

# AI workshop

Data, Algorithm & Computation, Creativity

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2022.09.28

Miro: <https://miro.com/app/board/uXjVPUTr8HQ=/>

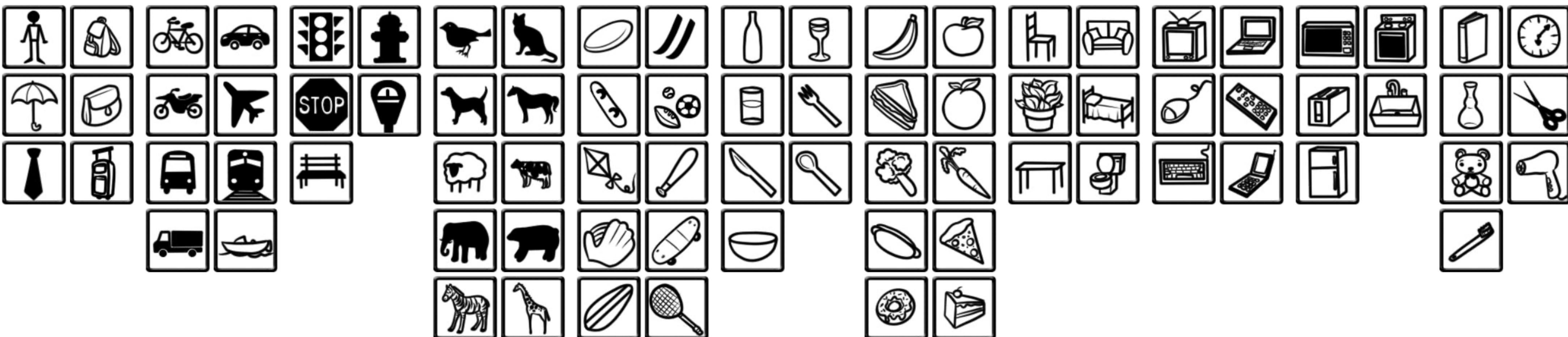
Source codes: [https://github.com/janetyc/AI-workshops/tree/main/ARTIFICE-AI%20workshop%20\(20220928\)](https://github.com/janetyc/AI-workshops/tree/main/ARTIFICE-AI%20workshop%20(20220928))

# Workshop Structure

- Session I (40 mins): Design your AI agents ([AI canvas](#))
- Session II (80 mins): Thing Constellation
  - subsection 1: object detector (30 mins) ([p5.js, ml5.js](#))
  - subsection 2: thing constellation (20 mins) ([starboard](#))
  - break (10 mins)
  - subsection 3: clustering + data visualization (20 mins) ([d3.js](#))
- Session III (20 mins): Collaborate with AI ([Stable Diffusion](#))

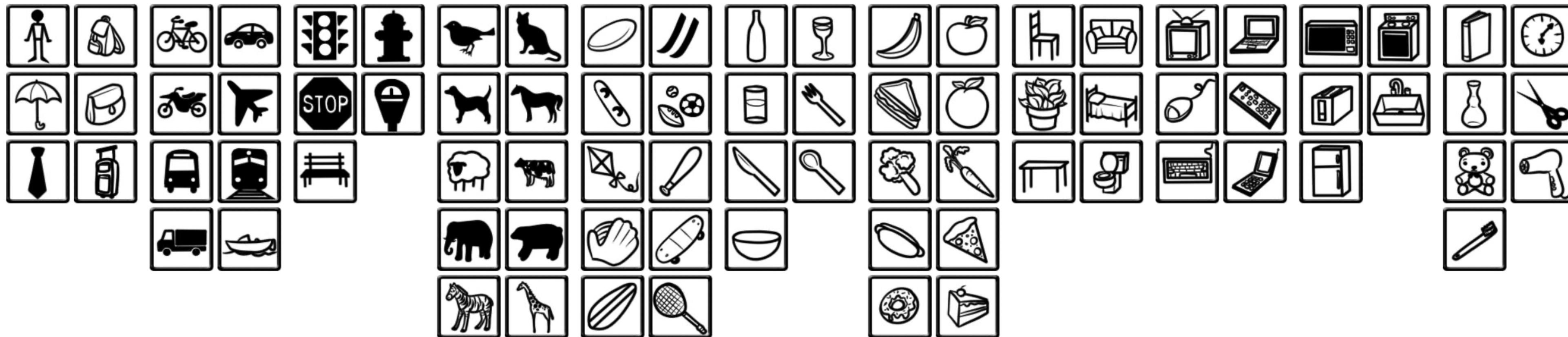
# Session I: Design Your AI Agents

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



# Hands-on 1: Design Your AI (15 mins)

- Every group/individual use 15 mins to
  - redesign 1 everyday object from 80 objects, and think about how this object interact with people.





COCO

Common Objects in Context

info@cocodataset.org

Home People Dataset Tasks Evaluate

## COCO Explorer

COCO 2017 train/val browser (123,287 images, 886,284 instances). Crowd labels not shown.



