kmeans

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Getting Started with ml5.js</title>
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <!-- p5 -->
    <script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/1.0.0/p5.min.js"></script>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/1.0.0/addons/p5.sound.min.js"></script>
    <!-- ml5 -->
    <script src="https://unpkg.com/ml5@latest/dist/ml5.min.js"></script>
  </head>

  <body>
    <script>
      function setup() {
        createCanvas(400, 400);
      }

      function draw() {
        background(200);
      }
    </script>
  </body>
</html>
```

p5\*

File ▾ Edit ▾ Sketch ▾ Help ▾

English ▾ Hello, janetyc! ▾

Auto-refresh ImageClassification by ml5

Sketch Files < sketch.js Preview

1 images

2 index.html

3 sketch.js

```
8 Image classification using MobileNet and p5.js
9 This example uses a callback pattern to create the classifier
10 === */
11
12 // Initialize the Image Classifier method with MobileNet. A callback needs to be
13 // passed.
13 let classifier;
14
15 // A variable to hold the image we want to classify
16 let img;
17
18 function preload() {
19   classifier = ml5.imageClassifier('MobileNet');
20   img = loadImage('images/bird.jpg');
21 }
22
23 function setup() {
24   createCanvas(400, 400);
25   classifier.classify(img, gotResult);
26   image(img, 0, 0);
27 }
28
29 // A function to run when we get any errors and the results
30 function gotResult(error, results) {
31   // Display error in the console
32   if (error) {
33     console.error(error);
34   }
35   // The results are in an array ordered by confidence.
36   console.log(results);
37   createDiv('Label: ' + results[0].label);
38   createDiv('Confidence: ' + nf(results[0].confidence, 0, 2));
39 }
40
```

1 Call ml5 function and load the model

2 Apply the ml5 function to an input (e.g., image, video, text)

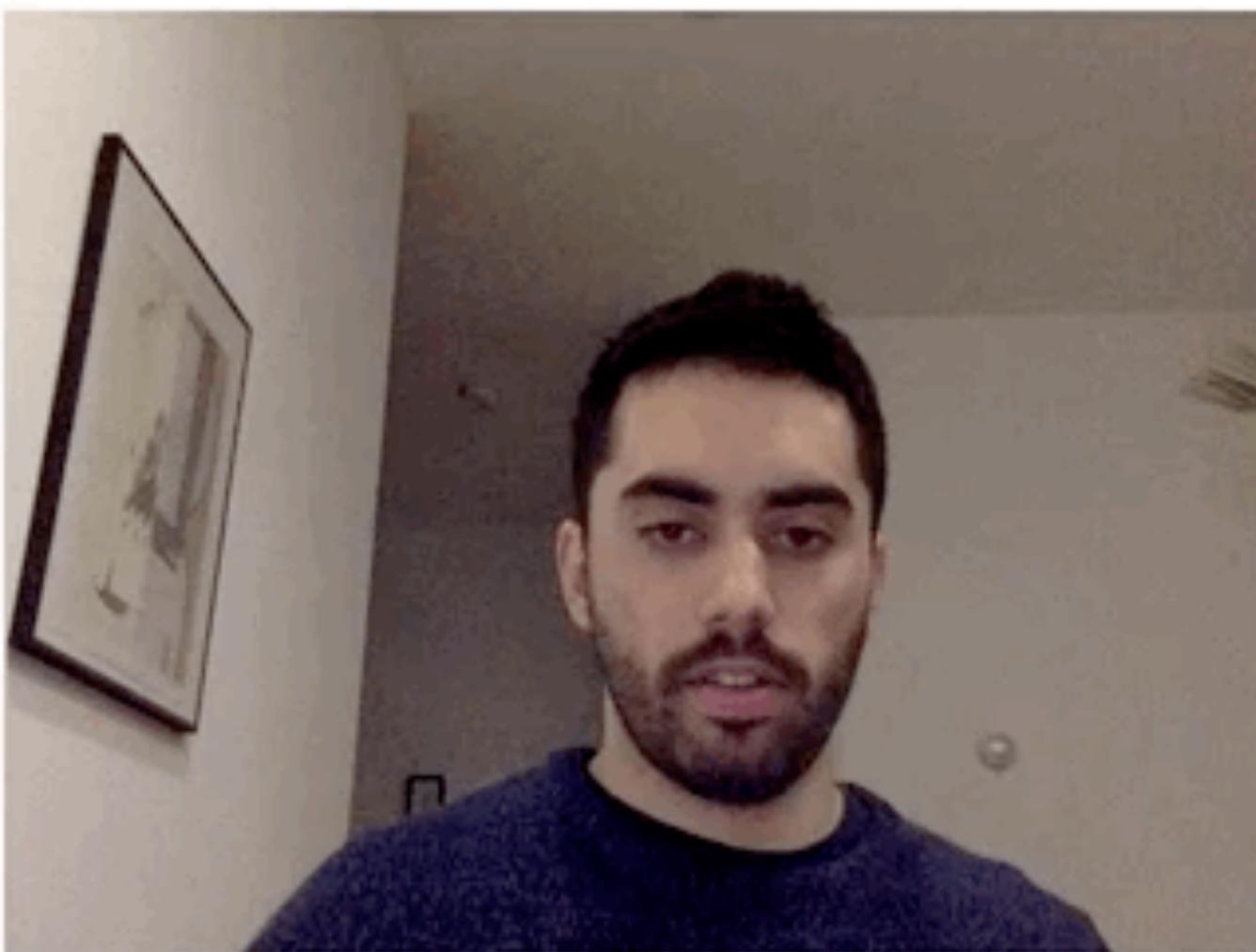
3 Do something with the output (e.g., value, labels, points, etc)

How to use ml5.js?

Image classification using MobileNet and p5.js



# imageClassifier('MobileNet')



```
const classifier = ml5.imageClassifier('MobileNet');

classifier.classify(video, gotResult);

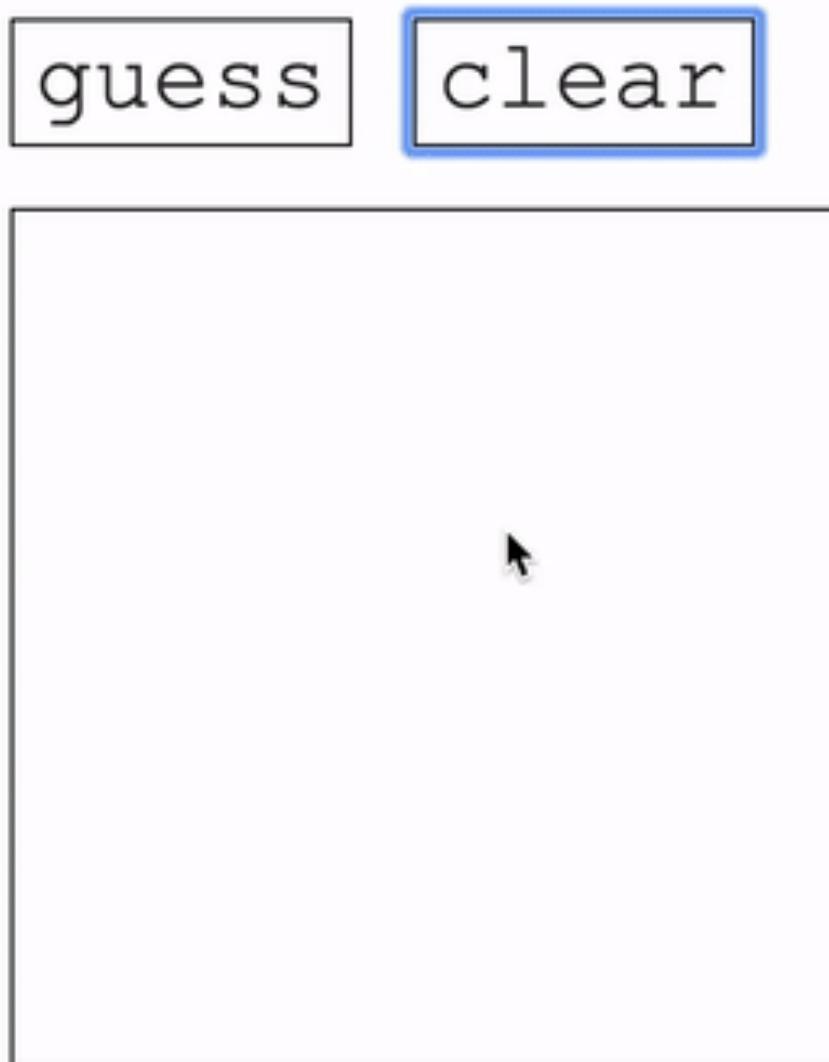
function gotResult(error, result) {
  console.log(result);
}
```

My guess is a toaster.

My confidence is 0.12.

# imageClassifier('DoodleNet')

Doodle Classifier on 345 classes



```
const classifier = ml5.imageClassifier('DoodleNet');

classifier.classify(canvas, gotResult);

function gotResult(error, result) {
  console.log(result);
}
```

---

<https://github.com/yining1023/doodleNet>

[https://editor.p5js.org/ml5/sketches/ImageClassification\\_DoodleNet\\_Canvas](https://editor.p5js.org/ml5/sketches/ImageClassification_DoodleNet_Canvas)

# PoseNet



[Image source]

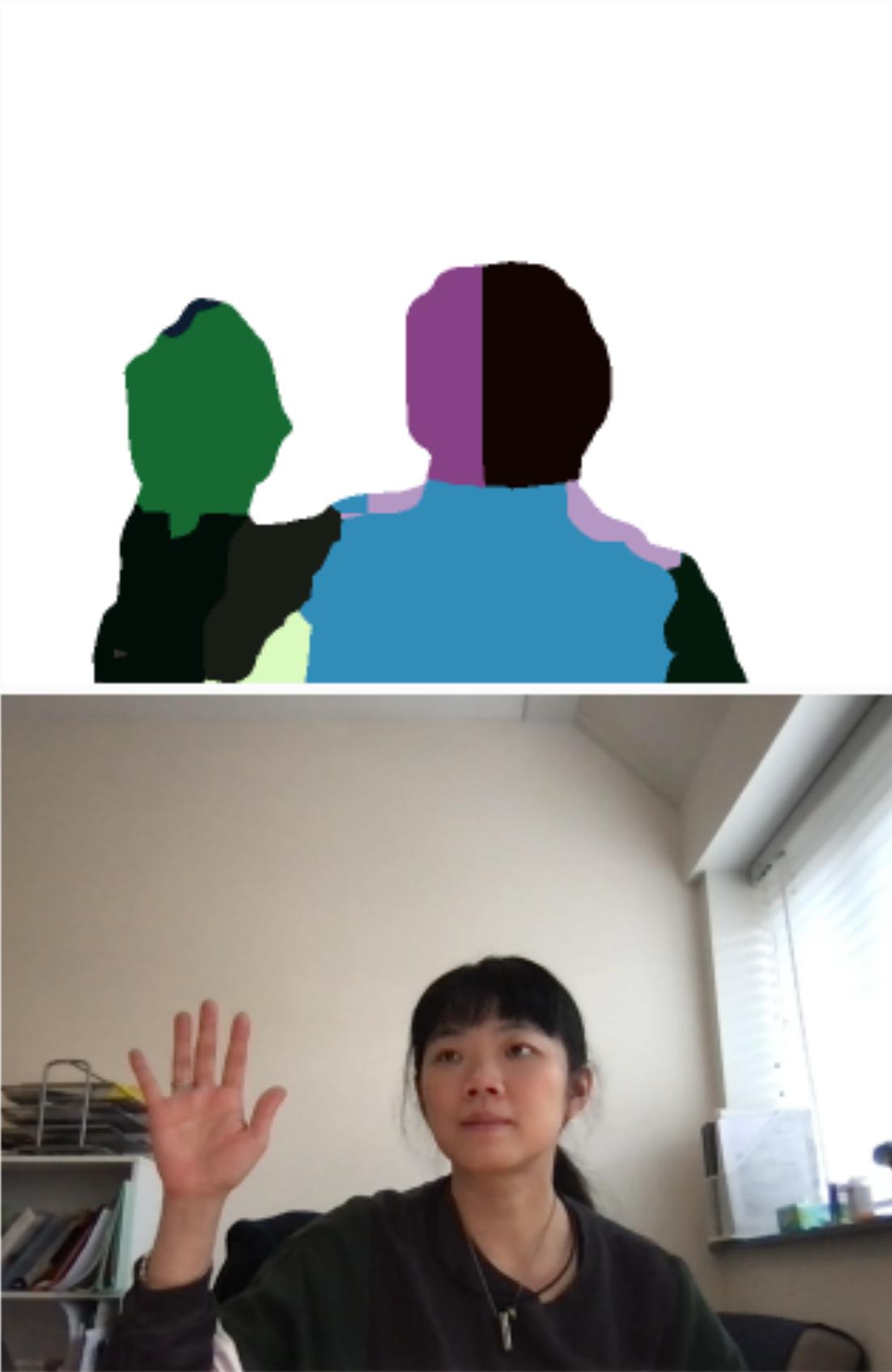
```
const video = document.getElementById('video');

// Create a new poseNet method
const poseNet = ml5.poseNet(video, modelLoaded);

// When the model is loaded
function modelLoaded() {
  console.log('Model Loaded!');
}

// Listen to new 'pose' events
poseNet.on('pose', (results) => {
  poses = results;
});
```

# BodyPix

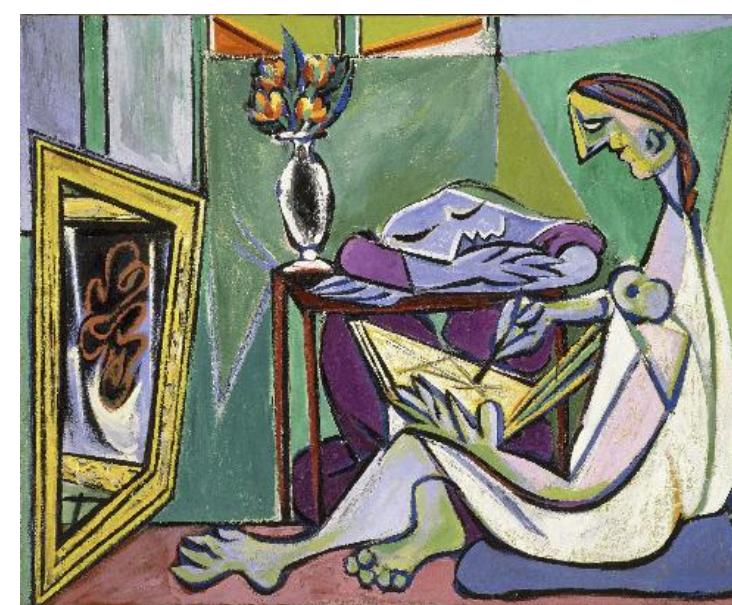


