

meet.js

JS & ML
Patryk Omiotek

¡HOLA AMIGOS!



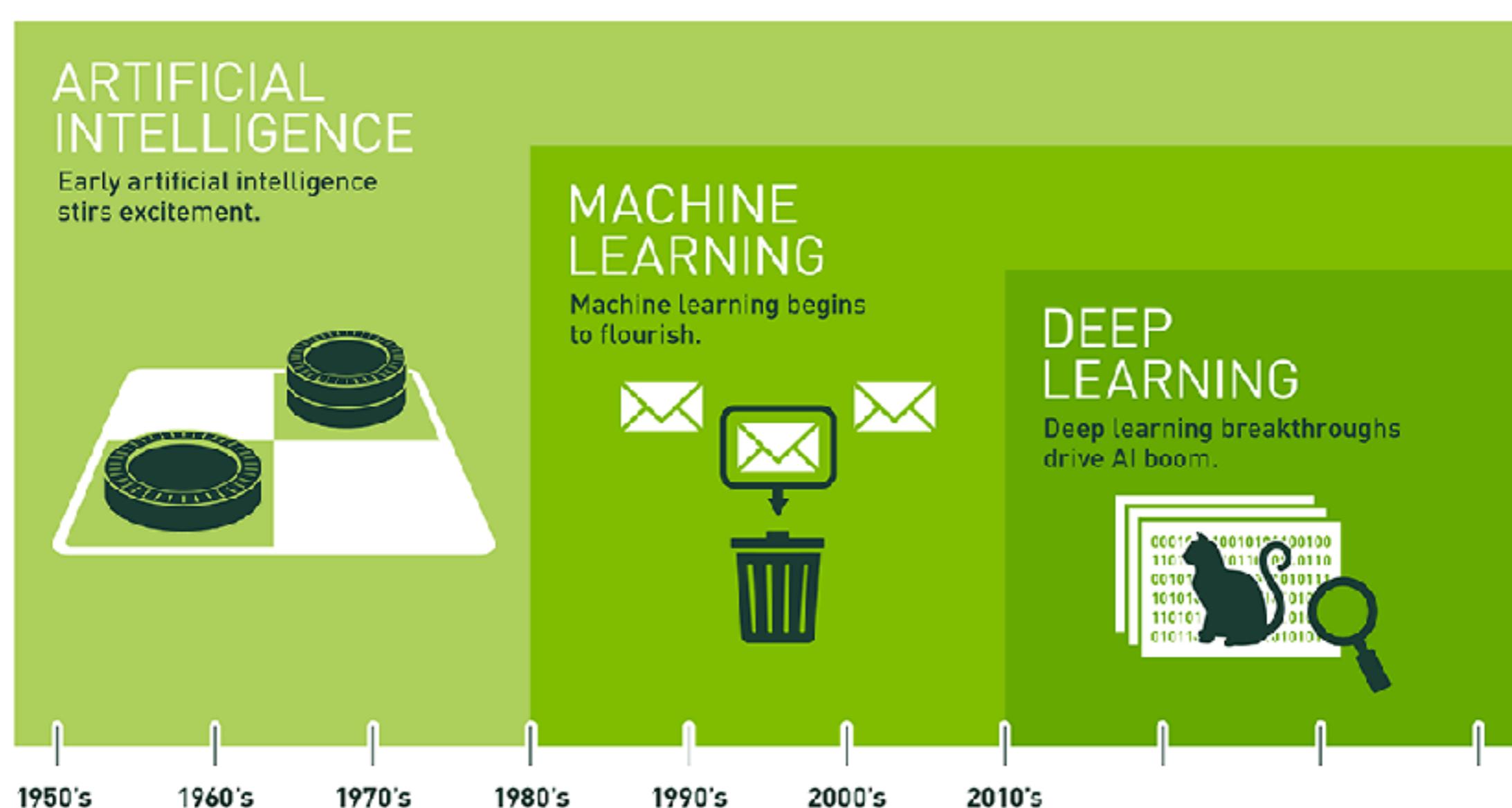
@PatrykOmiotek

jntive

info Share
<academy/>

WHAT IS MACHINE LEARNING?

ARTIFICIAL INTELLIGENCE

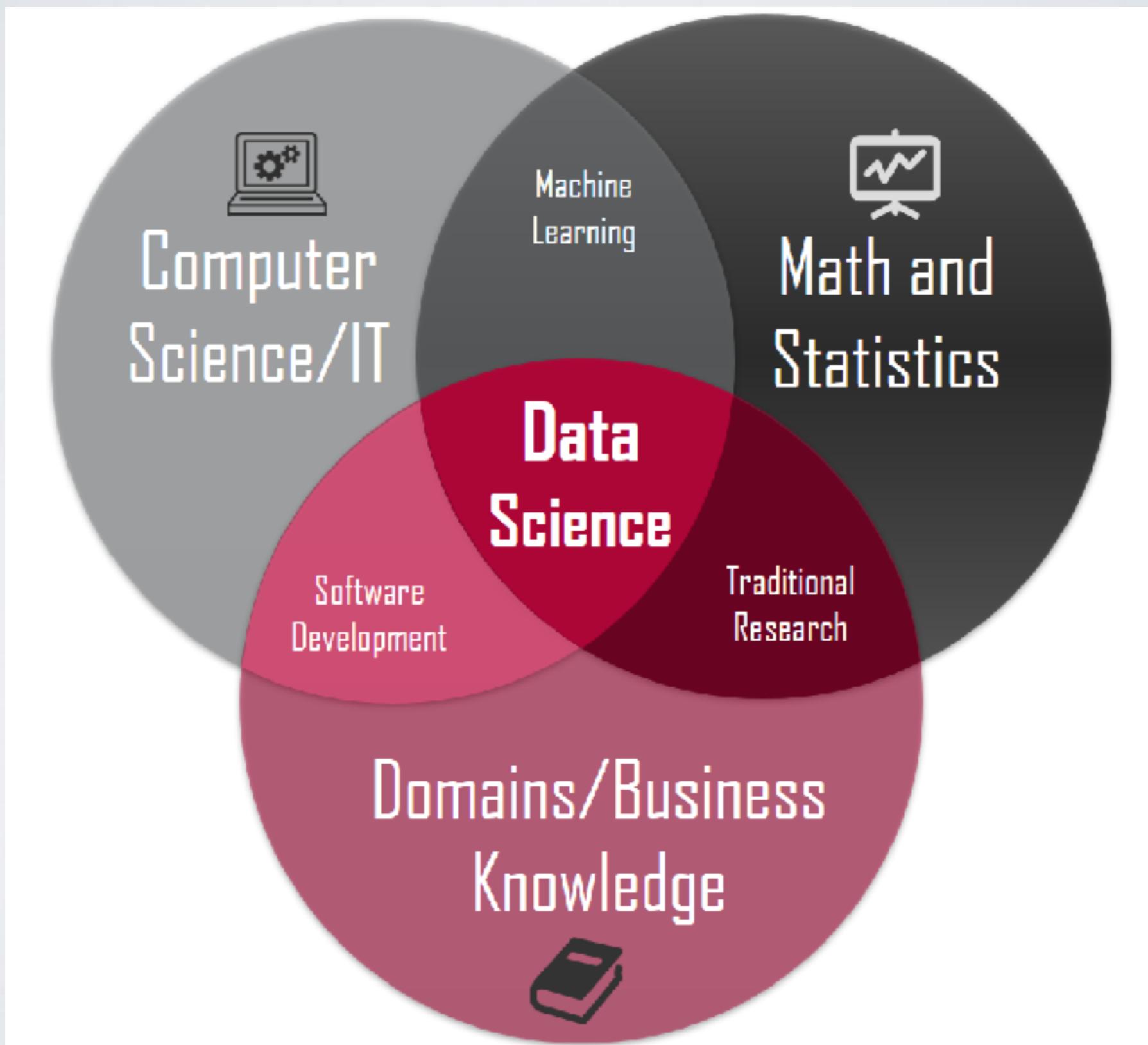


Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

DEEP LEARNING



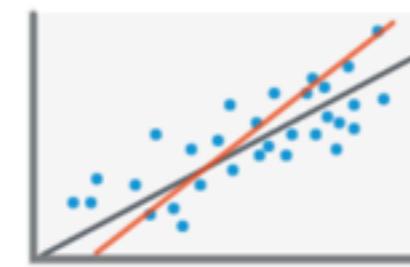
DATA SCIENCE



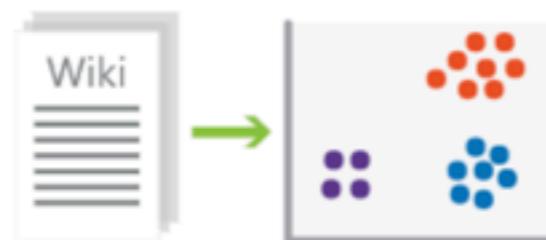
MACHINE LEARNING



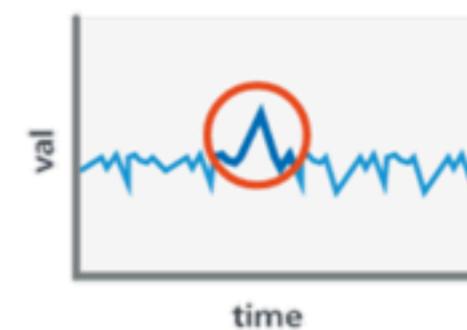
Classification
(supervised – predictive)



Regression
(supervised – predictive)



Clustering
(unsupervised – descriptive)

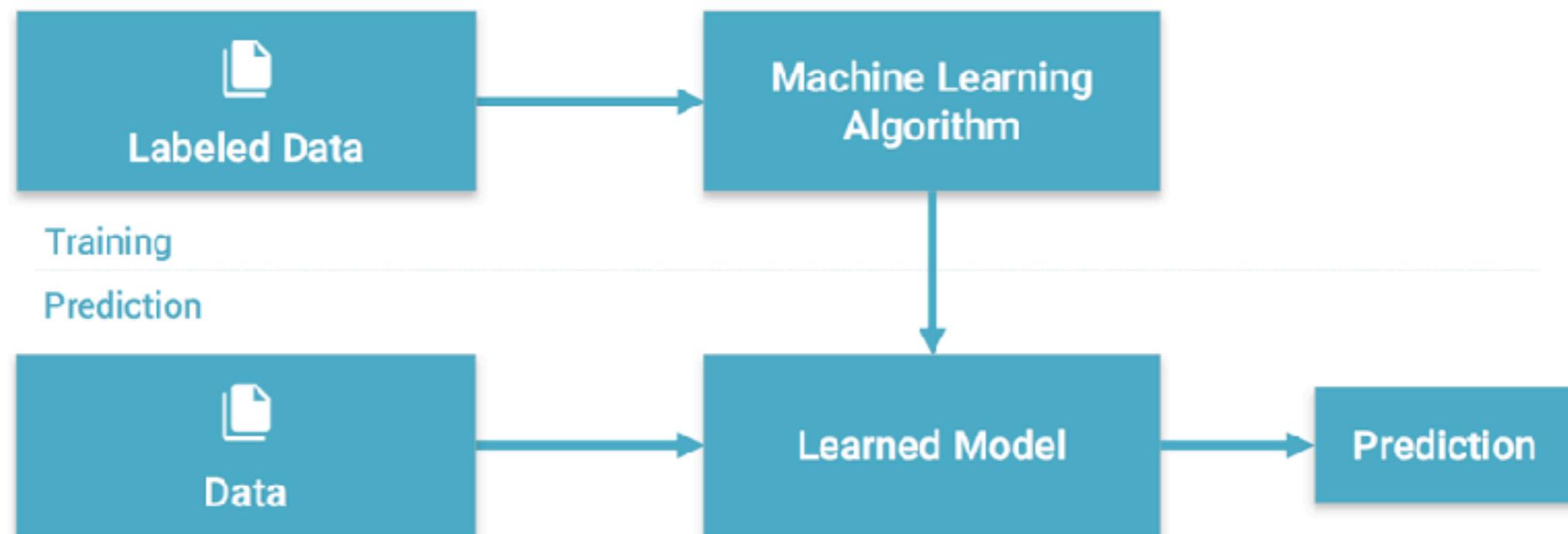


Anomaly Detection
(unsupervised – descriptive)

MACHINE LEARNING



Machine Learning is a type of Artificial Intelligence that provides computers with the ability to **learn without being explicitly programmed**.