dining table ×

search

12338 results

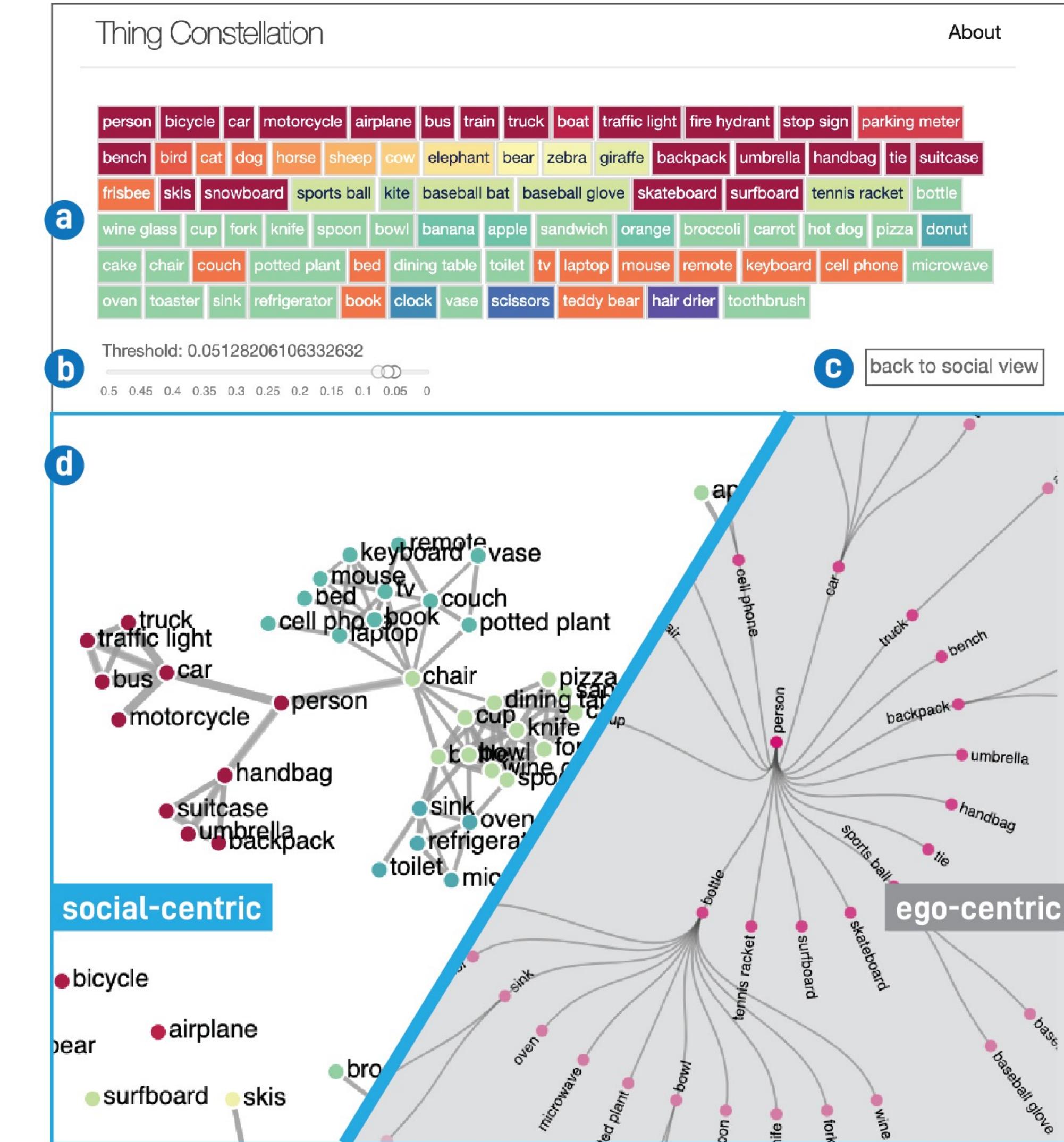


<https://cocodataset.org/#home>

# 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>

# 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**

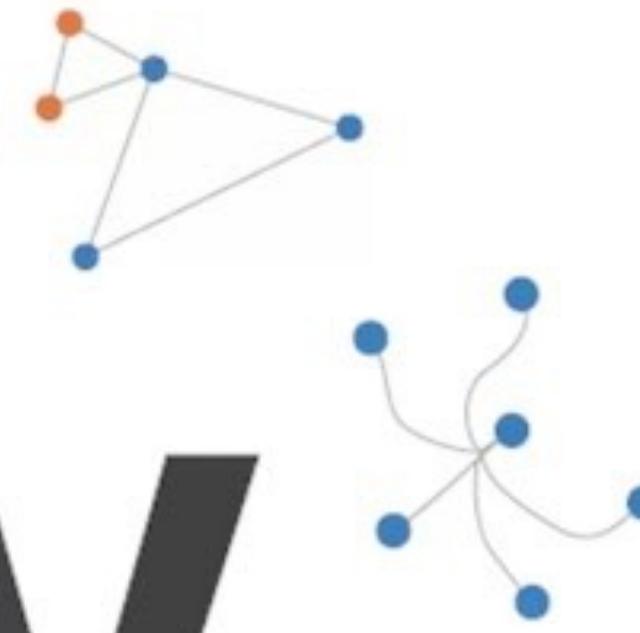
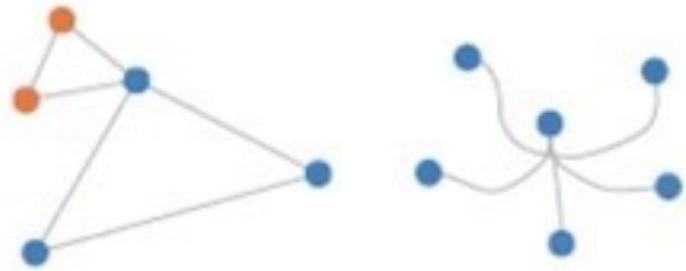
- switch two views under the same threshold value.

**d Thing Constellation Visualisation**

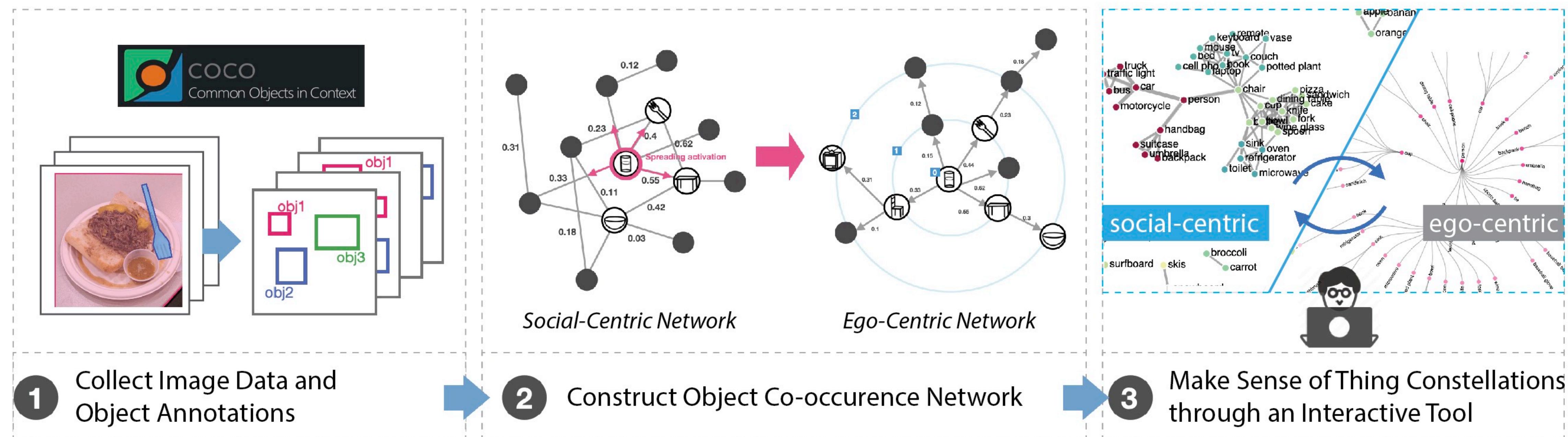
- based on the previous selections, here shows the result which can be social-centric or ego-centric constellation.