```
const bodypix = ml5.bodyPix(modelReady);

function modelReady() {
  // segment the image given
  bodypix.segment(img, gotResults);
}

function gotResults(error, result) {
  if (error) {
    console.log(error);
    return;
  }
  // log the result
  console.log(result.backgroundMask);
}
```

# Style Transfer



[Image source]

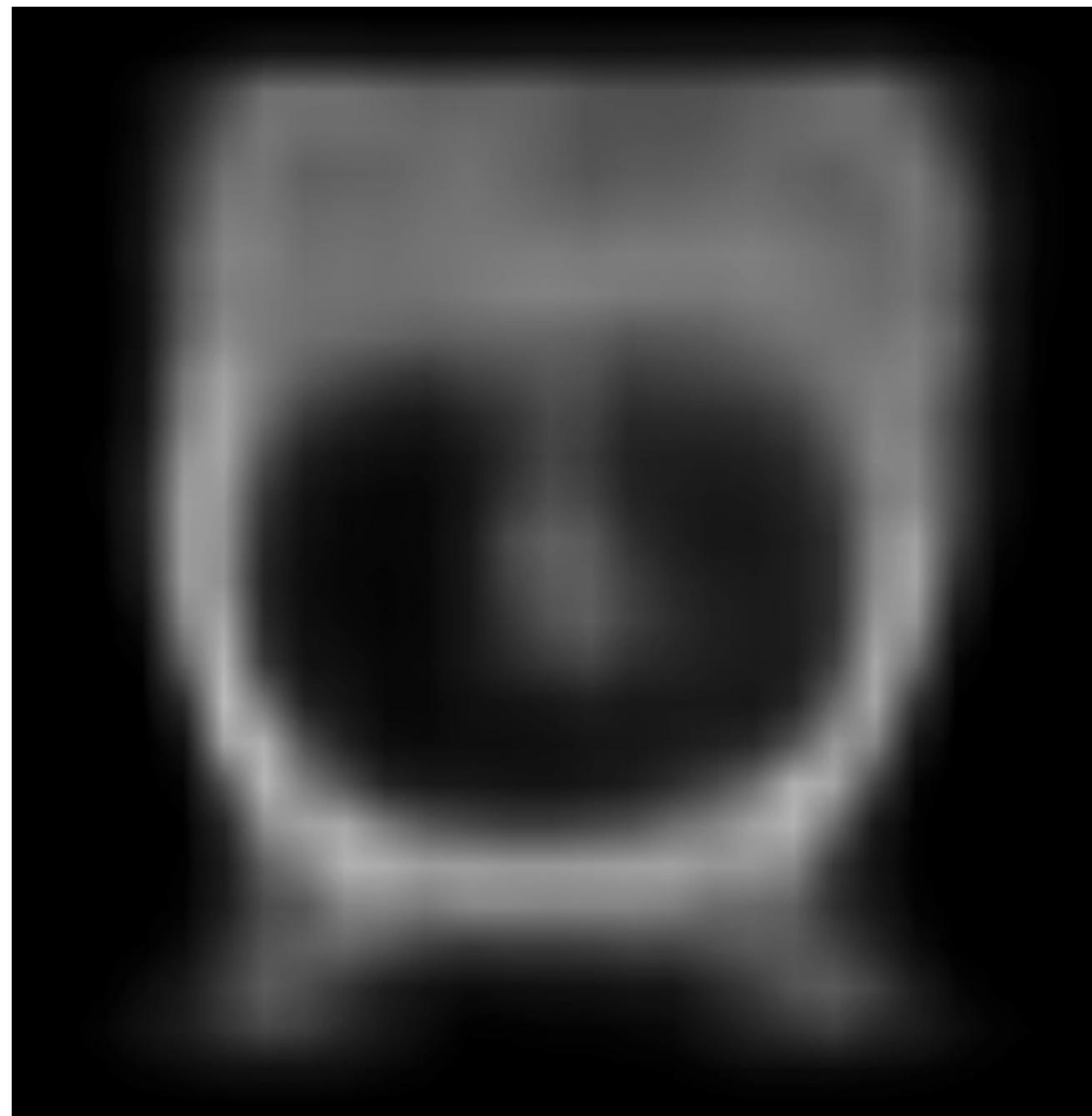
```
// Create a new Style Transfer Instance
const style = ml5.styleTransfer('data/myModel/', modelLoaded);

// When the model is loaded
function modelLoaded() {
  console.log('Model Loaded!');
}

// Grab a img element and generate a new image.
style.transfer(document.getElementById("img"), function(error, result)
{
  img.src = result.src;
});
```

# CVAE

(conditional variational autoencoder)



[Image source]

```
const cvae = ml5.CVAE('model/quick_draw/manifest.json', modelReady);

function modelReady() {
  // generate an image of an airplane
  cvae.generate('airplane', gotImage);
}

function gotImage(error, result) {
  if (error) {
    console.log(error);
    return;
  }
  // log the result
  console.log(result);
}
```

# CharRNN

This example uses a pre-trained model on a corpus of [Virginia Woolf](#)

seed text:

temperature:  0.5

Model Loaded

The sky was blue and

```
// Create the character level generator with a pre trained model
const rnn = ml5.charRNN('models/bolaño/', modelLoaded);

// When the model is loaded
function modelLoaded() {
  console.log('Model Loaded!');
}

// Generate content
rnn.generate({ seed: 'the meaning of pizza is' }, (err, results) => {
  console.log(results);
});
```

# Sentiment Analysis

## Sentiment Analysis Demo

This example uses model trained on movie reviews. This model scores the sentiment of text with a value between 0 ("negative") and 1 ("positive"). The movie reviews were truncated to a maximum of 200 words and only the 20,000 most common words in the reviews are used.

model loaded

sentiment score:

```
// Create a new Sentiment method
const sentiment = ml5.sentiment('movieReviews', modelReady);
```

```
// When the model is loaded
function modelReady() {
  // model is ready
  console.log('Model Loaded!');
}
```