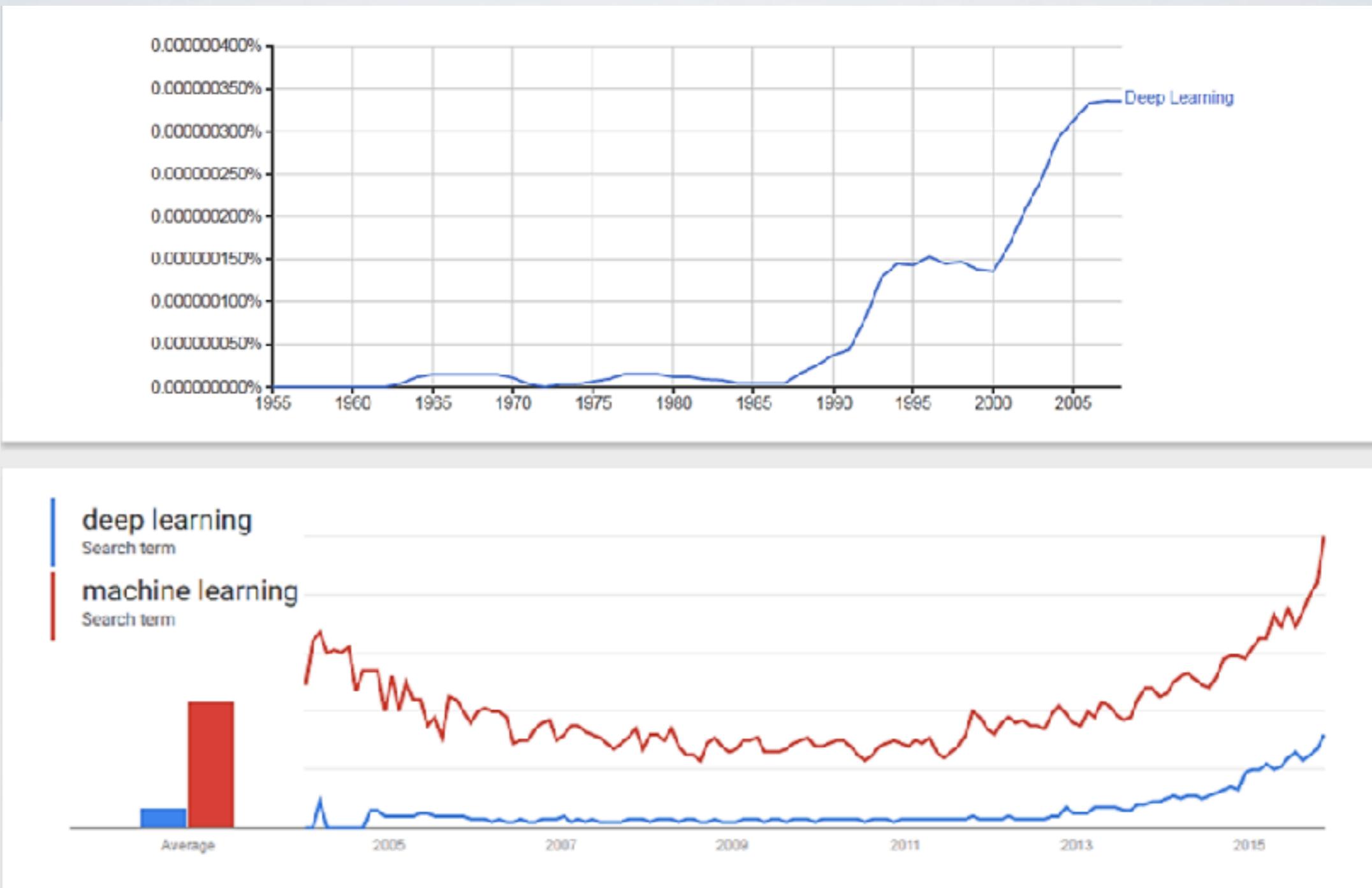


Provides **various techniques** that can learn from and make predictions on data

USE CASES

- Chatbots using Text / Voice interface
- Tax Offices
- Speech Recognition
- Recommendation systems
- Image recognition
- Agriculture

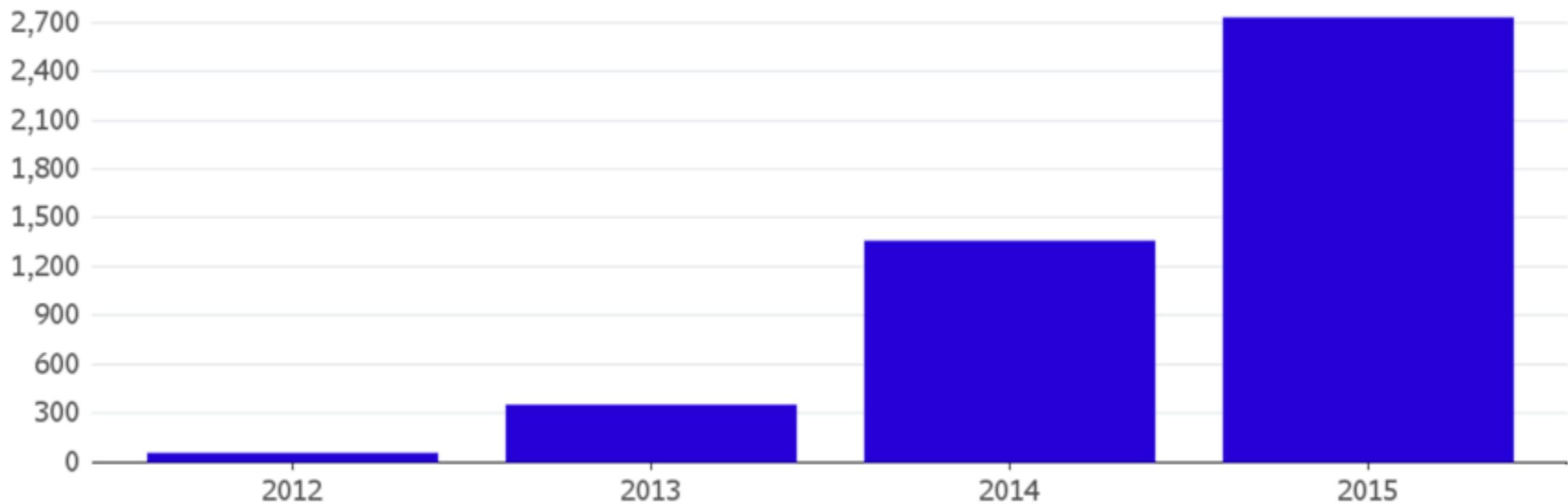
HYPE OR REALITY



HYPE OR REALITY

Artificial Intelligence Takes Off at Google

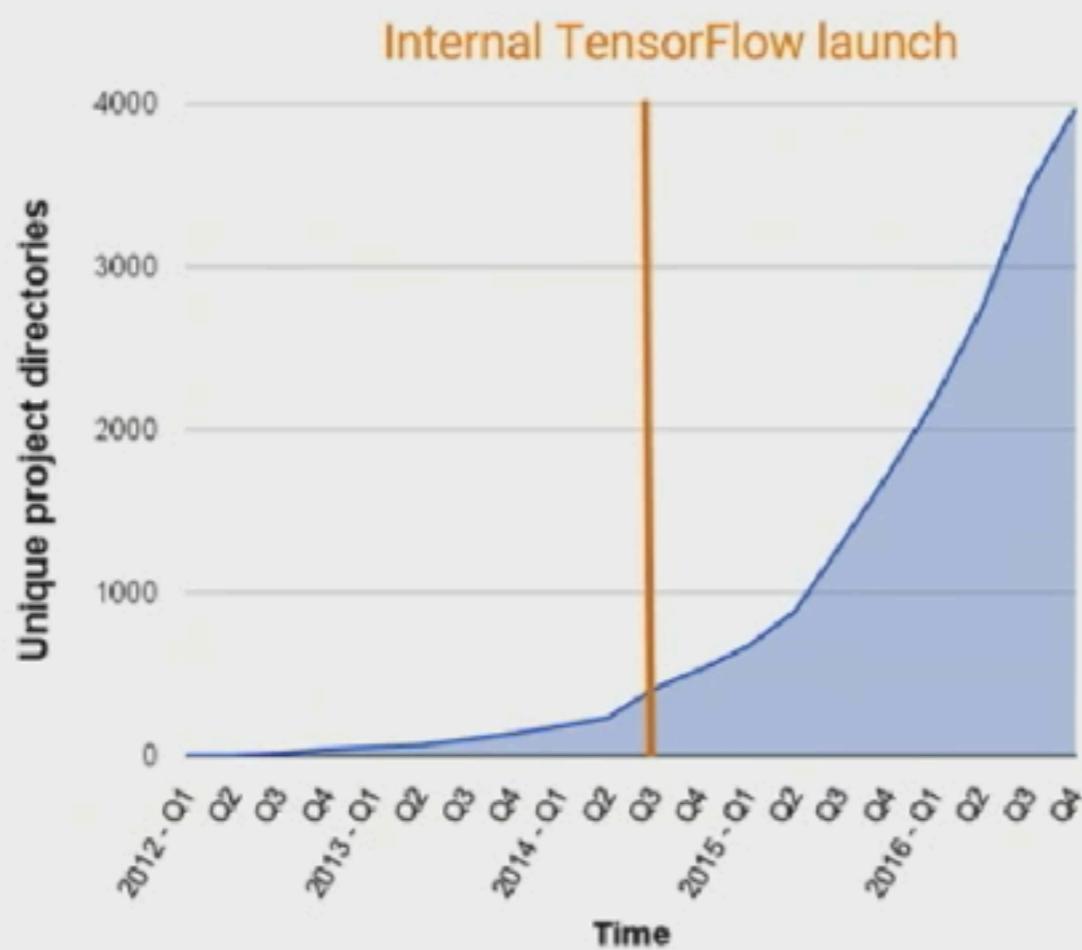
Number of software projects within Google that uses a key AI technology, called Deep Learning.



Source: Google

Note: 2015 data does not incorporate data from Q4

HYPE OR REALITY



Production use in many areas:

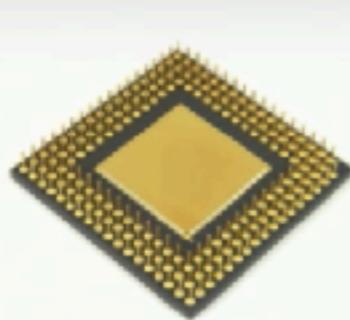
Search
Gmail
Translate
Maps
Android
Photos
Speech
YouTube
Play
... many others ...

Research use for:

