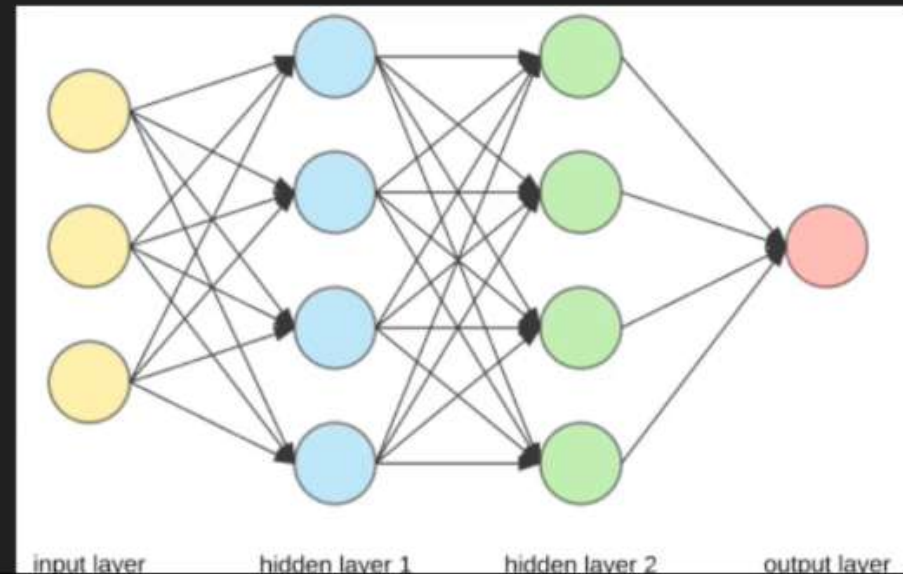
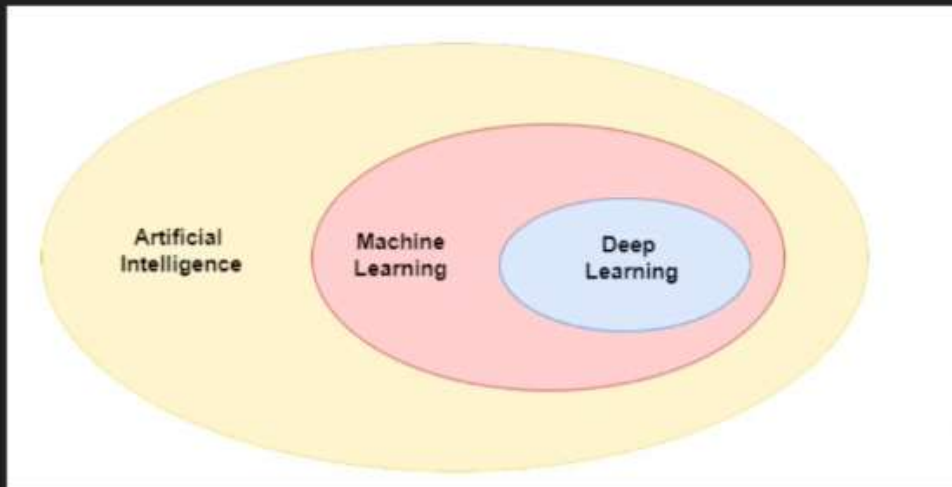


# What is Deep Learning?

16 February 2022 06:32

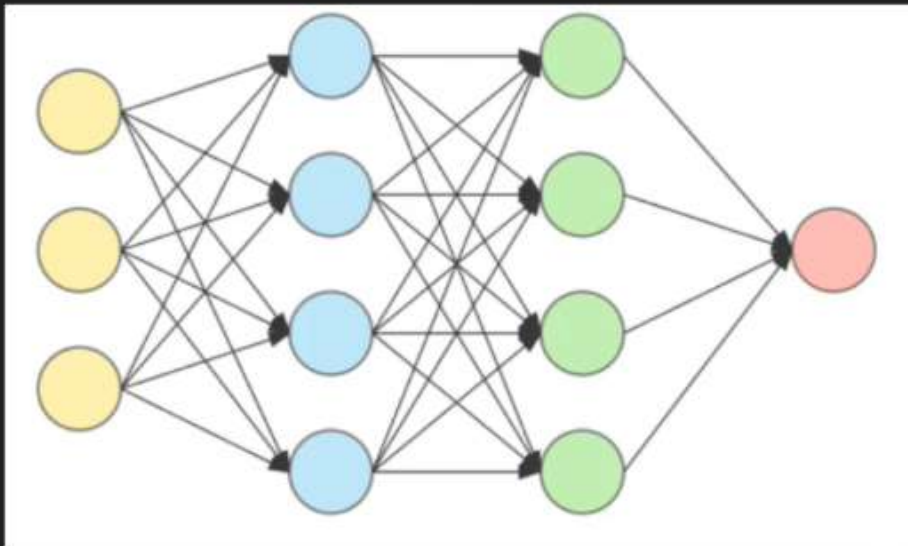
Deep Learning is a subfield of Artificial Intelligence and Machine Learning that is inspired by the structure of a human brain.

Deep learning algorithms attempt to draw similar conclusions as humans would by continually analyzing data with a given logical structure called Neural Network.



Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning.

Deep Learning Algorithms uses multiple layers to progressively extract higher-level features from the raw input. For example, in image processing, lower layers may identify edges, while higher layers may identify the concepts relevant to a human such as digits or letters or faces.



# Feature learning

[Article](#) [Talk](#)

🌐 [Language](#)

 [Download PDF](#)  [Watch](#)  [Edit](#)

In [machine learning](#), **feature learning** or **representation learning**<sup>[1]</sup> is a set of techniques that allows a system to automatically discover the representations needed for [feature](#) detection or classification from raw data. This replaces manual [feature engineering](#) and allows a machine to both learn the features and use them to perform a specific task.