# ThingCV

Thing Constellation Visualiser

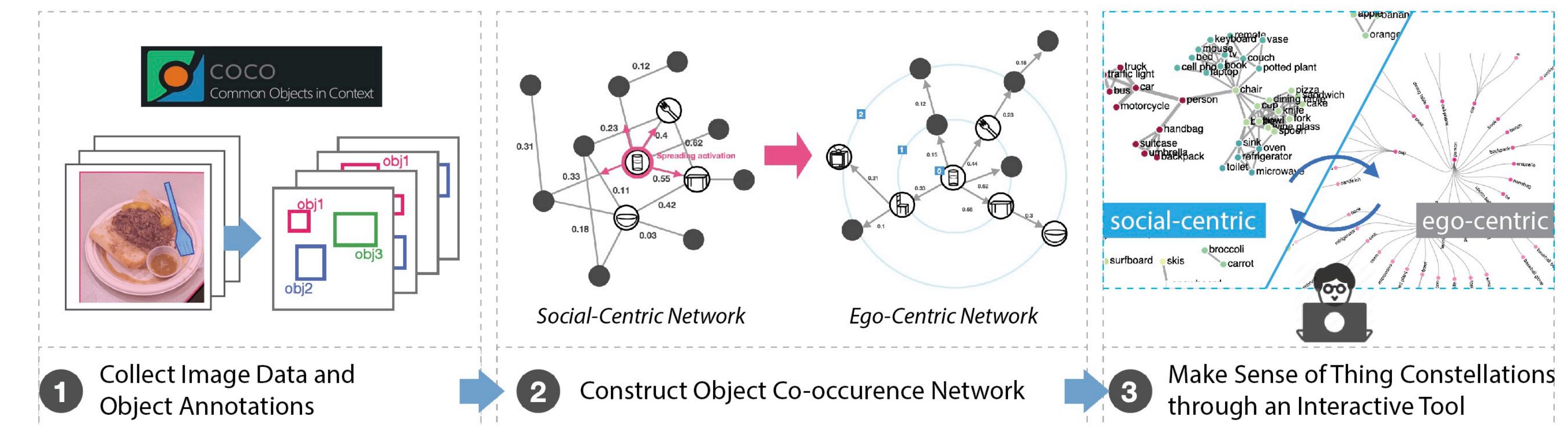


# Data-Driven Design Exploration



# Hands-on 2: Design collaborative AI (20 mins)

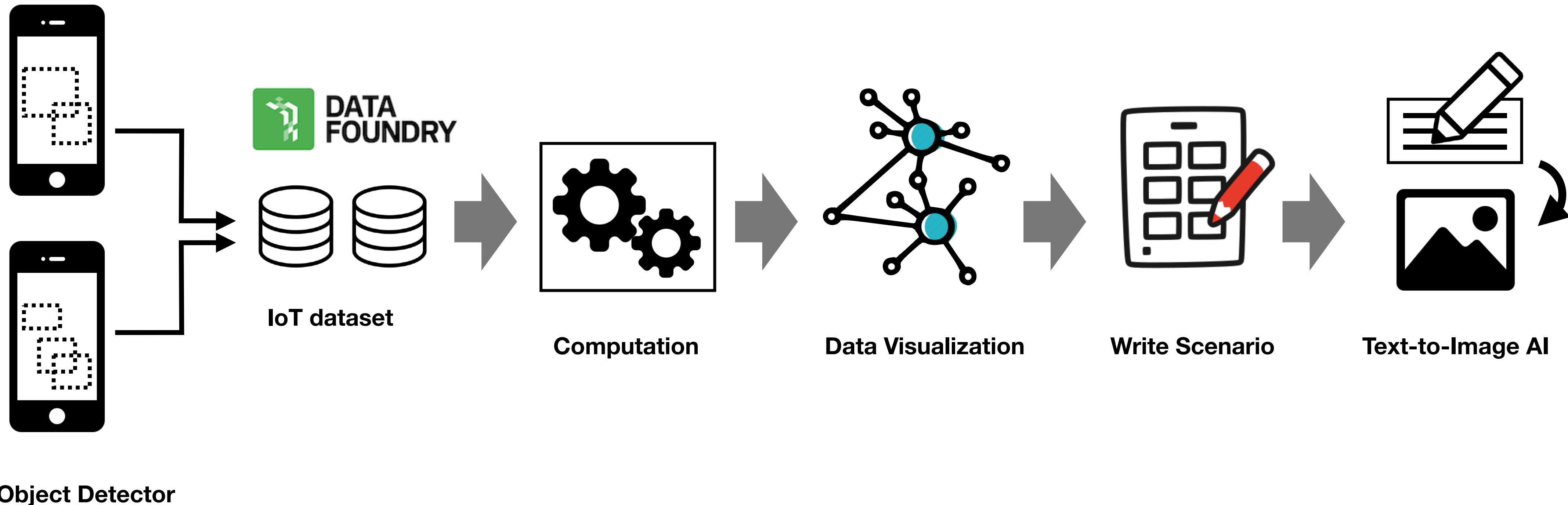
- Goal: use a data-driven design exploration process to design collaborative AI.
- Every group/individual use 20 mins to
  - use thingCV tool to explore the ecosystem of everyday objects
  - design “a collaborative AI” that can work with other AI(s)