```
// make the prediction
const prediction = sentiment.predict(text);
console.log(prediction);
```



**DATA  
FOUNDRY**

<https://data.id.tue.nl>

# What is Data Foundry?

The screenshot shows the Data Foundry web application interface. On the left is a sidebar with the Data Foundry logo and navigation links: My projects (highlighted in green), Data tools, Documentation, and Support. The main area is titled "Home" and "PROJECTS". A green "ADD PROJECT" button is located in the top right. The page displays a grid of project cards:

- New Data Collecting Project** by Henk Apeldoorn, I-Tang Chiang, Janet Huang, Wietse Loor, Geert van den Boomen. Tags: DIARY, SCRIPT, ENTITY, GOOGLEFIT, FITBIT, EXISTING, IOT.
- [ARTIFICE] AI Workshop 202...** by Janet Huang. Tags: SCRIPT, EXISTING, IOT.
- [DCM210] AI Workshop: Cust...** by I-Tang Chiang, Janet Huang. Tags: SCRIPT, EXISTING, IOT.
- DCB150 Digital Craftsmans...** by Mae-Yin Chan, Janet Huang. Tags: EXISTING.
- Digital Craftsmanship DCB1...** by Stijn Boogaart, van den Janet Huang. Tags: EXISTING.
- [ARTIFICE] AI workshop: Cu...** by I-Tang Chiang, Mathias Funk, Janet Huang. Tags: EXISTING, IOT.
- DCB150 Digital Craftsmans...** by I-Tang Chiang, Janet Huang. Tags: SCRIPT, EXISTING.
- DCB150 DC** by Janet Huang. Tags: EXISTING.
- DCB150 workshop - Chat-G...** by I-Tang Chiang, Janet Huang. Tags: EXISTING, IOT.
- Artifice Workshop** by Janet Huang. Tags: EXISTING.
- Starboard try-out for DBM1...** by I-Tang Chiang, Mathias Funk, Janet Huang. Tags: ENTITY, EXISTING, IOT.
- Artifice demo** by Janet Huang. Tags: EXISTING.
- ARTIFICE Data and AI tools**
- Prototype (P)**
- Prototype (A)**

# What is Data Foundry?

The screenshot shows the Data Foundry platform's user interface. On the left, a sidebar menu includes 'My projects' (selected), 'Data tools', 'Documentation', and 'Support'. The main area is titled 'PROJECTS' and features a dark header bar with 'Home' and 'ADD PROJECT' buttons. Below this, a grid of project cards is displayed. Each card contains a project title, a brief description, names of participants, and categories like 'SCRIPT', 'EXISTING', and 'IOT'. Some cards also show small icons for 'DIARY', 'ENTITY', 'GOOGLEFIT', 'FITBIT', and 'EXISTING'. The projects listed include:

