

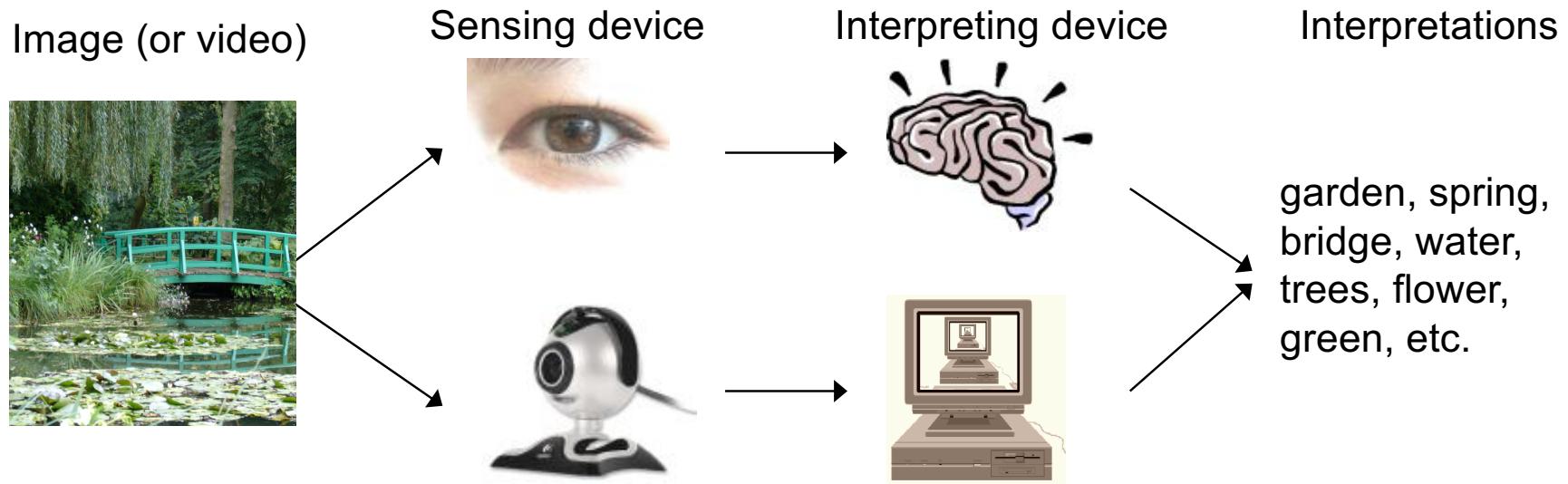
IMAGE - ANALYSE ET TRAITEMENTS D'IMAGES

Qu'est-ce que la vision par ordinateur ?

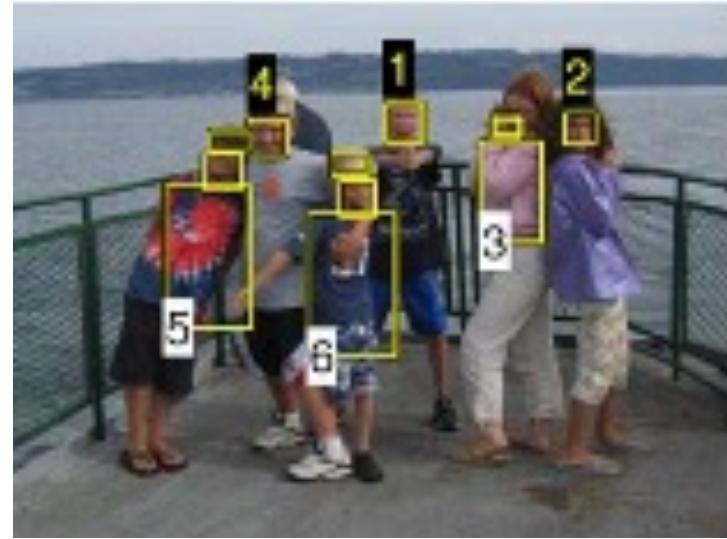
PLAN

- Qu'est-ce que la vision par ordinateur (*Computer Vision*) ?
- Applications
- Bref historique

QU'EST-CE QUE LA VISION PAR ORDINATEUR ? [3]



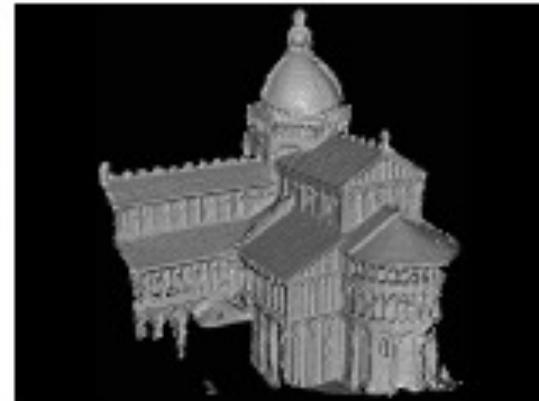
QU'EST-CE QUE LA VISION PAR ORDINATEUR ? [1]



QU'EST-CE QUE LA VISION PAR ORDINATEUR ? [1]