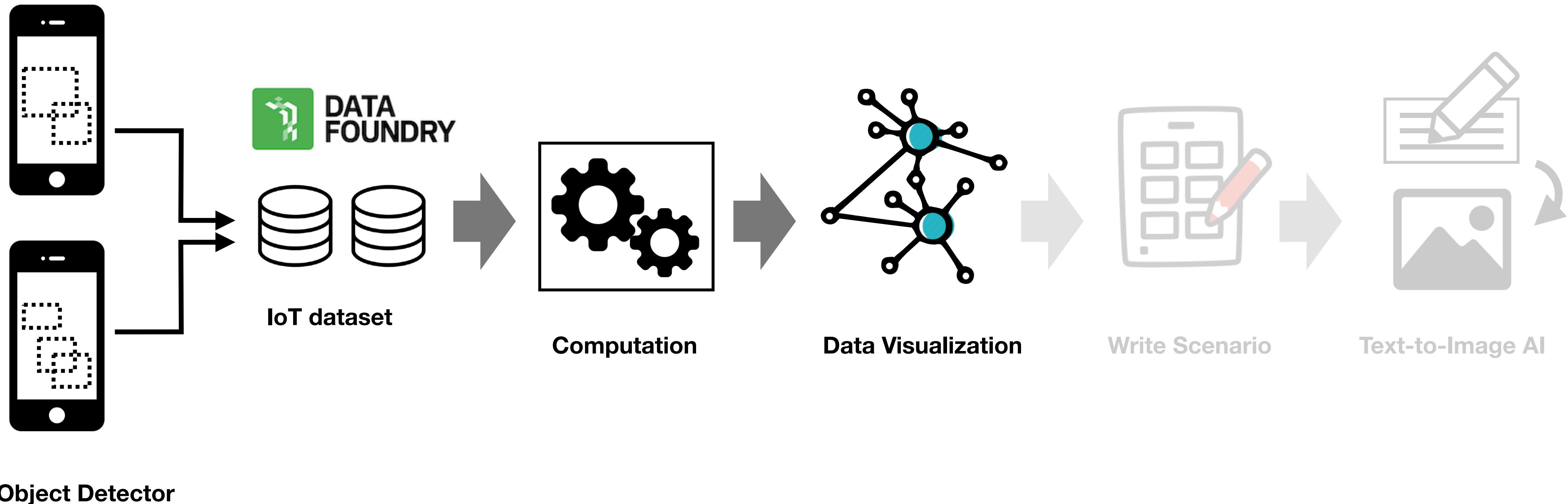
# Collaborative AI Canvas

<b>Concept / Idea Description</b> Describe your idea in 2-3 sentences	<b>Data from another AI #1 (group 1)</b> Which data from which other AI do you use in this concept?	<b>Collaborative Scenarios</b> What is the common goal do you want to achieve using the human-AI team? How AI collaborate with other AIs or other people?
<b>1</b>	<b>3</b>	<b>5</b>
<b>Your own AI</b> What is the functionality of your AI? What specific task does AI perform?	<b>Data from another AI #2 (group 2)</b> Which data from which other AI do you use in this concept?	<b>Open questions / problems?</b> Which aspects are still unclear for you in terms of this human-AI system?
<b>2</b>	<b>4</b>	<b>6</b>

