



Nicoletta Noceti, Francesca Odone



Funded by
the European Union
NextGenerationEU

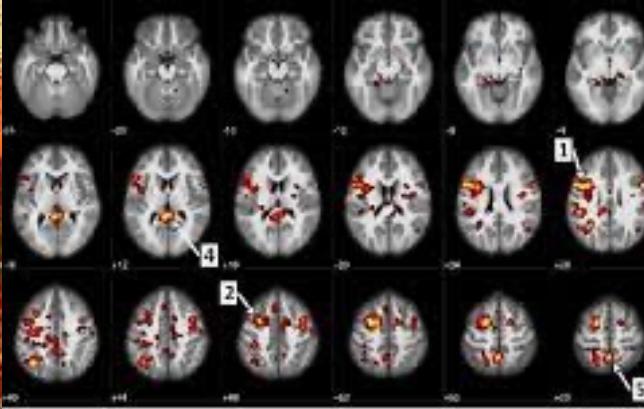
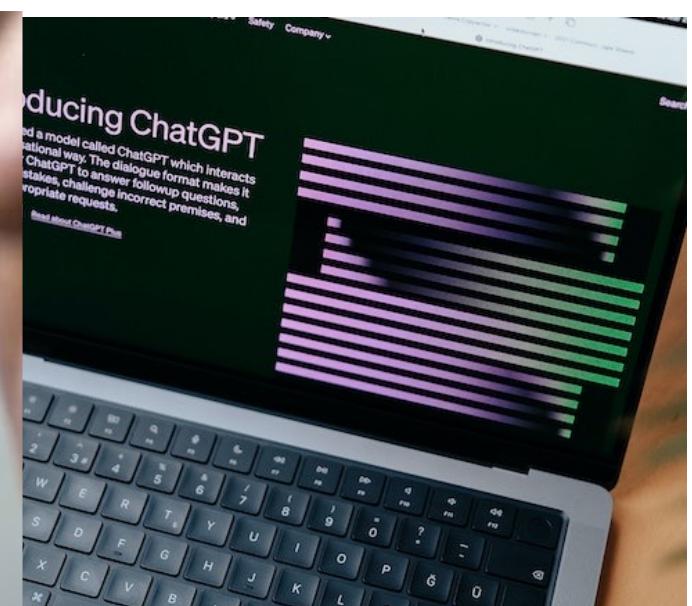


Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILLENZA

.RAISE



(Artificial) Intelligence: a working definition

- *Intelligence: ability to **perceive information**, and **retain it as knowledge** to be **applied towards adaptive behaviors** within an environment*
- Human-like
 - Sensitive to the surrounding environment
- ...but better
 - Faster
 - With a better memory

AI Ingredients

- Automated reasoning
- Machine learning and **Deep Learning**
- Interaction - Natural language processing
- Perception - **Computer Vision**
- Manipulation - Robotics



A little history

VOL. LIX. No. 236.]

[October, 1950]

M I N D

A QUARTERLY REVIEW
OF
PSYCHOLOGY AND PHILOSOPHY

I.—COMPUTING MACHINERY AND
INTELLIGENCE

By A. M. TURING

1. *The Imitation Game.*

I PROPOSE to consider the question, ‘Can machines think?’ This should begin with definitions of the meaning of the terms ‘machine’ and ‘think’. The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words ‘machine’ and ‘think’ are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, ‘Can machines think?’ is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.

The new form of the problem can be described in terms of a game which we call the ‘imitation game’. It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman. He knows them by labels X and Y, and at the end of the game he says either ‘X is A and Y is B’ or ‘X is B and Y is A’. The interrogator is allowed to put questions to A and B thus:

C : Will X please tell me the length of his or her hair?
Now suppose X is actually A, then A must answer. It is A’s



Image credit: The Turing Digital Archive
<https://turingarchive.kings.cam.ac.uk/>