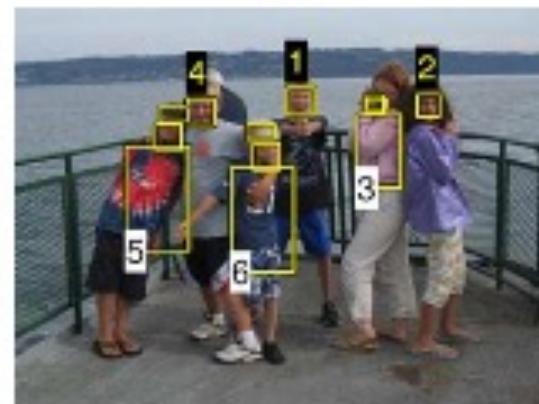
(a)



(b)

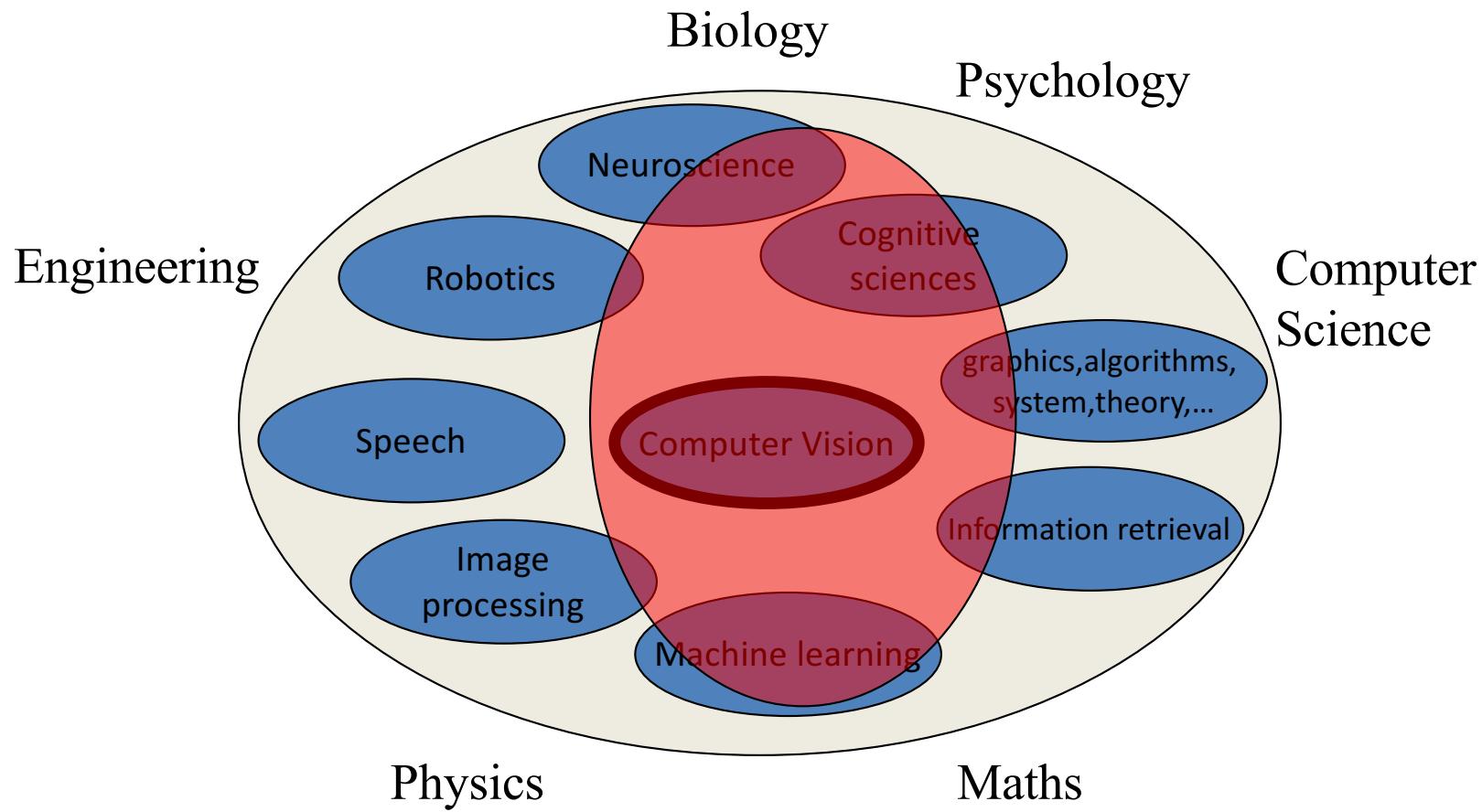


(c)



(d)

A QUOI EST-CE LIÉ ? [3]



BUT DE LA VISION PAR ORDINATEUR

- Faire le lien entre pixel et sens



What we see

0	3	2	5	4	7	6	9	8
3	0	1	2	3	4	5	6	7
2	1	0	3	2	5	4	7	6
5	2	3	0	1	2	3	4	5
4	3	2	1	0	3	2	5	4
7	4	5	2	3	0	1	2	3
6	5	4	3	2	1	0	3	2
9	6	7	4	5	2	3	0	1
8	7	6	5	4	3	2	1	0

What a computer sees

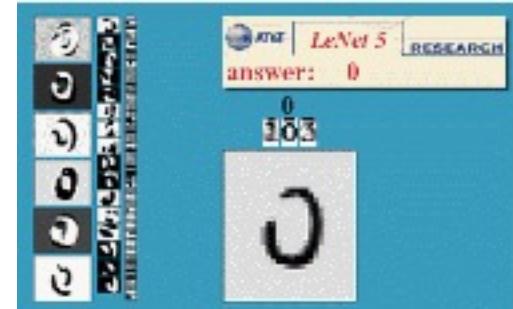
Source: S. Narasimhan

QUE PEUT-ON EXTRAIRE D'UNE IMAGE ?