# System Workflow



# Session II: Thing Constellation



Object Detector

ml5.js

Data foundry

starboard

d3.js

Stable Diffusion

# Object Detection

**Classification**



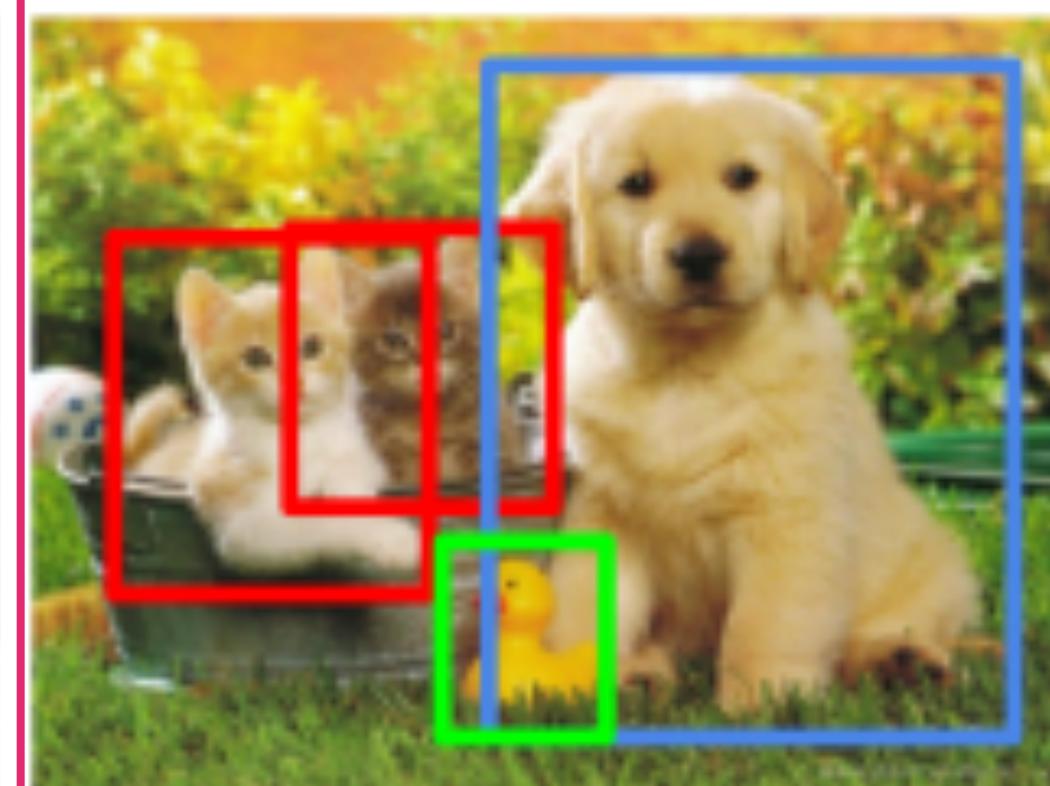
CAT

**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>
```

```
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
```

setup

```
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 }
```

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

# Data Foundry: IoT Dataset

The screenshot shows the Data Foundry web application interface. On the left, there is a sidebar with various navigation options: Portfolio, My projects, Archive, Community (which is highlighted in green), Collaborations, Subscriptions, Explore, Data tools, Guides, and Support. The main area displays a list of datasets under 'DATASETS (5)'. A modal window titled 'CHOOSE A DATASET TYPE' is open in the center, listing several dataset types:

- 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

OOCST STREAM

CSV/JSON TOKEN ...

OOCST STREAM

### HTTP POST requests for this dataset (ID: 2711)

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

T1BiL25QaERad0RQWDBiZnZraEg1cHJtMnVjdnRBM2lBajRjTmNqV0gyUT0=

**GENERATE**    **DELETE**

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

### How to use this?

JavaScript

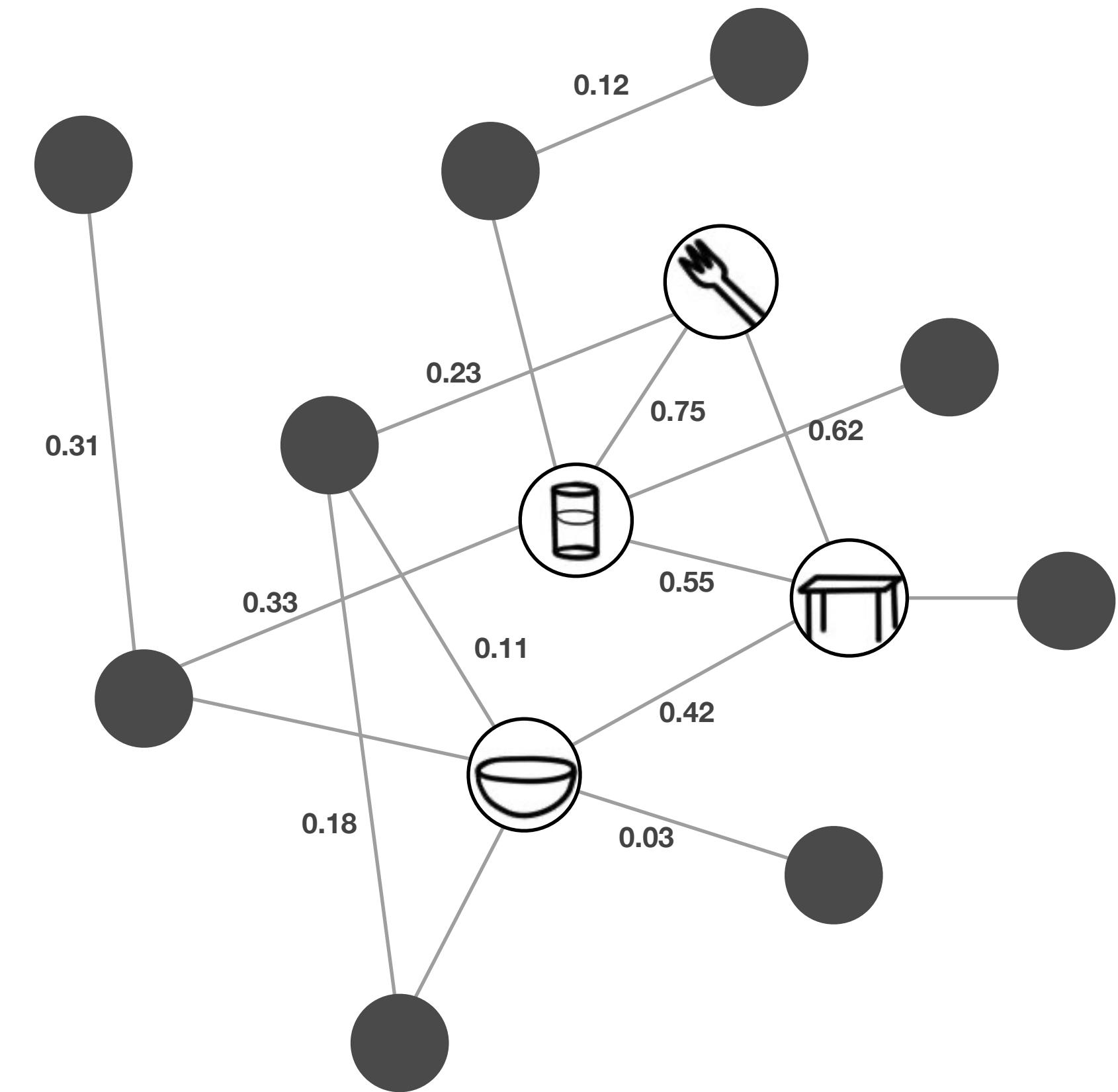
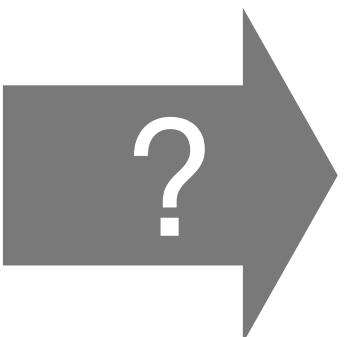
```
var data = { ... your data goes here ... }
var jsonBody = {
  activity: 'ACTIVITY',
  source_id: 'DEVICE_ID',
  data: JSON.stringify(data)
}
fetch('https://data.id.tue.nl/datasets/ts/record/2711/T1BiL25QaERad0RQWDBiZnZraEg1cHJtMn'
  method: 'POST',
  mode: 'cors',
  cache: 'no-cache',
  headers: {
    '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}

```
91  function touchQueue() {
92    function logData() {
93      final_detections = detections
94      objectList = getDetectionObjects(final_detections);
95
96      let data= {
97        time: +(new Date),
98        detections: objectList
99      }
100
101     let jsonBody = {
102       activity: 'Customize_ThingCV',
103       data: JSON.stringify(data)
104     }
105
106     fetch('https://data.id.tue.nl/datasets/ts/record/2711/T1BiL25QaERad0RQWDBiZnZraEg1cHJtMnVjdnRBM2lBajRjTmNqV0gyUT0='
107       method: 'POST',
108       mode: 'cors',
109       cache: 'no-cache',
110       headers: {
111         'Content-Type': 'application/json'
112       },
113       redirect: 'follow',
114       referrerPolicy: 'no-referrer',
115       body: JSON.stringify(jsonBody)
116     });
117   }
118 }
```

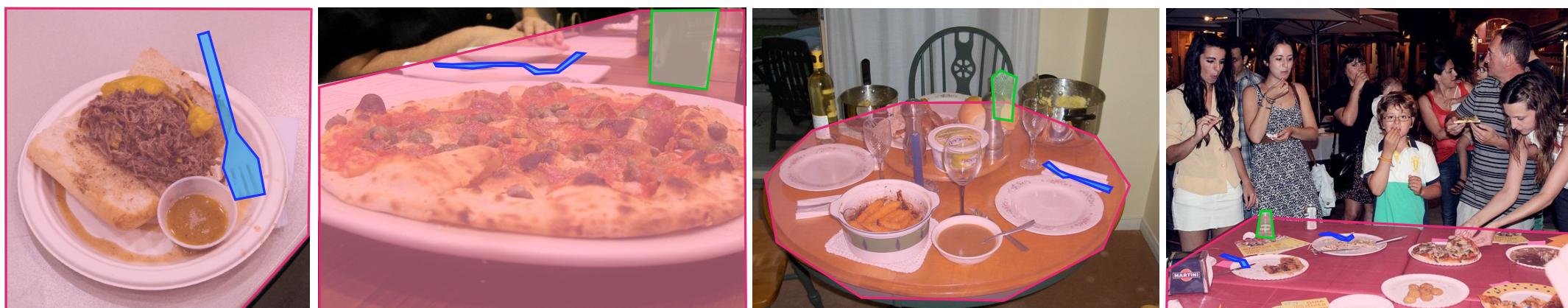
# Creativity and Computation

How to construct a social network of object based on image data?



