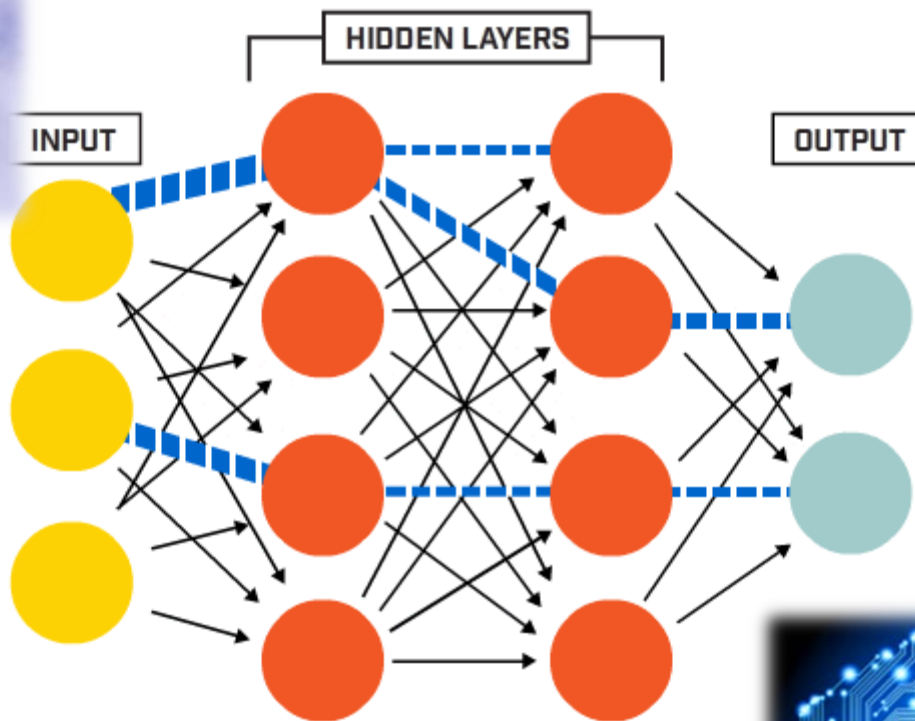




Trends in Automated inspection

Agustín
Asthma patient
Argentina

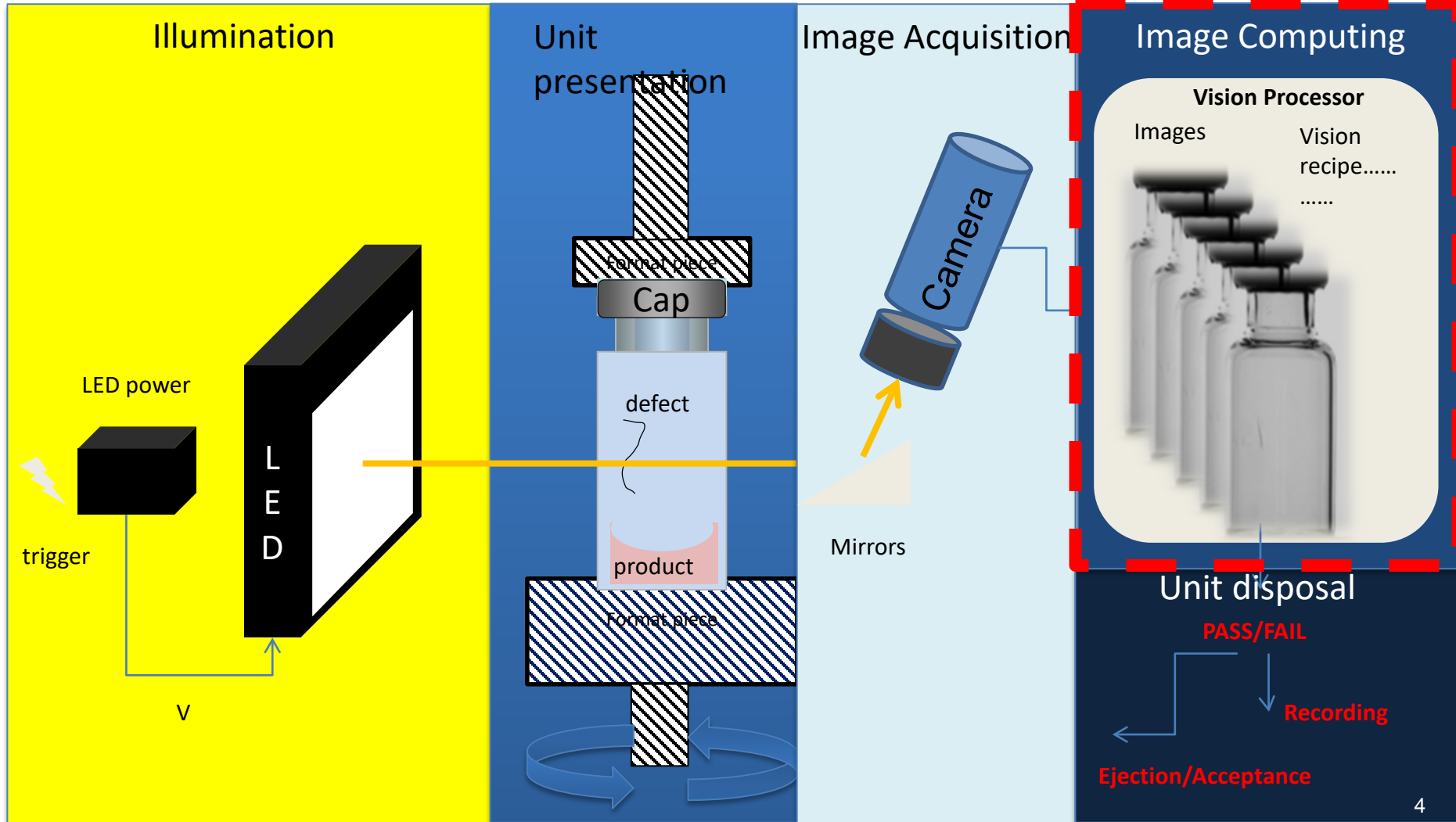