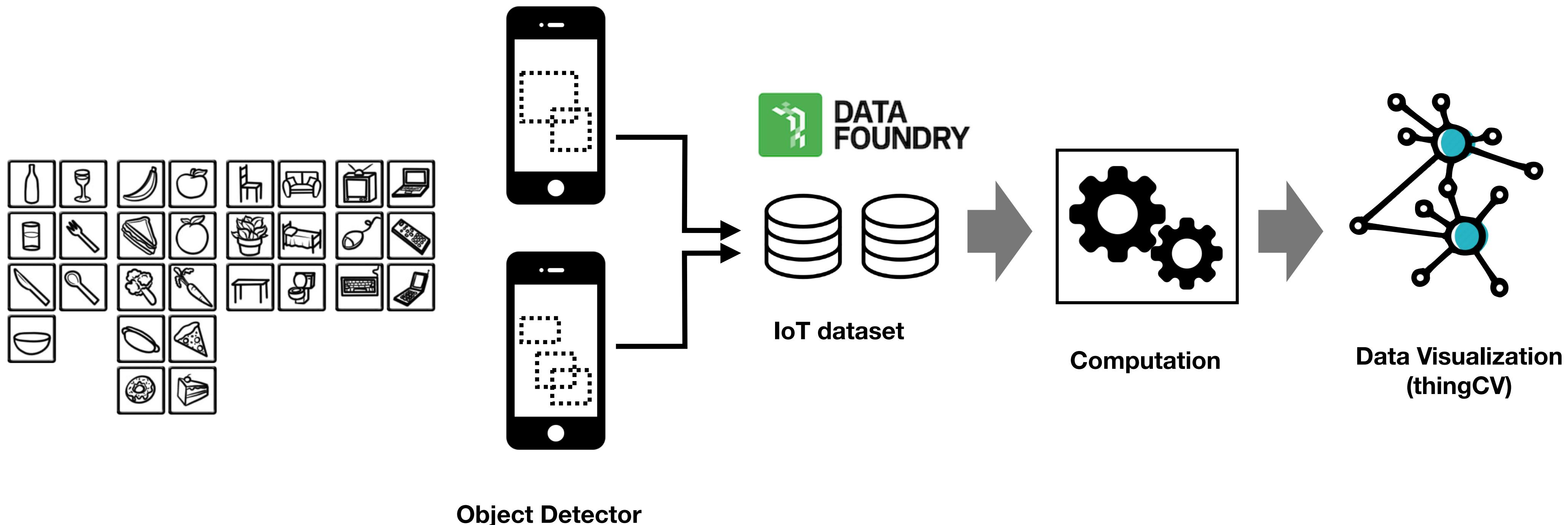
- New Data Collecting Project
- [ARTIFICE] AI Workshop 202...
- [DCM210] AI Workshop: Cust...
- Digital Craftsmanship DCB150
- [ARTIFICE] AI workshop: Cu...
- DCB150 Digital Craftsmans...
- DCB150 Digital Craftsmanship
- DCB150 workshop Ch... (partially visible)
- Artifice Workshop
- Starboard try-out for DBM1...
- Artifice demo
- ARTIFICE Data and AI tools
- Prototype (P)
- Prototype (A)

**Data foundry (<https://data.id.tue.nl>)**

- a data platform that support researchers to collect data from a variety of sources and store data in a unified format (and GDPR-safe).
- Researchers can : (1) manage their design research projects with participants and devices, (2) collaborate and share data and (3) mash-up and export data

# Session II-(1): Object Detector

# System Workflow



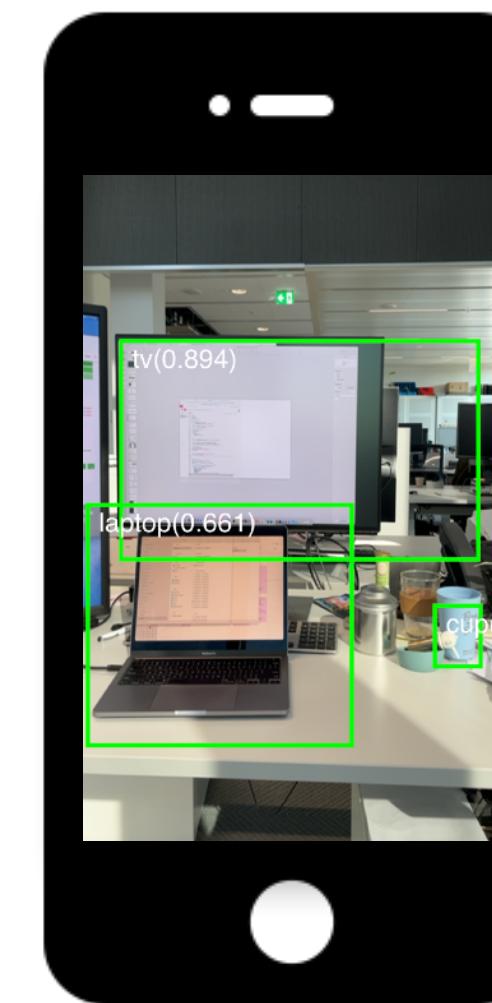
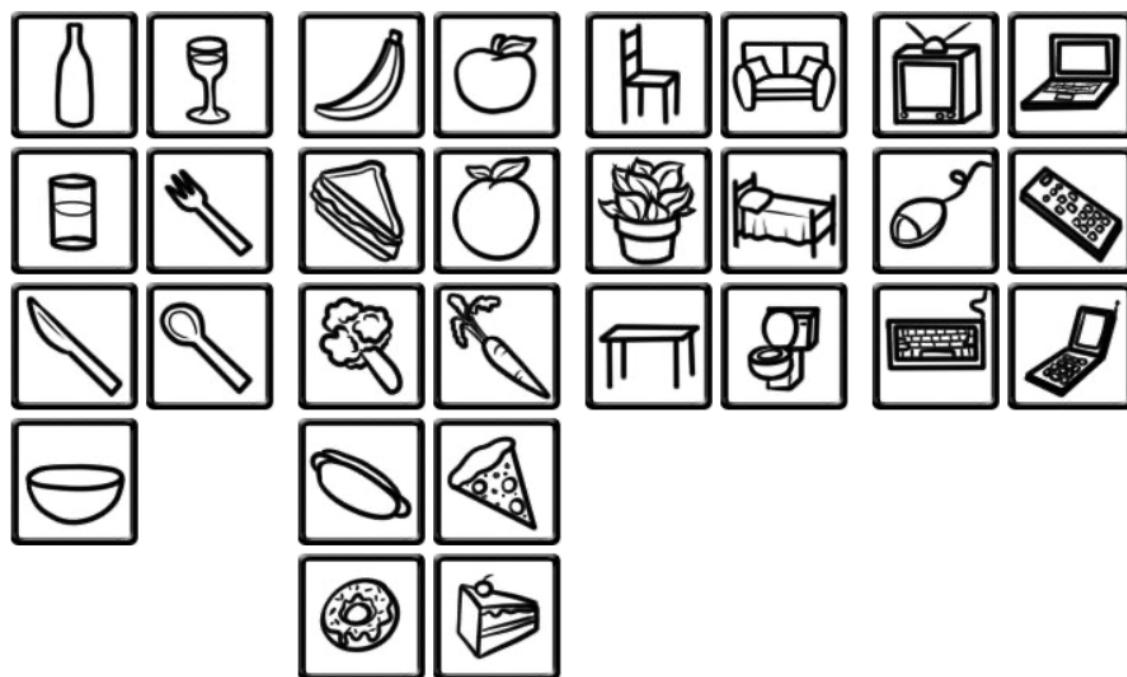


1

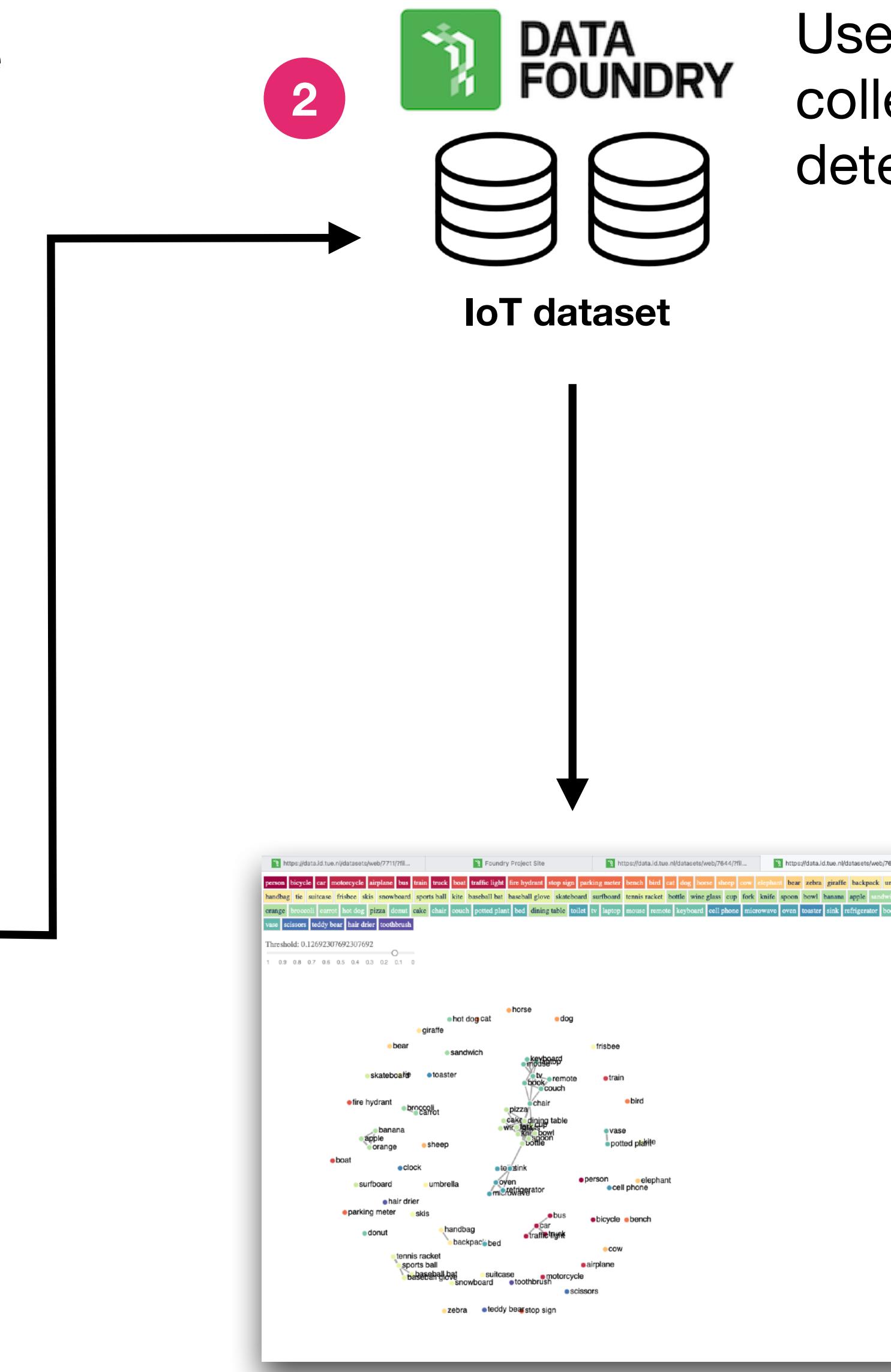
p5.js

ml5

Use DF to host your website  
that includes **an object  
detector using a pre-trained  
model**



Object Detector



Use DF to **store object data**  
collected from your object  
detector



3

existing dataset

Use DF to host your  
website that includes a  
**data visualization**

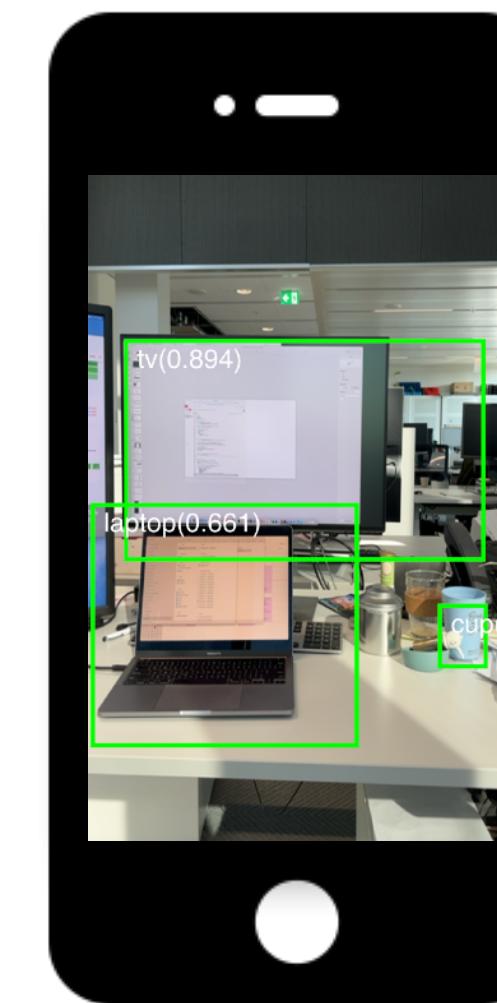


1

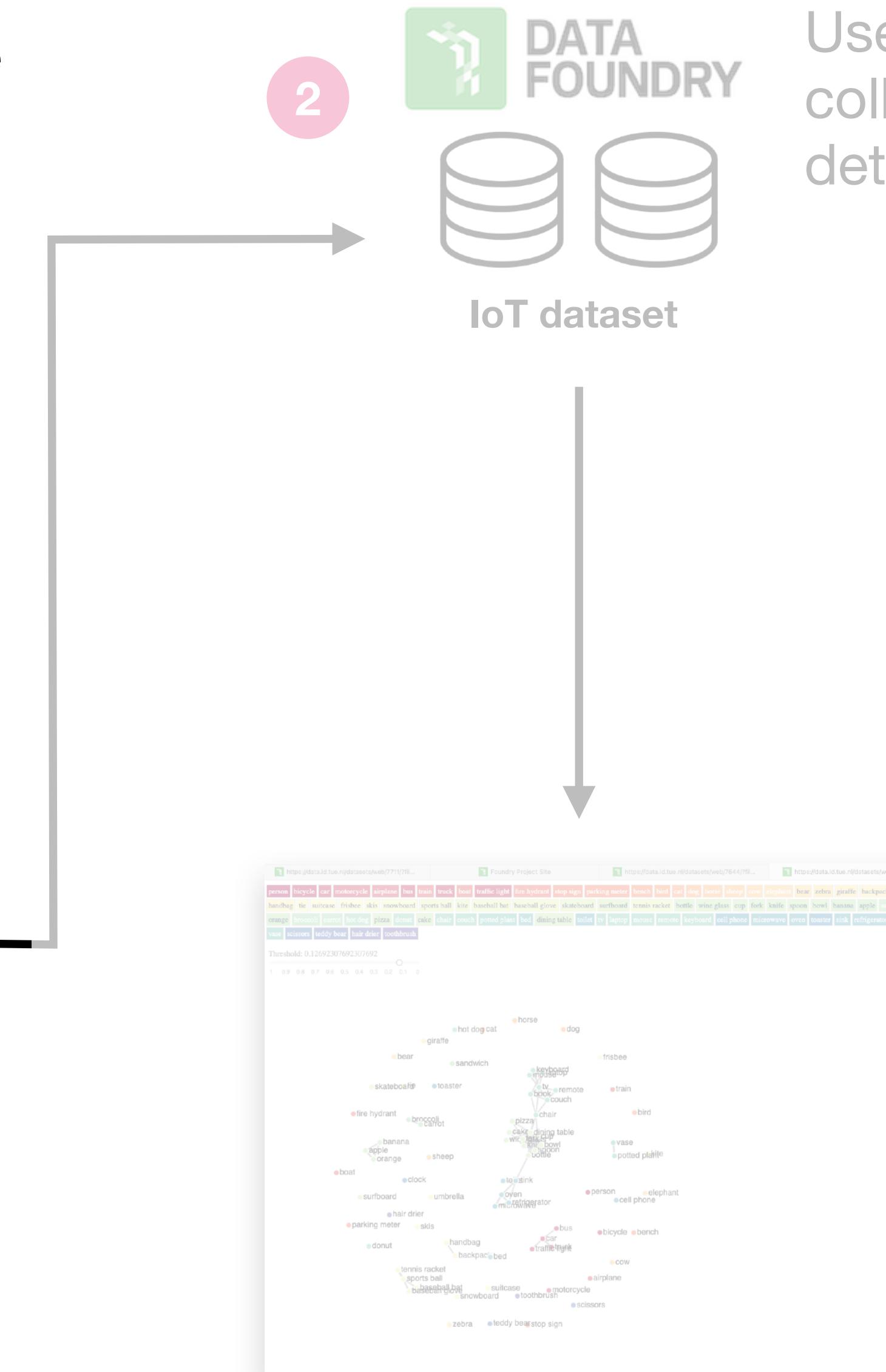
p5.js

ml5

Use DF to host your website  
that includes **an object  
detector using a pre-trained  
model**



Object Detector

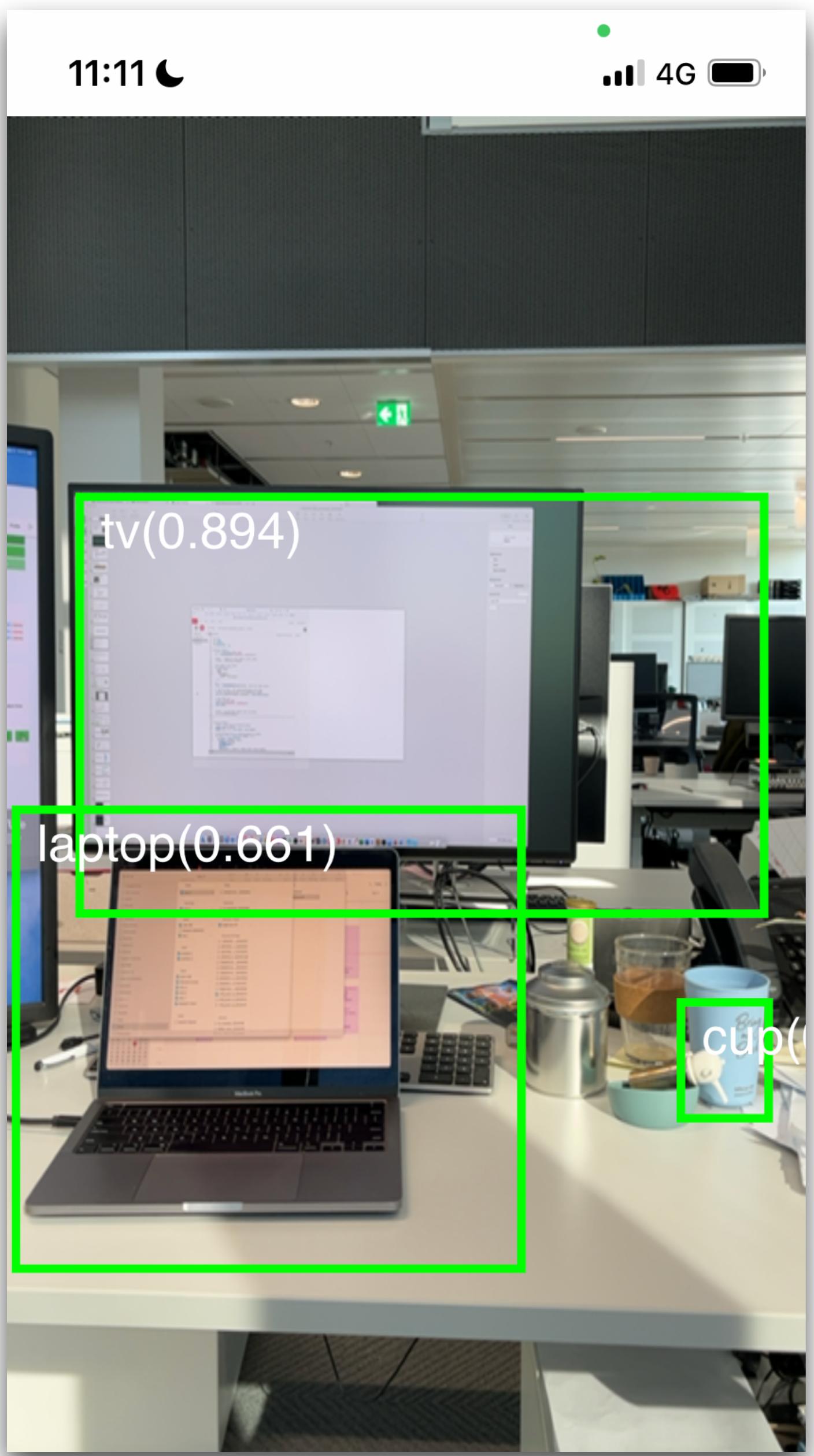
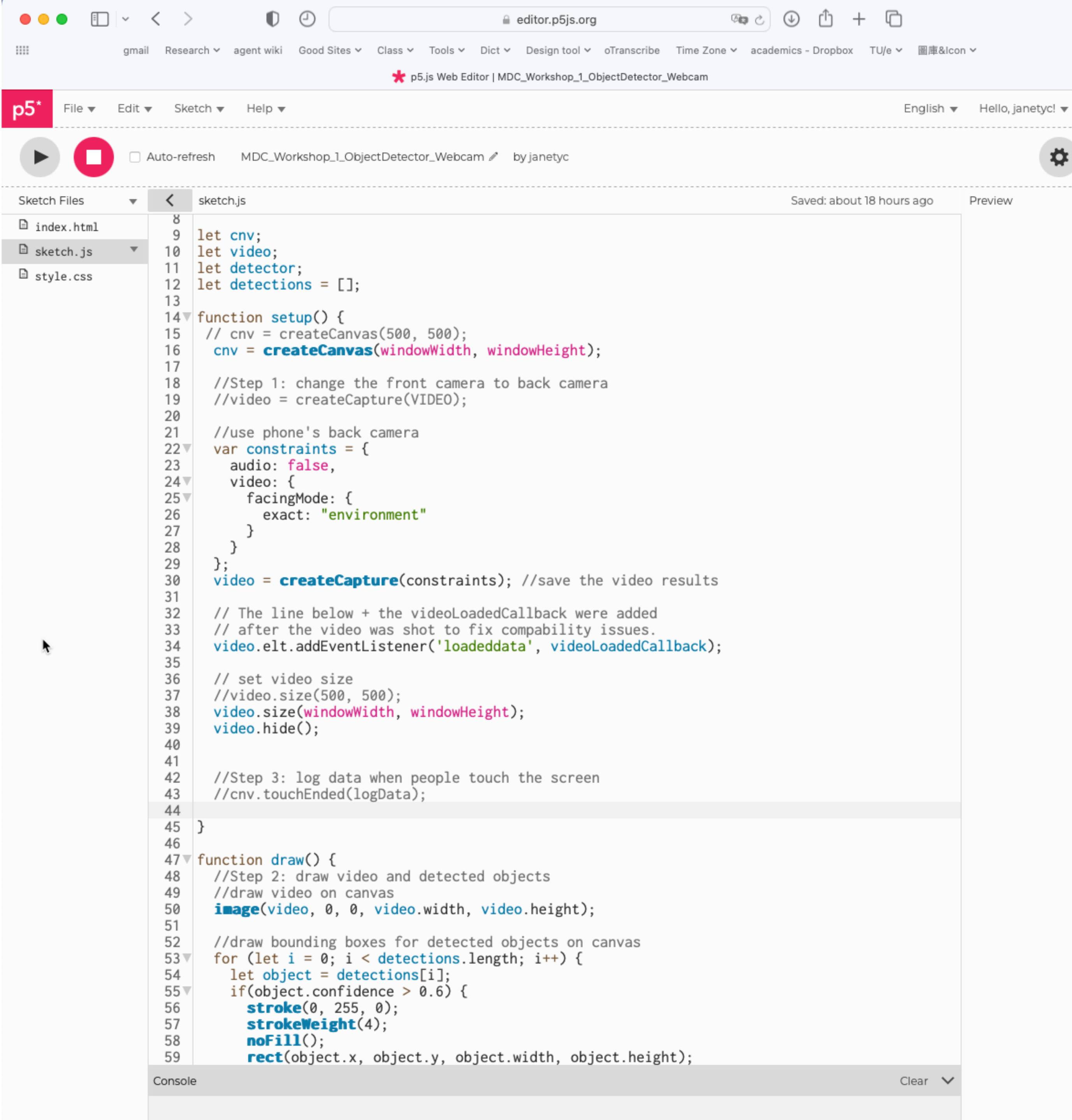


Use DF to **store object data**  
collected from your object  
detector



3

Use DF to host your  
website that includes a  
data visualization