Feature learning is motivated by the fact that machine learning tasks such as [classification](#) often require input that is mathematically and computationally convenient to process. However, real-world data such as images, video, and sensor data has not yielded to attempts to algorithmically define specific features. An alternative is to discover such features or representations through examination, without relying on explicit algorithms.

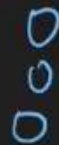
Feature learning can be either supervised or unsupervised.

- In [supervised feature learning](#), features are learned using labeled input data. Examples include [supervised neural networks](#), [multilayer perceptron](#) and (supervised) [dictionary learning](#).
- In [unsupervised feature learning](#), features are learned with unlabeled input data. Examples include dictionary learning, [independent component analysis](#), [autoencoders](#), [matrix factorization](#)<sup>[2]</sup> and various forms of [clustering](#).<sup>[3][4][5]</sup>

Raw data



Low-level features

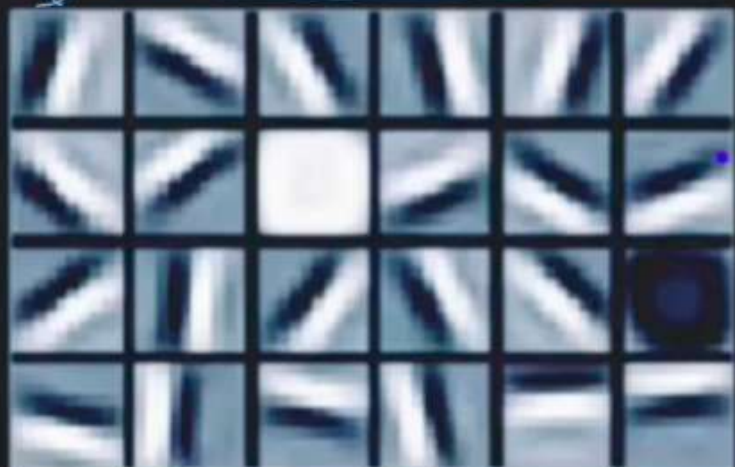


Mid-level features





Low-level features



000

Mid-level features



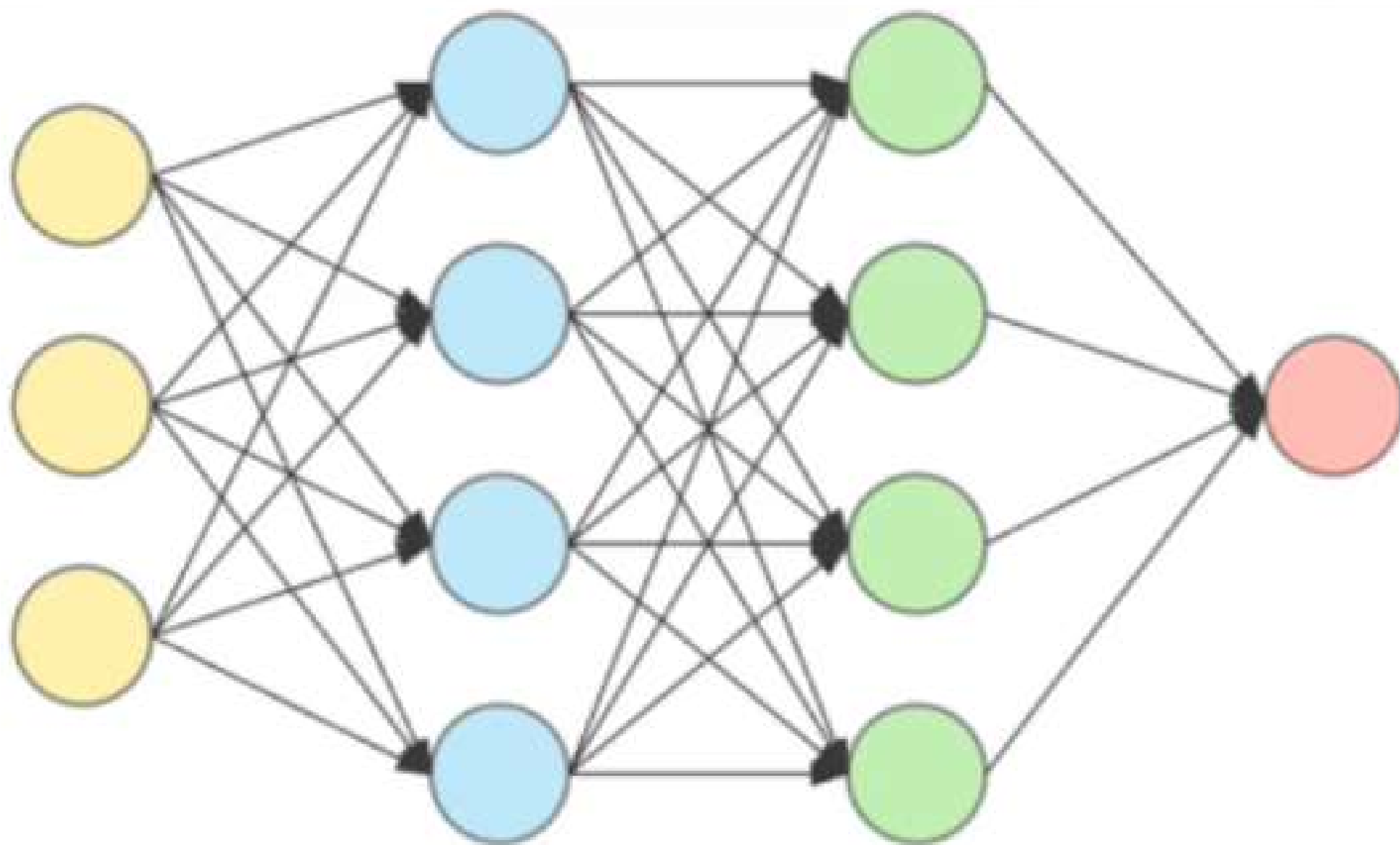
High-level features



→ FP4A → ECE → fast,  
low power  
reprog → custom  
↓ expensive  
Xilinx ~ Bing → AI