- Information métriques
- Information sémantiques

APPLICATIONS [1]

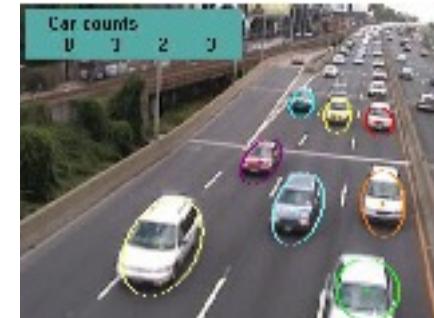
- Reconnaissance optique de caractères
(Optical character recognition (OCR))
- Inspection automatique de pièces
(Machine inspection)
- Vente au détail avec reconnaissance automatique des objets
- Imagerie médicale



APPLICATIONS [1]

- Sécurité automobile
- *Match moving / motion tracking*
- *Motion capture (mocap)*
- Surveillance
- Biométrie
- Télédétection

<http://www.cs.ubc.ca/~lowe/vision.html>



APPLICATIONS [1]



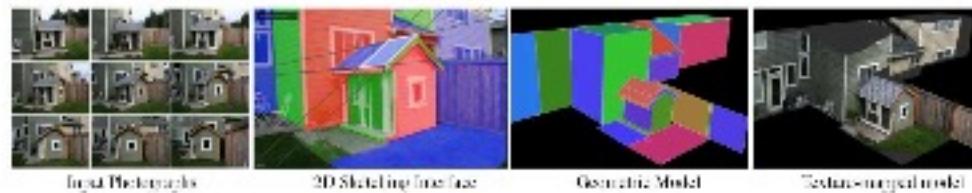
(a)



(b)



(c)



APPLICATIONS[3]

- Effets spéciaux et motion capture



Source: S. Seitz

APPLICATIONS[3]

- Modélisation 3D urbaine



[Bing maps](#), Google Streetview

Source: S. Seitz

APPLICATIONS[3]

- Modélisation 3D urbaine : Microsoft Photosynth



<http://photosynth.net>

Source: S. Seitz

APPLICATIONS[3]

- Reconnaissance de visages, sourires



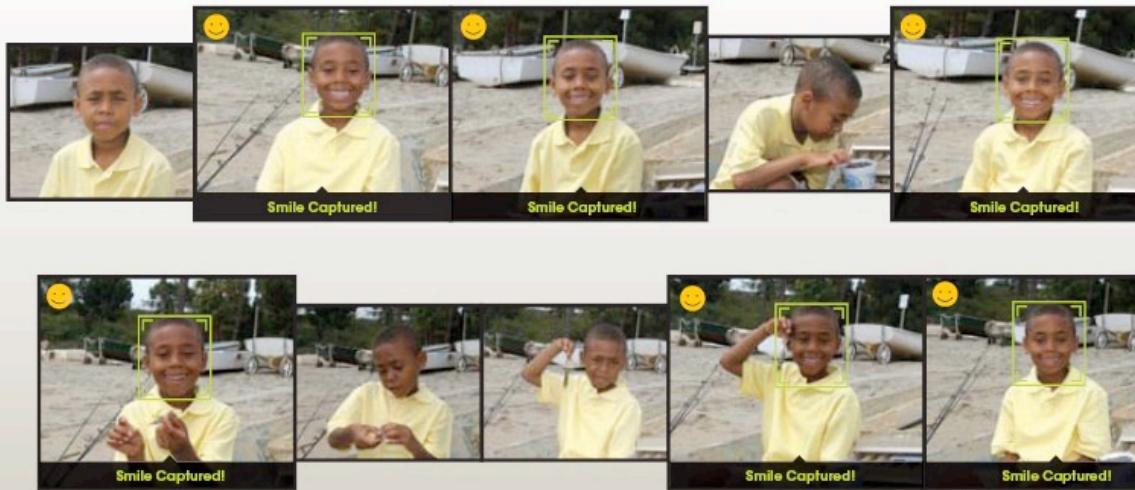
Directement par les appareils photos

APPLICATIONS[3]

- Reconnaissance de visages, sourires

The Smile Shutter flow

Imagine a camera smart enough to catch every smile! In Smile Shutter Mode, your Cyber-shot® camera can automatically trip the shutter at just the right instant to catch the perfect expression.