Dartmouth Summer Research Project on AI



1955 - 1956

Shakey the robot, the world's first AI-based robot

1966-1972

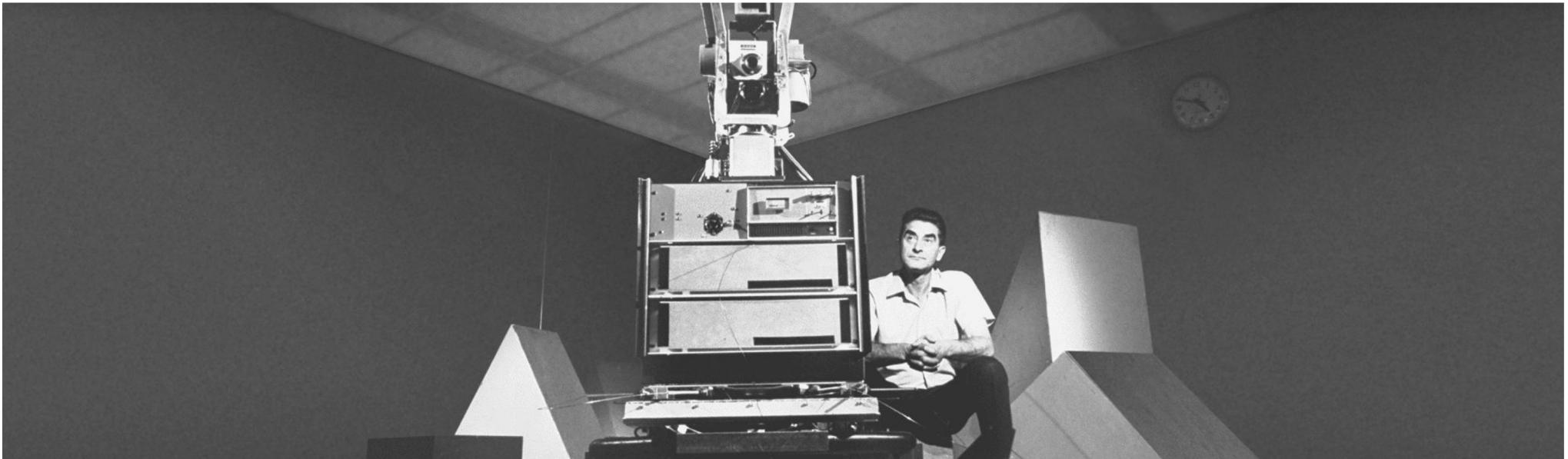


Image credit: SRI International, <https://www.sri.com/case-study/the-man-the-myth-the-legends-meet-shakey-the-robot-the-worlds-first-ai-based-robot/>