```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Getting Started with ml5.js</title>
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <!-- p5 -->
    <script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/1.0.0/p5.min.js"></script>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/p5.js/1.0.0/addons/p5.sound.min.js"></script>
    <!-- ml5 -->
    <script src="https://unpkg.com/ml5@latest/dist/ml5.min.js"></script>
  </head>
```

```
<body>
  <script>
    function setup() {
      createCanvas(400, 400);
    }

    function draw() {
      background(200);
    }
  </script>
</body>
</html>
```

Or you could put the code into “sketch.js” and include it here

```
<body>
  <script src="sketch.js"></script>
</body>
```

```
9
10 let cnv;
11 let video;
12 let detector;
13 let detections = [];
14
15 function setup() {
16   cnv = createCanvas(windowWidth, windowHeight);
17   cnv.touchEnded(logData);
18   var constraints = {
19     audio: false,
20     video: {
21       facingMode: {
22         exact: "environment"
23       }
24     }
25   };
26   video = createCapture(constraints);
27
28 // The line below + the videoLoadedCallback were added
29 // after the video was shot to fix compatibility issues.
30 video.elt.addEventListener('loadeddata', videoLoadedCallback);
31
32 video.size(windowWidth, windowHeight);
33 video.hide();
34}
35
36
37 function draw() {
38   image(video, 0, 0, video.width, video.height);
39
40   for (let i = 0; i < detections.length; i++) {
41     let object = detections[i];
42     if(object.confidence > 0.6) {
43       stroke(0, 255, 0);
44       strokeWeight(4);
45       noFill();
46       rect(object.x, object.y, object.width, object.height);
47       noStroke();
48       fill(255);
49       textSize(24);
50       text(object.label+(object.confidence.toFixed(3)), object.x + 10, object.y + 24);
51     }
52   }
53 }
```

setup

draw

```
54
55 //solve loaded video issues
56 function videoLoadedCallback() {
57   print("Video Loaded");
58
59 //call model here
60 // Models available are 'cocossd', 'yolo'
61 detector = ml5.objectDetector('cocossd', modelReady);
62 }
63
64 function modelReady() {
65   detector.detect(video, gotDetections);
66 }
67
68 function gotDetections(error, results) {
69   if (error) {
70     console.error(error);
71   }
72   detections = results;
73   detector.detect(video, gotDetections);
74 }
```

objectDetector

Portfolio

My projects

Archive

Community

Collaborations

Subscriptions

Explore

Data tools

Guides

Support

Home

PROJECT STATUS

ADD PROJECT

## PROJECTS

## MY DIARY

post a diary via telegram bot

Janet Huang

EXISTING

## TELEGRAM DIARY

Post a diary via telegram bot

Janet Huang

DIARY MEDIA

## THING DIARY

collect object story

Janet Huang

DIARY MEDIA

## ARTIFICE WORKSHOP

starboard with ml5.js

Janet Huang

EXISTING

## ARTIFICE DEMO

demo

Janet Huang

EXISTING

## DCB150 DATA WORKSHOP

data workshop

Janet Huang

EXISTING

## [ARTIFICE] AI WORKSHOP: CUS...

Build your own thingCV using object detector

Janet Huang

IOT EXISTING

## [ARTIFICE] OBJECT HUNTER

object hunter for 80 objects

Janet Huang

EXISTING

## Data Foundry

Data Foundry is a platform that supports researchers to design intelligent interactive product.

It enables an easier way of collecting data, storing data, connecting data, and sharing data with other people. It also provides multiple useful tools for researchers to do rapid prototyping.

# Data Foundry: Existing Dataset

[ARTIFICE] AI WORKSHOP 2023: CUSTOMIZE THINGCV

**DATA FOUNDRY**

- My projects
- Data tools
- Documentation
- Support
- Profile
- Logout

**Diary Dataset**  
Data by participants as diary entries 📝

**Media Dataset**  
Media files (images) 🎥

**Existing Dataset**  
One or more files of an existing dataset (data, text, images, audio, html)

**Movement Dataset**  
Import one or more files of a movement dataset (GPX) 🏃

**Experience Sampling Dataset**  
Import one or more files of an experience sampling dataset (created by PIEL)

EXISTING Web access

ADD DATASET  
choose a dataset to add +

RESEARCHERS  
Janet Huang

EDIT PROJECT

PROJECT ID: 4197

Public

Creation: 2023-10-01 -

REQUEST

Portfolio  
My projects  
Archive  
Community  
Collaborations  
Subscriptions  
Explore  
Data tools  
Guides  
Support

Home > [DCM210] AI Workshop: Customized your thingCV > Object Detector using ml5.js

**id: 7641 EXISTING PUBLIC MIT**

## OBJECT DETECTOR USING ML5.JS

2023-03-01 2024-03-01

an object detector that can detect 80 objects through a camera

INFO

License: MIT

VIEW DATA  
DOWNLOAD  
UPLOAD FILE(S)

events

02 AM day

“sketch.js” is the main file we are working on, including init() and draw()

**DATASET FILES**

File name	Description	Uploaded	Action
sketch.js	object detector	Mar 01 at 14:27	<a href="#">edit</a>   <a href="#">delete</a>
style.css	object detector	Mar 01 at 14:27	<a href="#">edit</a>   <a href="#">delete</a>
index.html	object detector	Mar 01 at 14:27	<a href="#">edit</a>   <a href="#">delete</a>

CONFIGURATION

CSV/JSON TOK... WEB-ACCESS OOCST STREAM

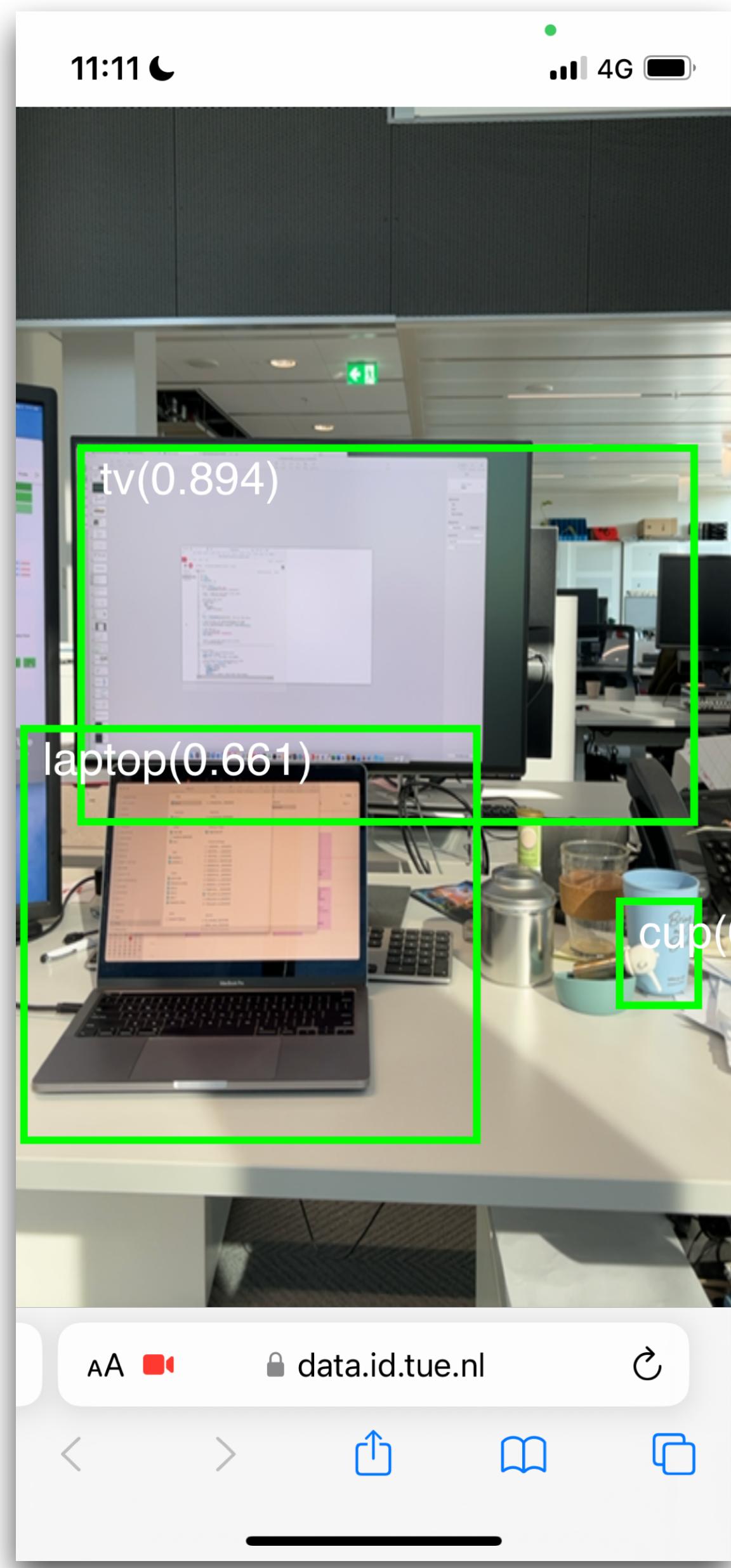
Access the data as a website

As the research team, you can always access the dataset as a [website](#), if the dataset is [active](#). (This is independent from public accessibility.)

This dataset is accessible as a public website with the following link:

<https://data.id.tue.nl/web/dStvaTU4ZGZKVVZLeGtPNU5FTVVlQWs1MFFidk1xM1ZQUVlp>

ACTIVATE WEB ACCESS DISABLE WEB ACCESS



## Exercise 2: Build a object detector (20 mins)

Step 1: Create you DF project

Step 2: Create “an existing dataset”

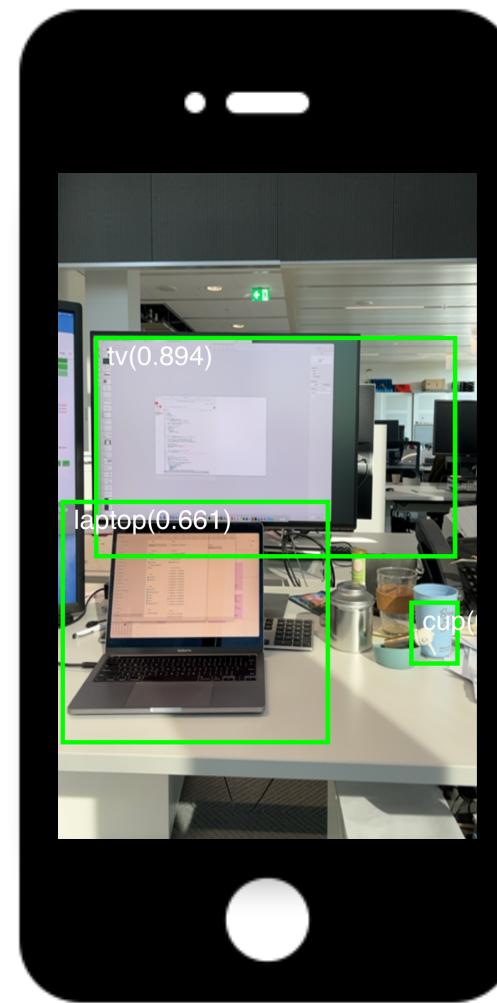
Step 3: Download the source code and submit the code  
to the existing dataset

Step 4: Find the link and play with your object detector



Use DF to host your website  
that includes **an object  
detector using a pre-trained  
model**

80 everyday objects



Object Detector

**Share your thoughts with your peers!!**

# **Break**

# **Session II-(2) : Store data in DF**

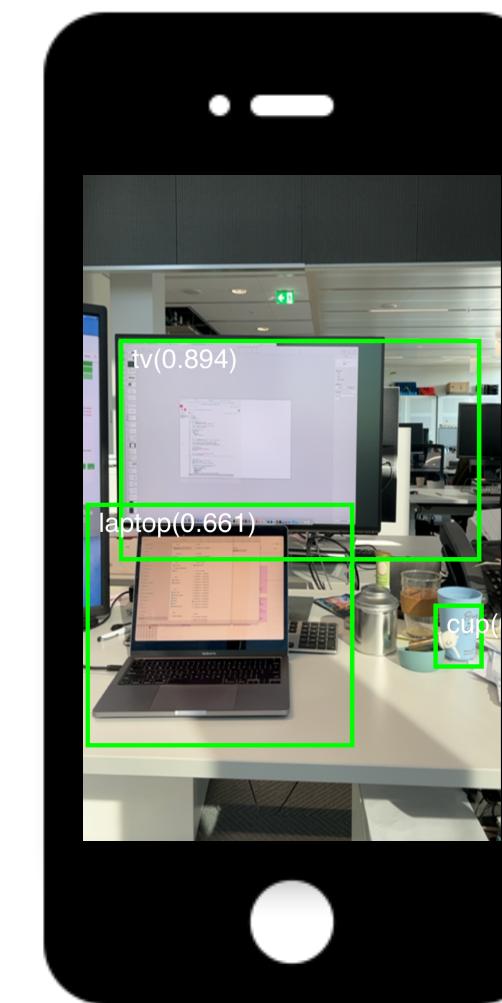


1

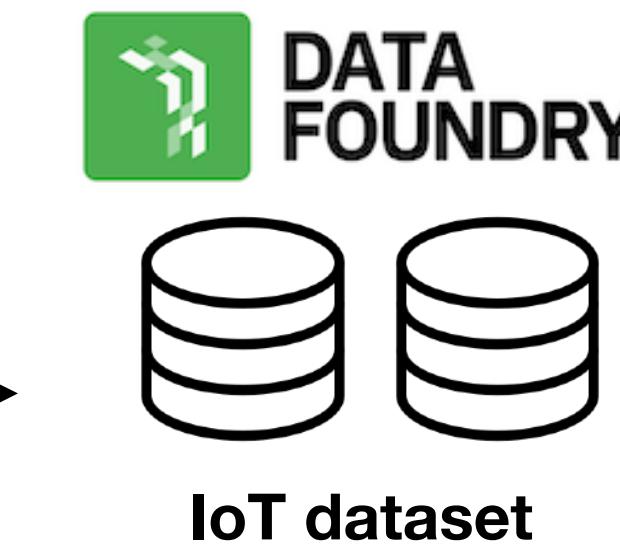
p5.js

ml5

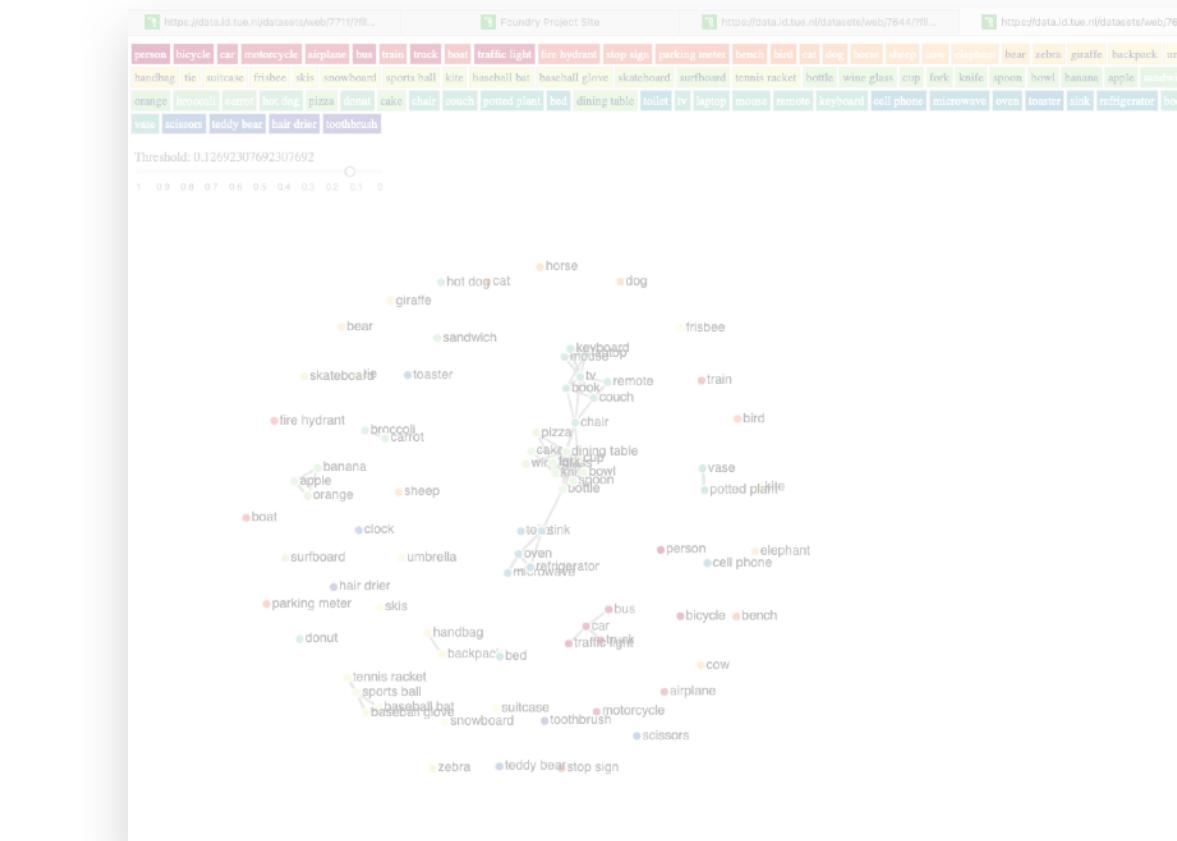
Use DF to host your website  
that includes **an object  
detector using a pre-trained  
model**



Object Detector



Use DF to **store object data**  
collected from your object  
detector



3



Use DF to host your  
website that includes a  
**data visualization**

# Data Foundry: IoT Dataset

The screenshot shows the Data Foundry web application interface. On the left is a sidebar with links: Portfolio, My projects, Archive, Community (which is highlighted in green), Collaborations, Subscriptions, Explore, Data tools, Guides, and Support. The main area has a header with a search icon, profile icon, and a 'Profile' link. Below the header, a message says "Build your own thingCV using object detector". A central modal window titled "CHOOSE A DATASET TYPE" lists several options:

- Script**: Script to automate stuff 🔃
- FitBit Dataset**: Data from connected FitBit devices 🏃
- GoogleFit Dataset**: Data from connected GoogleFit devices 🏃
- IOT Dataset**: Data from connected devices 🌐
- Entity Dataset**: JSON Database for variable data 🏛
- Form Dataset**: Data is collected by a simple form 📝
- Annotation data set**: Data by researcher as annotations 🧩
- Diary Dataset**: Data by participants as diary entries 📇

## CONFIGURATION

HTTP-POST

OOCSI STREAM

CSV/JSON TOKEN LINK

OOCSI STREAM

## HTTP POST requests for this dataset (ID: 9330)

POST requests are easy to send from a wide variety of platforms and technologies. Find a list of possible options on the right side.

To allow these requests to store data in the dataset, you need to send them with a special token:

Token

N3pCQTRjbUlIdFdWMXZkTmJpOFBIMmlCOGICRnhPUGRhTd1amt2TnhDUT0=

GENERATE    DELETE

Generate a token to activate this inlet, delete the token to deactivate.

## HTTP POST Diagnostics



## How to use this?

## JavaScript