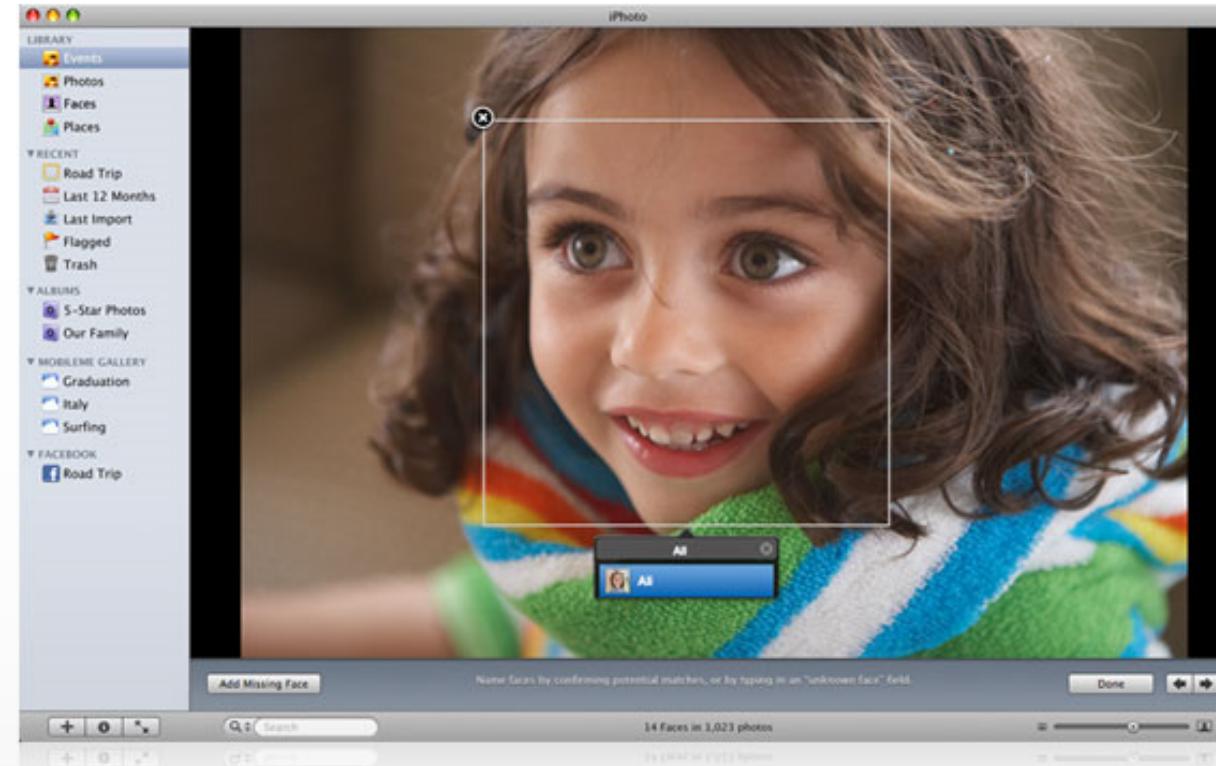


[Sony Cyber-shot® T70 Digital Still Camera](#)

Source: S. Seitz

APPLICATIONS[3]

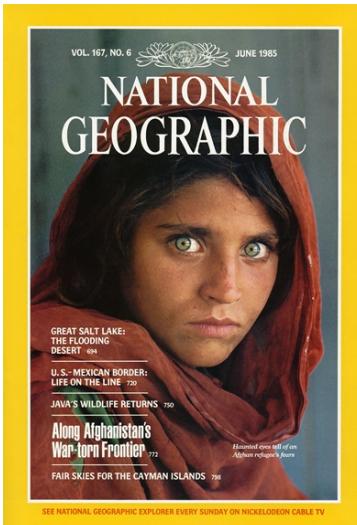
- Reconnaissance de visages, sourires



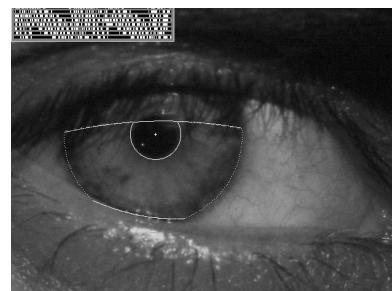
<http://www.apple.com/ilife/iphoto/>

APPLICATIONS[3]

- Biométrie



<http://www.cl.cam.ac.uk/~jgd1000/afghan.html>



Source: S. Seitz

APPLICATIONS[3]