AI in Genova: P.A.P.A. system



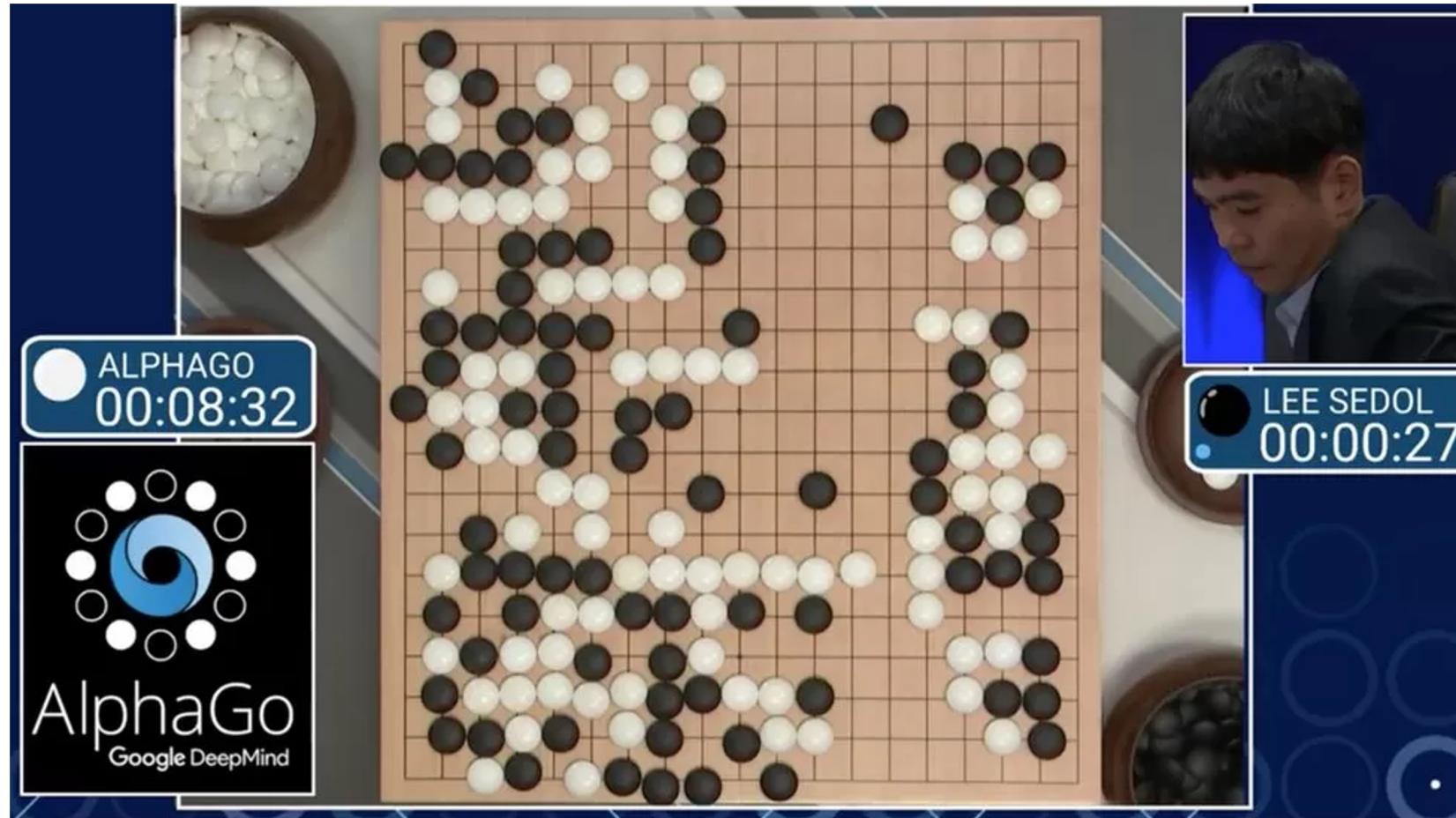
The first character recognition
system learning from examples
(Genova, Istituto di Fisica, 1961)

Deep Blue beats Kasparov



– Image credit: La Stampa, <https://www.lastampa.it/cultura/2017/09/13/news/deep-blue-vs-kasparov-scacco-matto-all-intelligenza-umana-1.34414089/>