100s of projects and papers



HYPE OR REALITY



CPU



GPU



Raspberry
Pi



Cloud TPU

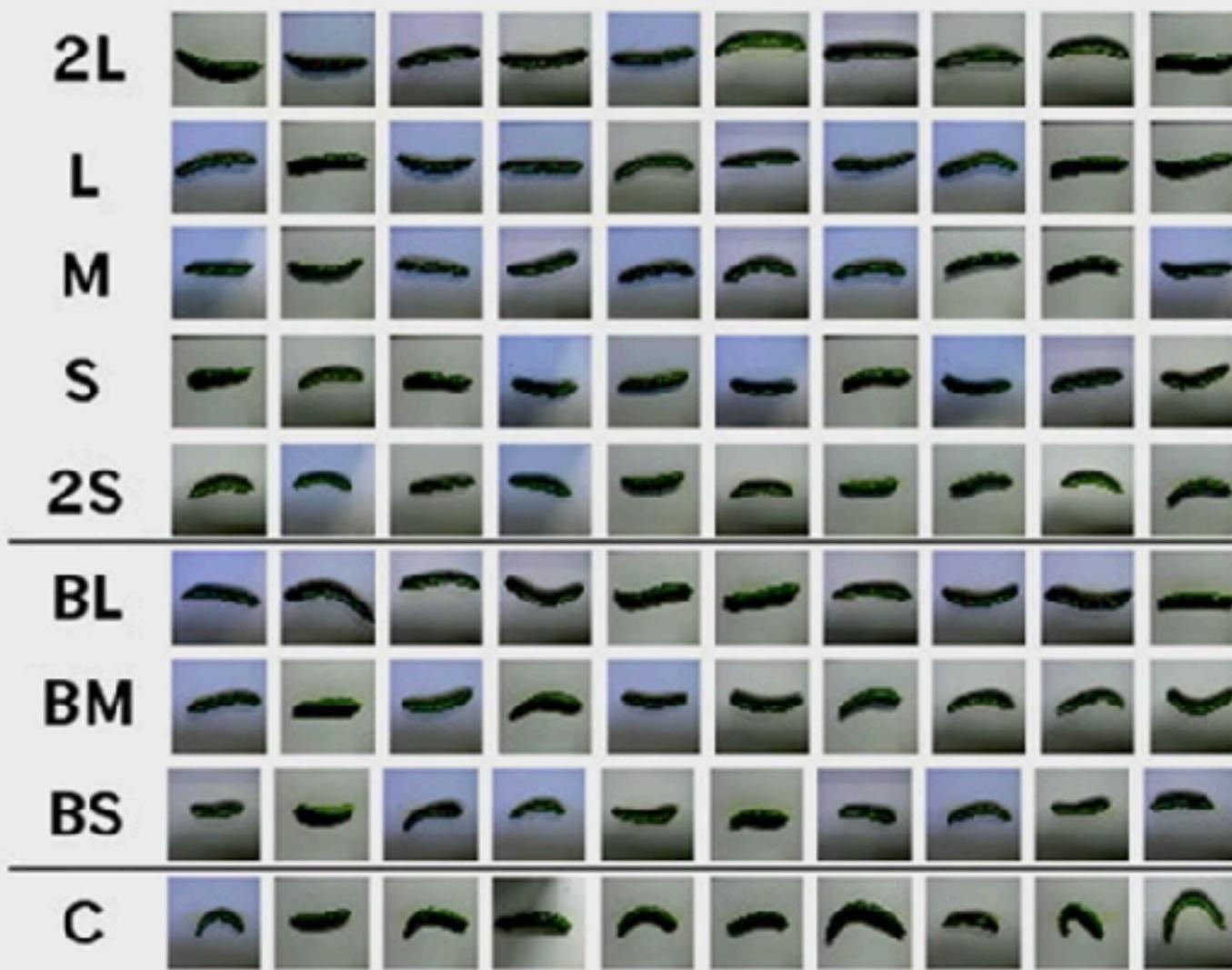


Android
iOS

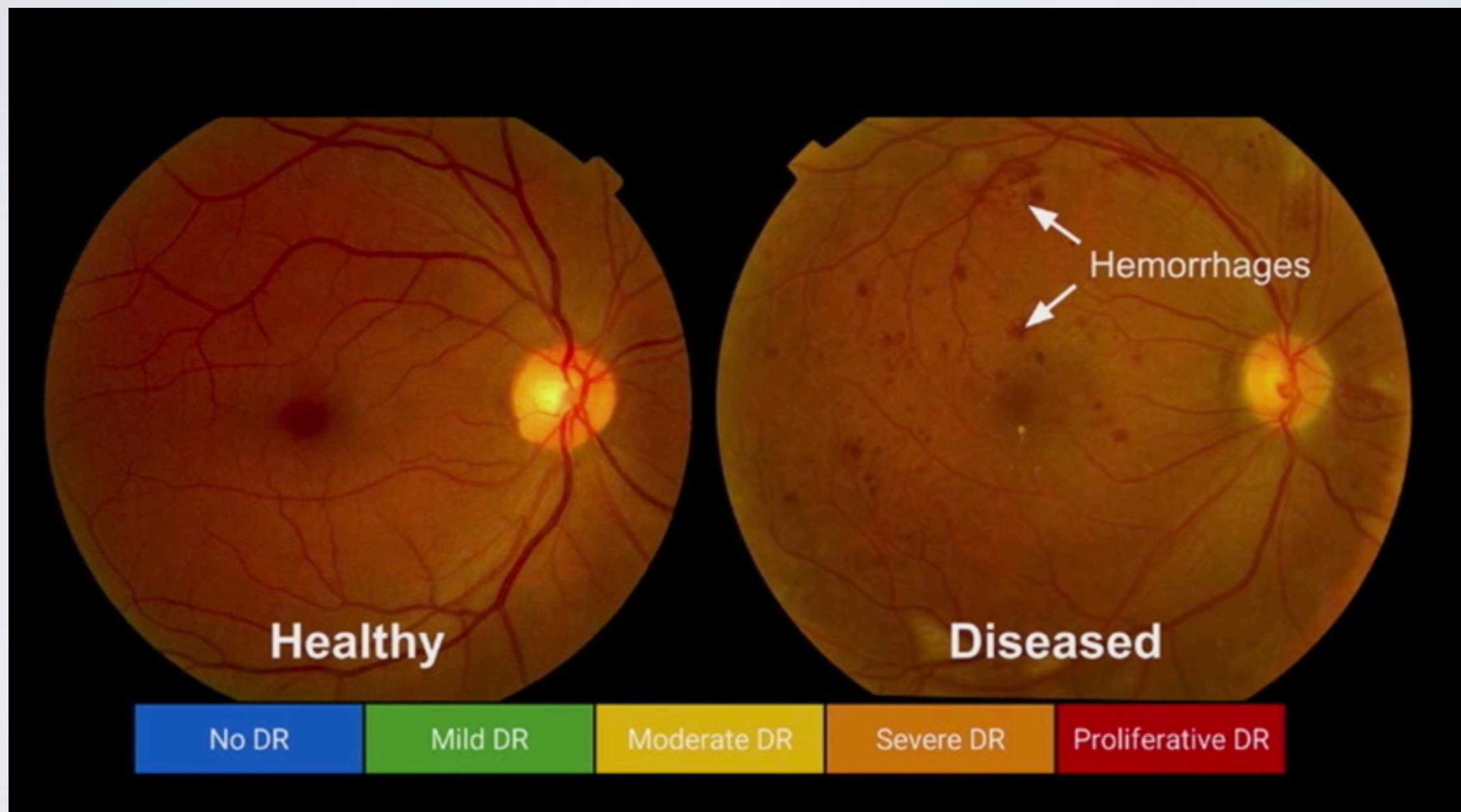


HYPE OR REALITY

TensorFlow powered cucumber sorter



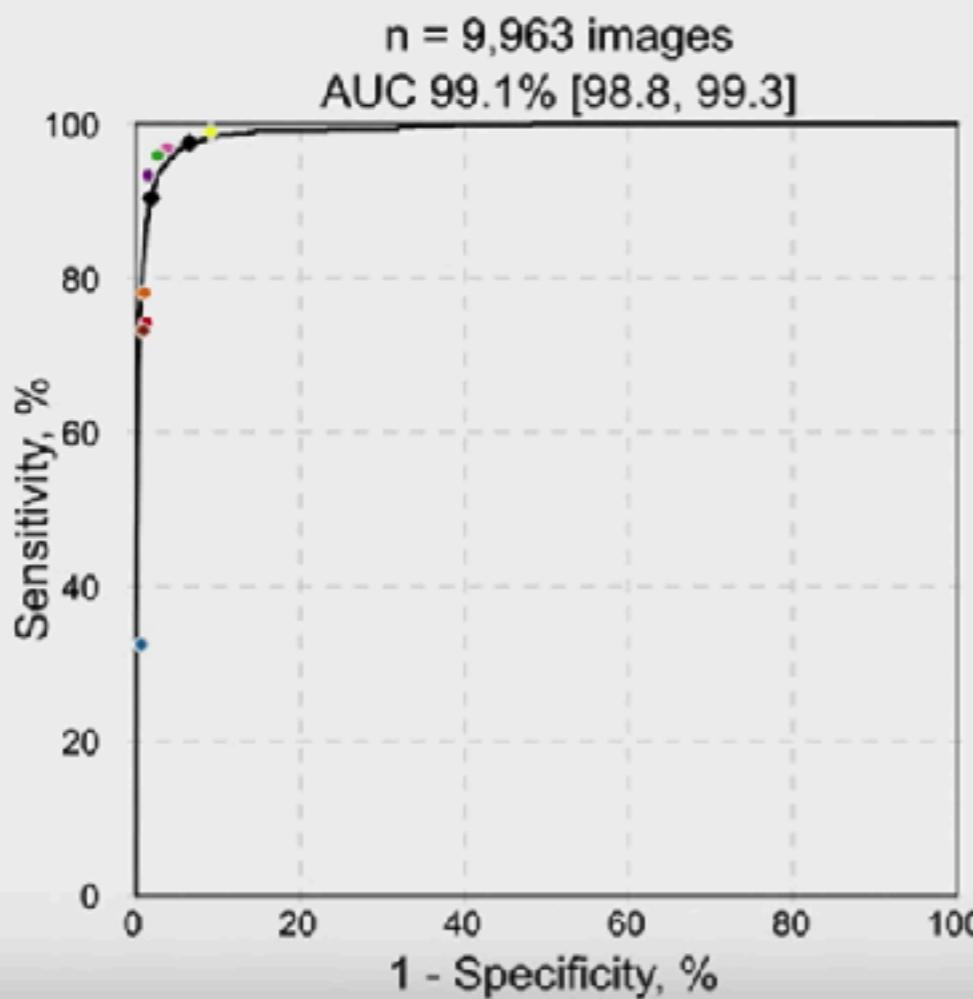
HYPE OR REALITY



HYPE OR REALITY

JAMA | Original Investigation | INNOVATIONS IN HEALTH CARE DELIVERY

Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs



F-score

0.95

Algorithm

0.91

Ophthalmologist
(median)

"The study by Gulshan and colleagues **truly represents the brave new world in medicine.**"

Dr. Andrew Beam, Dr. Isaac Kohane
Harvard Medical School

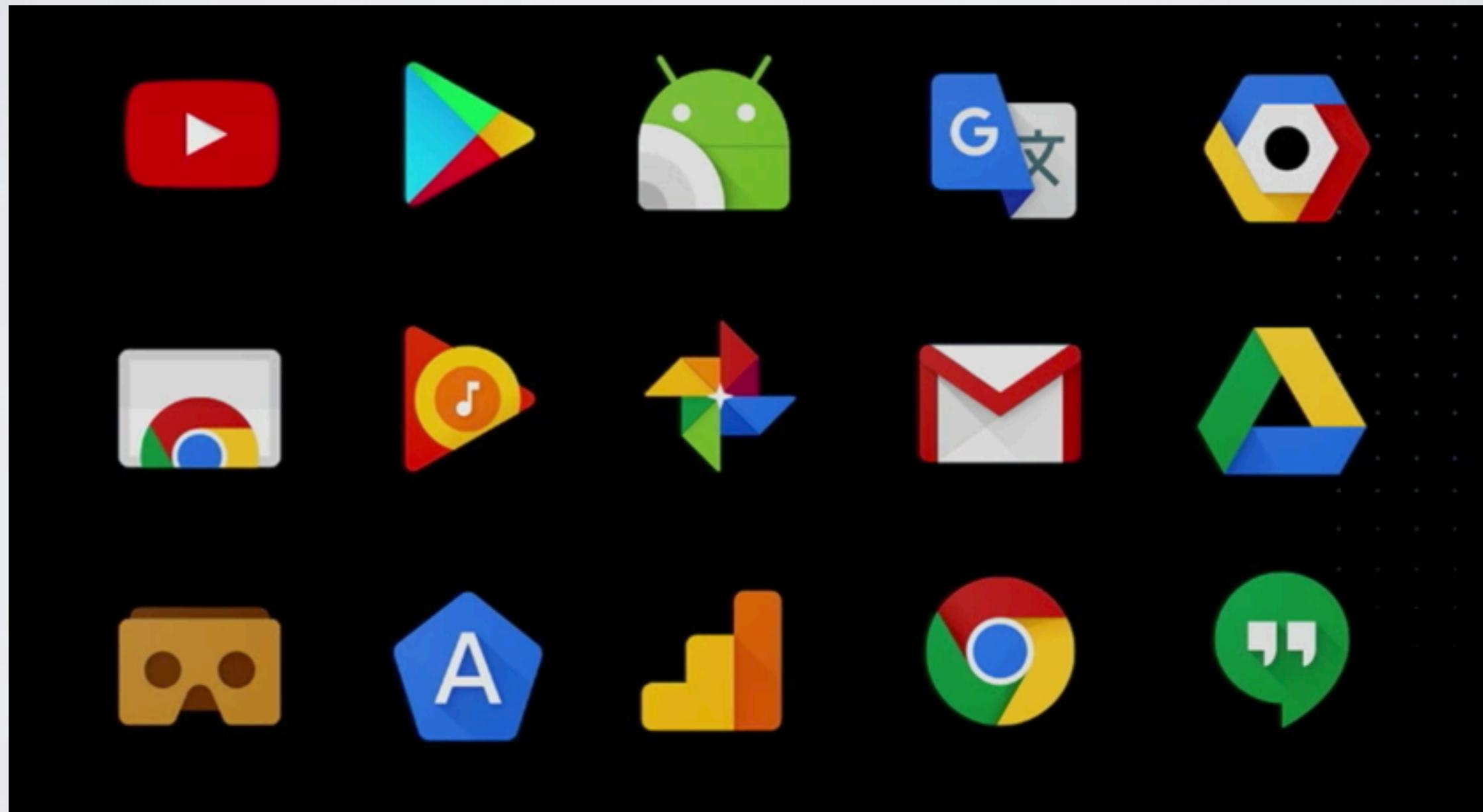
"Google just published this paper in JAMA (impact factor 37) [...] **It actually lives up to the hype.**"