## ASIC

→ TPU → Tensor processing  
unit (Google)  
↓  
google colab  
→ Edge TPU → Drone, watch  
smart glass  
→ NPU → Neural Processing units  
→ accelerate



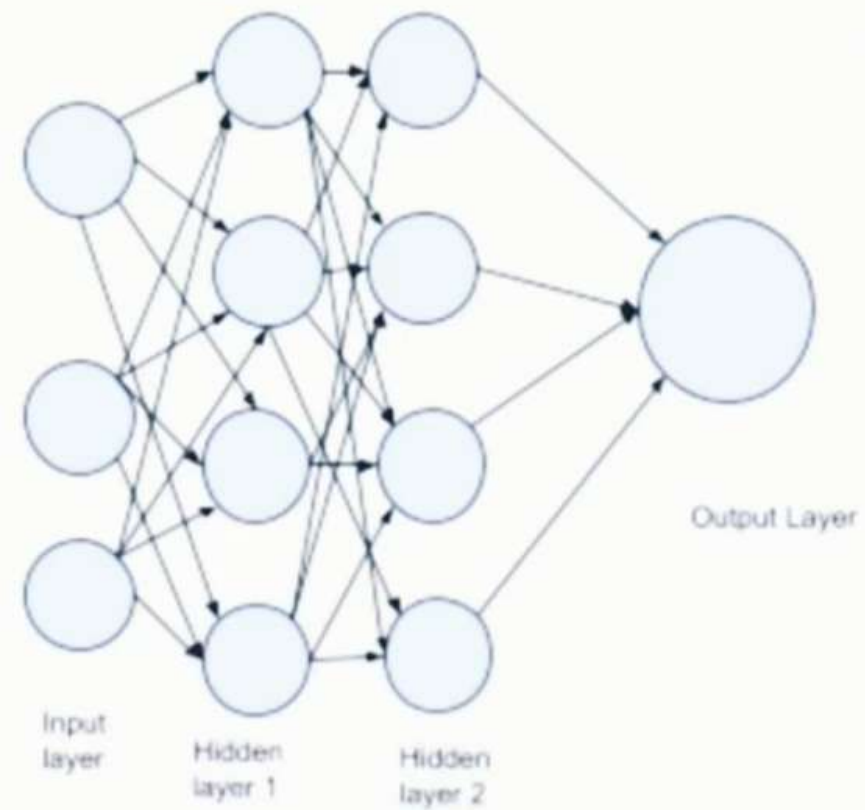
input layer

hidden layer 1