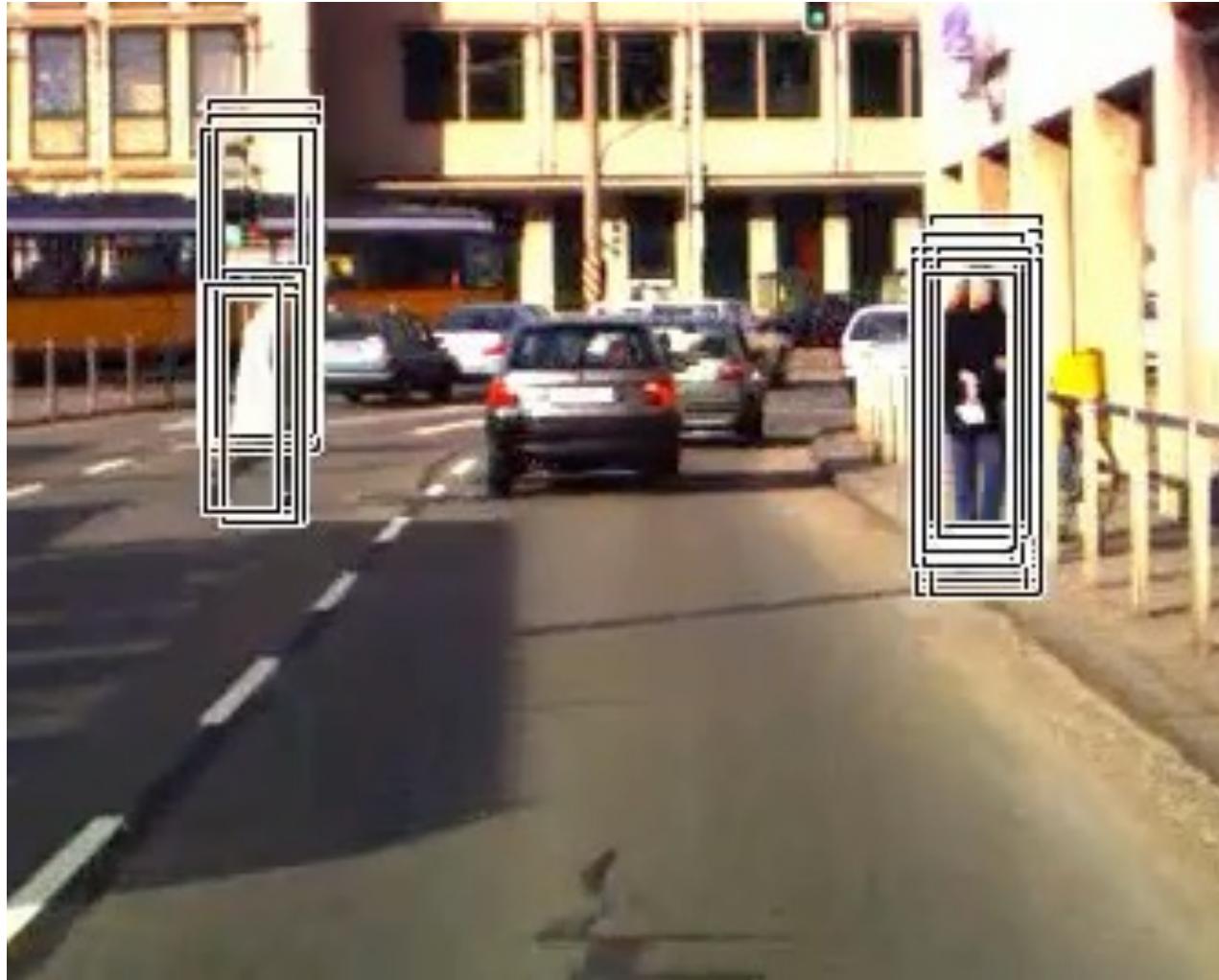
AlphaGo



2016

– Image credit: BBC, <https://www.bbc.com/news/technology-35785875>

20 years ago...



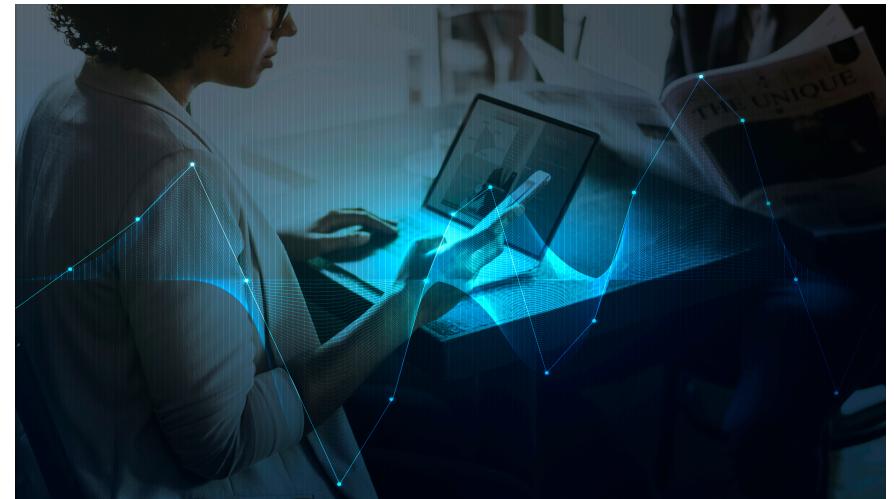
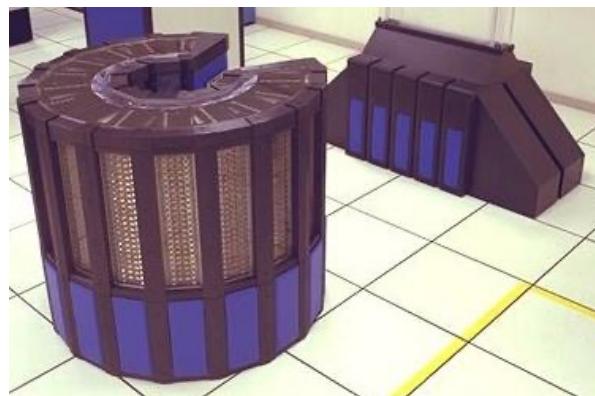
...today