```
var data = { ... your data goes here ... }
var jsonBody = {
  activity: 'ACTIVITY',
  source_id: 'DEVICE_ID',
  data: JSON.stringify(data)
}
fetch('https://data.id.tue.nl/datasets/ts/record/9330/N3pCQTRjbUlIdFdWMXZkTmJpOFBIMmlCOGICRnhPUGRhTd1amt2T'
  method: 'POST',
  mode: 'cors',
  cache: 'no-cache',
  headers: {
    'Content-Type': 'application/json'
  },
  redirect: 'follow',
  referrerPolicy: 'no-referrer',
  body: JSON.stringify(jsonBody)
);
```

Replace DEVICE\_ID by the refId attribute of any device in the project. Use any ACTIVITY or leave empty. Provide data in JSON format, such as  
`{"parameter1": 2, "parameter2": 5}`

```
92
93 function logData() {
94   final_detections = detections
95   objectList = getDetectionObjects(final_detections);
96
97   let data= {
98     time: +(new Date),
99     detections: objectList
100   }
101
102   let jsonBody = {
103     activity: 'Customize_ThingCV',
104     data: JSON.stringify(data)
105   }
106
107   fetch('https://data.id.tue.nl/datasets/ts/record/7642/MzIySFJHSFNqUjkzMHVWSmovSS9DMEhkMitEY25GV3'
108     method: 'POST',
109     mode: 'cors',
110     cache: 'no-cache',
111     headers: {
112       'Content-Type': 'application/json'
113     },
114     redirect: 'follow',
115     referrerPolicy: 'no-referrer',
116     body: JSON.stringify(jsonBody)
117   );
118
119 }
```

data.id.tue.nl

gmail Research agent wiki Good Sites Class Tools Dict Design tool oTranscribe Time Zone academics - Dropbox TU/e 圖庫&Icon

Dataset table view

Home > [ARTIFICE] AI Workshop 2023: Customize ThingCV > Object data > Data table

My projects

Data tools

Documentation

Show entries

Support

Check whether your data is recorded successfully

Search:

OBJECT DATA

id	ts	pp1	pp2	pp3	detections	time
1	2023-10-02T16:56:03				laptop, tv, tv	1696258563822
2	2023-10-02T16:56:04				laptop, tv, cup, tv	1696258564523
3	2023-10-02T16:56:04				laptop, tv, tv	1696258564827
4	2023-10-02T16:56:05				laptop, tv, tv	1696258565008
5	2023-10-02T16:56:05				laptop, tv, tv	1696258565191
6	2023-10-02T16:56:05				laptop, tv, tv	1696258565374
7	2023-10-02T16:56:05				laptop, tv, tv	1696258565517
8	2023-10-02T16:56:10				tv	1696258570971
9	2023-10-02T16:56:11				tv	1696258571168
10	2023-10-02T16:56:11				tv	1696258571399
11	2023-10-02T16:56:11				tv	1696258571571

Profile

Logout

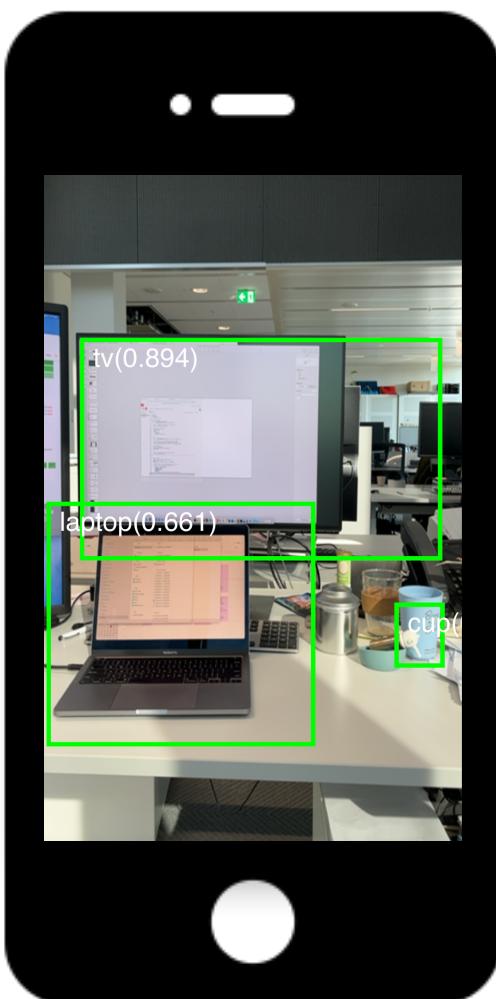
## Exercise 3: Store object data to DF

Step 1: Create an IoT dataset

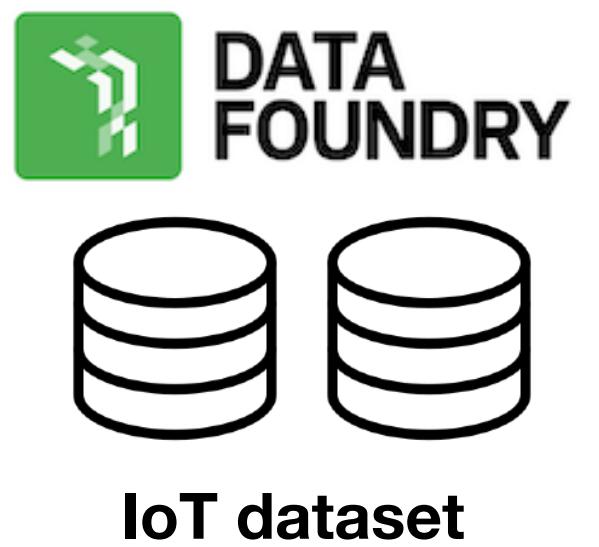
Step 2: Find the HTTP-POST link under the IoT dataset storing your object data

Step 3: Create a mouse-clicked event to upload your object data through the HTTP-POST link

Step 4: Check whether your data been stored on DF successfully



Object Detector



Use DF to **store object data** collected from your object detector



1

p5.js

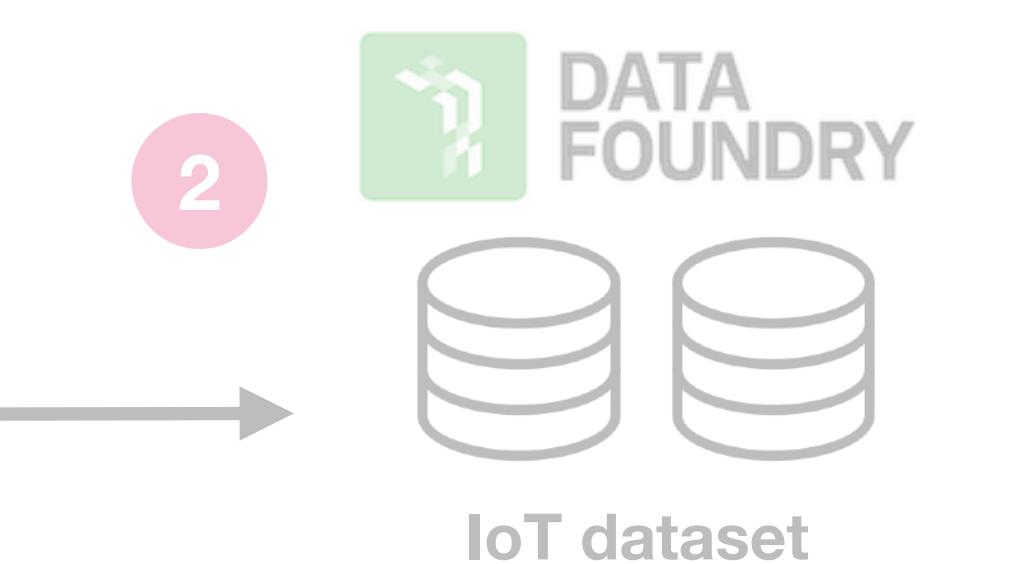
ml5

80 everyday objects



Object Detector

Use DF to host your website  
that includes **an object  
detector using a pre-trained  
model**



Use DF to **store object data**  
collected from your object  
detector



3

existing dataset

Use DF to host your  
website that includes a  
**data visualization**

# **Session II-(3) : Data Visualizer**

# Data Foundry: Existing Dataset

[ARTIFICE] AI WORKSHOP 2023: CUSTOMIZE THINGCV

**Diary Dataset**  
Data by participants as diary entries 📋

**Media Dataset**  
Media files (images) ⚡

**Existing Dataset**  
One or more files of an existing dataset (data, text, images, audio, html)

**Movement Dataset**  
Import one or more files of a movement dataset (GPX) 🏃

**Experience Sampling Dataset**  
Import one or more files of an experience sampling dataset (created by PIEL)

EXISTING Web access

ADD DATASET  
choose a dataset to add +

RESEARCHERS  
Janet Huang

EDIT PROJECT

PROJECT ID: 4197

public

creation: 2023-10-01 -

REQUEST

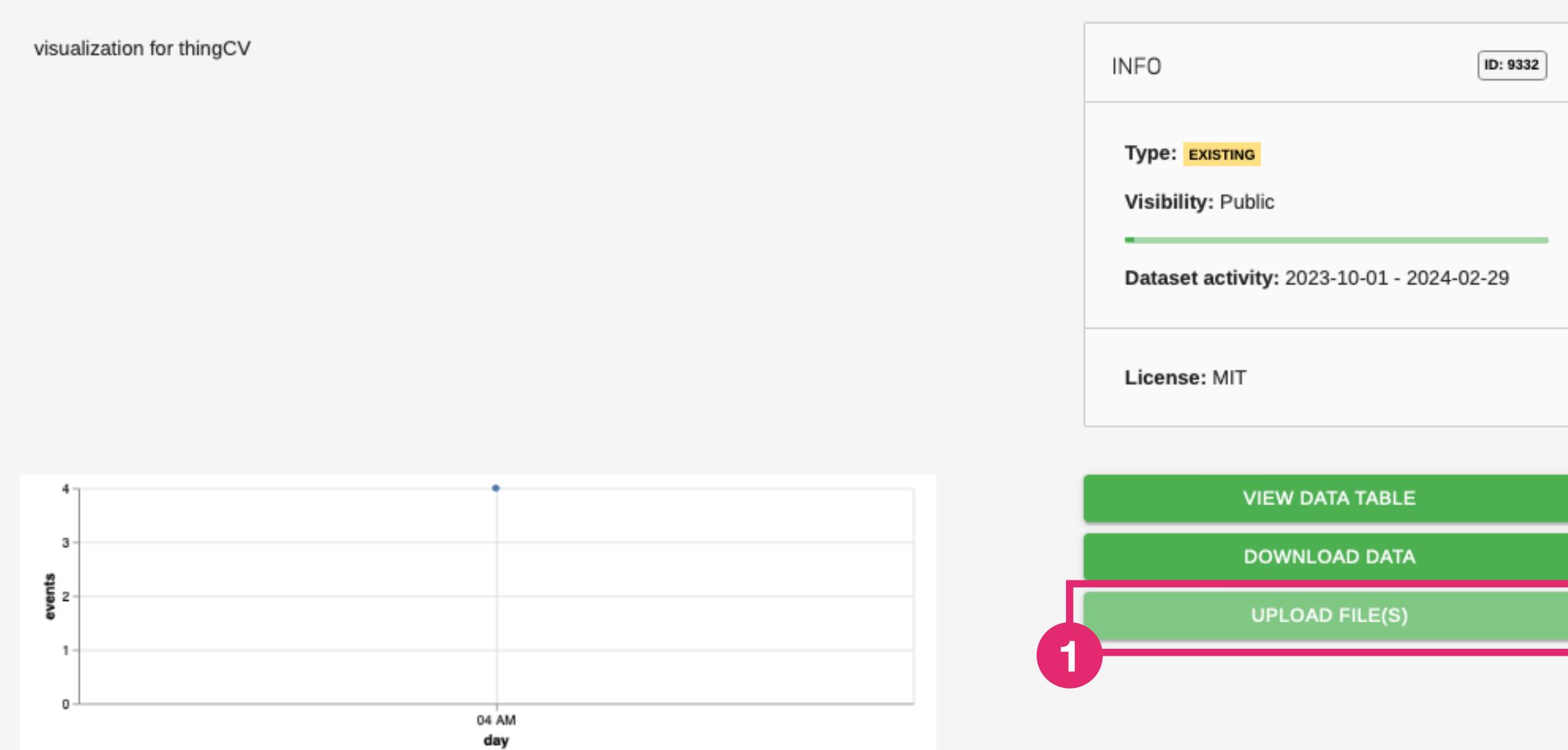
Profile

Logout

## THINGCV

visualization for thingCV

EDIT DATASET



## 2 DATASET FILES

File name	Description	Uploaded	Actions
object_graph.json (open in tab)	thingCV	Oct 02 at 16:58	<a href="#">download</a>   <a href="#">edit</a>   <a href="#">delete</a>
jLouvain.js (open in tab)	thingCV	Oct 02 at 16:58	<a href="#">download</a>   <a href="#">edit</a>   <a href="#">delete</a>
jsnetworkx.js (open in tab)	thingCV	Oct 02 at 16:58	<a href="#">download</a>   <a href="#">edit</a>   <a href="#">delete</a>
index.html (open in tab)	thingCV	Oct 02 at 16:58	<a href="#">download</a>   <a href="#">edit</a>   <a href="#">delete</a>

CONFIGURATION 3

CSV/JSON TOKEN LINK

WEB-ACCESS 4

OOCST STREAM

Access the data as a website

As the research team, you can always access the dataset as a [website](#), if the dataset is [active](#). (This is independent from public accessibility.)

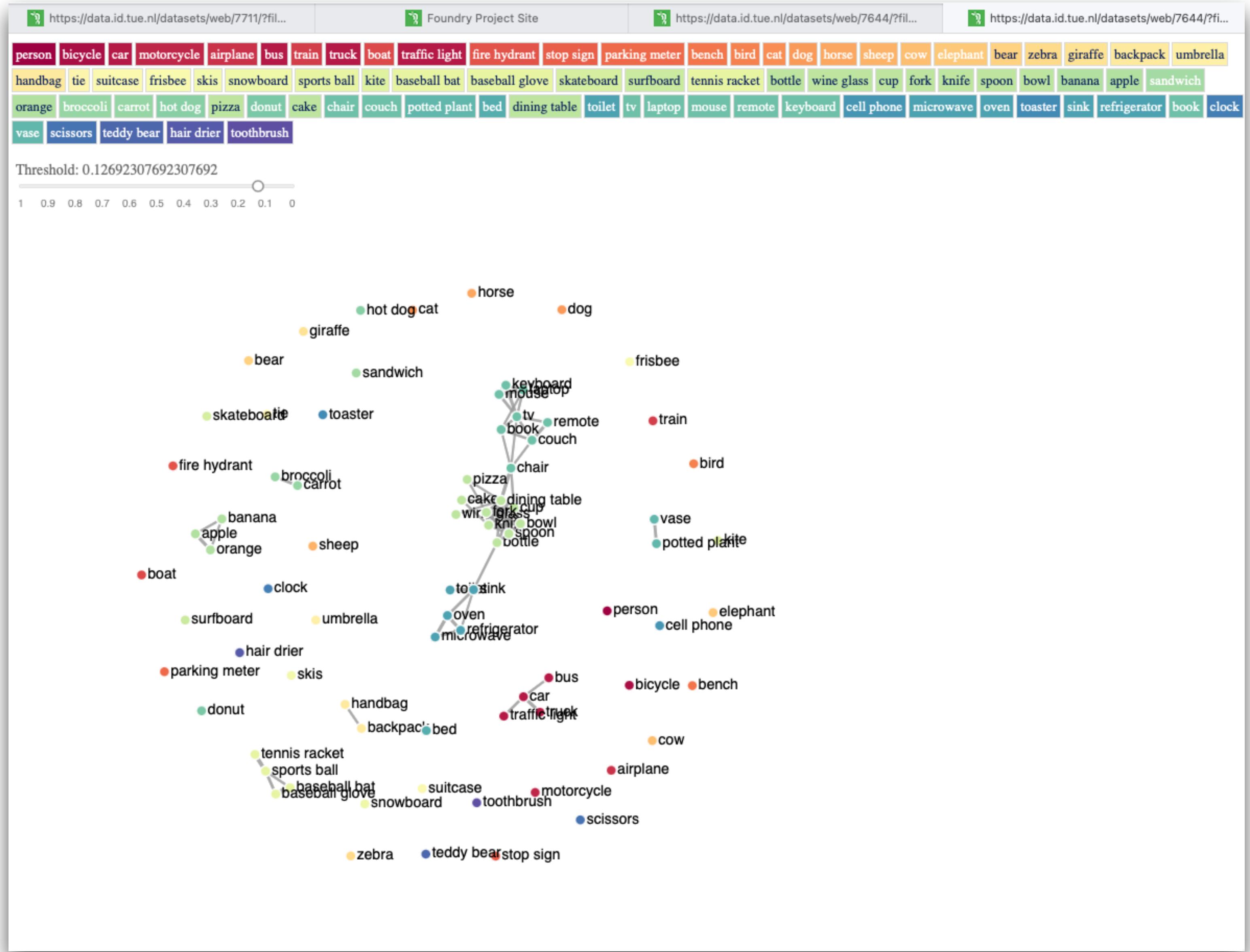
This dataset is accessible as a public website with the following link:

[5](https://data.id.tue.nl/web/elZBQWxRd1F5UDN3N1ExRHkY0VqZ1JCV2FCVThUbG1QZ2htRwqTm9uTT0=)

ACTIVATE WEB ACCESS

DISABLE WEB ACCESS

This screenshot shows the 'CONFIGURATION' section of the dataset page. It includes links for CSV/JSON TOKEN LINK, WEB-ACCESS (which is highlighted with a red box and has a red circle with '4' over it), and OOCST STREAM. Below this is a section for accessing the data as a website, which includes a link to a public website (highlighted with a red box and has a red circle with '5' over it). At the bottom are 'ACTIVATE WEB ACCESS' and 'DISABLE WEB ACCESS' buttons.



## Data visualizer

- use DF existing dataset
- input data

[object\\_graph.json \(open in tab\)](#)

- source code

[jLouvain.js \(open in tab\)](#)

[jsnetworkx.js \(open in tab\)](#)

[index.html \(open in tab\)](#)

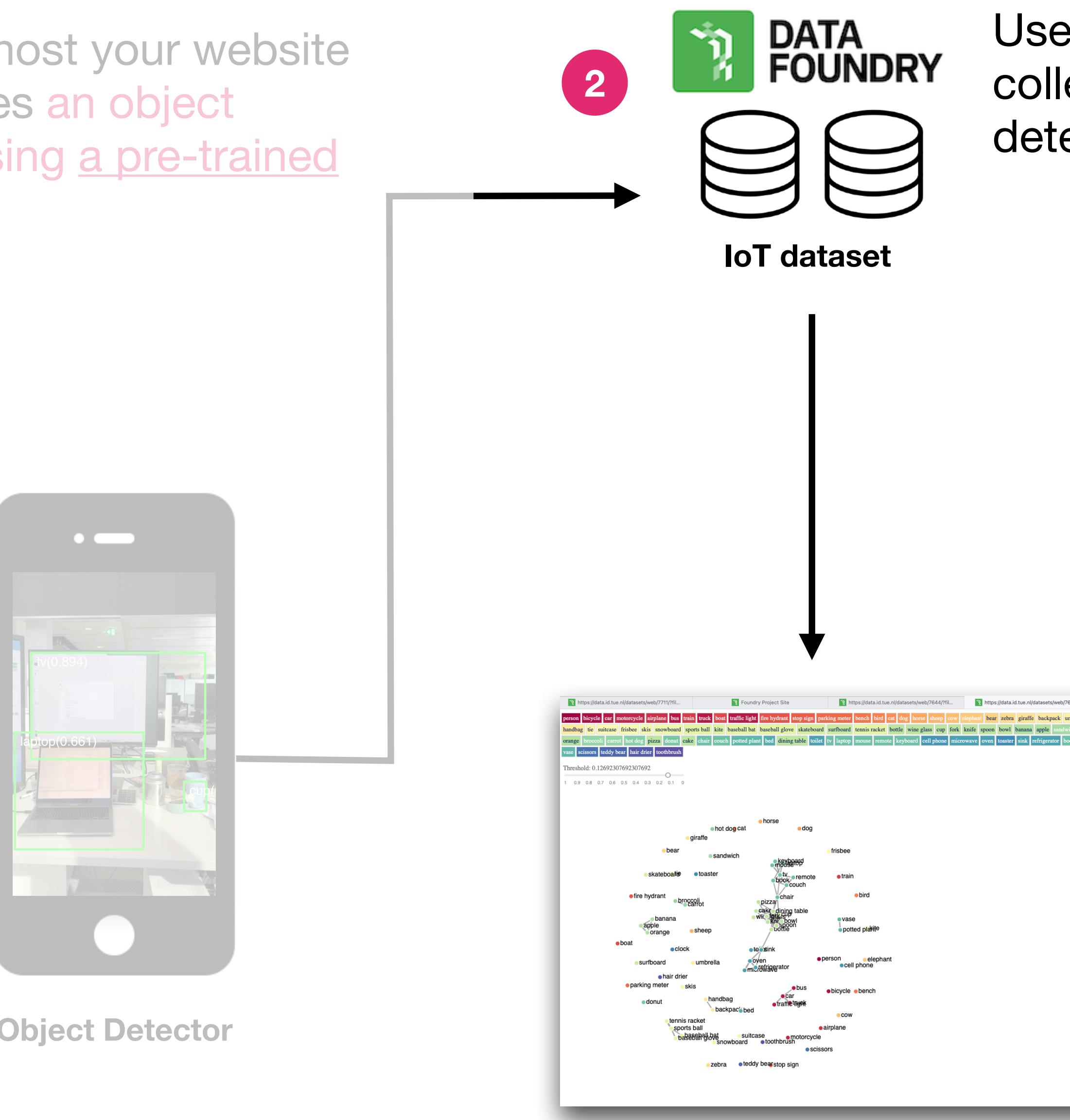


# 80 everyday objects



## Object Detector

Use DF to host your website  
that includes an object  
detector using a pre-trained  
model



Use DF to store object data collected from your object detector



## **existing dataset**

3

Use DF to host your website that includes a data visualization

# Make a connection between IoT dataset and web interface

Home > [ARTIFICE] AI Workshop 2023: Customize ThingCV > Object data

## ~ OBJECT DATA

EDIT DATASET

CONFIGURATION

1 click CSV/JSON tab

Download and live-access the data as a CSV or JSON file (public link)

You can download the dataset [directly](#) anytime, if you are logged in. If you want to import the data in external software, you can generate a [token](#) link that is publicly accessible. **Be careful: anyone with the link will have access to the data, even outside TU/e. Please ensure that there is no personal data contained in this dataset and that you comply with the statements that you have made in your informed consent form.** To invalidate or revoke a link, just delete it or generate a new one below:

CSV download ([click to download](#))

<https://data.id.tue.nl/datasets/downloadPublic/ZnU4YTBXVzc3UDBPVEw1NW5GdHVkcmQzYzByeW1ldUR3UERTclpsbh>

3 copy JSON link

JSON download ([click to download](#))

<https://data.id.tue.nl/datasets/downloadPublic/json/ZnU4YTBXVzc3UDBPVEw1NW5GdHVkcmQzYzByeW1ldUR3UERTclpsbh>

2 click the button to generate token link

GENERATE TOKEN LINK DELETE

For a mobile dashboard view, use [link](#) or click here:

How to use this?

Python

Home > [ARTIFICE] AI Workshop 2023: Customize ThingCV > thingCV > Edit file

## EDIT FILE

Edit contents of 'index.html' below, press 'SAVE' to save your changes.