- Biométrie



Fingerprint scanners on
many new laptops,
other devices

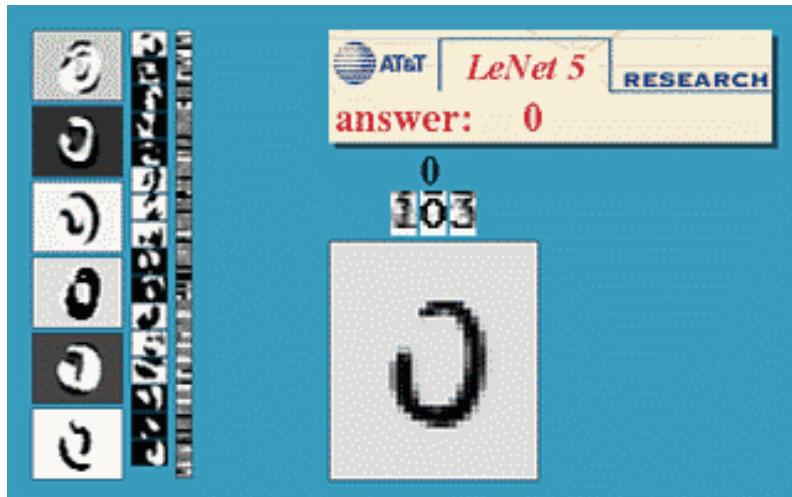


Face recognition systems now beginning
to appear more widely
<http://www.sensiblevision.com/>

Source: S. Seitz

APPLICATIONS[3]

- Optical Character Recognition (OCR)



Digit recognition, AT&T labs



License plate readers

http://en.wikipedia.org/wiki/Automatic_number_plate_recognition

APPLICATIONS[3]

- Dans les jouets et Robots



APPLICATIONS[3]

○ Sécurité automobile

The screenshot shows the Mobileye website's homepage. At the top, there are two tabs: "manufacturer products" (highlighted) and "consumer products". Below them is a main heading "Our Vision. Your Safety." with an image of a car from above showing three cameras: "rear looking camera", "forward looking camera", and "side looking camera". Below this are three cards: "EyeQ Vision on a Chip" (with an image of a chip), "Vision Applications" (with an image of a person walking), and "AWS Advance Warning System" (with an image of a display screen). To the right, there are two sections: "News" (listing articles like "Mobileye Advanced Technologies Power Volvo Cars World First Collision Warning With Auto Brake System") and "Events" (listing events like "Mobileye at Equip Auto, Paris, France").

- Mobileye: Vision systems in high-end BMW, GM, Volvo models
 - “In mid 2010 Mobileye will launch a world's first application of full emergency braking for collision mitigation for pedestrians where vision is the key technology for detecting pedestrians.”

APPLICATIONS[3]

- Interactions basées vision



Microsoft's Kinect



Sony EyeToy



Assistive technologies

Source: S. Seitz

BREF HISTORIQUE [2]

Avant la vision par ordinateur :

- L'origine du traitement des images se trouve dans l'optique
- XVIIIeme siècle : traitement physico-chimiques des photographies
- Fin du XIXeme siècle : disque de Nipkow
 - transformation d'une image en signal électrique analogique

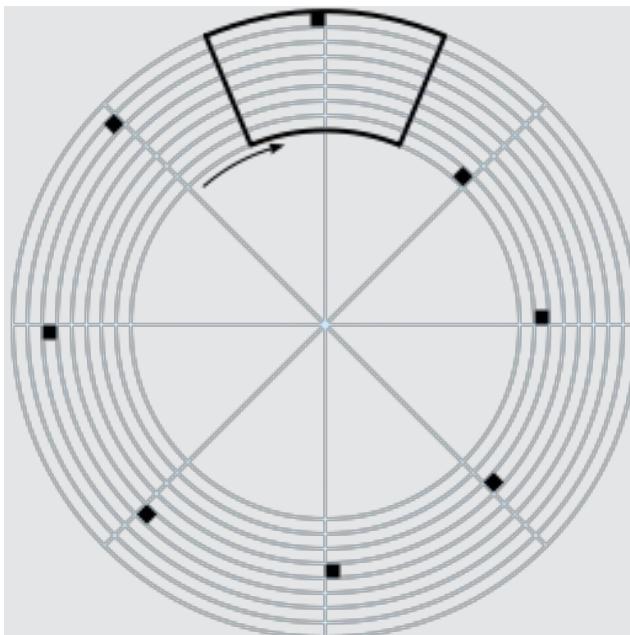


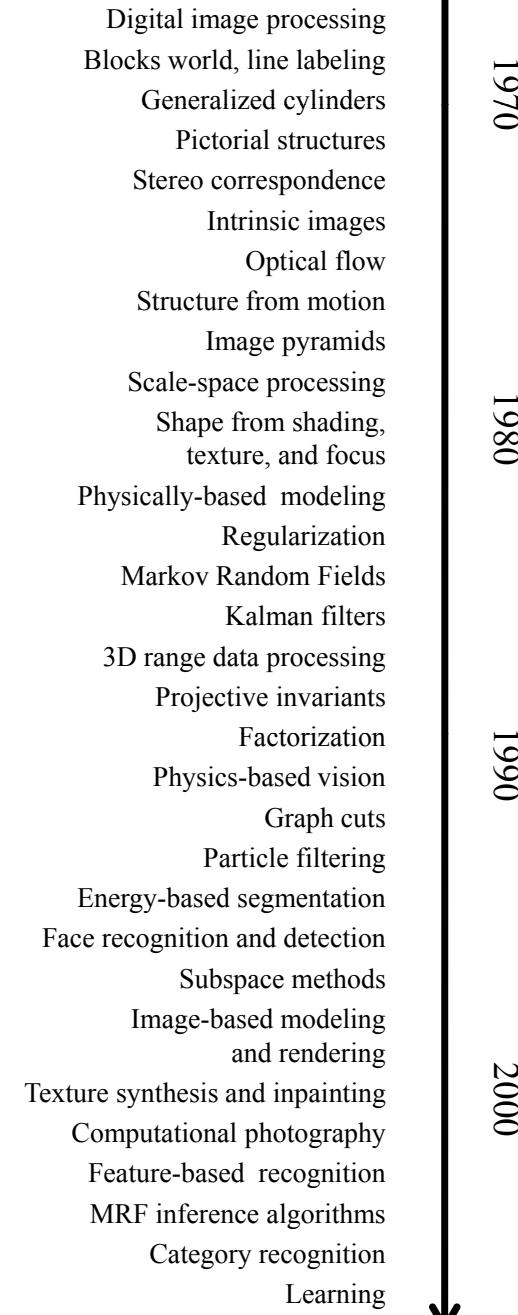
Schéma d'un disque
de Nipkow
[Wikipédia]