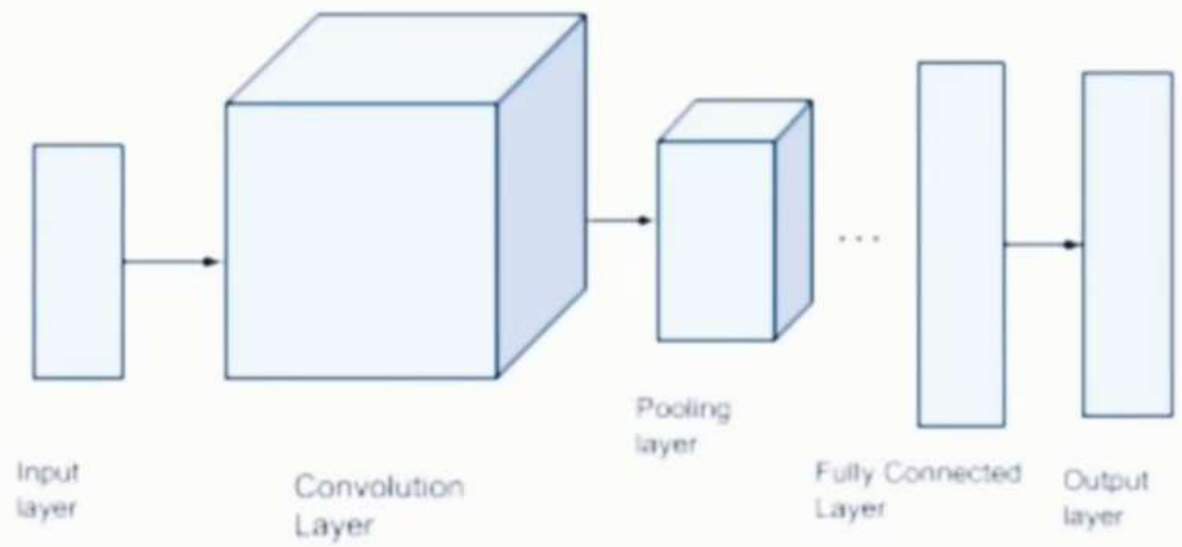
hidden layer 2

output layer

## Regular Neural Network

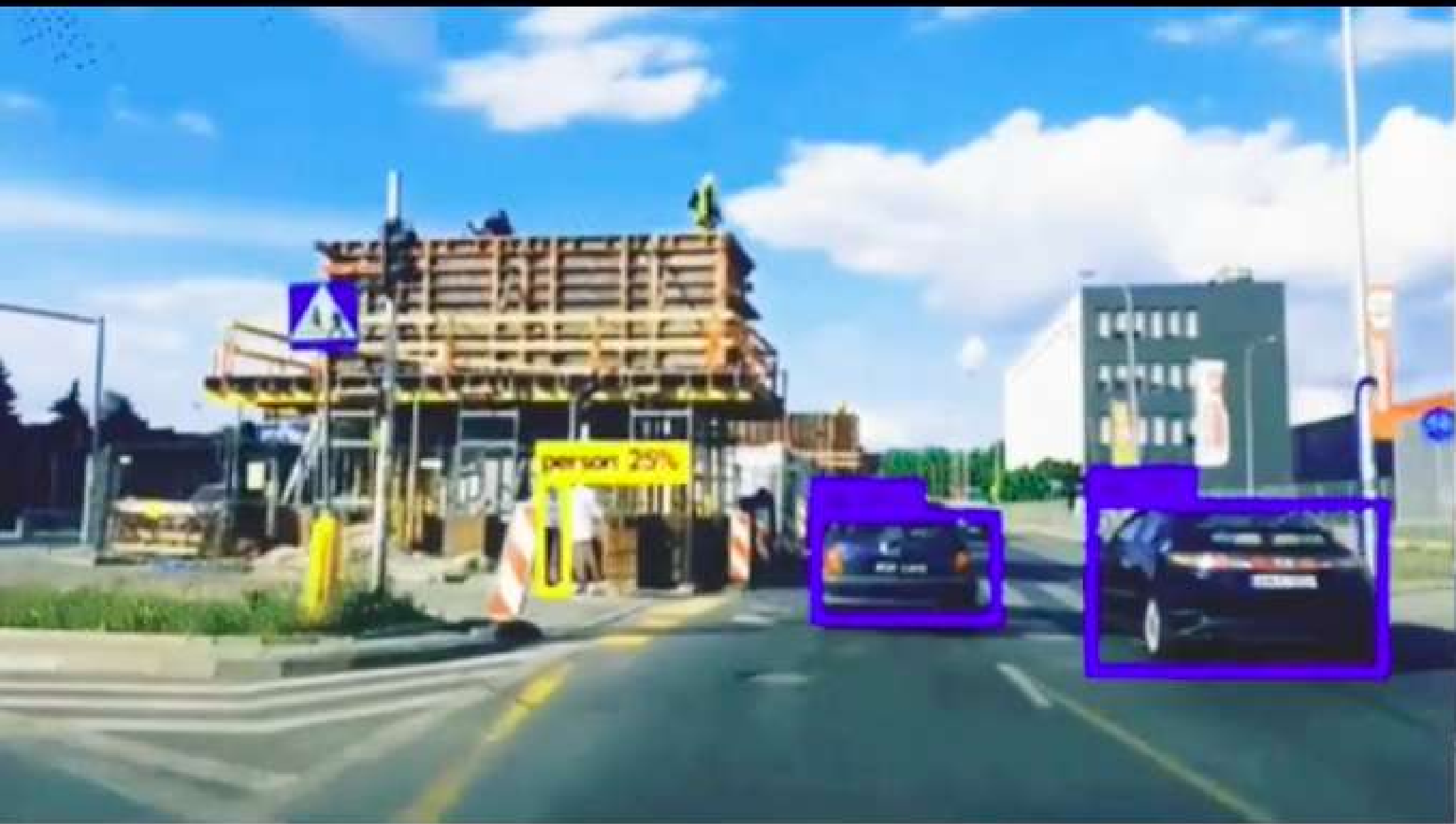


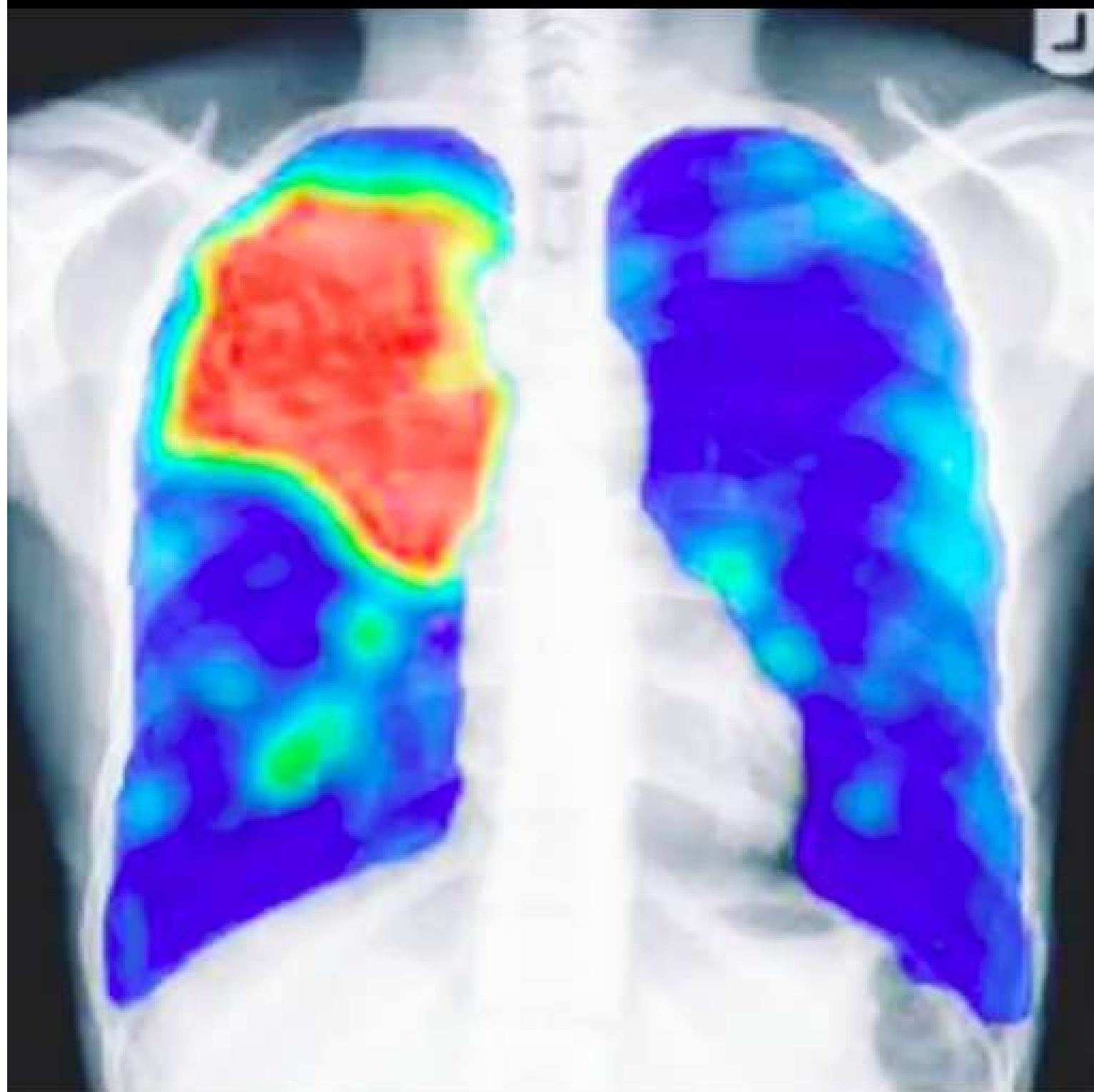
## Convolutional Neural Network

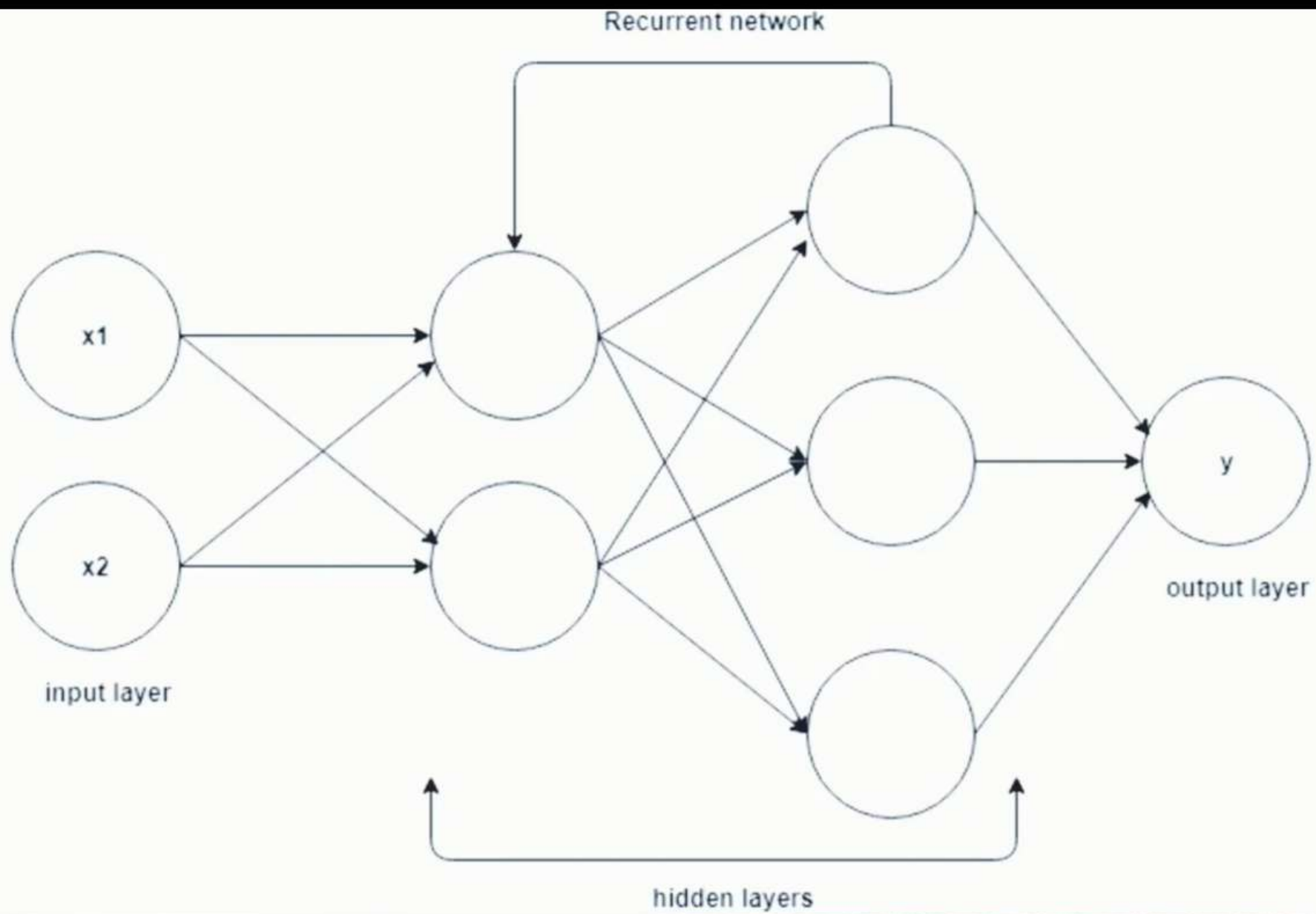