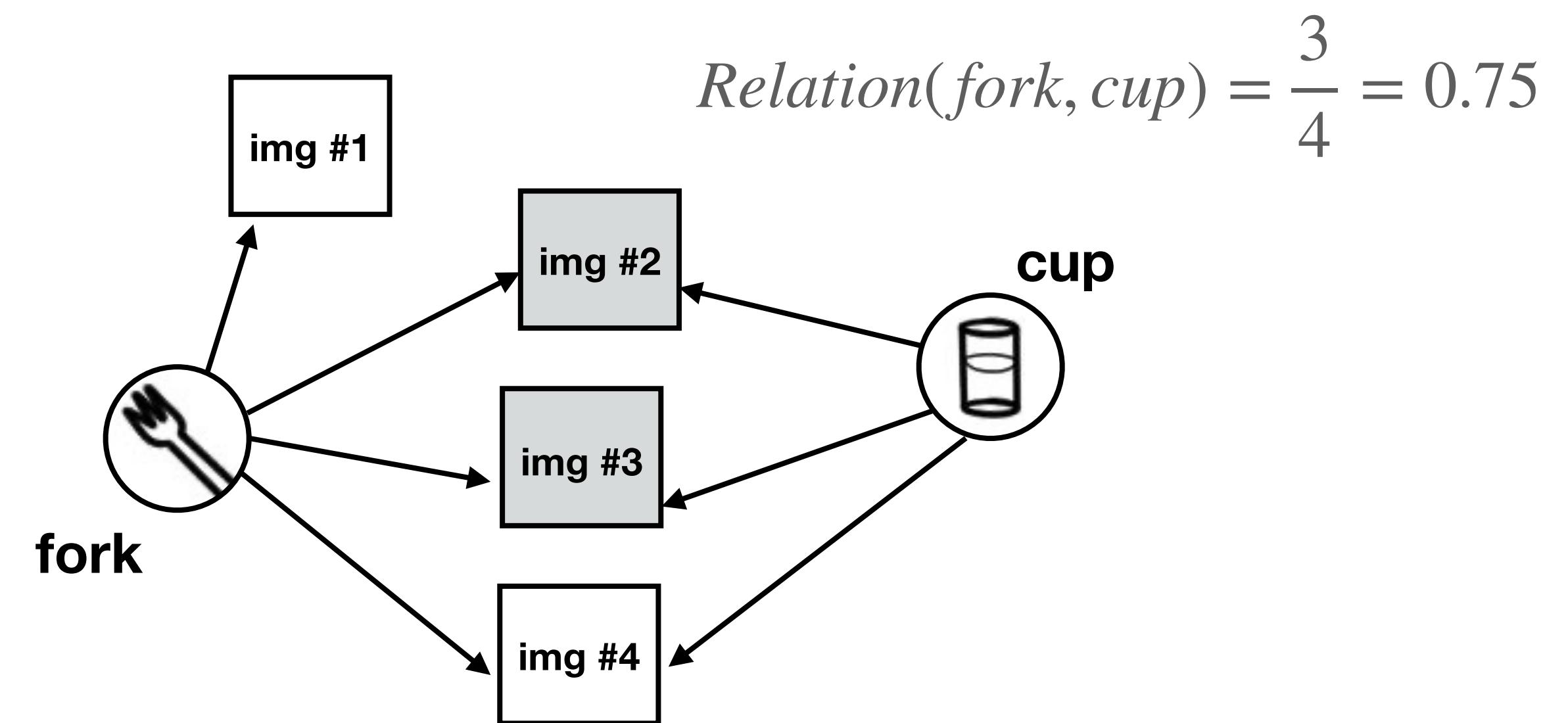
# Creativity and Computation

How to construct a social network of object Based on object co-occurrence?



$$Relation(Cup, Fork) = \frac{|Collection_{Cup} \cap Collection_{Fork}|}{|Collection_{Cup} \cup Collection_{Fork}|}$$

(Jaccard similarity coefficient)



# Starboard

The in-browser notebook

HTML

Python

Javascript

Markdown

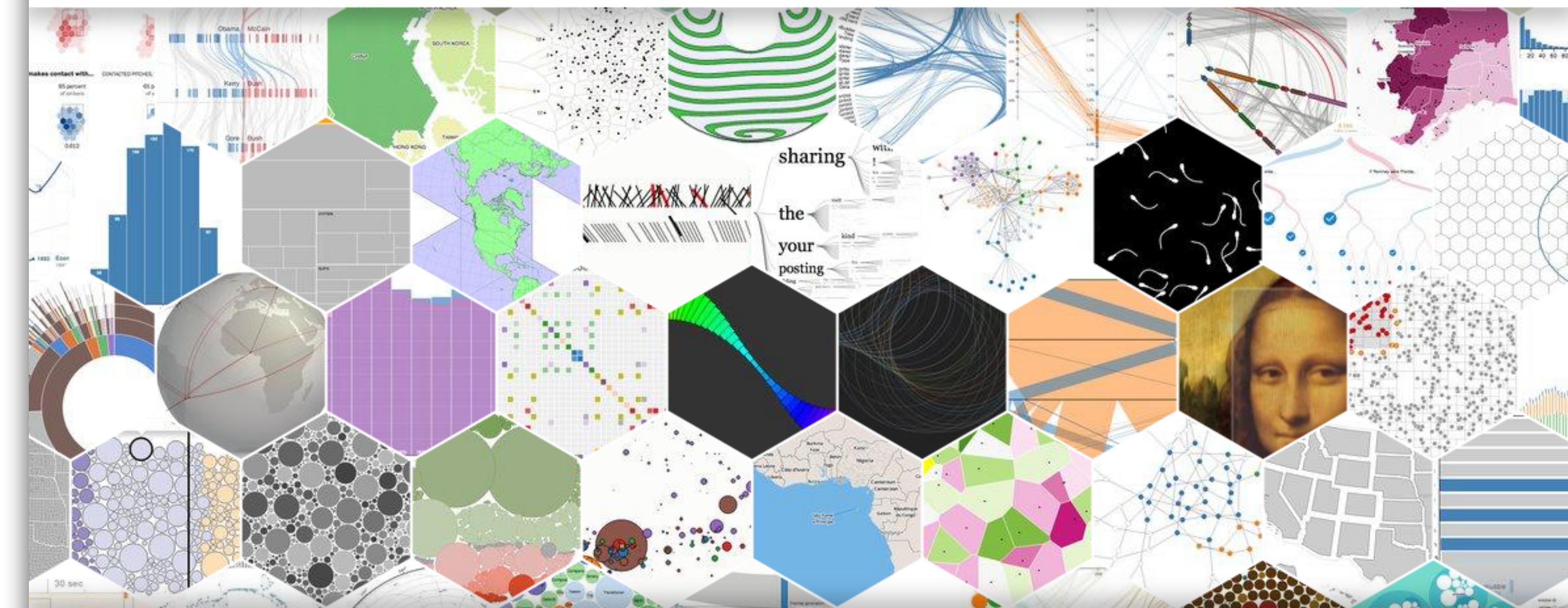
```
1 obj_img_map = []
2 data.forEach((obj_list, indx) => {
3   obj_list.forEach(obj => {
4     if(obj in obj_img_map){
5       obj_img_map[obj].push(indx)
6     }else{
7       obj_img_map[obj] = []
8       obj_img_map[obj].push(indx)
9     }
10   })
11 }
12 })
13 console.log(obj_img_map);

▶ {obj1: Array(6), obj2: Array(4), obj3: Array(5), obj4: Array(3), obj5: Array(4)...}

+ object_net = {}
1
2
3 for(obj_1 in obj_img_map){
4
5   if(!(obj_1 in object_net)){
6     object_net[obj_1] = {};
7   }
8
9   for(obj_2 in obj_img_map){
10    if(obj_2 == obj_1){
11      object_net[obj_1][obj_2] = 1.0;
12      continue;
13    }
14
15    if(!(obj_2 in object_net[obj_1])){
16      let intersection = obj_img_map[obj_1].filter(x => obj_img_map[obj_2].includes(x));
17      let union = [...obj_img_map[obj_1], ...obj_img_map[obj_2]];
18
19      score = (new Set(intersection)).size*1.0 / (new Set(union)).size;
20    }
21    object_net[obj_1][obj_2] = score;
22  }
23 }
24
25 for(obj in object_net){
26   console.log(object_net[obj]);
27 }

▶ {obj1: 1, obj2: 0.2857142857142857, obj3: 0.2857142857142857, obj4: 0.14285714285714285, obj5: 0.2857142857142857...}
▶ {obj1: 0.2857142857142857, obj2: 1, obj3: 0.14285714285714285, obj4: 0, obj5: 0.3333333333333333...}
▶ {obj1: 0.2857142857142857, obj2: 0.14285714285714285, obj3: 1, obj4: 0.1666666666666666, obj5: 0...}
▶ {obj1: 0.14285714285714285, obj2: 0, obj3: 0.1666666666666666, obj4: 1, obj5: 0.1666666666666666...}
▶ {obj1: 0.2857142857142857, obj2: 0.3333333333333333, obj3: 0, obj4: 0.1666666666666666, obj5: 1...}
▶ {obj1: 0.4, obj2: 0.2, obj3: 0, obj4: 0.25, obj5: 0.2...}
```