La vision



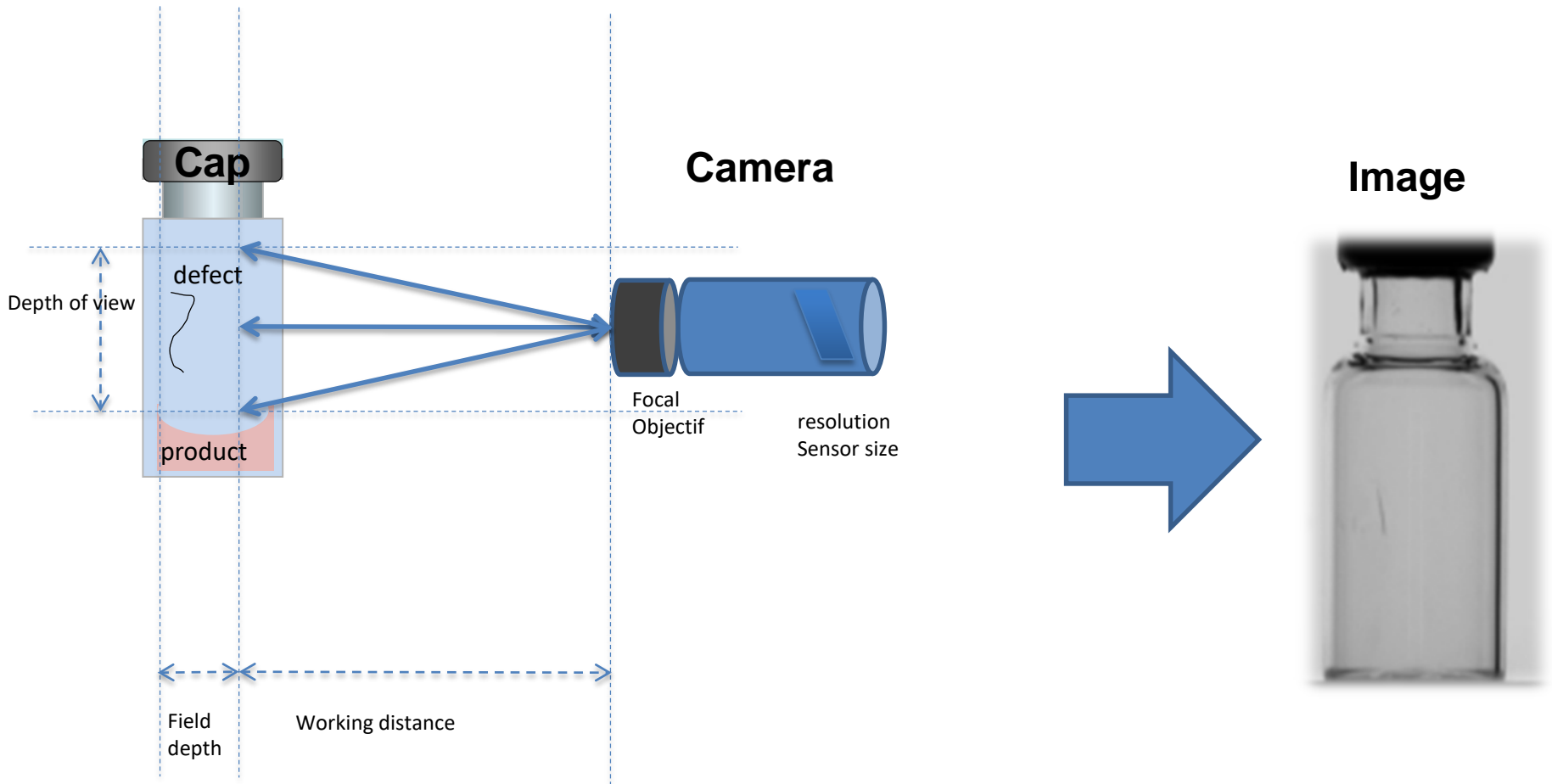
Objectif: présentation of current trends in AVI and computer vision