BREF HISTORIQUE [2]

- Fin des années 30 : lien entre optique et sciences de la communication
 - Plan expérimental : arrivée de la télévision
 - Plan théorique : formulation mathématique de la théorie du signal monodimensionnel $f(t)$ et bidimensionnel $f(x,y)$
- Début des années 50 : traitement analogique des images
 - Techniques photographiques, optiques et électroniques analogiques
- Parallèlement, développement des signaux numériques
- Années 1960 : apparition des calculateurs 3eme génération
 - Début du traitement numérique moderne

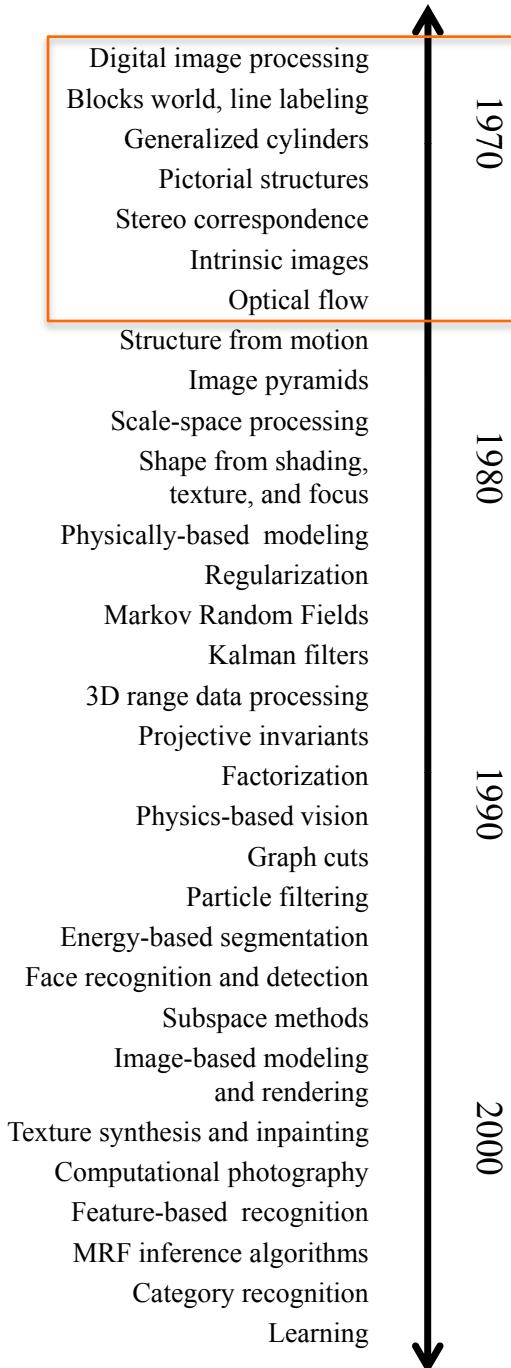
BREF HISTORIQUE [1]

Champs actifs en vision par ordinateur depuis 70's



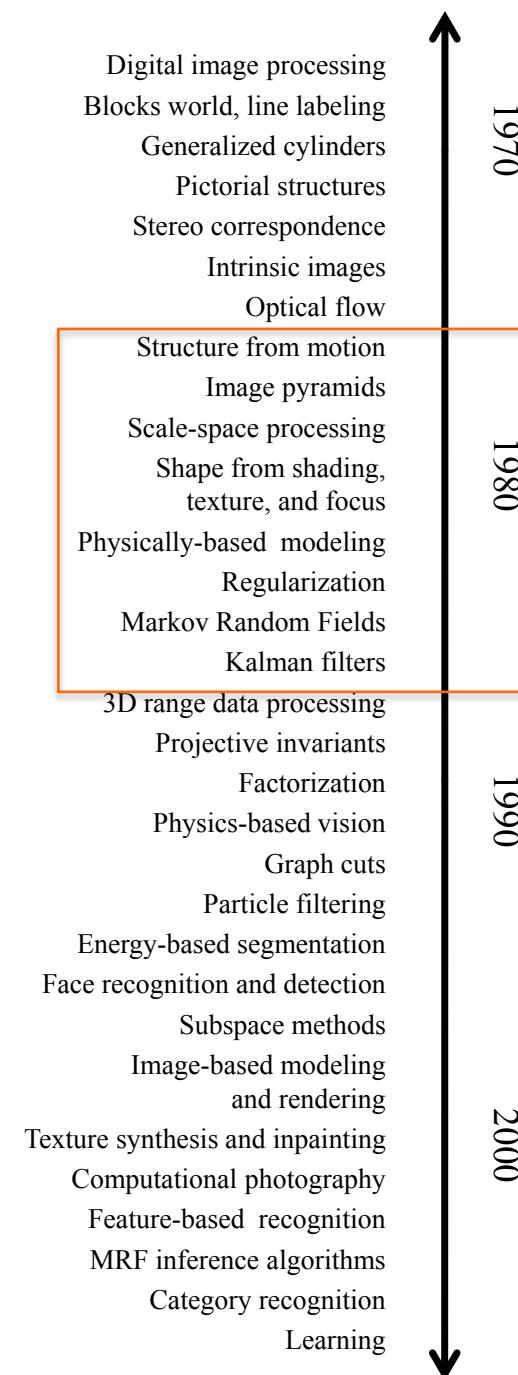
BREF HISTORIQUE [1]