Real-time Multi-Person 2D Pose Estimation Using Part Affinity Fields

Zhe Cao, Tomas Simon, Shih-En Wei, Yaser Sheikh
Carnegie Mellon University

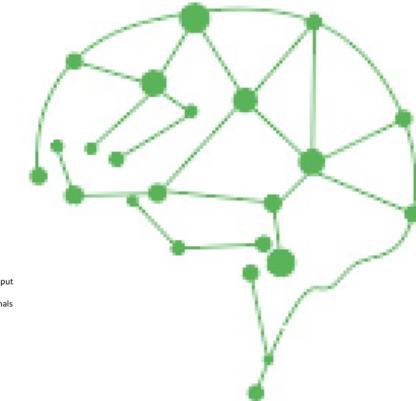
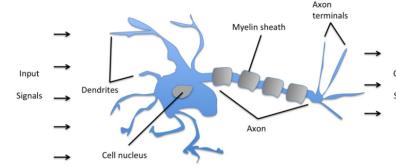
How?

"It takes these very simple-minded instructions – 'Go fetch a number, add it to this number, put the result there, perceive if it's greater than this other number' – but executes them at a rate of, let's say, 1,000,000 per second. At 1,000,000 per second, the results appear to be magic." Steve Jobs



Computing

This week: DL objectives



Providing the background to understand deep learning principles

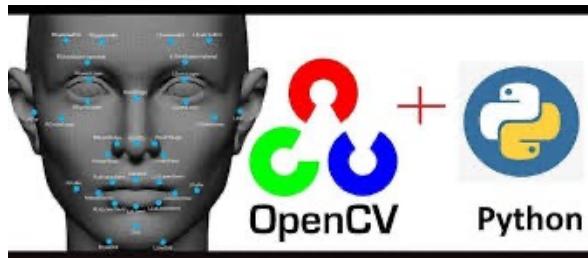
Gaining hands-on experience of a variety of problems with state-of-art frameworks



