La computer vision è sempre più pervasiva
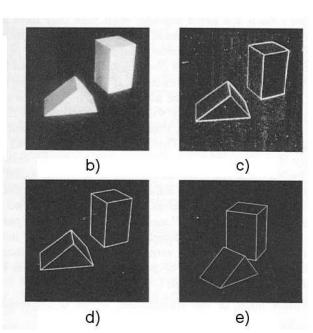
Luigi Di Stefano (luigi.distefano@unibo.it)

Department of Computer Science and Engineering (DISI)
University of Bologna, Italy

An amazing journey !

Larry Roberts, PhD thesis, *Machine perception of three-dimensional solids*, **MIT, 1963.**

iDetection App (Ultralytics), YOLO

Key Process Technology in all Industries

Cognex DataMan
(1982)

Automotive

Textile

Food&Bevarage

Inspection, Gauging, Guidance, *Tracing*, *Compliance*

Electronics

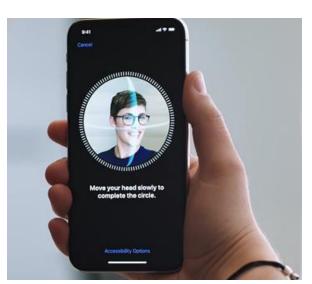**Transportation & Logistics**

Whole Process Optimization

Pharma & Tobacco

Mass-Market Consumer Products

Paradigms and Timeline

Representation   Decision Rules

Image → **Program** → *Features* → **Program** → Output

Image → **Program** → *Features* → *Learn* → Output   ≈ *2000*

Image → *Learn* → *Features* → *Learn* → Output   *2012*

Deep Learning - Convolutional Neural Networks/Transformers
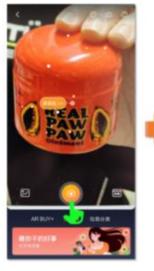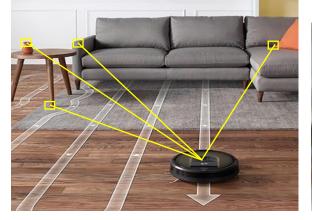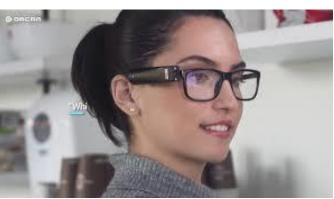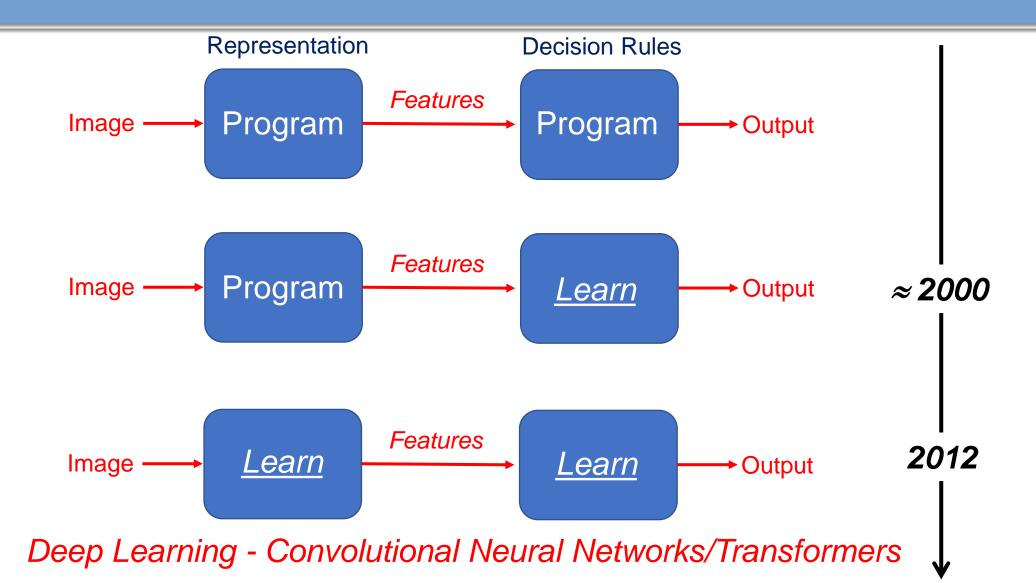
SOTA on recognition and detection
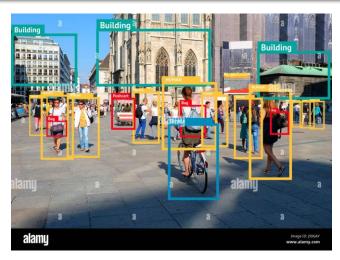
Image Classification
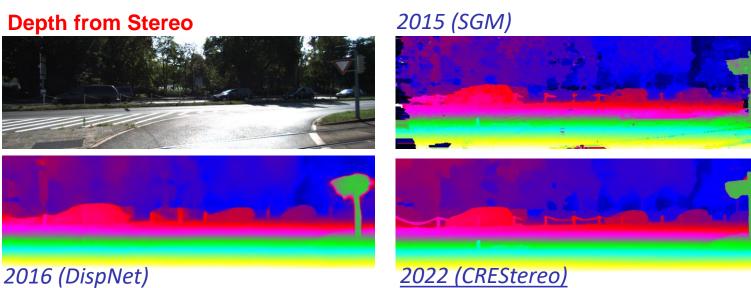
Object Detection
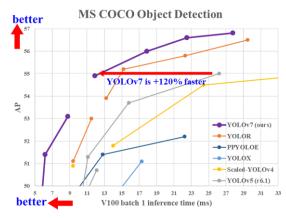
Traffic Sign Recognition
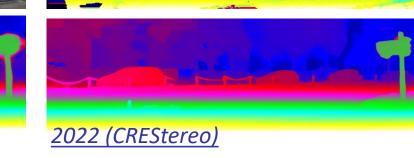
Face Recognition
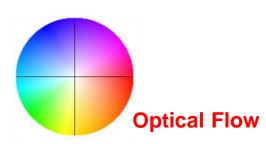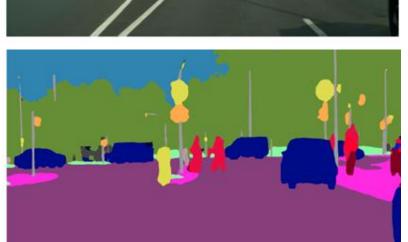
and per-pixel perception !