```
220 //here you need to think of how to get data from the dataset via API
221 var readDataFromDF = async function() {
222   data_url = "https://data.id.tue.nl/datasets/downloadPublic/json/ZnU4YTBXVzc3UDBPVEw1NW5GdHVkcmQzYz
223   var jdata = await fetch(data_url);
224
225   var jsonData = await jdata.json();
226   var object_data = [];
227
228   for(d in jsonData){
229     if(jsonData[d].detections != ""){
230       object_data.push(jsonData[d].detections.split(","));
231     }
232   }
233
234   graph = calculateGraph(object_data);
235   return graph;
236 };
237
238 function calculateGraph(data){
239   obj_img_map = {}
240   data.forEach((obj_list, indx) => {
241     obj_list.forEach(obj => {
242       if(obj in obj_img_map){
243         obj_img_map[obj].push(indx)
244       }else{
245         obj_img_map[obj] = []
246         obj_img_map[obj].push(indx)
247       }
248     })
249   })
250 }
```

4 paste the JSON link here

# Change input from reading a local JSON file to reading data from DF

DATA FOUNDRY

My projects

Data tools

Documentation

Show entries

Support

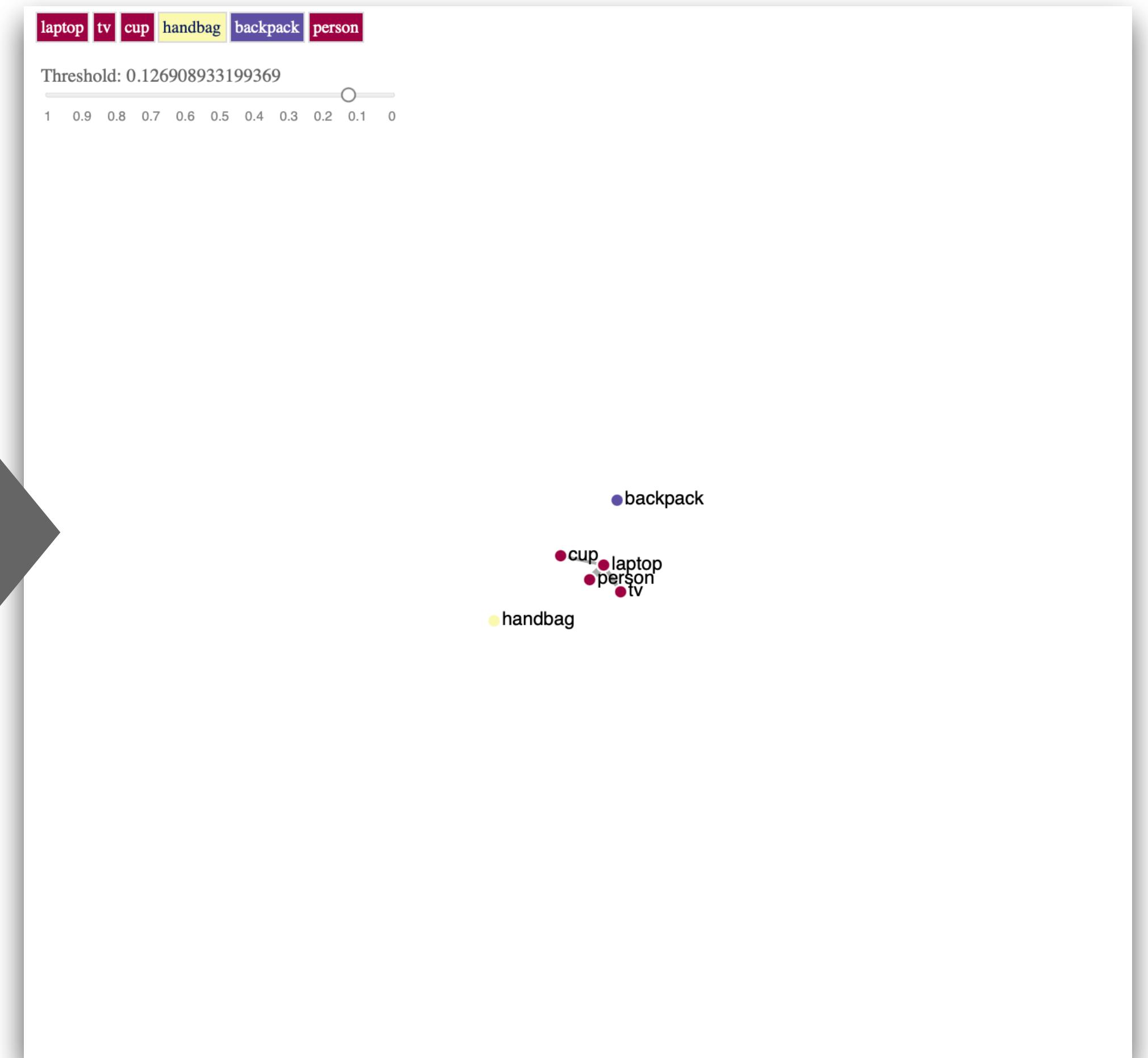
Profile

Logout

Home > [ARTIFICE] AI Workshop 2023: Customize ThingCV > Object data > Data table

## OBJECT DATA

	<b>id</b>	<b>ts</b>	<b>pp1</b>	<b>pp2</b>	<b>pp3</b>	<b>detections</b>	<b>time</b>
1	2023-10-02T16:56:03					laptop, tv, tv	1696258563822
2	2023-10-02T16:56:04					laptop, tv, cup, tv	1696258564523
3	2023-10-02T16:56:04					laptop, tv, tv	1696258564827
4	2023-10-02T16:56:05					laptop, tv, tv	1696258565008
5	2023-10-02T16:56:05					laptop, tv, tv	1696258565191
6	2023-10-02T16:56:05					laptop, tv, tv	1696258565374
7	2023-10-02T16:56:05					laptop, tv, tv	1696258565517
8	2023-10-02T16:56:10					tv	1696258570971
9	2023-10-02T16:56:11					tv	1696258571168
10	2023-10-02T16:56:11					tv	1696258571399
11	2023-10-02T16:56:11					tv	1696258571571



# Exercise 4: Data Visualizer

Step 1: Create an existing dataset

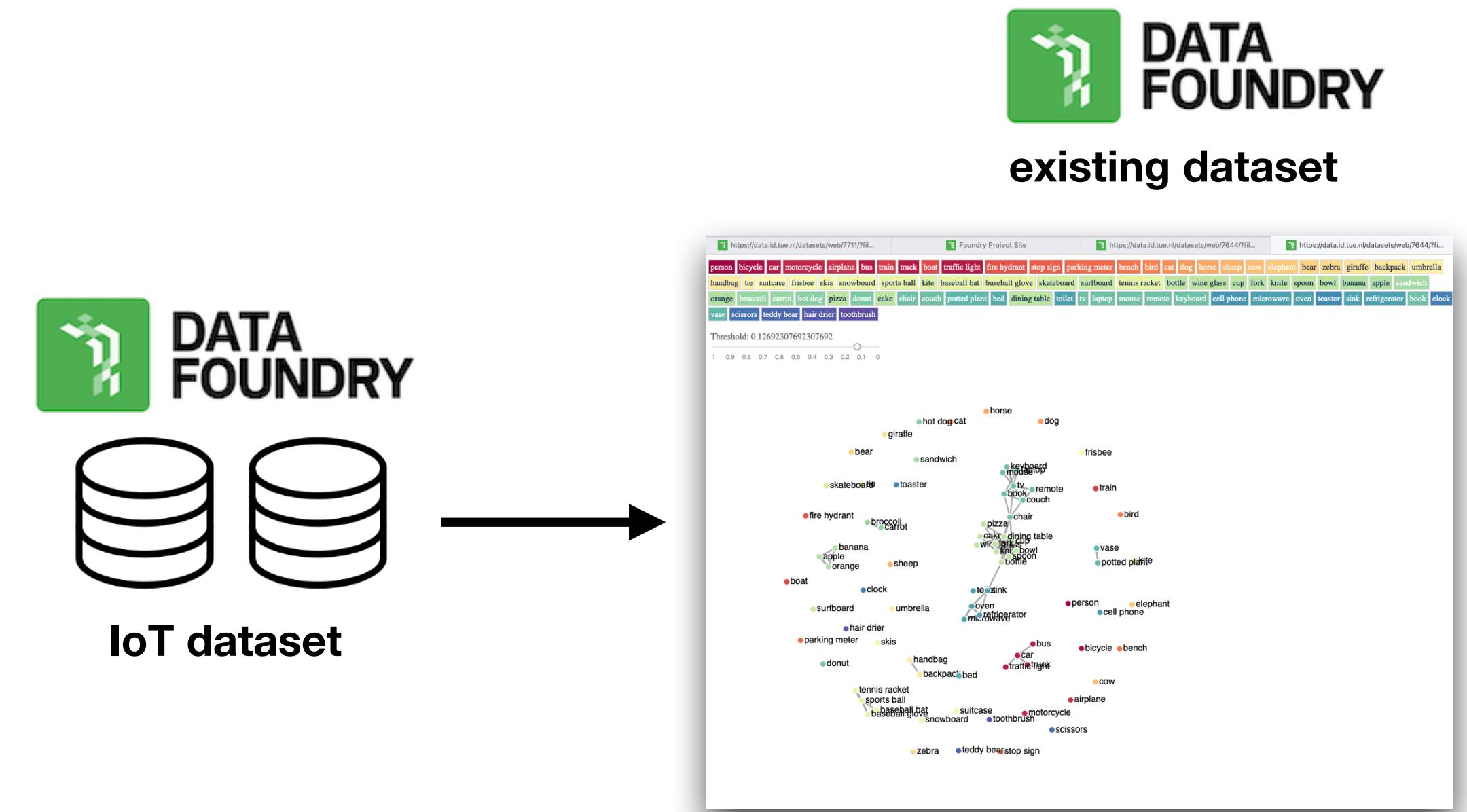
Step 2: Download the source code and upload the code to the existing dataset