1. Main function blocks of AVI
 2. What can « see » a machine
 3. Historic milestones
 4. Comparaison Man/machine
 5. How is working « deep learning » ?
 6. Some practical demos
-

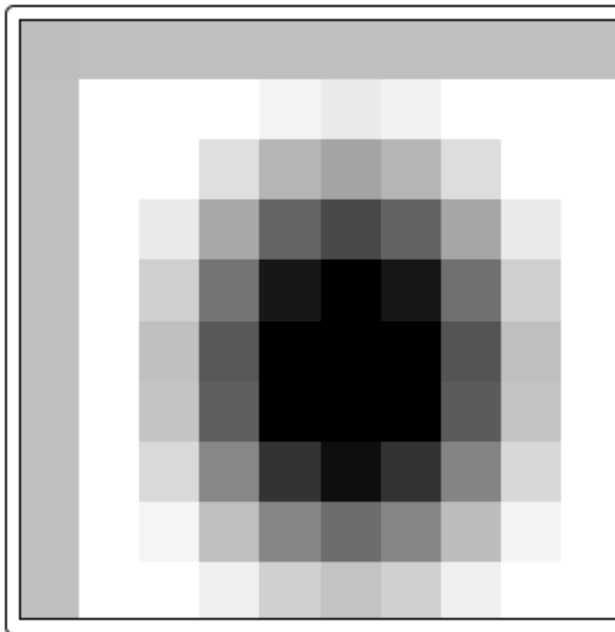
Main machine blocks



How to obtain an image



What does really see a computer vision?



1 particle

0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
0.75	1.00	1.00	1.00	0.95	0.92	0.95	1.00	1.00	1.00
0.75	1.00	1.00	0.87	0.71	0.64	0.71	0.87	1.00	1.00
0.75	1.00	0.92	0.66	0.40	0.28	0.39	0.65	0.92	1.00
0.75	1.00	0.81	0.46	0.09	0.00	0.09	0.44	0.81	1.00
0.75	1.00	0.75	0.35	0.00	0.00	0.00	0.33	0.75	1.00
0.75	1.00	0.77	0.37	0.00	0.00	0.00	0.36	0.76	1.00
0.75	1.00	0.85	0.53	0.20	0.05	0.20	0.52	0.85	1.00
0.75	1.00	0.96	0.75	0.52	0.43	0.52	0.74	0.96	1.00
0.75	1.00	1.00	0.94	0.82	0.76	0.82	0.94	1.00	1.00

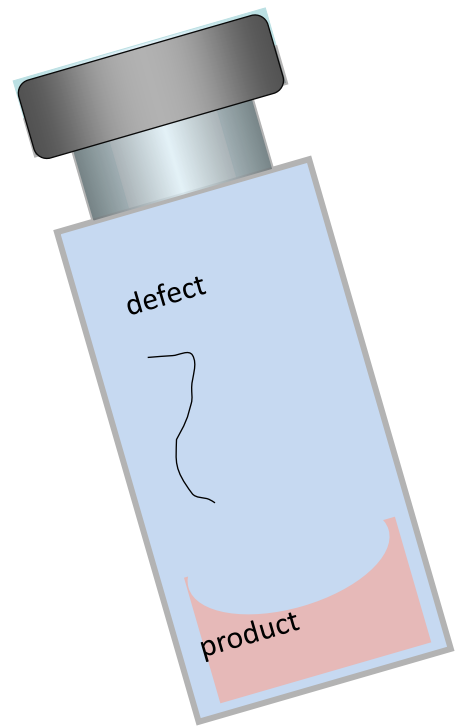
Image with grey level...