Dr. Luke Oakden-Rayner
University of Adelaide

HYPE OR REALITY



GOOGLE APPS



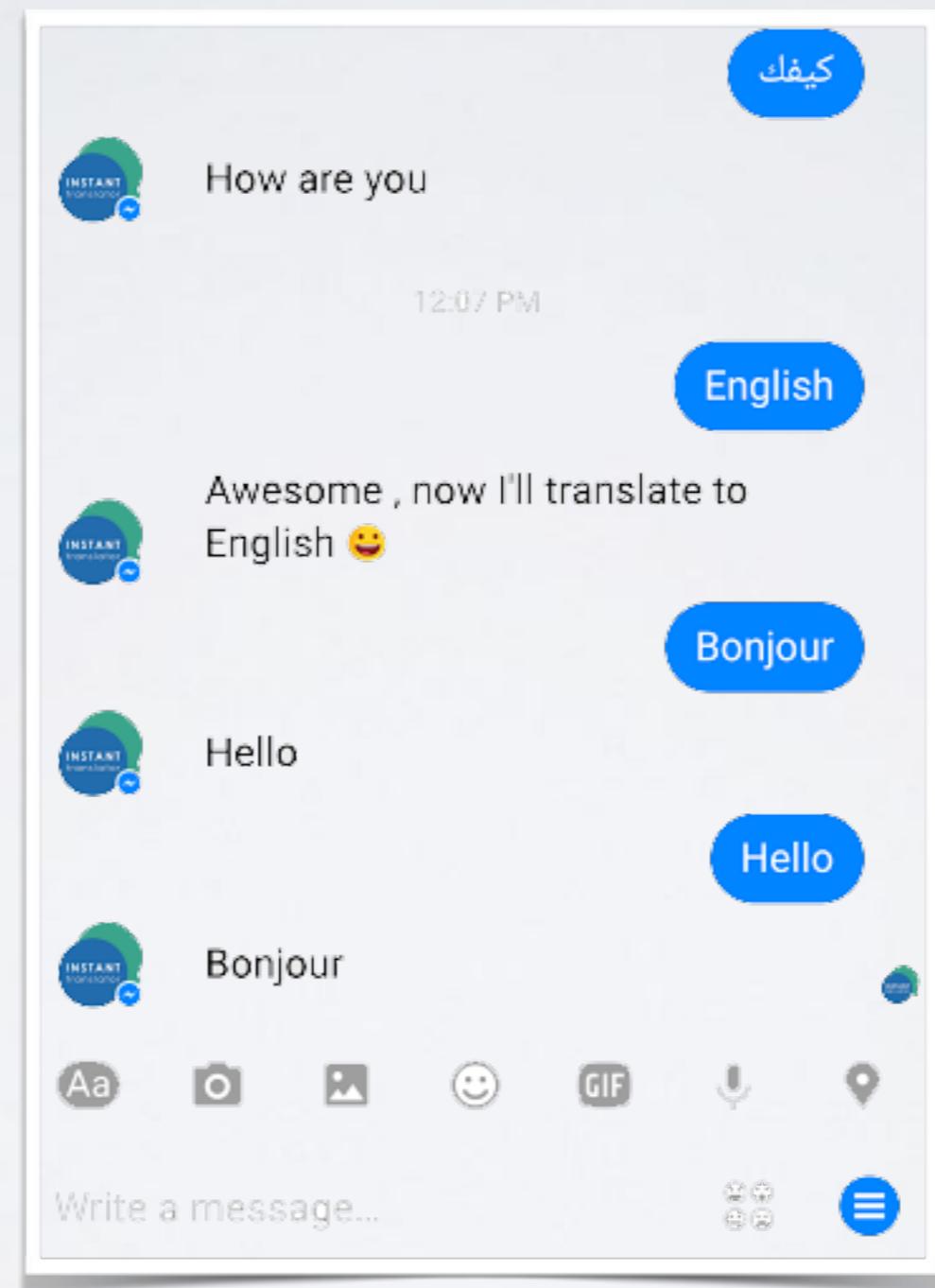
SPEECH RECOGNITION



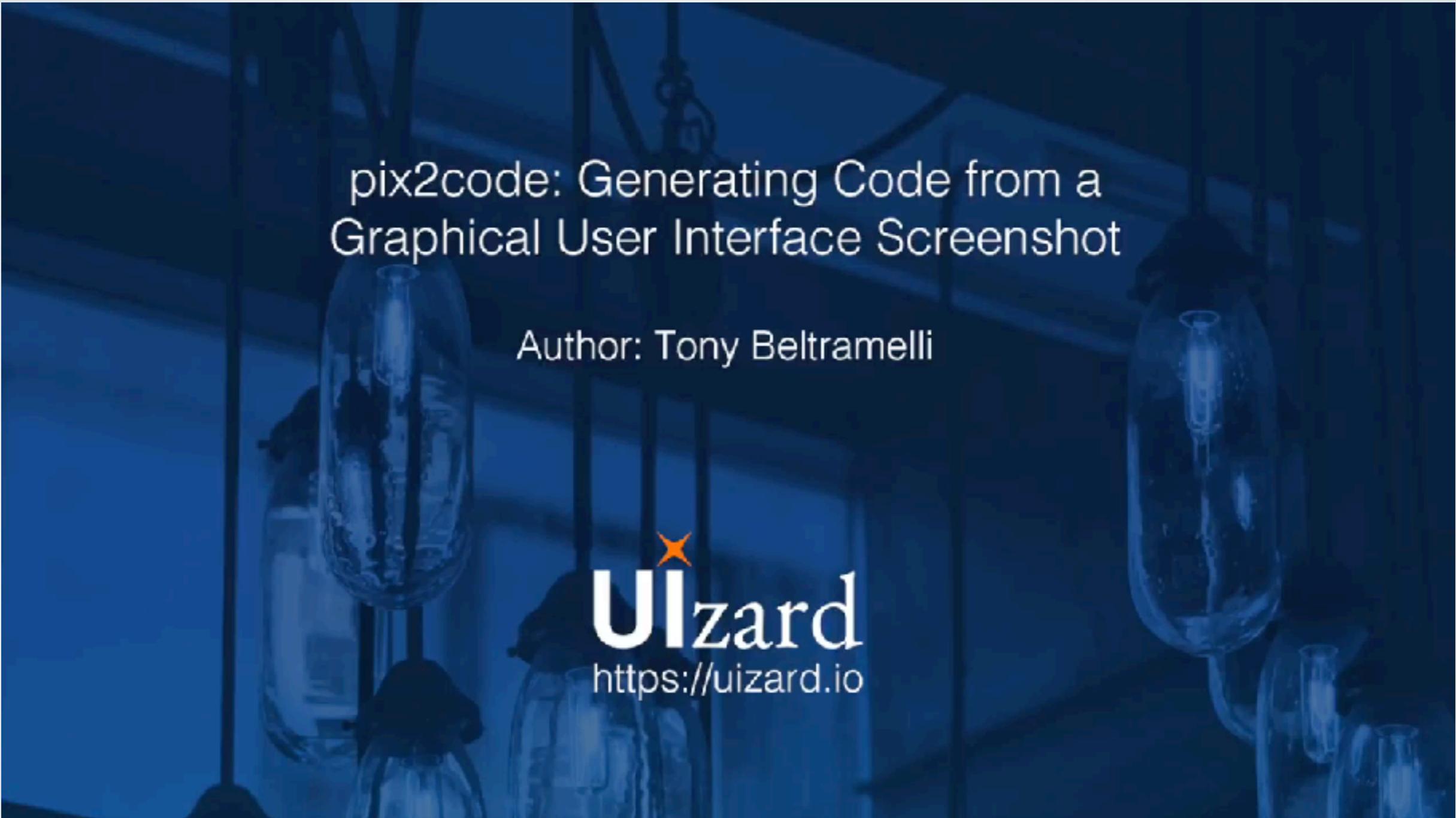
DRONES, DRONES EVERYWHERE



TRANSLATORS



PIX2CODE



pix2code: Generating Code from a
Graphical User Interface Screenshot

Author: Tony Beltramelli


<https://uizard.io>

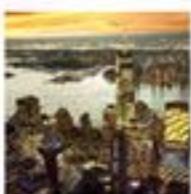
AMAZON RECOGNITION

Object and Scene Detection

Receive automatic image labeling of objects, concepts, and scene detection with a confidence score. (Your images will not be stored.)



Select A Sample Image



Use Your Own Image

Upload

or

Provide an Image URL here

Go

Next Steps: [Developer Guide >](#)

▼ Labels | Confidence

animal	97.9%
dog	97.9%
golden retriever	97.9%
pet	97.9%

▶ Request

▶ Response

```
[  
  {  
    "Confidence": 97.97281646728516,  
    "Name": "animal"  
  },  
  {  
    "Confidence": 97.97281646728516,  
    "Name": "dog"  
  },  
  {  
    "Confidence": 97.97281646728516,  
    "Name": "golden_retriever"  
  },  
  {  
    "Confidence": 97.97281646728516,  
    "Name": "pet"  
  }]
```

AMAZON RECOGNITION

Facial Analysis

Get full analysis of facial attributes, including confidence scores.



Select A Sample Image



Use Your Own Image

Upload

or

Provide an Image URL here

Go

[Next Steps: Developer Guide >](#)

▼ Faces | Confidence



looks like a face	99.9%
appears to be female	100%
smiling	92.8%
appears to be happy	99.0%
notwearing eyeglasses	99.8%
notwearing sunglasses	94.4%
eyes are open	94.8%
mouth is closed	81.6%
does not have a mustache	99.9%
does not have a beard	99.2%
Show Less	
▶ Request	
▶ Response	

IBM WATSON

Watson

Stories

About

Developers ▾

Products & Services ▾

Conversation

Discovery

Language

Conversation

Discovery

Language Translator

Virtual Agent

Natural Language Understanding

Natural Language Classifier

Discovery News

Knowledge Studio

Empathy

Vision

Speech

Personality Insights

Visual Recognition

Speech to Text

Tone Analyzer

Text to Speech

MICROSOFT AZURE

Use AI to solve business problems



Vision

Image-processing algorithms to smartly identify, caption and moderate your pictures.



Knowledge

Map complex information and data in order to solve tasks such as intelligent recommendations and semantic search.



Language

Allow your apps to process natural language with pre-built scripts, evaluate sentiment and learn how to recognize what users want.



Speech

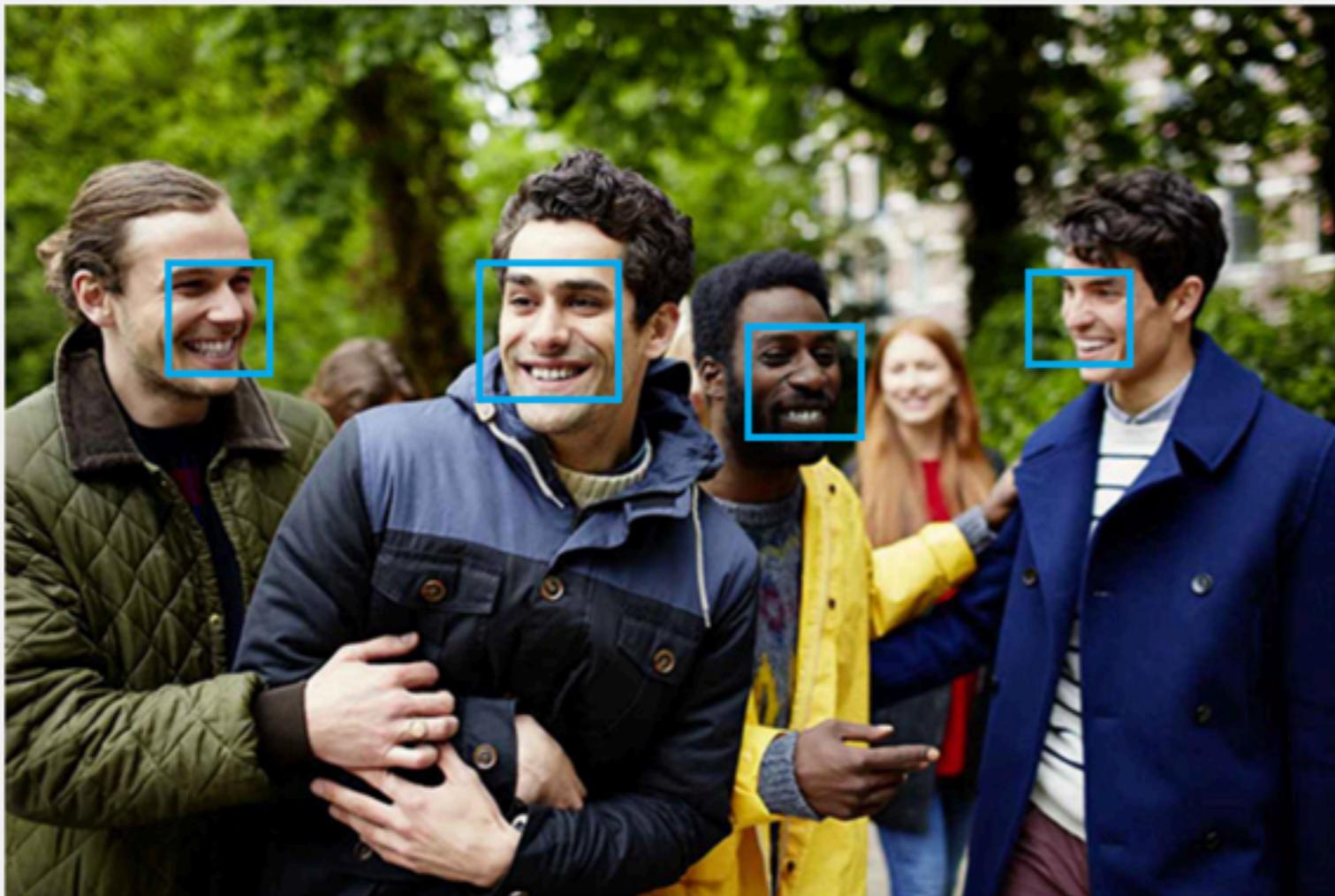
Convert spoken audio into text, use voice for verification, or add speaker recognition to your app.



Search

Add Bing Search APIs to your apps and harness the ability to comb billions of webpages, images, videos, and news with a single API call.

EMOTION RECOGNITION API



Detection result:

4 faces detected

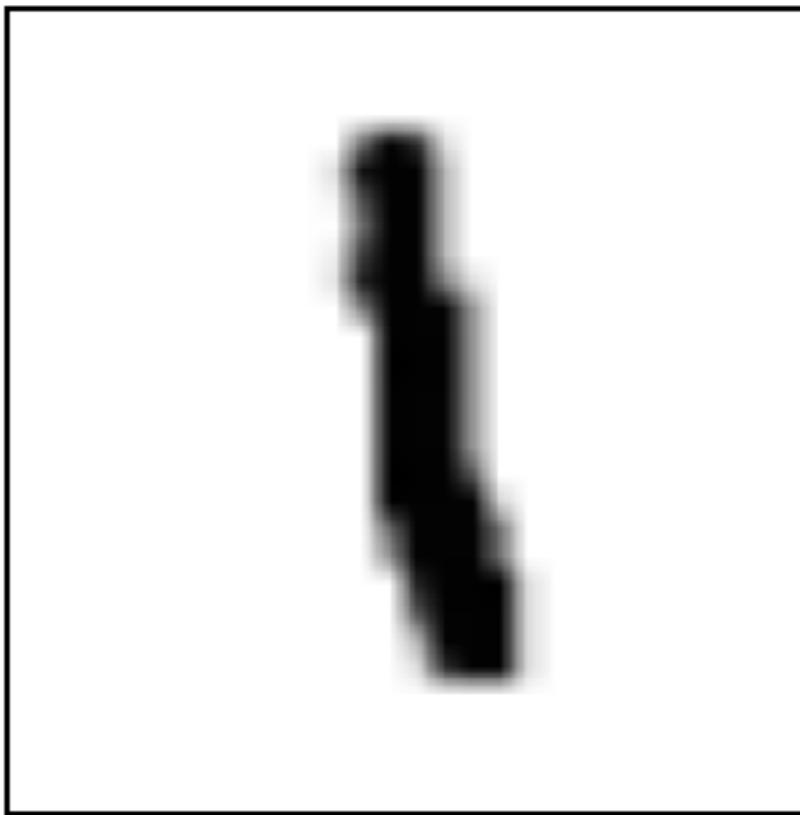
JSON:

```
[  
  {  
    "faceRectangle": {  
      "top": 114,  
      "left": 212,  
      "width": 65,  
      "height": 65  
    },  
    "scores": {  
      "anger": 1.0570484E-08,  
      "contempt": 1.52679547E-09,  
      "disgust": 1.60232943E-07,  
      "fear": 6.00660363E-12,  
      "happiness": 0.9999998,  
      "neutral": 9.449728E-09,  
      "sadness": 1.23025981E-08,  
      "surprise": 9.91396E-10  
    }  
  },  
  {  
    "faceRectangle": {  
      "top": 212,  
      "left": 452,  
      "width": 65,  
      "height": 65  
    },  
    "scores": {  
      "anger": 1.0570484E-08,  
      "contempt": 1.52679547E-09,  
      "disgust": 1.60232943E-07,  
      "fear": 6.00660363E-12,  
      "happiness": 0.9999998,  
      "neutral": 9.449728E-09,  
      "sadness": 1.23025981E-08,  
      "surprise": 9.91396E-10  
    }  
  },  
  {  
    "faceRectangle": {  
      "top": 312,  
      "left": 312,  
      "width": 65,  
      "height": 65  
    },  
    "scores": {  
      "anger": 1.0570484E-08,  
      "contempt": 1.52679547E-09,  
      "disgust": 1.60232943E-07,  
      "fear": 6.00660363E-12,  
      "happiness": 0.9999998,  
      "neutral": 9.449728E-09,  
      "sadness": 1.23025981E-08,  
      "surprise": 9.91396E-10  
    }  
  },  
  {  
    "faceRectangle": {  
      "top": 412,  
      "left": 512,  
      "width": 65,  
      "height": 65  
    },  
    "scores": {  
      "anger": 1.0570484E-08,  
      "contempt": 1.52679547E-09,  
      "disgust": 1.60232943E-07,  
      "fear": 6.00660363E-12,  
      "happiness": 0.9999998,  
      "neutral": 9.449728E-09,  
      "sadness": 1.23025981E-08,  
      "surprise": 9.91396E-10  
    }  
  }]
```