Champs actifs en vision par ordinateur depuis 70's

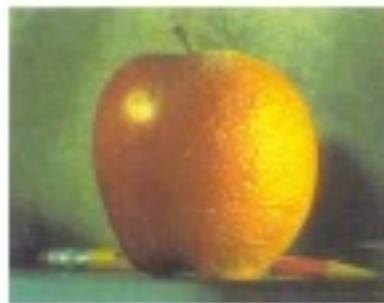


BREF HISTORIQUE [1]

Champs actifs en vision par ordinateur depuis 70's



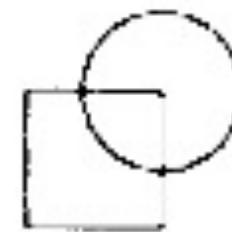
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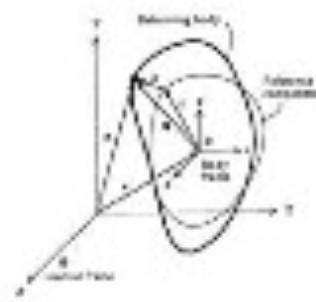
(a)



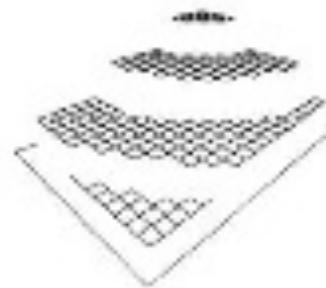
(b)



(c)



(d)



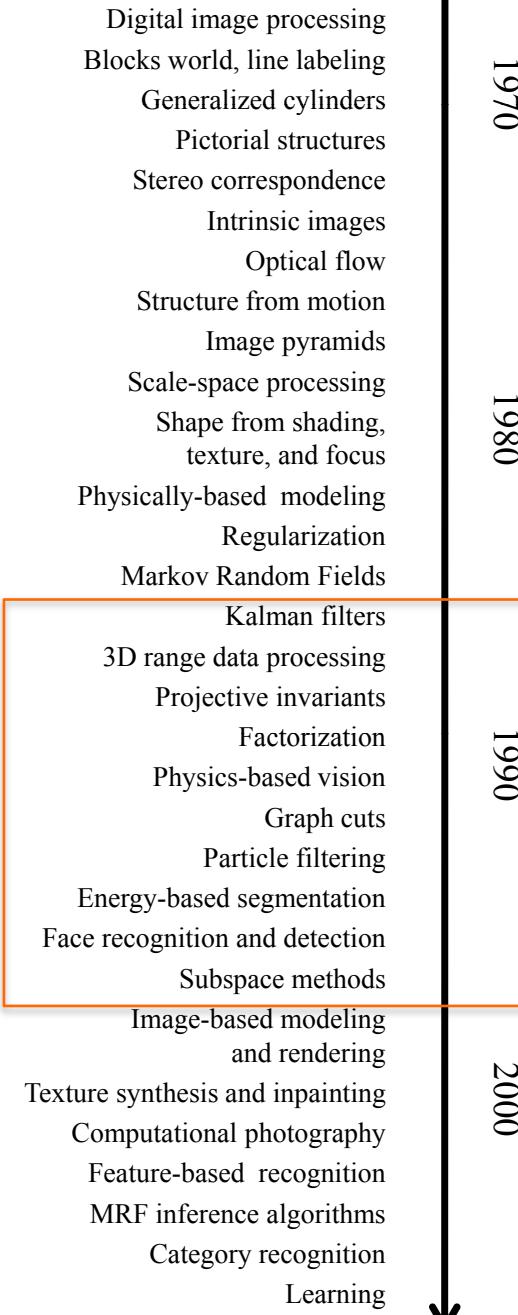
(e)



(f)

BREF HISTORIQUE [1]

Champs actifs en vision par ordinateur depuis 70's



BREF HISTORIQUE [1]



(a)