0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
0.75	1.00	1.00	1.00	0.95	0.92	0.95	1.00	1.00	1.00
0.75	1.00	1.00	0.87	0.71	0.64	0.71	0.87	1.00	1.00
0.75	1.00	0.92	0.66	0.40	0.28	0.39	0.65	0.92	1.00
0.75	1.00	0.81	0.46	0.09	0.00	0.09	0.44	0.81	1.00
0.75	1.00	0.75	0.35	0.00	0.00	0.00	0.33	0.75	1.00
0.75	1.00	0.77	0.37	0.00	0.00	0.00	0.36	0.76	1.00
0.75	1.00	0.85	0.53	0.20	0.05	0.20	0.52	0.85	1.00
0.75	1.00	0.96	0.75	0.52	0.43	0.52	0.74	0.96	1.00
0.75	1.00	1.00	0.94	0.82	0.76	0.82	0.94	1.00	1.00

Digital Image = matrix grid of figures ☹

python:
`np.zeros(img.shape, dtype=img.dtype`

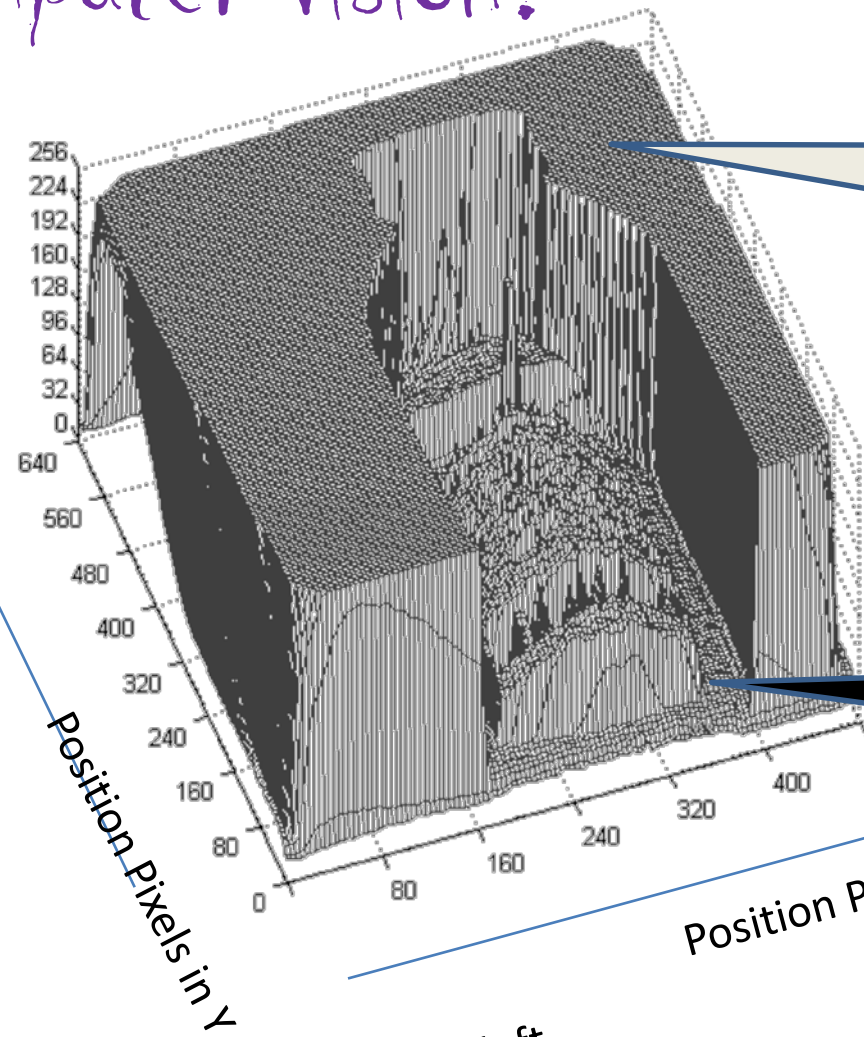
How the vial is being perceived by computer vision?