# Data Visualization



Like visualization and creative coding? Try interactive JavaScript notebooks in [Observable!](#)

**D3.js** is a JavaScript library for manipulating documents based on data. **D3** helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation.

Download the latest version (7.6.1) here:

- [d3-7.6.1.tgz](#)

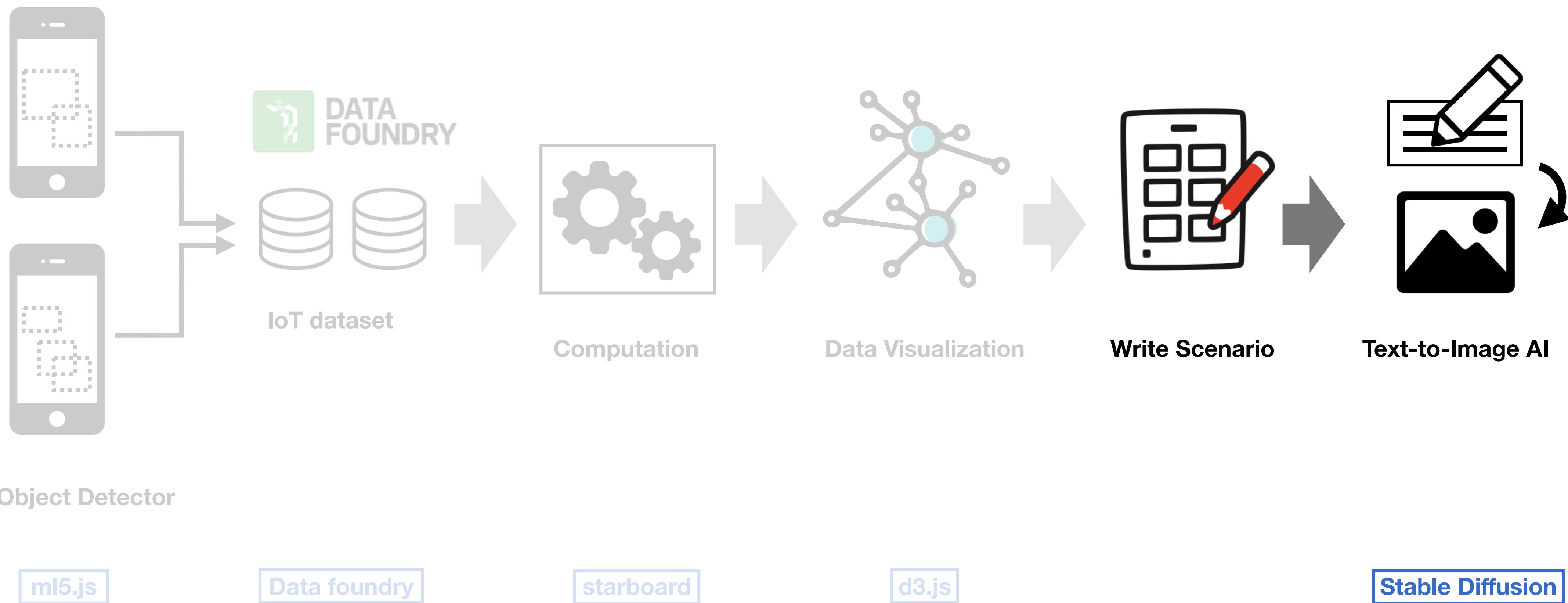
To link directly to the latest release, copy this snippet:

```
<script src="https://d3js.org/d3.v7.min.js"></script>
```

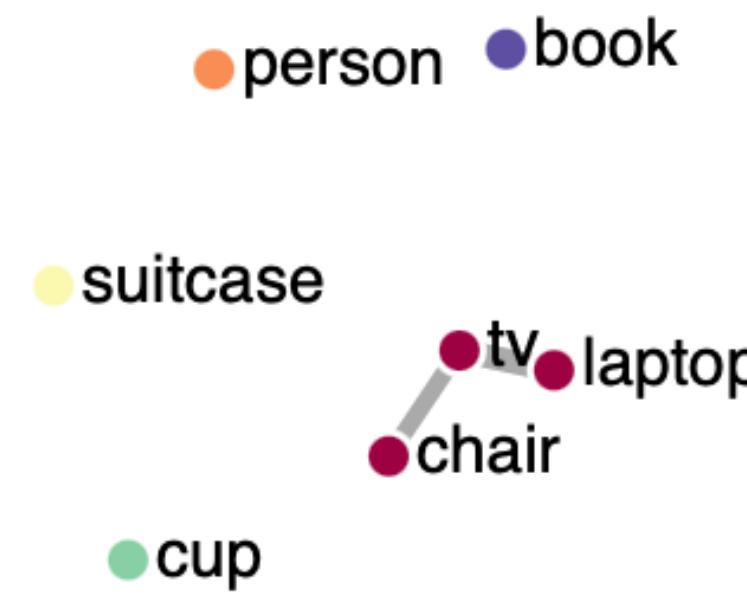
The [full source and tests](#) are also available [for download](#) on GitHub.