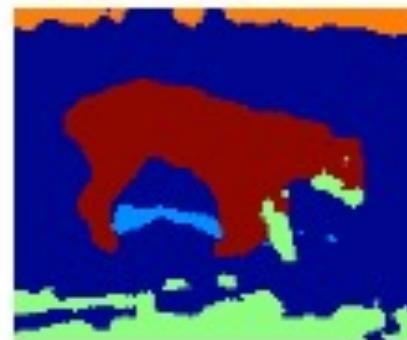
(b)



(c)



(d)



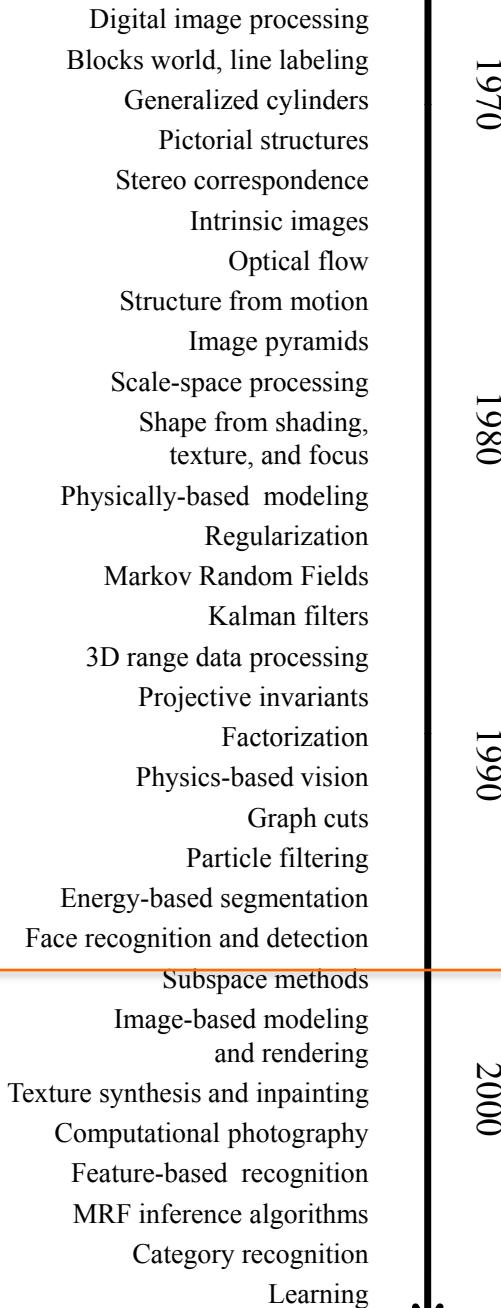
(e)



(f)

BREF HISTORIQUE [1]

Champs actifs en vision par ordinateur depuis 70's



BREF HISTORIQUE [1]



(a)



(b)



(c)



(d)



(e)



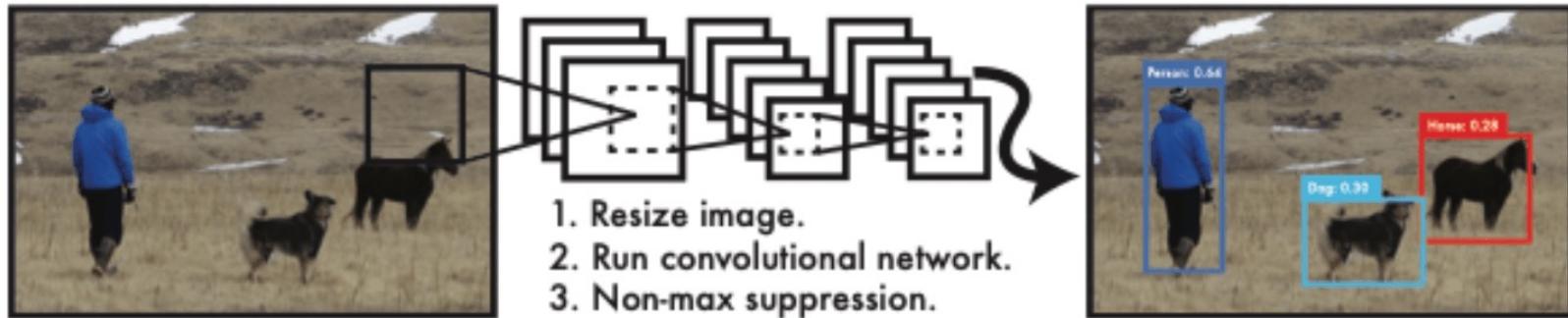
(f)

COMPUTER VISION ET IA

- 2010 - 2017 ImageNet Large Scale Visual Recognition Challenge (ILSVRC)

- 2015 You Only Look Once – YOLO

https://www.cv-foundation.org/openaccess/content_cvpr_2016/papers/Redmon_You_Only_Look_CVPR_2016_paper.pdf



BIBLIOGRAPHIE

1. Computer Vision, Algorithms and applications,
Richard Szeliski, Springer, 2011
(<http://szeliski.org/Book/>)
2. Acquisition et Visualisation des images, *André Marion*, 1997
3. Stanford University - CS 131 Computer Vision:
Foundations and Applications