Grey level 8bits
255=white

0=black

Top
bottom



if 255 = white contour

If 10 = dark black

The vial

the same vials seen by camera..... ☹️

computer vision historic milestones

... it just started

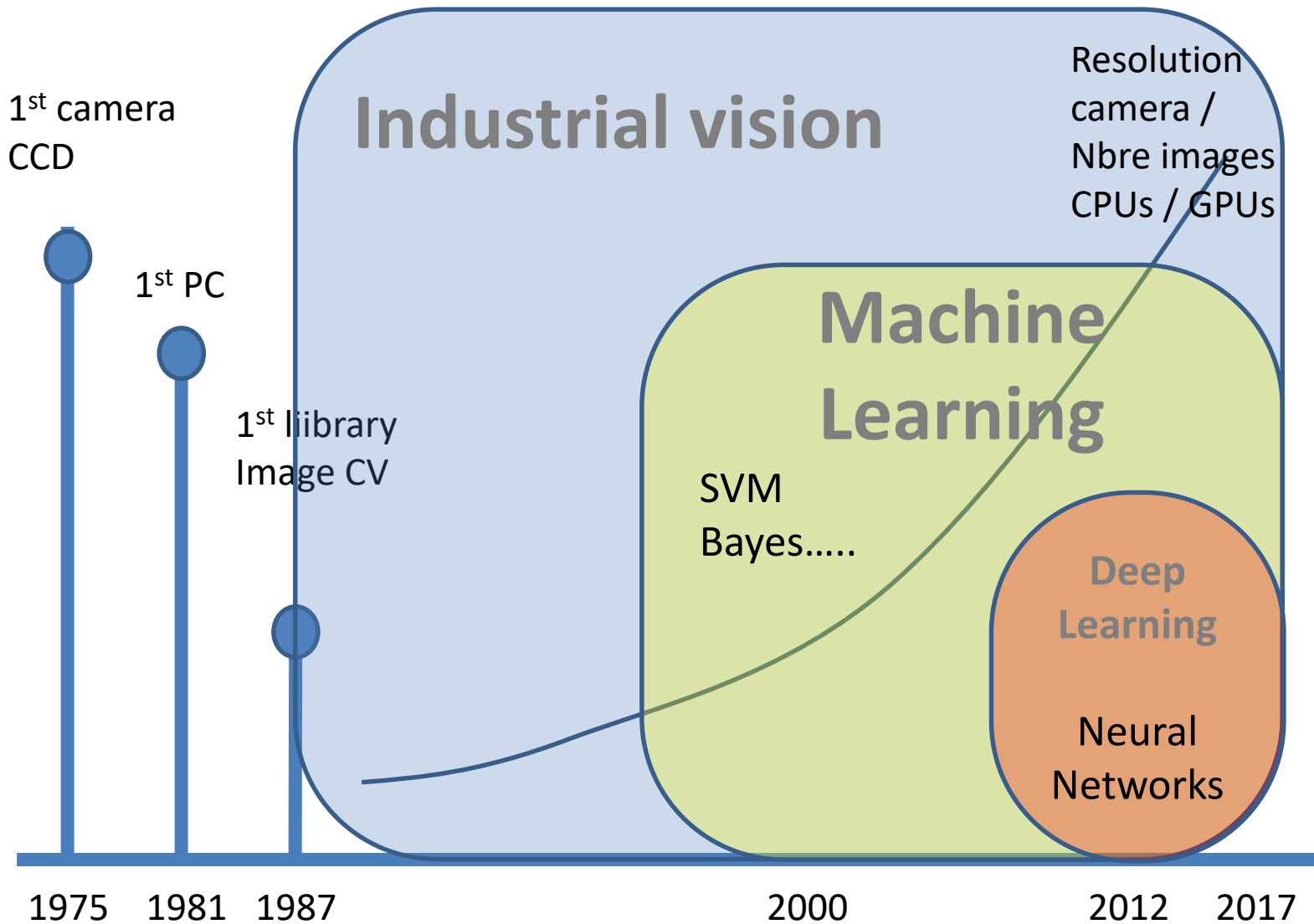
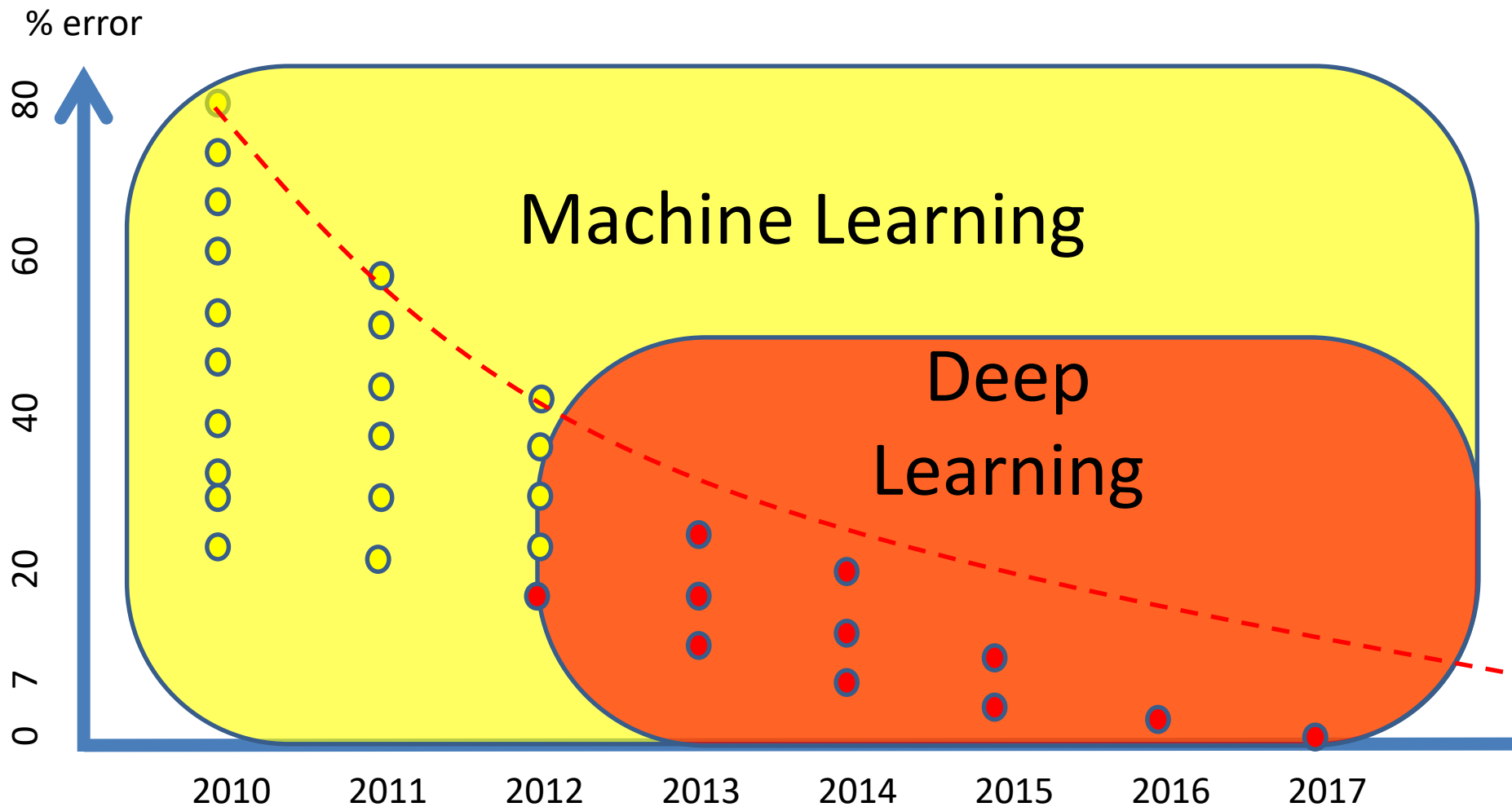