This week: CV Objectives

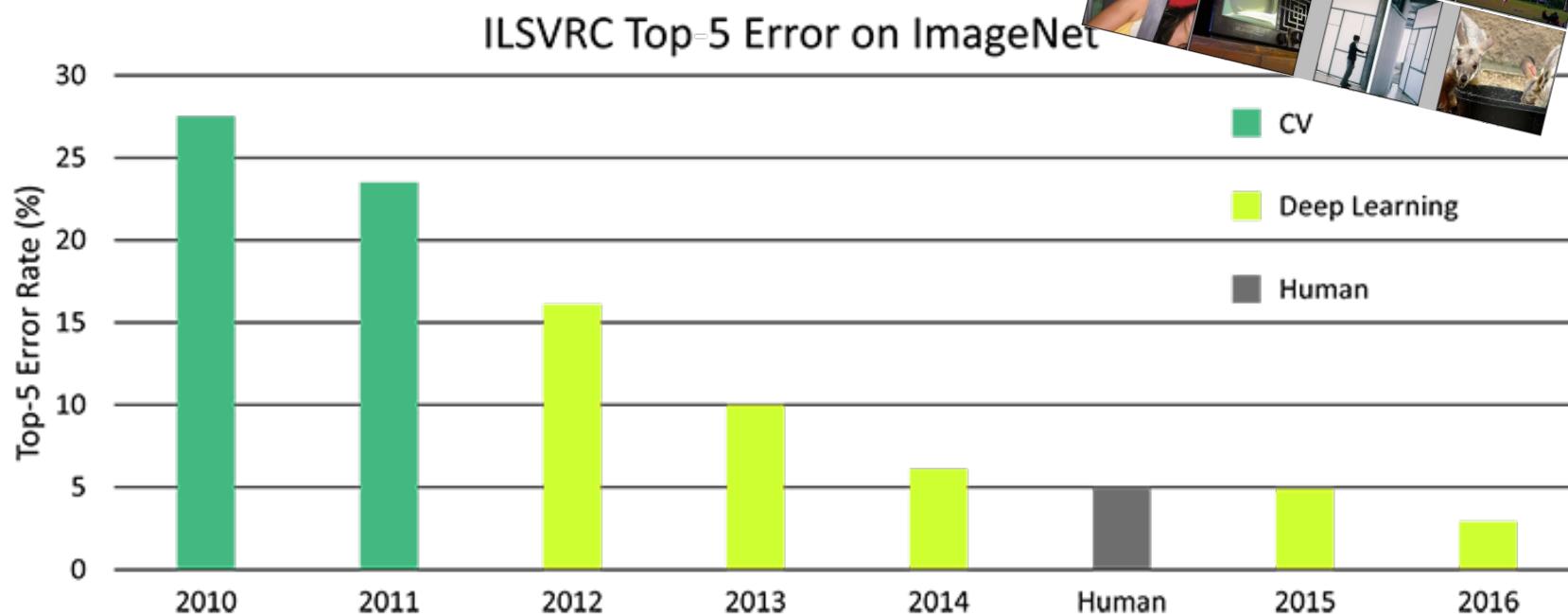


1. To provide a practical introduction to main concepts in the CV domain.
2. In relationship with DL to equip with an in-depth knowledge on a specific type of data: visual data (images)
3. Hands-on activities will help us focusing on specific sub-tasks and example algorithms.



Two courses become a school

Why together?



Two courses become a school



An integrated schedule

	10/06	11/06	12/06	13/06	14/06
9-9:30	Welcome				
9:30-11	DL intro	Image features	CNN	GANs	Group Project
11:30-13	Image intro	LAB	LAB	LAB	Group Project
14:30-16	LAB: warmup	Motion+ Depth	14:30-15:30 Applications 15:30-16:30 Seminar by F.Roli	RNNs& Transformers	Group Project
16:30-18	Intro to GP (ending at ~17:15)	LAB	★	LAB	<i>Wrap up and good bye (ending at 16:30)</i>

Poster session and aperitif!!

What's a lab?

A Python notebook with a guided hands-on activity that complements the theoretical class

The screenshot shows a Jupyter Notebook interface with the title "jupyter Images_GANs_REVISED (unsaved changes)". The notebook has a "TensorFlow" kernel selected. At the top, there are standard menu options: File, Edit, View, Insert, Cell, Kernel, Widgets, Help, and a "Logout" button. Below the menu is a toolbar with various icons for cell selection, running code, and file operations.

Discriminator

The discriminator estimates a probability values evaluating how likely is that the sample is a training example rather than a fake sample drawn from the model.

The discriminator learns to become better at distinguishing real from generated images. The generator learns to generate better images to fool the discriminator.

The choice of such data is guided by the fact the generated samples can be easily visually inspected to appreciate the quality.

LIBRARIES

```
In [1]: # we start importing some libraries
from numpy import zeros, ones, expand_dims, asarray
from numpy.random import randn, randint
from keras.datasets import fashion_mnist
from tensorflow.keras.optimizers.legacy import Adam, RMSprop, SGD
from keras.models import Model, load_model
from keras.layers import Input, Dense, Reshape, Flatten
from keras.layers import Conv2D, Conv2DTranspose, Concatenate
from keras.layers import LeakyReLU, Dropout, Embedding
from keras.layers import BatchNormalization, Activation
from keras import initializers
from keras.initializers import RandomNormal

from matplotlib import pyplot as plt
import numpy as np
```



colab

Logistics

- Where: Classes and hands-on in room 506

- Material sharing:



- Today we are also collecting a few other info:

- *Have you a laptop?*

- YES: you need an installation of Jupyter in Anaconda (or similar framework) or a google account to work on Colab. The hands-on will be in 505
 - NO: let us know asap!!!

Logistics (cont.)

- *Do you have EDUROAM access?*
 - YES: fine!
 - NO: we will provide credentials for wifi connection
- *Are you presenting a poster, slides or demo on Wednesday?*
 - YES: let us know!!!
 - NO: you are more than welcome to join in any case!!
- *Do you need a certificate of attendance?*
 - YES: Presences will be collected each day → Certificate of attendance with at most one day missing
- *Do you need a final grade?*
 - YES: it will be automatically assigned to each group project participant

Questions?

UniGe