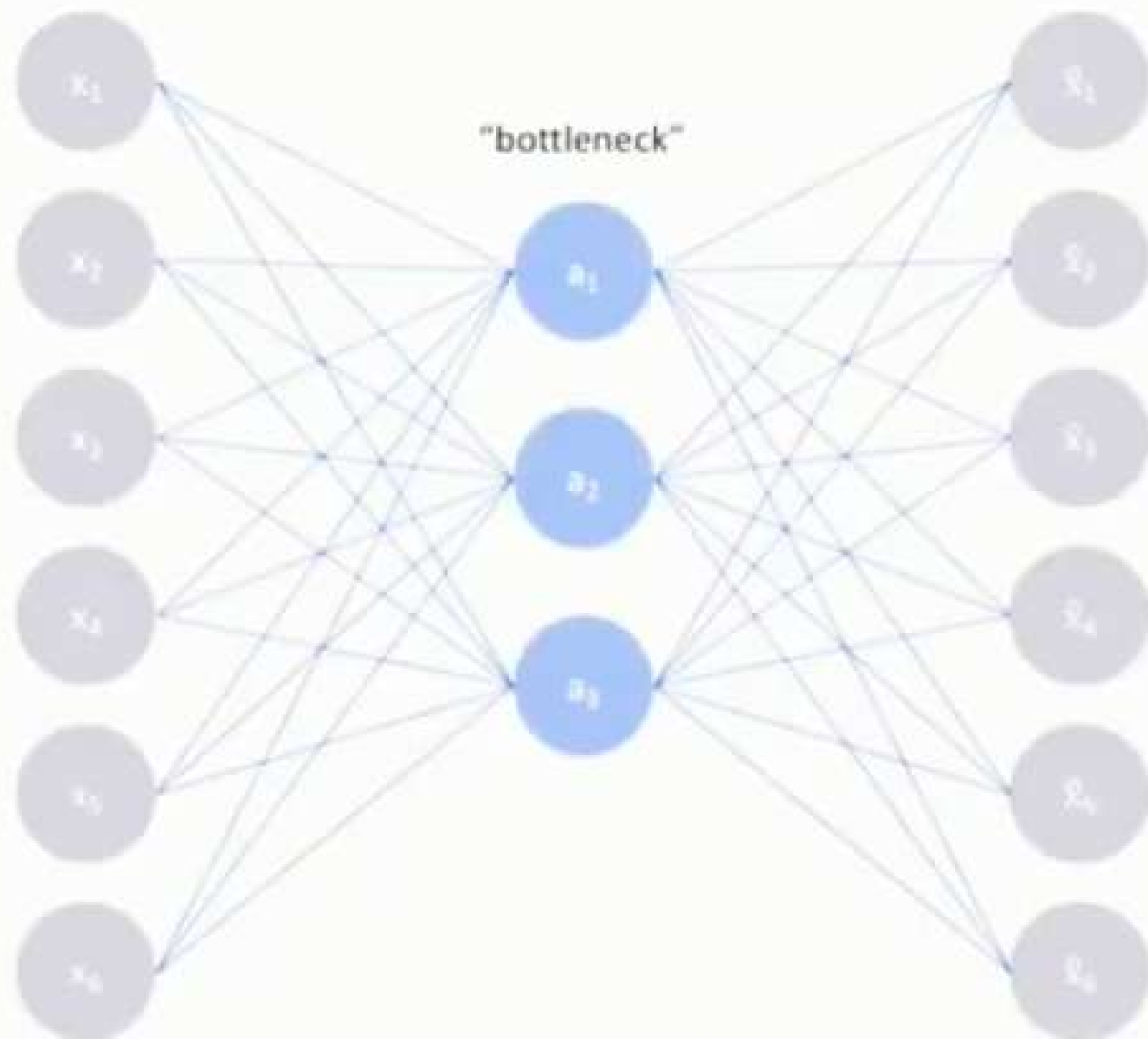


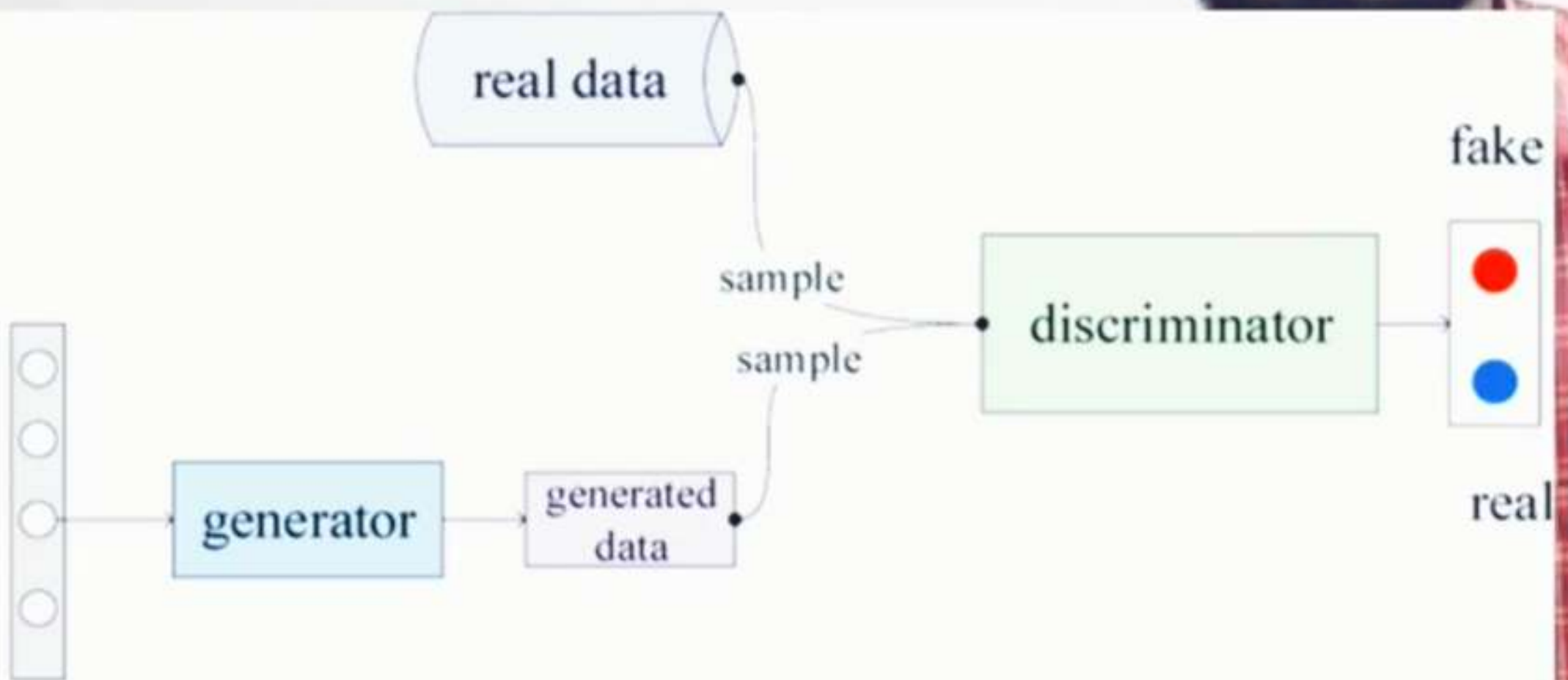


Input layer

Hidden layer

Output layer









**Music**

**Stories**



**Self-driving Cars**



## Lidars

Short range x4  
Mid range x1  