Image recognition

= very young technology



Objective of Computer Vision

= remove back ground noise to take a fast & specific decision

Why ?

Too much useless
infos in images

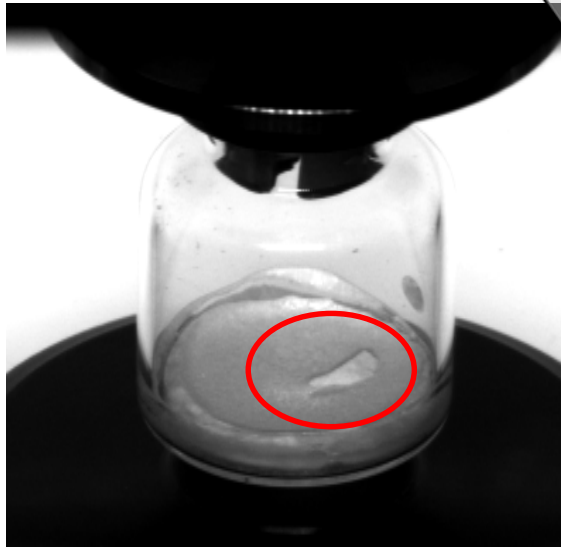
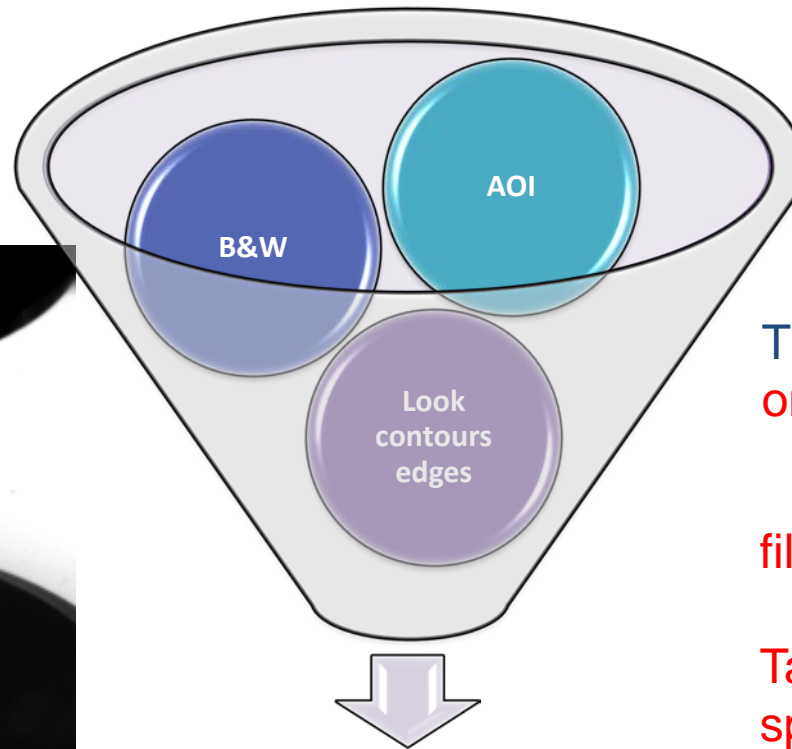


Image 480x640 Pixels

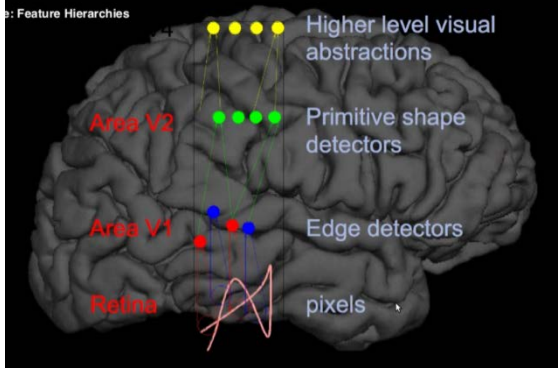


Treatment = focus
on essential info

filtre

Take decision
specific on key
attributes

Attributes of
image
=> Pass / Fail



Compararison

Human

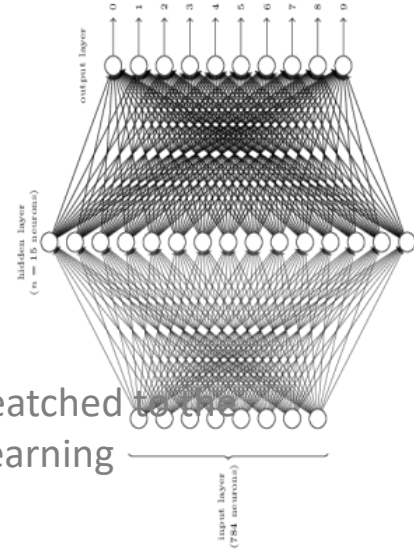
- ✓ 1 real object object that was teatched to the machine = supervised learning
- ✓ Observation; concentration / light/ fatigue....
- ✓ Cones in retina activated
- ✓ Image projected in V1 area of brain for detection angles/ edges /contours
- ✓ Area V2 of brain to detect gross forms/shapes
- ✓ Area V4 -V5 for forms more abstract
- ✓ Activation memory area

➔ Object Identification +classification

Machine

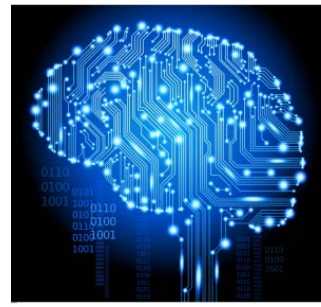
- ✓ 1 real object that was teatched to the machine = supervised learning
- ✓ Image camera capture
- ✓ Presentation of image in 1st layer of neuron = nbre pixels
- ✓ Each part of image is sent to other layers of neuron that are interconnected, adjustment of coefficients to match elements as best
- ✓ Last neron layer to classify object