- [See more examples](#)
- [Chat with the community](#)
- [Follow announcements](#)
- [Report a bug](#)
- [Ask for help](#)

# Session III: Collaborate with Text-to-Image AI



# Session III: Collaborate with AI

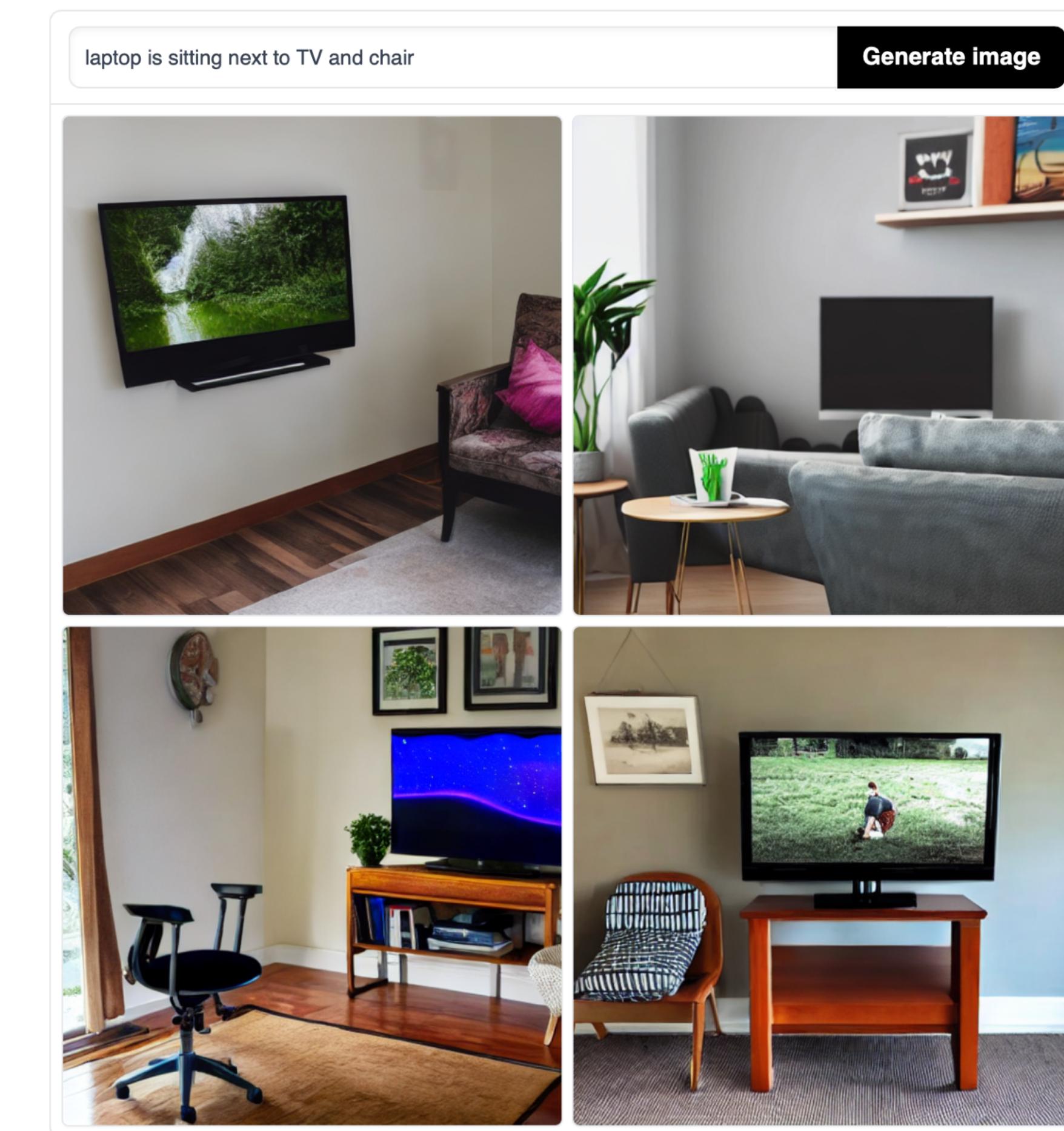


laptop is sitting next to TV and chair

## Stable Diffusion Demo

Stable Diffusion is a state of the art text-to-image model that generates images from text.

For faster generation and forthcoming API access you can try [DreamStudio Beta](#)



# Stable Diffusion: Text-to-Image AI

<https://huggingface.co/spaces/stabilityai/stable-diffusion>

The image shows a user interface for generating images using text prompts. On the left, there are two examples of generated landscapes: a mountain range at sunset and a valley with a bridge. Below them are two more landscape images, one with a prominent peak and another with a bridge over water. In the center, there is a control panel with sliders for 'Width' (768), 'Height' (512), 'Cfg Scale' (7), 'Steps' (50), 'Number of Images' (1), and a dropdown for 'Sampler' set to 'K-LMS'. To the right of the interface are several generated images: an astronaut playing a piano in space, a white unicorn in a field, a seal wearing a top hat and leather jacket, a bear in an astronaut suit on a planet, a robot holding a drink, a lizard shooting a beam of light, a red mushroom in a cityscape, and an astronaut riding a tiger.

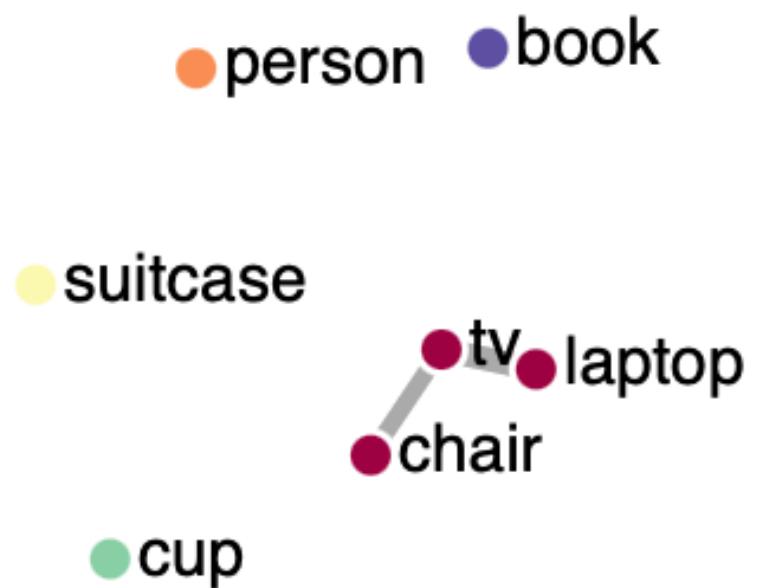
Compute Costs & Generation Counts Explained

Steps	512x512	512x768	512x1024	768x768	768x1024	1024x1024
10	0.2	0.5	0.8	0.9	1.3	1.9
25	0.5	1.2	1.9	2.3	3.3	4.7
50	1.0	2.4	3.8	4.6	6.6	9.4
75	1.5	3.6	5.7	6.9	9.9	14.1
100	2.0	4.8	7.6	9.2	13.2	18.8
150	3.0	7.2	11.4	13.8	19.8	28.2

Image source: [link1, link2]

# Hands-on 4: Collaborate with Text-to-Image AI (20 mins)

- Every group/individual use 20 mins to
  - use Stable Diffusion to create a scenario for your collaborate AI
  - screenshot of thingCV
  - scenario (text)
  - AI images



laptop is sitting next to TV and chair