MNIST



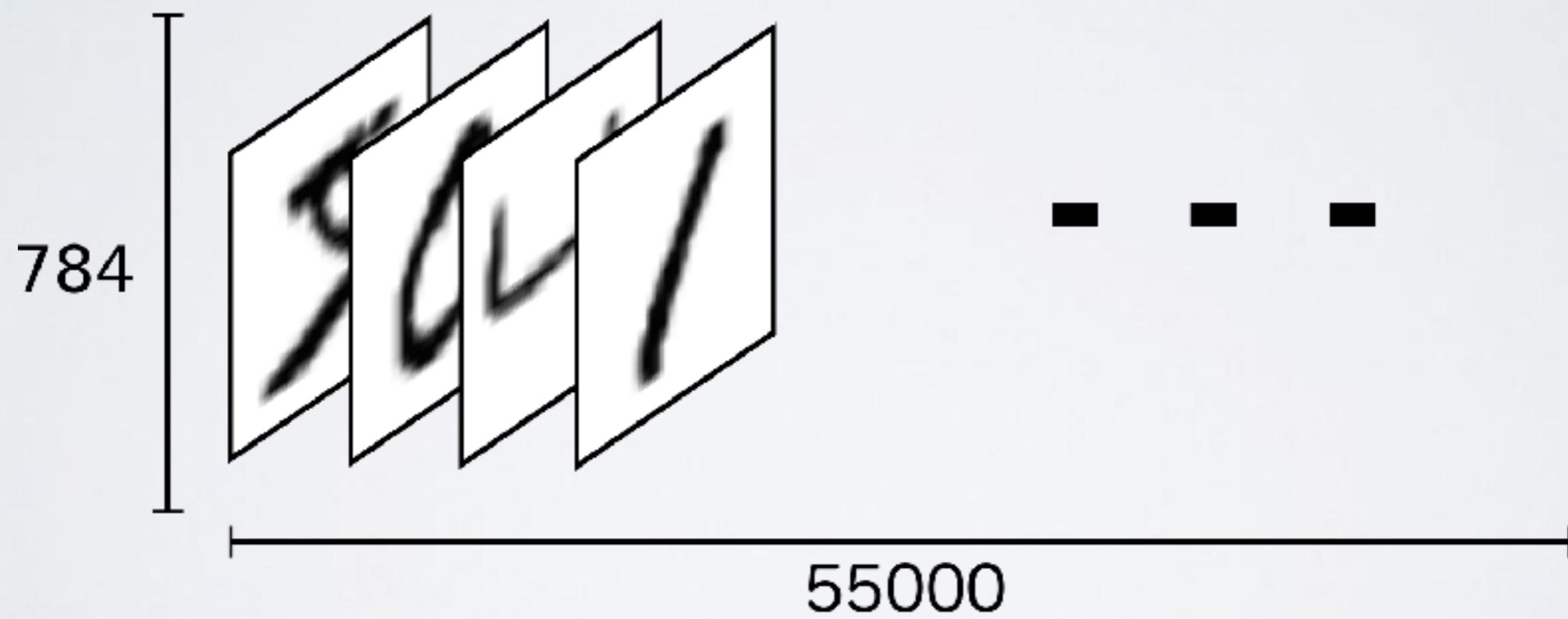
MNIST



2

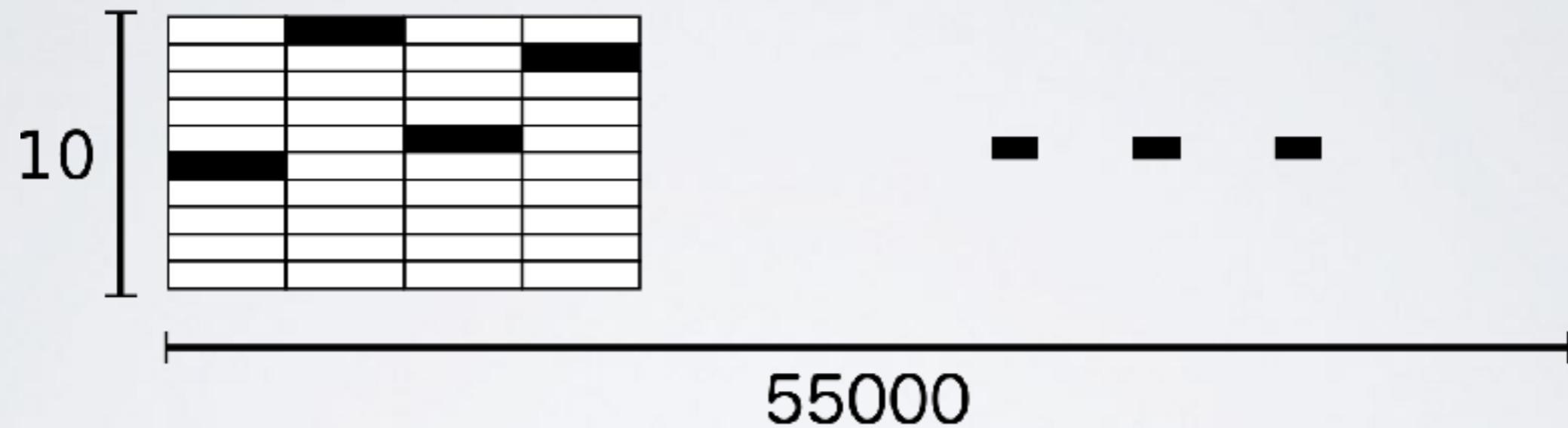
MNIST

mnist.train.xs

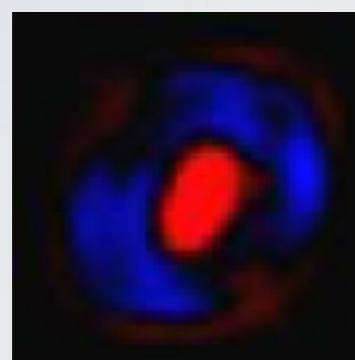


MNIST

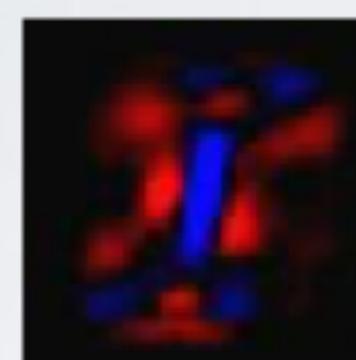
`mnist.train.ys`



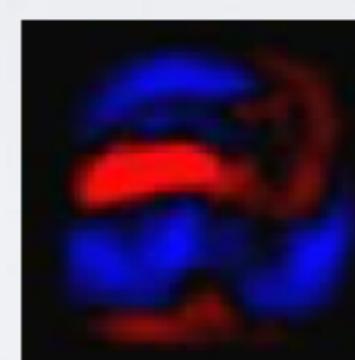
MNIST



0



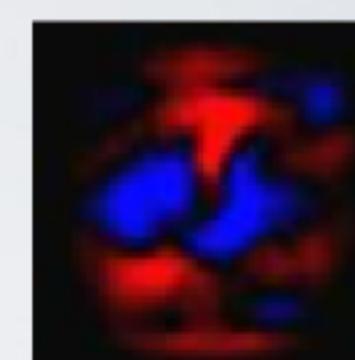
1



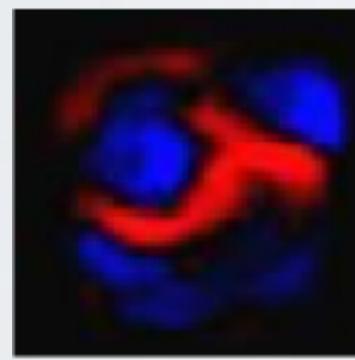
2



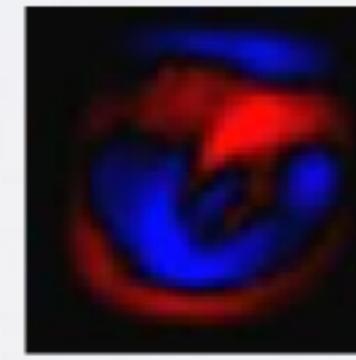
3



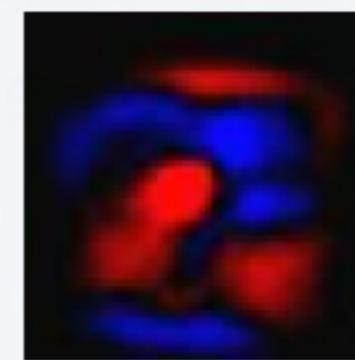
4



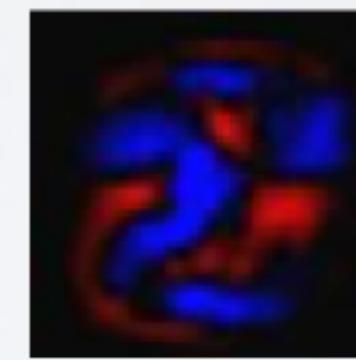
5



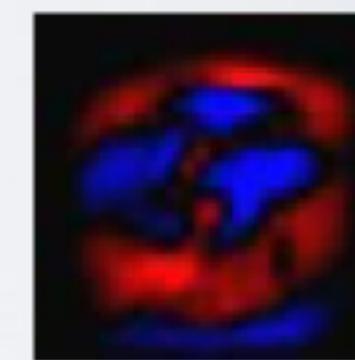
6



7

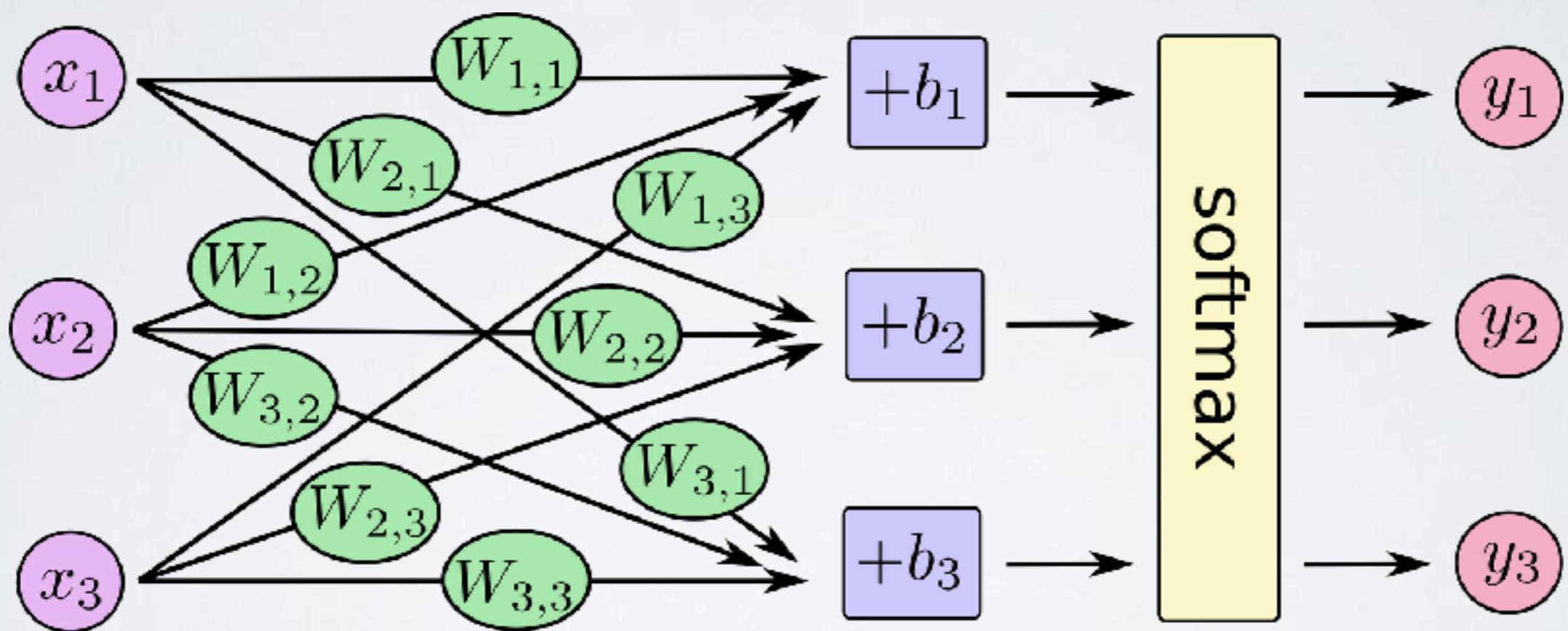


8



9

MNIST



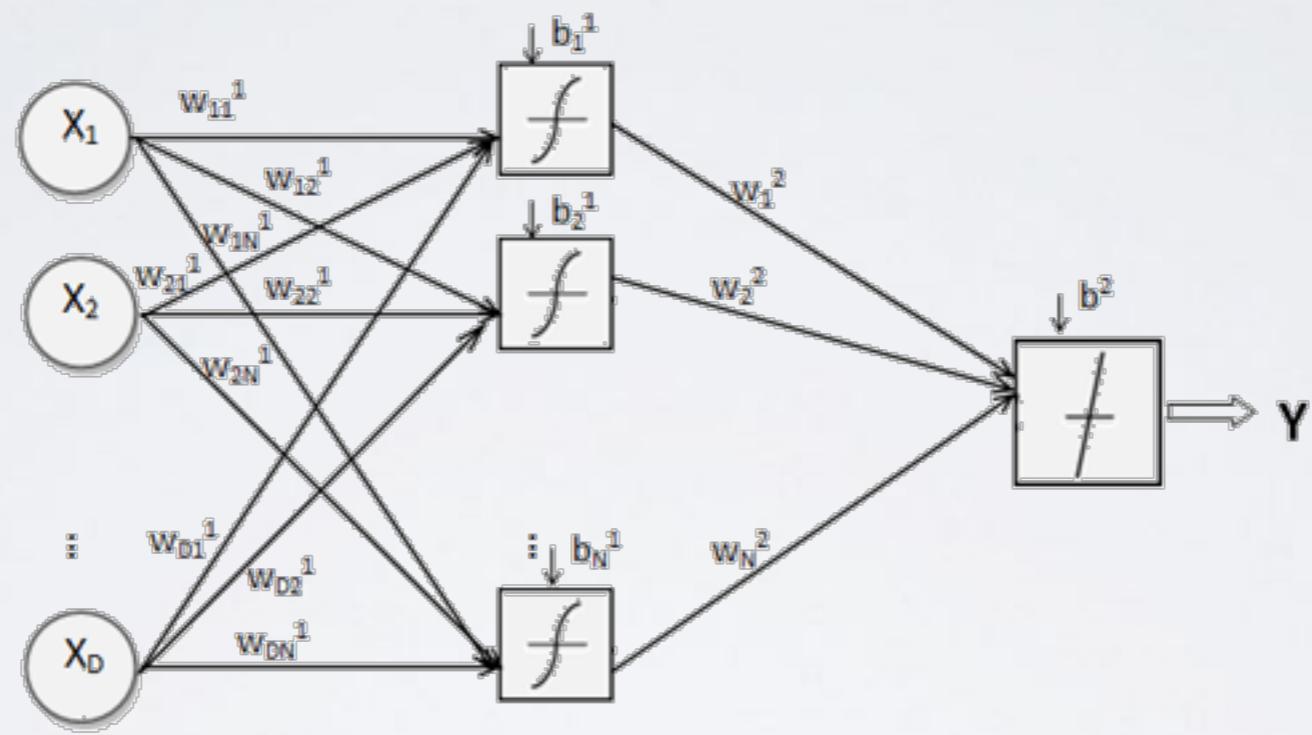
MNIST

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \text{softmax} \begin{bmatrix} W_{1,1}x_1 + W_{1,2}x_2 + W_{1,3}x_3 + b_1 \\ W_{2,1}x_1 + W_{2,2}x_2 + W_{2,3}x_3 + b_2 \\ W_{3,1}x_1 + W_{3,2}x_2 + W_{3,3}x_3 + b_3 \end{bmatrix}$$

MNIST

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \text{softmax} \left(\begin{bmatrix} W_{1,1} & W_{1,2} & W_{1,3} \\ W_{2,1} & W_{2,2} & W_{2,3} \\ W_{3,1} & W_{3,2} & W_{3,3} \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} \right)$$

MACHINE LEARNING



JS & ML?

JS & ML?



Swapnil Banga, Computer Science undergraduate.

Answered May 9



Not much, really. As a front end developer, your job is to collaborate with the back end developers and implement the client side of an application. That could mean creating your own designs or converting designs made by web designers into HTML, CSS, and JS code, depending on your job description.

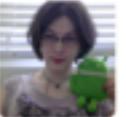
If you limit yourself to the front end, I'm afraid there isn't any machine learning involved. Even if your web app uses machine learning algorithms, all the logic will be implemented on server side, and your job will be to fetch results and display them.

For example, if your web app uses machine learning to flag potentially graphic content (images or videos), none of that is happening on the front end. Your job will be to hide content from the user if it has a flag. How it's flagged is abstracted away from you.