➔ Object Identification=classification





Comparaison



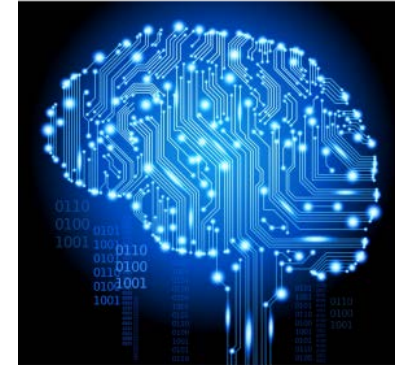
Industrial vision

- ✓ Ajustement light
+ optic + image
- ✓ Image Capture
Images confoirming units (kits)
+ defect images (kits)
+ identification defects (logbooks)
- ✓ **Preparation of image treatment
for each camera**
 - click and drag software
 - opened computing or hard coding
- Optimization processing time**
- ✓ Adjustment on images / auto ajust.
- ✓ Evaluation on machine
- ✓ Validation (PQ)
- ✓ Go Live to production

Deep Learning

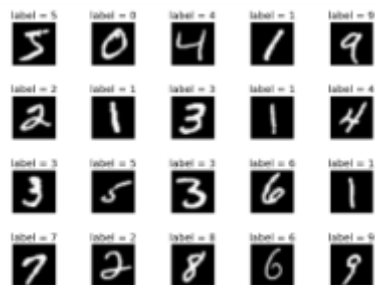
- ✓ Ajustement light
+ optic + image
- ✓ Image Capture
Images confoirming units (kits)
+ defect images (kits)
+ identification defects (logbooks)
- ✓ **Construction of 2 data bases of image:**
- ✓ **learning (training_set)**
- ✓ **Evaluation (Prediction_set)**
- ✓ **Programmation neural network**
- ✓ **Evaluation & ajustements**
- ✓ Optimisation processing time
- ✓ Validation (PQ)
- ✓ Go live to production

Lets try deep learning?

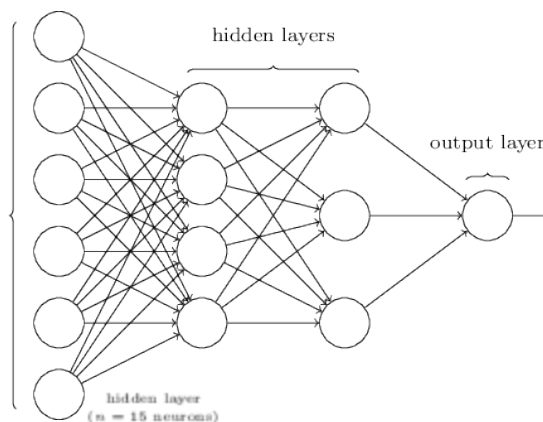


1 Learning

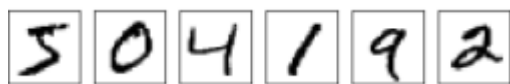
60 000 images of figure hand written
+ corresponding labels



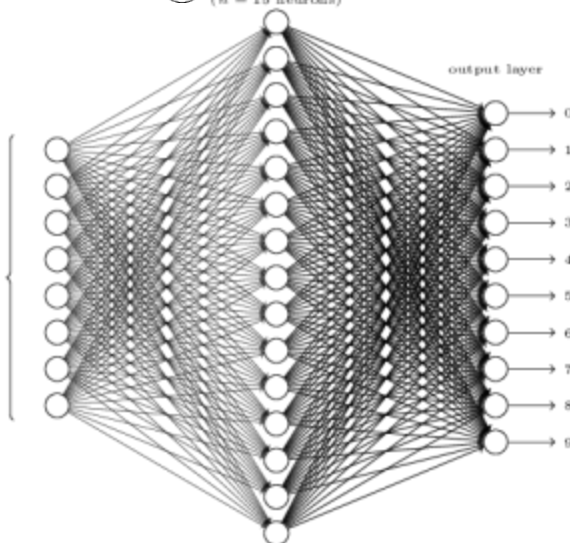
neural network (74 lines progr.)



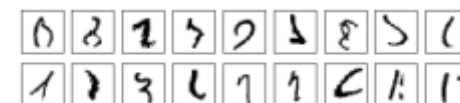
2 Evaluation



Submit new images
never show without label



96% of labels found OK
4% « error » or just badly
writtent ?



What you need ?

- ✓ 1 PC Linux
- ✓ Python + OpenCV
- ✓ Scikit-learn
- ✓ TensorFlow + Keras
- ✓ Some images



Deep Learning