Long range x1

## Radars

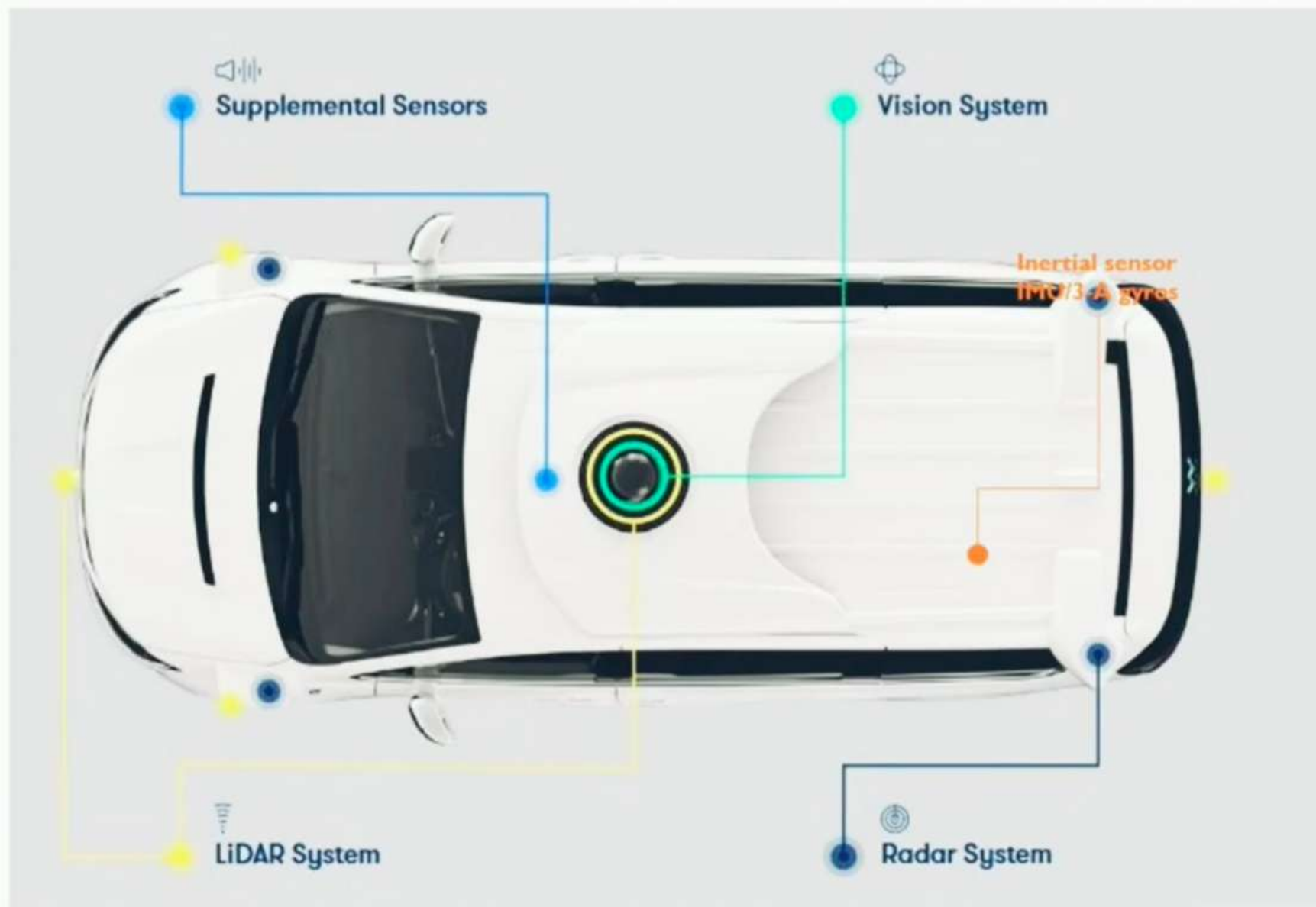
360° view x4

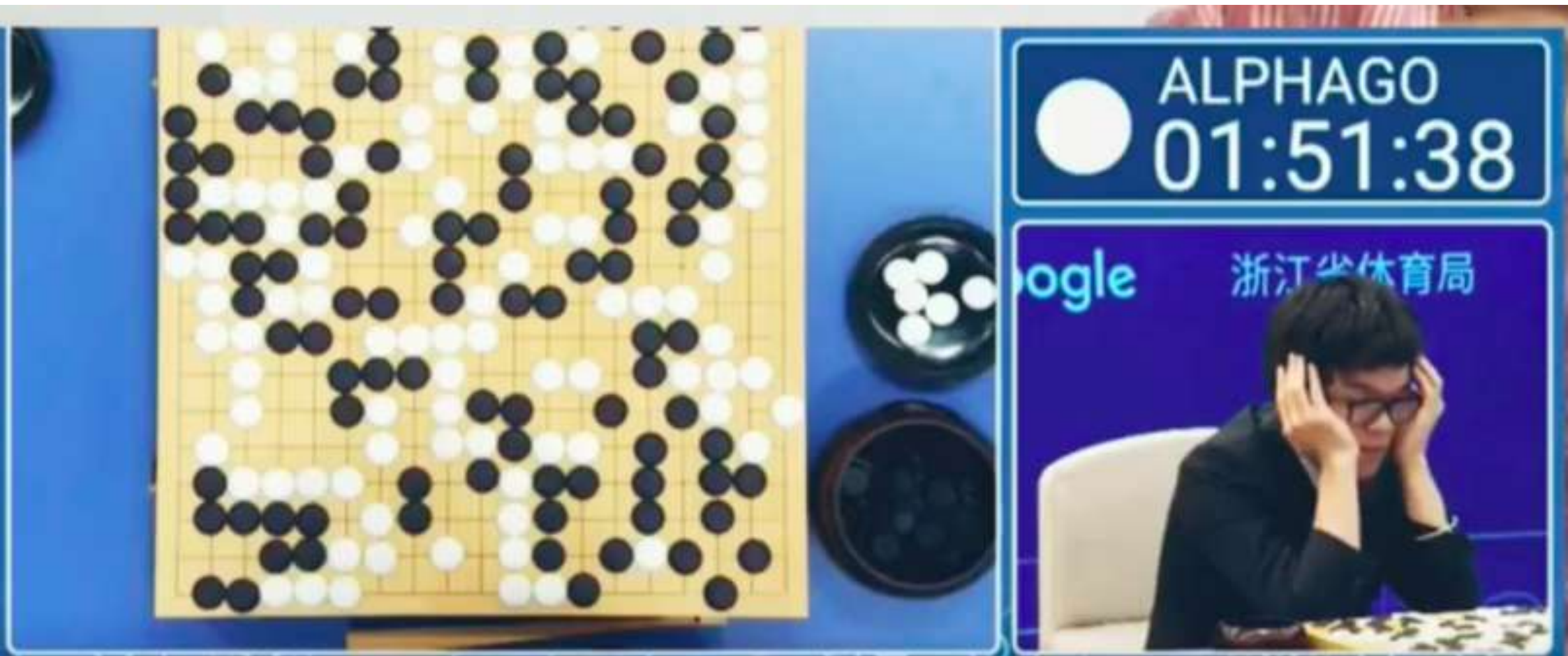
## Cameras :

360° view  
Cameras x8

## Other sensors

Ultrasonic x8  
GPS/IMU x2





ALPHAGO  
01:51:38

Google

浙江省体育局