Machine learning is a completely different and unrelated field. It's quite an undertaking, if you want to switch careers and don't have a background in computer science and mathematics.

If you are sure you want to do it, then go ahead, it's very exciting. My recommendation would be to take a few introductory courses from Coursera, Udacity, and YouTube. MIT and Stanford both offer Machine Learning courses.

NODE & TENSORFLOW



jart commented on Jul 14 +

I suspect what happened is, last year, the TensorFlow team indicated that it would be difficult to support a NodeJS wrapper written with SWIG and suggested that the C API be used instead.
[tensorflow/tensorflow#2206 \(comment\)](#) A new project was started a few weeks ago to attempt doing exactly that. [tensorflow/tensorflow#37 \(comment\)](#)

 1  2

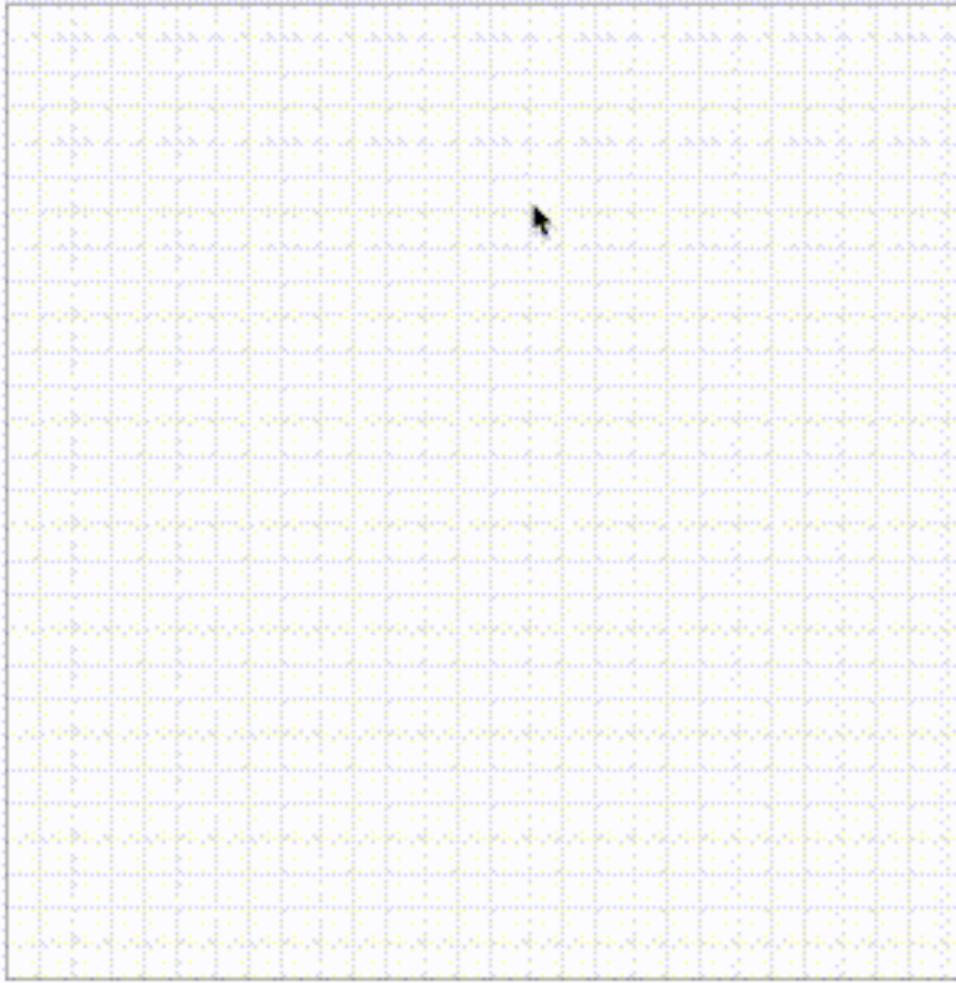
SHOW US SOME CODE!

BE: <https://github.com/patrykomiotek/tensorflow-mnist-backend>

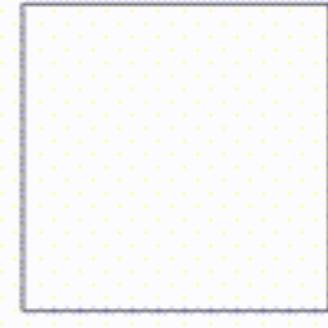
FE: <https://github.com/patrykomiotek/tensorflow-mnist-frontend>

TENSORFLOW & MNIST

draw a digit here!



input:



output:

simple convolutional

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

clear

JS LIBRARIES

- math.js
- brain.js (Neural Networks)
- Synaptic (Neural Networks)
- Natural (Natural Language Processing)
- ConvNetJS (Convolutional Neural Networks)
- mljs (A set of sub-libraries with a variety of functions)
- Neaptic (Nural Networks)
- Webdnn (Deep Learning)

JS & ML

Matrices

Simple Regression Example

MATH.JS / MATRICES

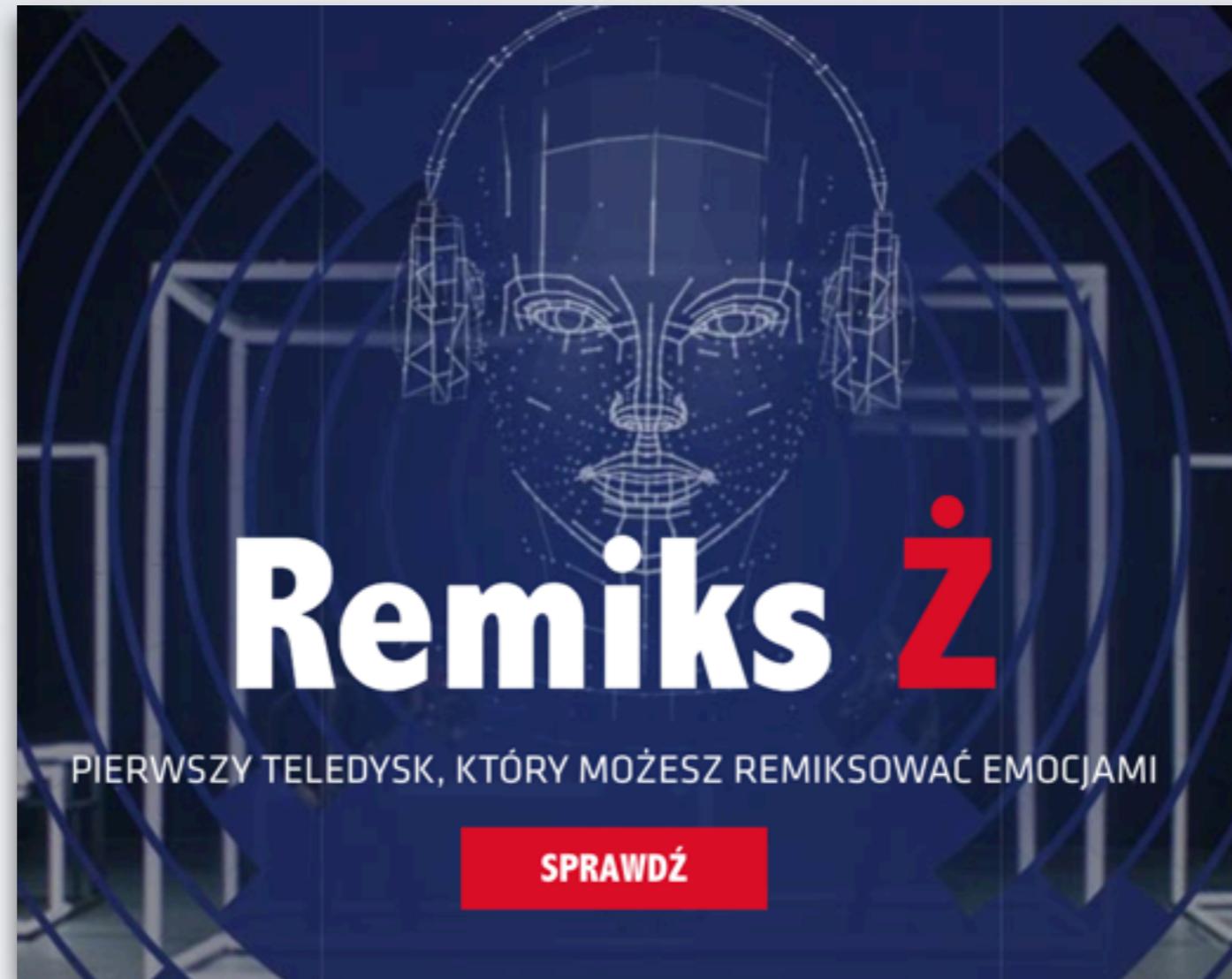
```
// load math.js (using node.js)
var math = require('mathjs');

// create matrices and arrays. a matrix is just a wrapper around an Array,
// providing some handy utilities.
console.log('create a matrix');
var a = math.matrix([1, 4, 9, 16, 25]);
print(a); // [1, 4, 9, 16, 25]
var b = math.matrix(math.ones([2, 3]));
print(b); // [[1, 1, 1], [1, 1, 1]]
print(b.size()); // [2, 3]

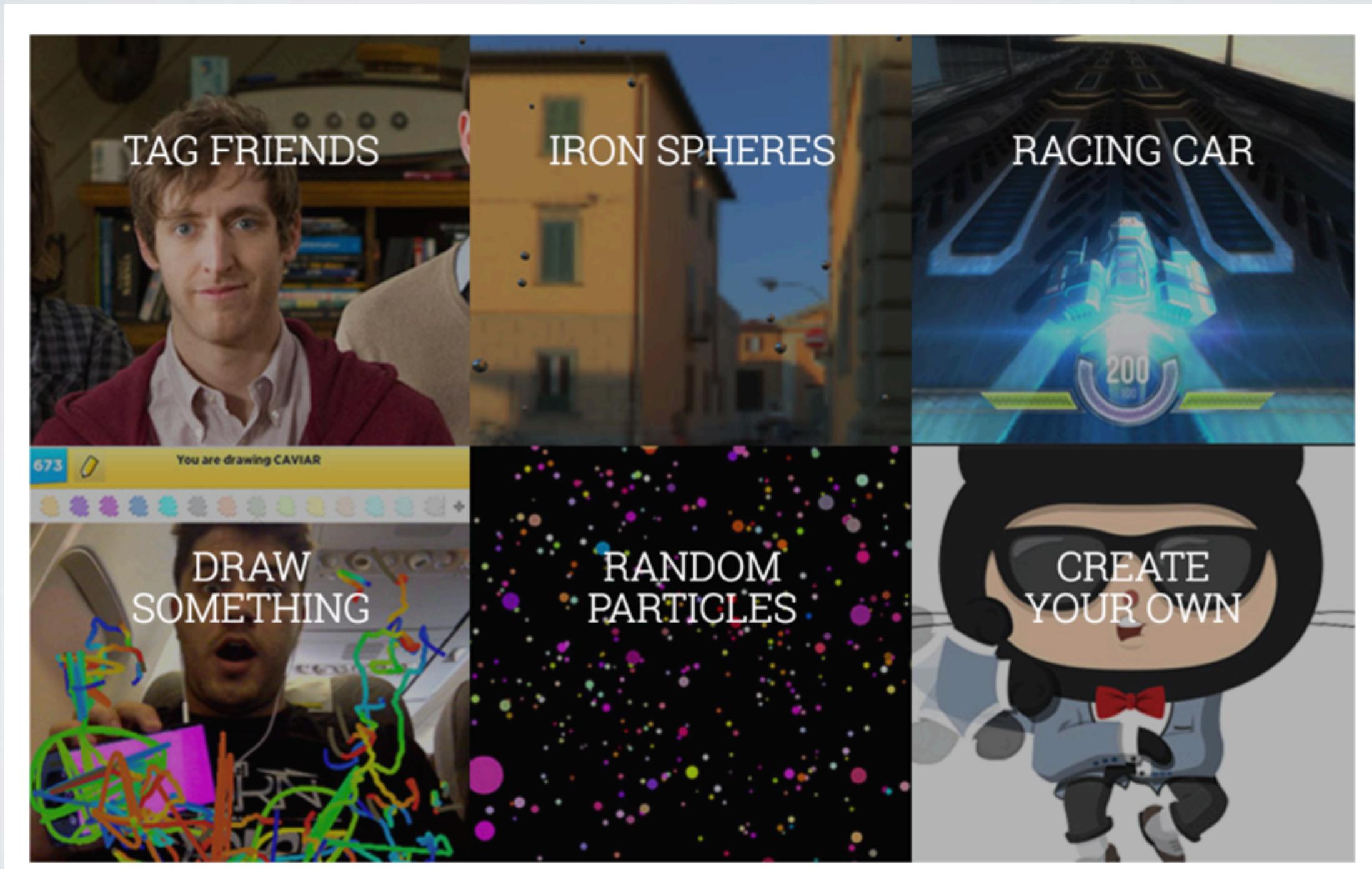
// the Array data of a Matrix can be retrieved using valueOf()
var array = a.valueOf();
print(array); // [1, 4, 9, 16, 25]

// Matrices can be cloned
var clone = a.clone();
print(clone); // [1, 4, 9, 16, 25]
console.log();
```