Depth from Stereo

2015 (SGM)

Semantic Segmentation

2016 (DispNet)

2022 (CREStereo)

Depth from Mono

Optical Flow

Deep Learning (aka AI) ?

Cognex DataMan (1982)
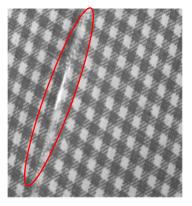
Automotive

Textile

Food&Bevarage

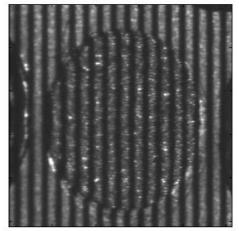**Inspection, Gauging, Guidance, *Tracing*, *Compliance***

↓

Process Optimization

Electronics

Transportation & Logistics

Pharma & Tobacco

It's happening

👍

- Can solve seemingly impossible problems.

- Simplicity: no programming, configuring, tuning.

🙁

- Collecting large labelled datasets is difficult and expensive.

- It is a black-box (*Explicability & Certification*).
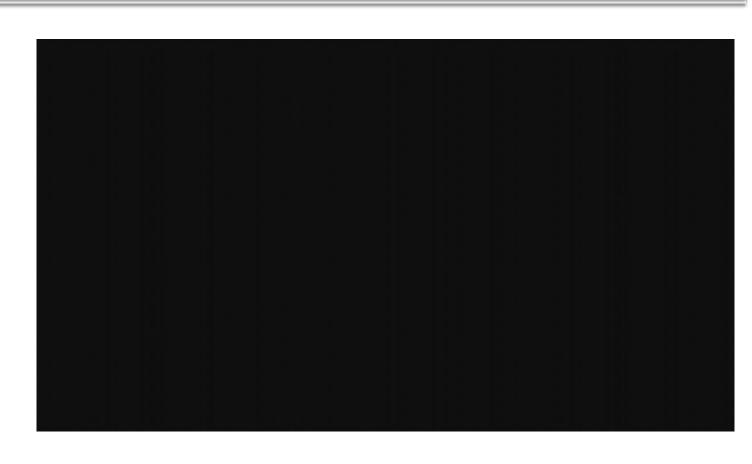
It's happening

- Can solve seemingly impossible problems.

- Simplicity: no programming, configuring, tuning.

- Collecting large labelled datasets is difficult and expensive.

- It is a black-box (*Explicability & Certification*).

Generative AI & Computer Vision

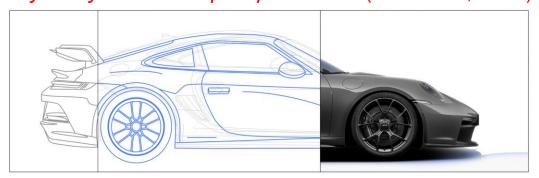*Image Synthesis* (DDPM, 2020)

Novel View Synthesis

(NeRF, 2020)

A bucket bag made of blue suede. The bag is decorated with intricate golden paisley patterns. The handle of the bag is made of rubies and pearls

Imagen - Google, May 2022

Physically-Driven Shape Optimization (*MeshSDF*, 2020)

EPFL & Neural Concept SA

Turn him into a cyborg

Make it a Miro painting

Photoshop with words – UC Berkeley – Nov 2022

dawn ai

CV LAB
Computer Vision Laboratory

Thanks for your attention !

Stable Diffusion Playground