3:08 AM

81% 

“Do you have any pets”

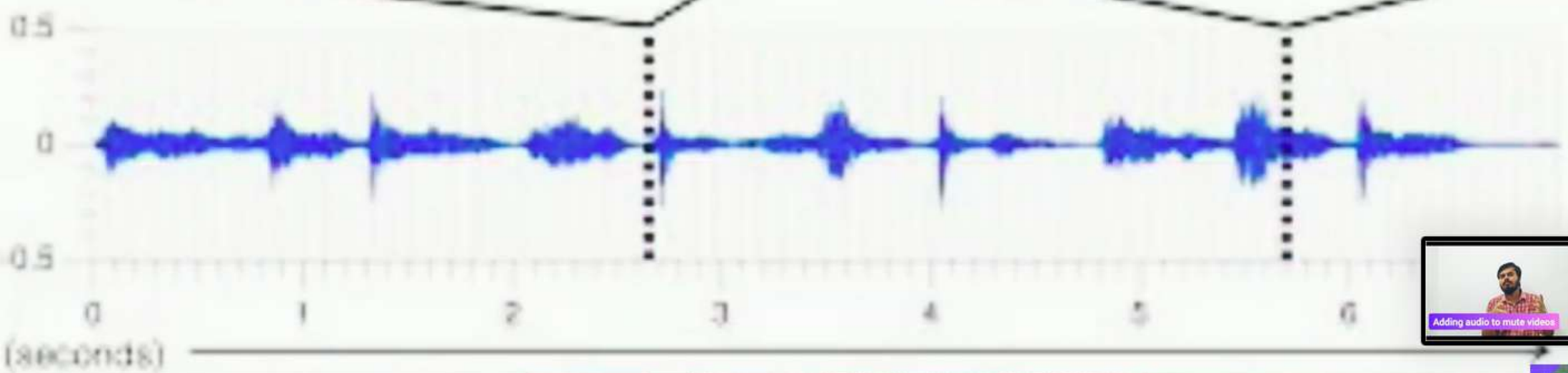
tap to edit

I have an angry bird.













"man in black shirt is playing guitar."



"construction worker in orange safety vest is working on road."



"two young girls are playing with lego toy."



"girl in pink dress is jumping in air."



"black and white dog jumps over bar."



"young girl in pink shirt is swinging on swing."





$8 \times 8$  input



$32 \times 32$  samples



ground truth