MACHINE LEARNING



TRACKING.JS



TRACKING.JS

Click

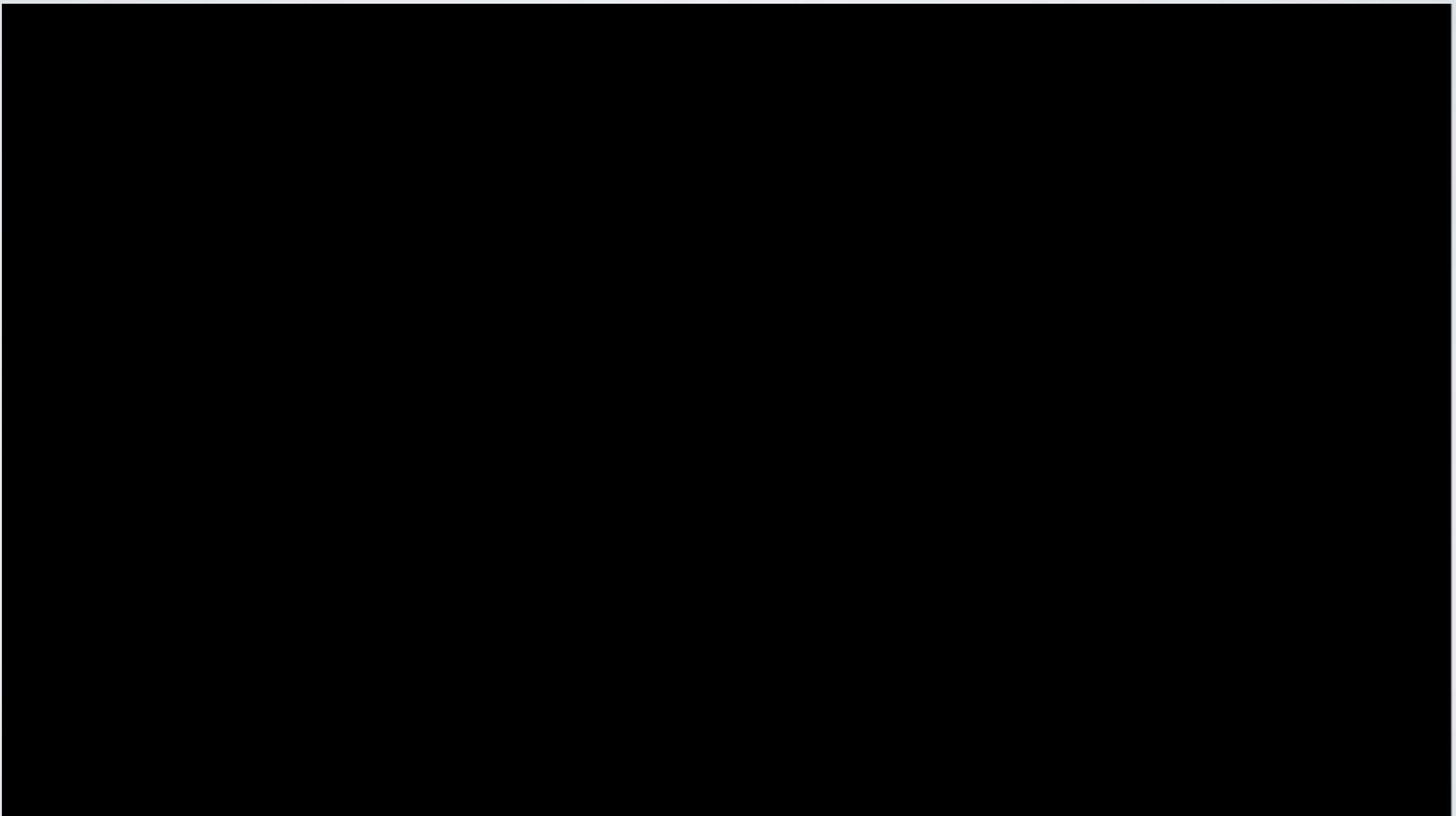
CLMTRACKR



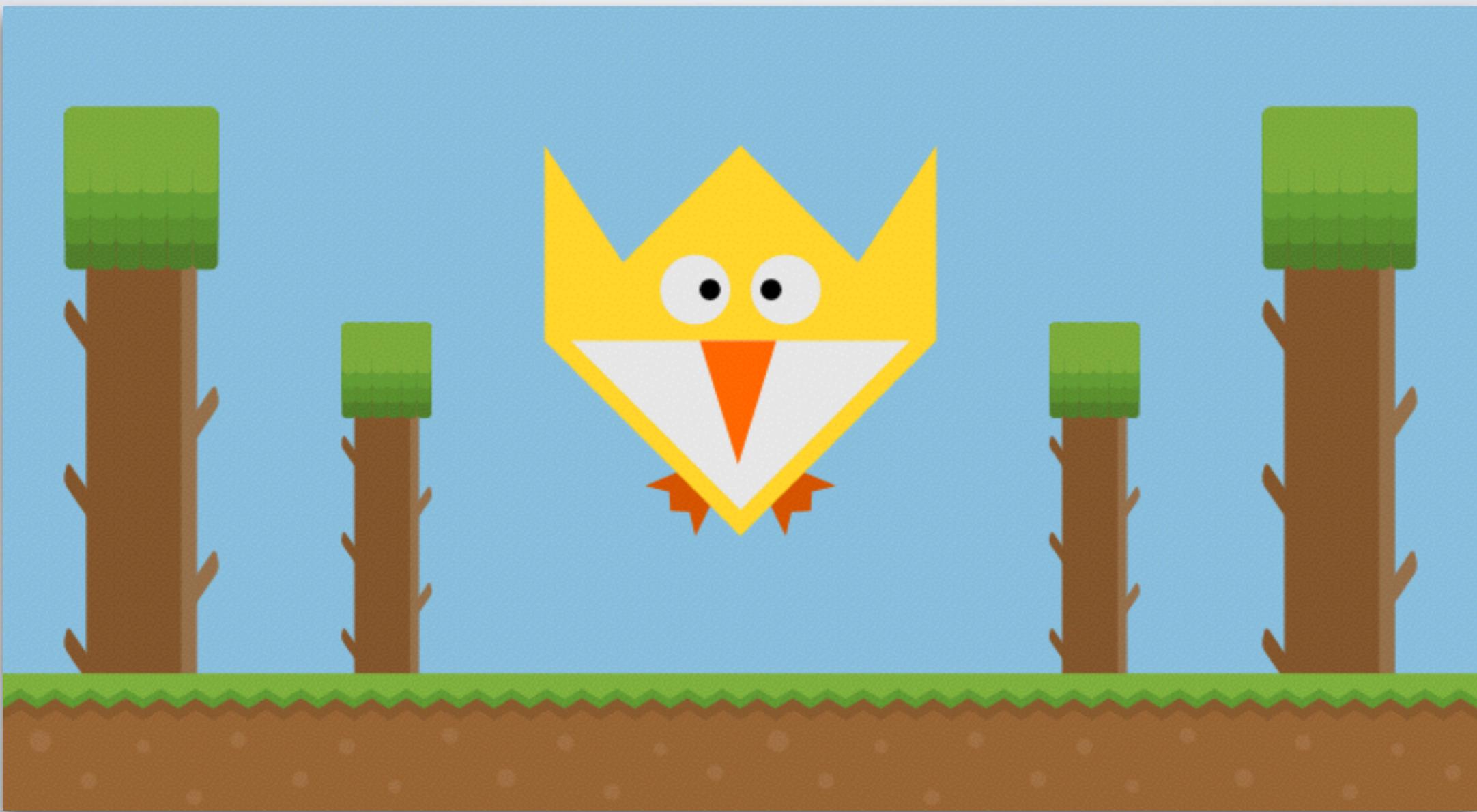
Example 1

Example 2

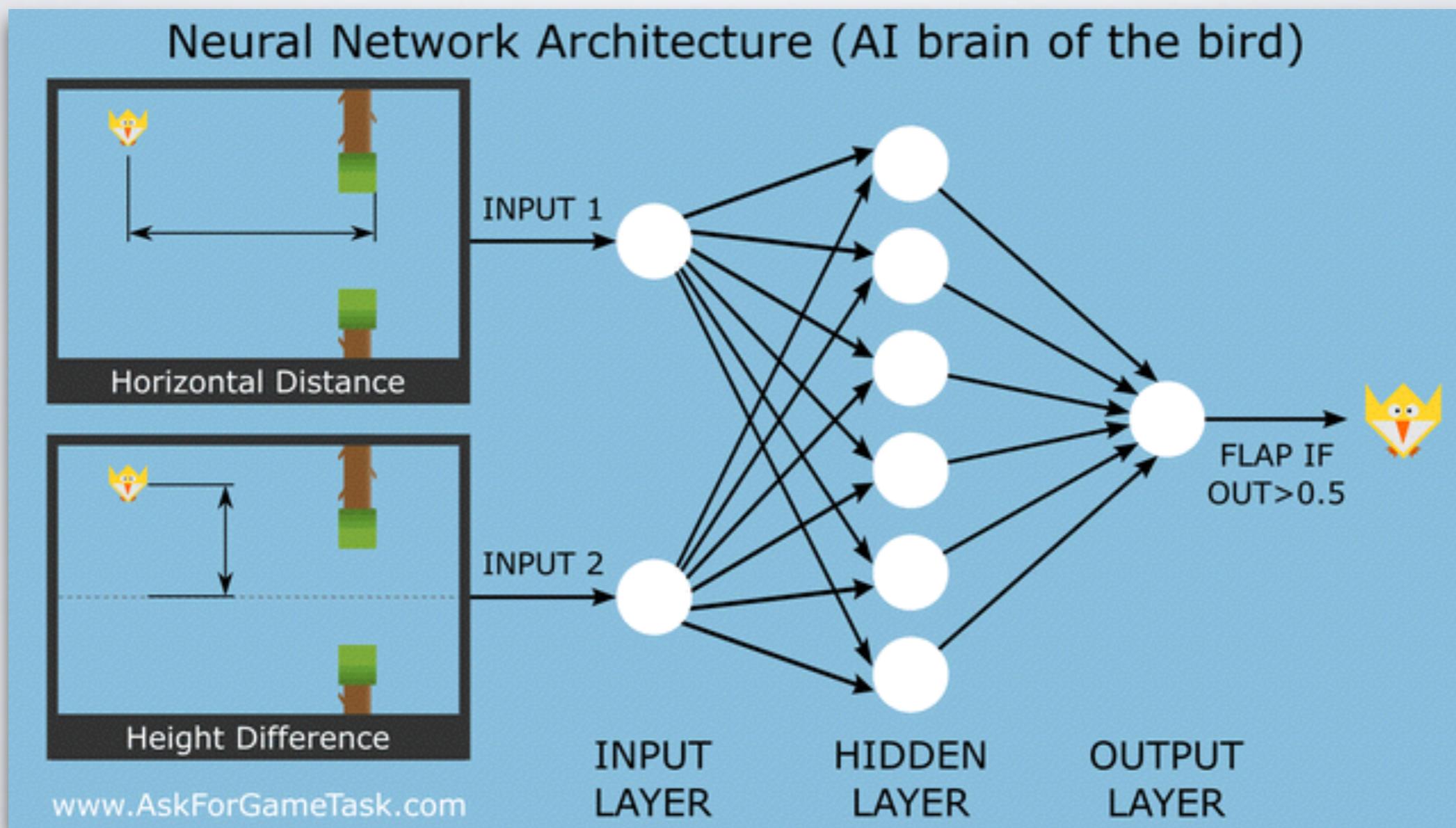
MARI/O



JS & ML



JS & ML



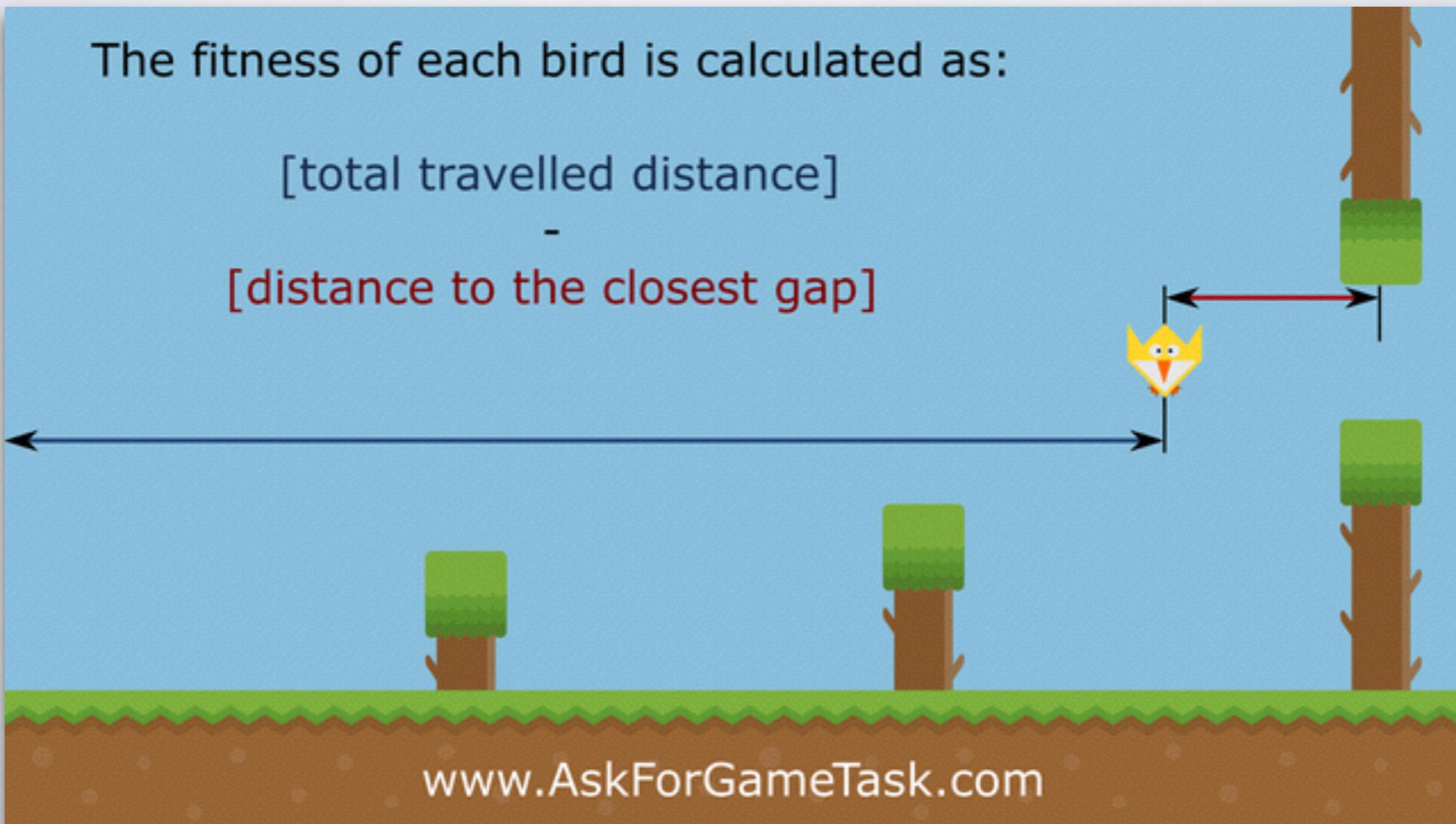
JS & ML

The fitness of each bird is calculated as:

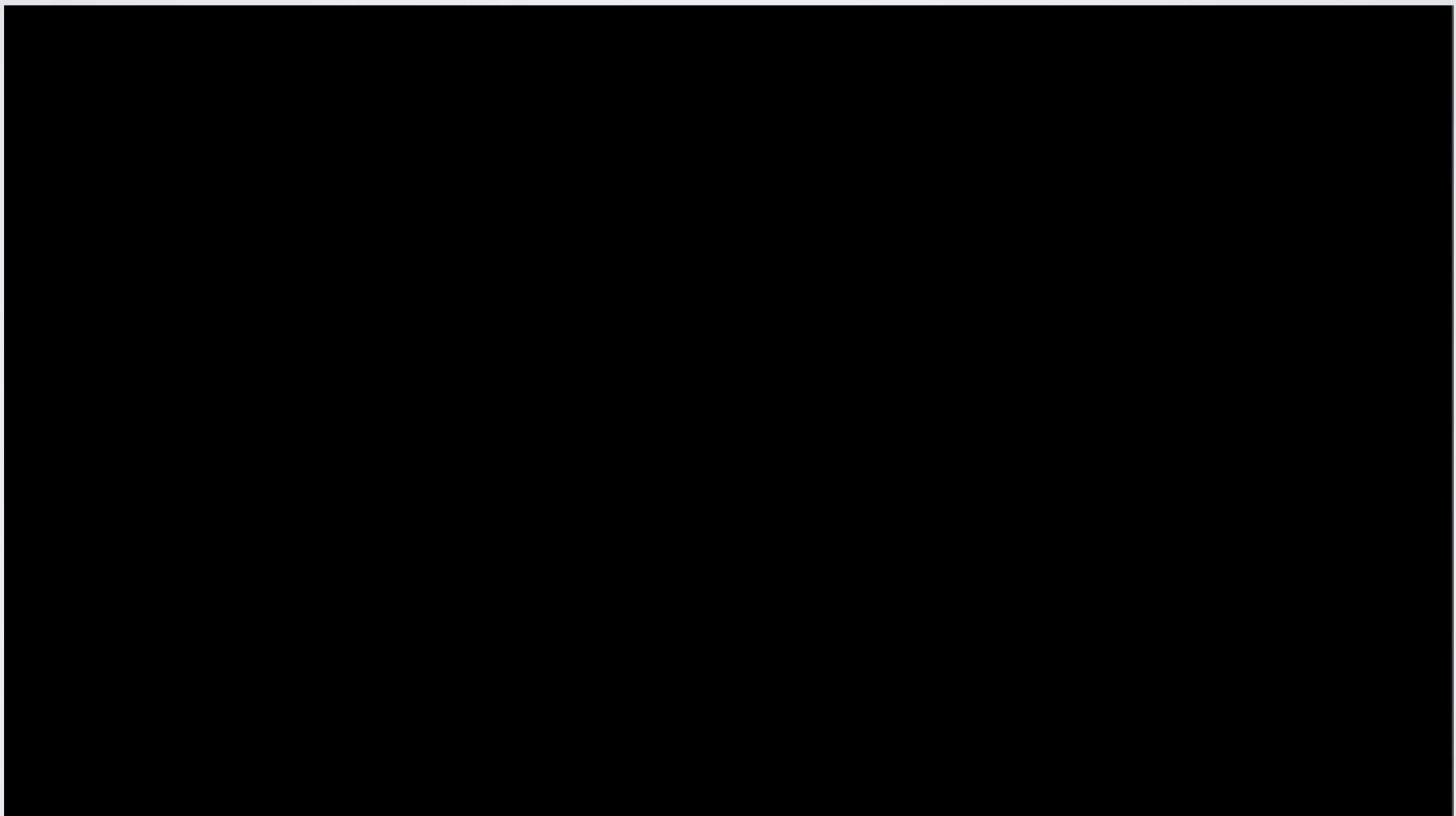
[total travelled distance]

-

[distance to the closest gap]



JS & ML



ACTIVATE “BRAIN”

```
// activates the neural network of an unit from the population
// to calculate an output action according to the inputs
activateBrain : function(bird, target){
    // input 1: the horizontal distance between the bird and the target
    var targetDeltaX = this.normalize(target.x, 700) * this.SCALE_FACTOR;

    // input 2: the height difference between the bird and the target
    var targetDeltaY = this.normalize(bird.y - target.y, 800) * this.SCALE_FACTOR;

    // create an array of all inputs
    var inputs = [targetDeltaX, targetDeltaY];

    // calculate outputs by activating synaptic neural network of this bird
    var outputs = this.Population[bird.index].activate(inputs);

    // perform flap if output is greater than 0.5
    if (outputs[0] > 0.5) bird.flap();
},
```

SYNAPTIC.JS



Neurons

Neurons are the basic unit of the neural network. They can be connected to another neuron or gate connections between other neurons. This allows you to create complex and flexible architectures.