Step 3: Check whether the default data visualization is live through the website link

Step 4: Find and copy the data link (JSON link) under the object dataset

Step 5: change the code in “index.html” under data visualizer (in the existing dataset) and change input method (read input data from a json file to the JSON link)

Step 6: Check whether your data visualization that display the actual data stored from the IoT dataset (i.e., object data)



Use DF to host your website that includes a **data visualization**

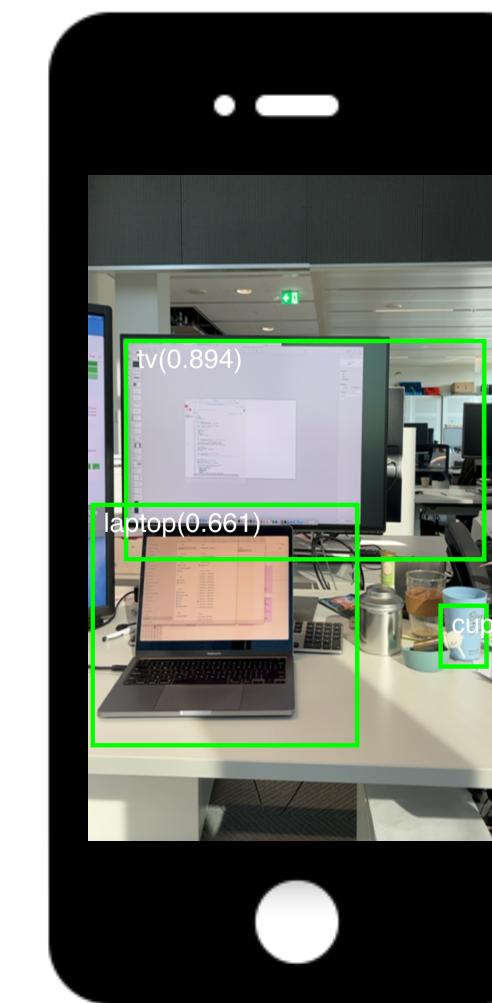


1

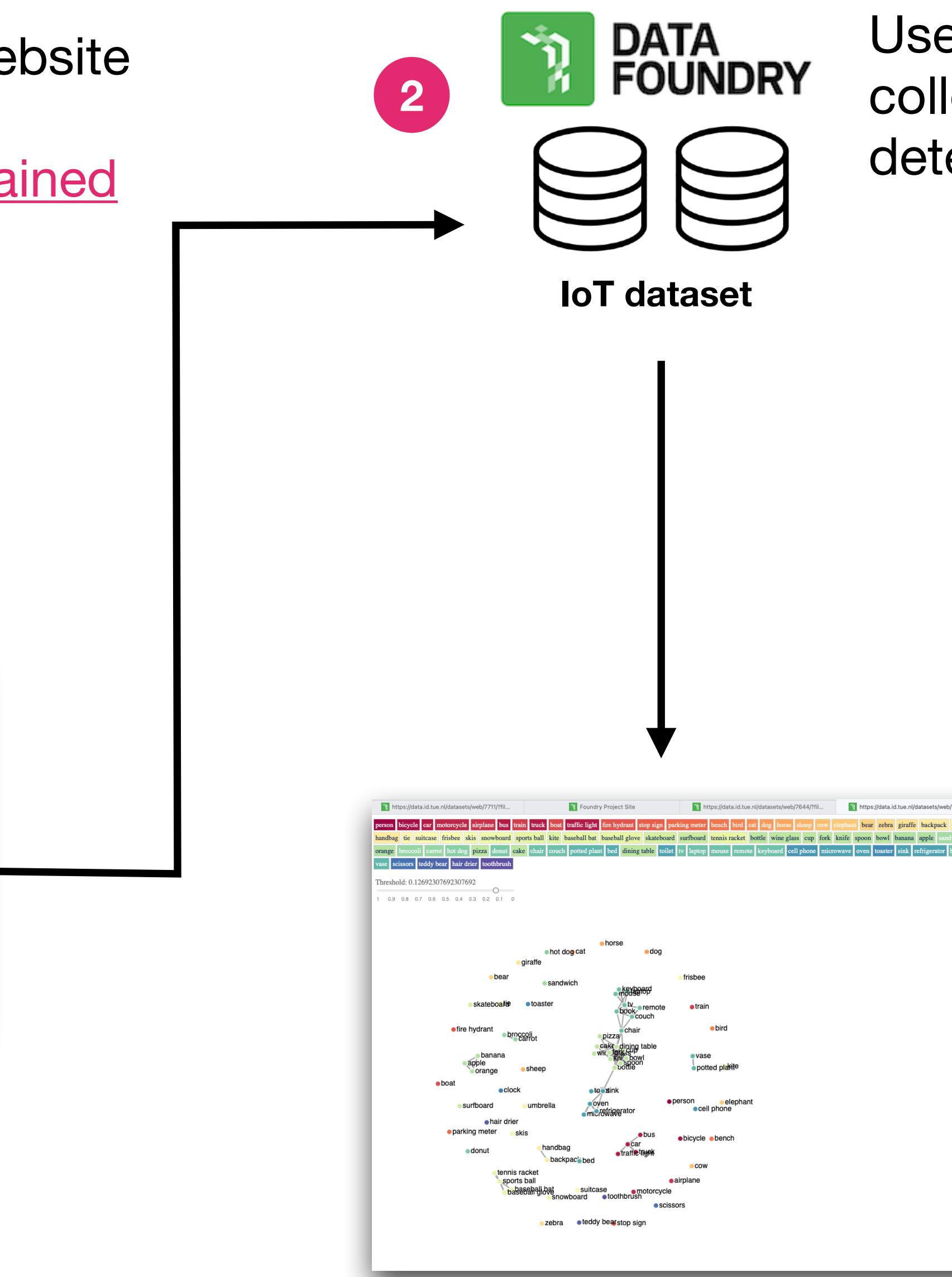
p5.js

ml5

80 everyday objects



Object Detector



Use DF to **store object data** collected from your object detector

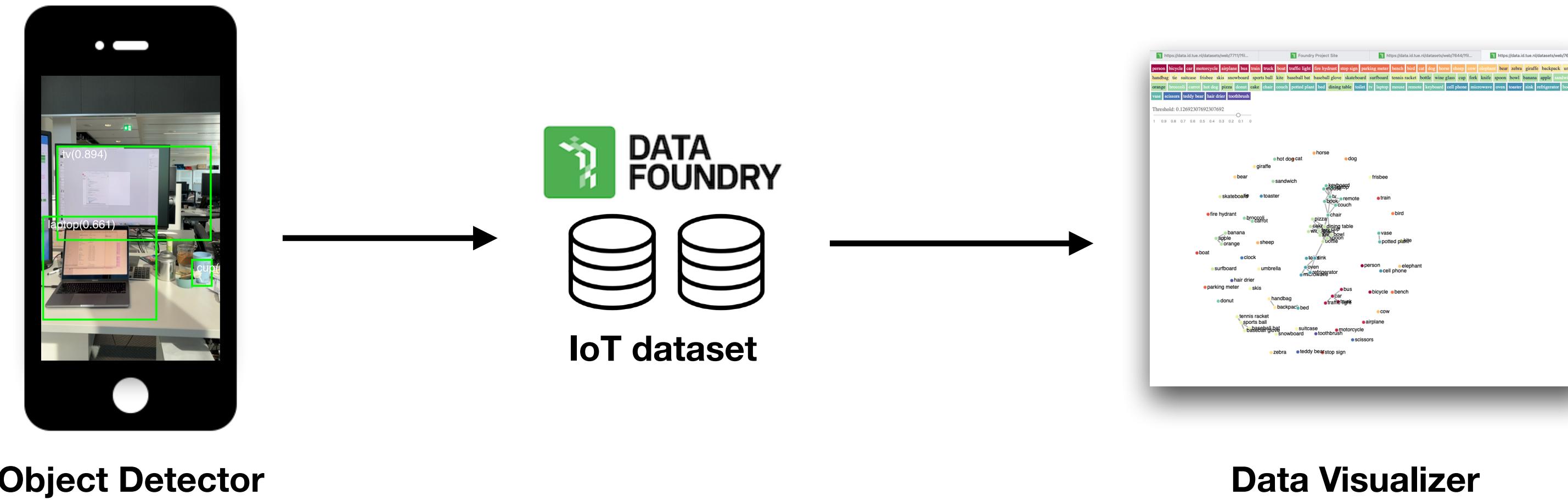


3

existing dataset

Use DF to host your website that includes a **data visualization**

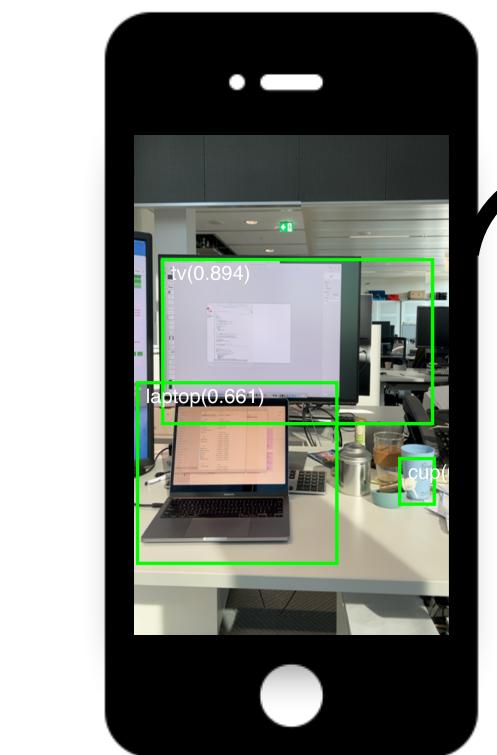
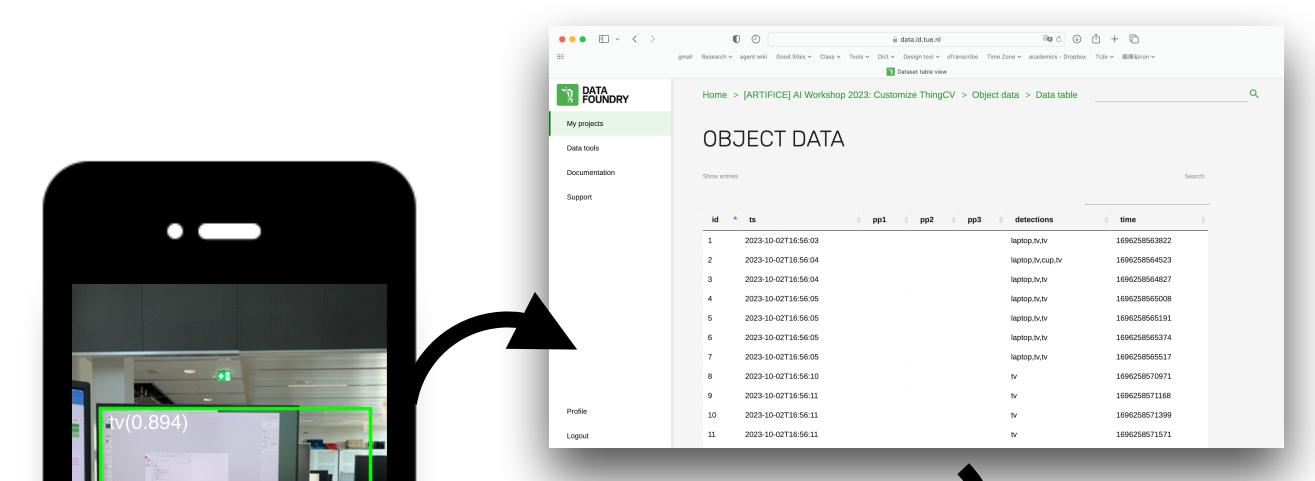
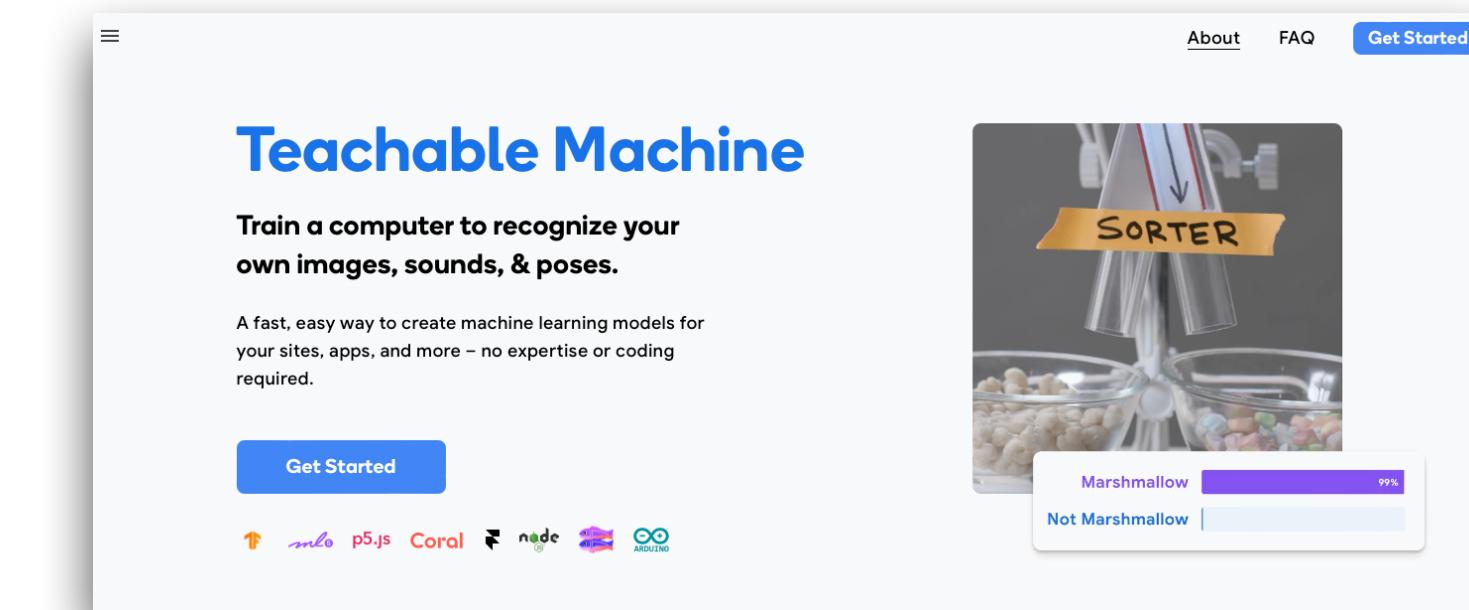
**Play with your own thingCV and celebrate! :)**



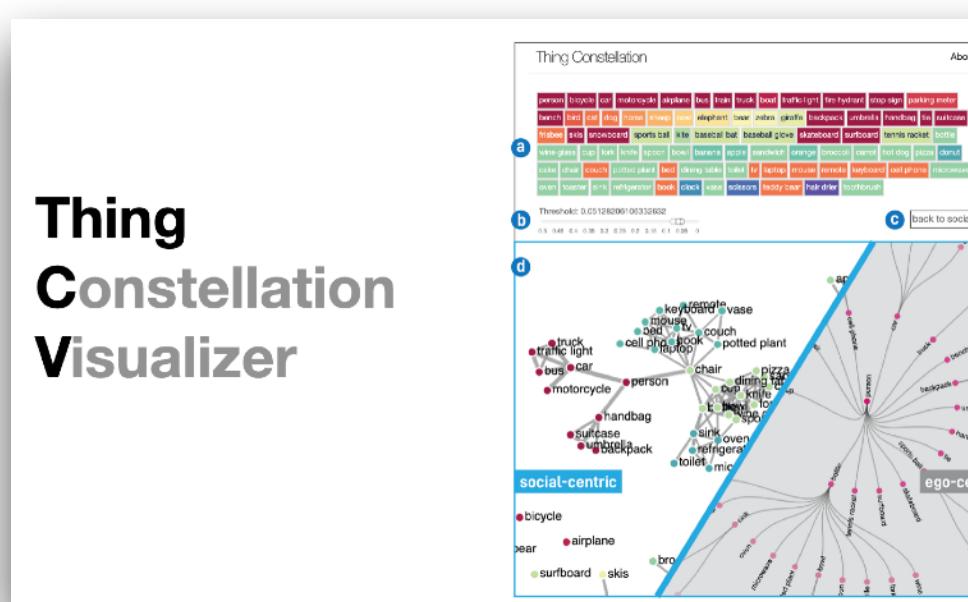
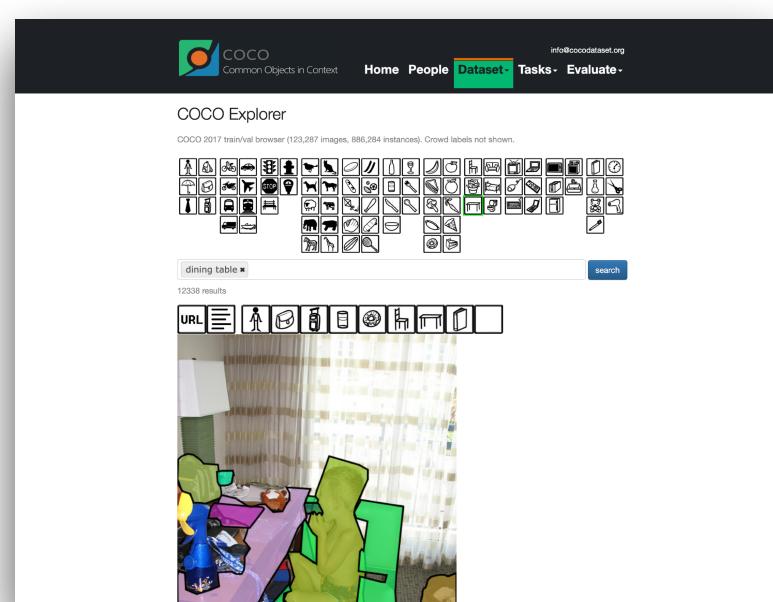
# Recap

- use Teachable Machine to **train your own classifier**
- use MS-COCO dataset and thingCV to **support your design exploration**
- use AI canvas to **design the whole system**

- use Data Foundry, p5.js and ml5.js to **build an entire system**
  - including object detector, data storage, and data visualization
- object detector
  - **build an object detector** using a pre-trained model (i.e., COCO-SD or YOLO)
  - host your object detector in DF
- data storage
  - use DF to **store your data** (i.e., AI-extracted data)
- data visualization
  - use DF to **host your interactive data visualization**



Object Detector



Thing  
Constellation  
Visualizer

A screenshot of the AI Canvas interface. It consists of a 2x4 grid of numbered steps. Step 1: Concept / Idea Description. Step 2: Contextual situations. Step 3: The Role of Human. Step 4: The Role of AI. Step 5: Feature. Step 6: Input Data. Step 7: Output Results. Step 8: Open questions / problems.

# **Q&A**

**Thank you!**