[Learn More](#)



Trainer

Trainers can take any given network regardless of its architecture and use any training set. It includes built-in tasks to test networks, like learning an XOR, completing a Discrete Sequence Recall task or an Embedded Reber Grammar test.

[Learn More](#)

SYNAPTIC.js



Networks

Networks can be imported/exported to JSON, converted to workers or standalone functions. They can be connected to other networks or gate connections.

[Learn More](#)



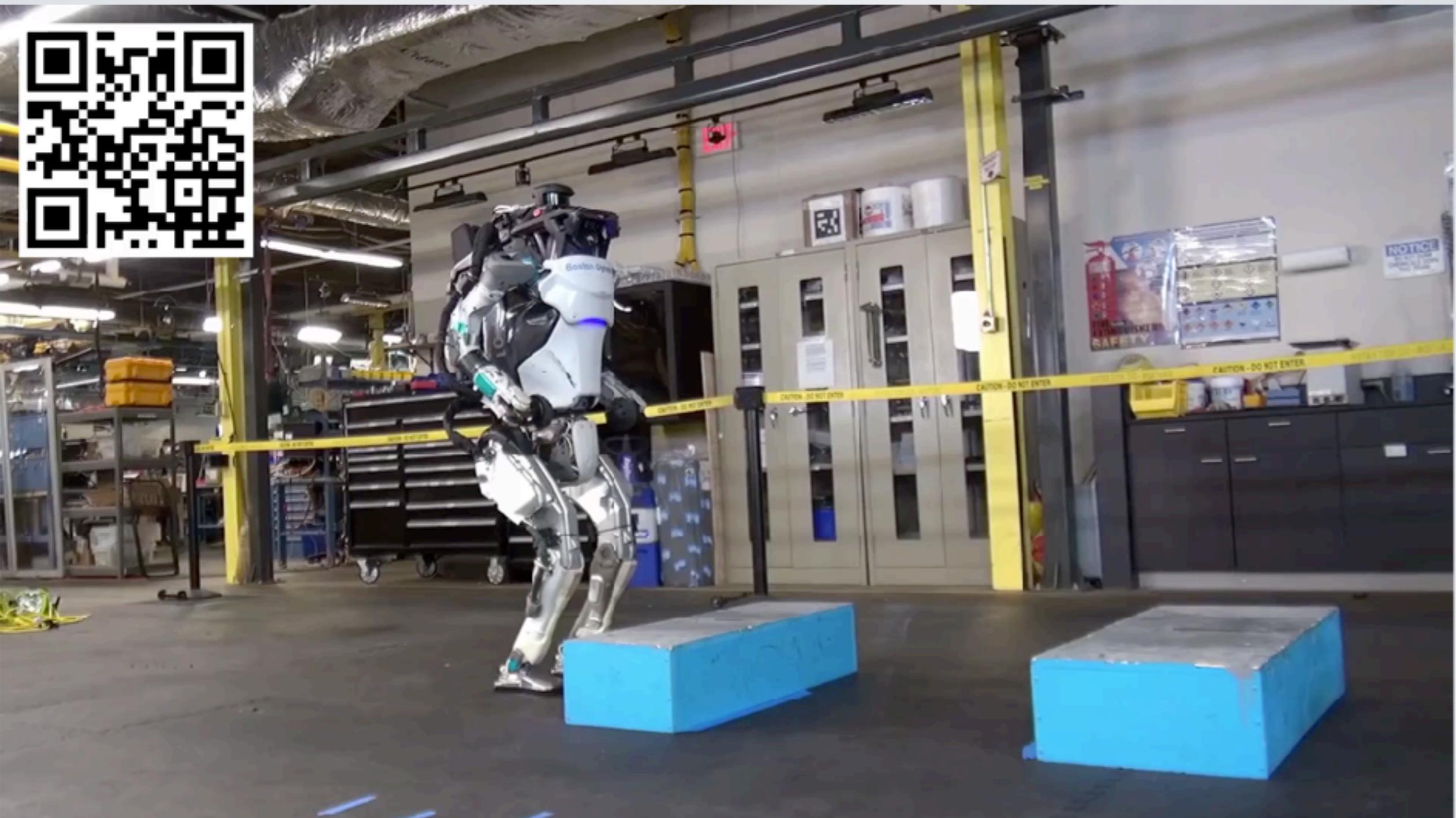
Architect

The Architect includes built-in useful architectures such as multilayer **perceptrons**, multilayer **long short-term memory** networks (LSTM), **liquid state machines** and **Hopfield** networks.

[Learn More](#)

VUI (VOICE USER INTERFACES)

BOSTON DYNAMICS



CONCLUSION

WE NEED YOU!

The advertisement features a large, semi-transparent background image of a diverse group of people, possibly a software development team, sitting and standing together in what looks like a modern office or workshop environment.

Be our
Front-end
_Developer

Lublin

jntive

Never settle.
intive.com

Are you good at:

- JS
- ANGULAR
- Scrum.org
- HTML5

QUESTIONS?



¡ADIÓS!

@PatrykOmiotek



Zapisy na warsztaty z Machine Learning:

<http://patryk.omiotek.info/ML>