

Introduction

Computer Vision Crash Course

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What is computer vision

Computer vision as an AI task

Intelligence and Perception

In the evolution the perception of surrounding environment played a crucial role



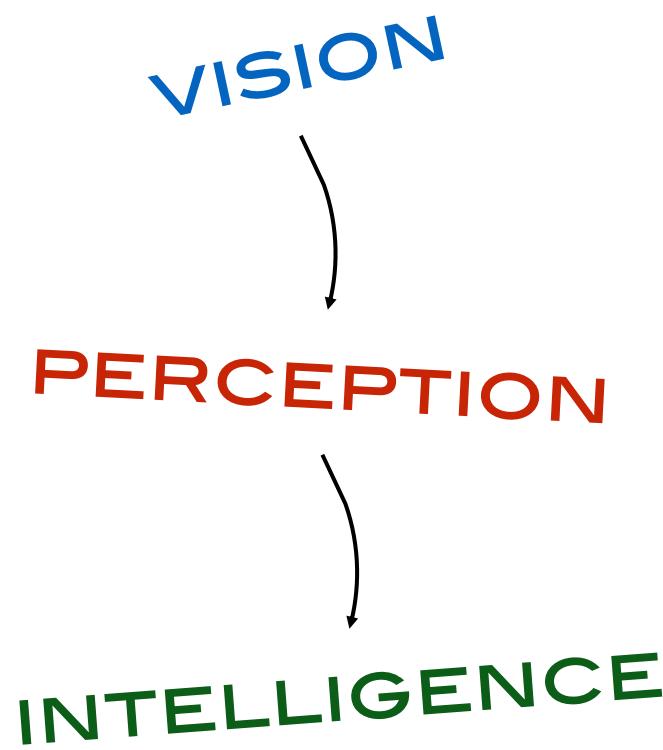
Vision is an “innate” ability of humans and, as such, it is often given for granted

In this photo there are some boats...
Tell me how many do you see

All of them!



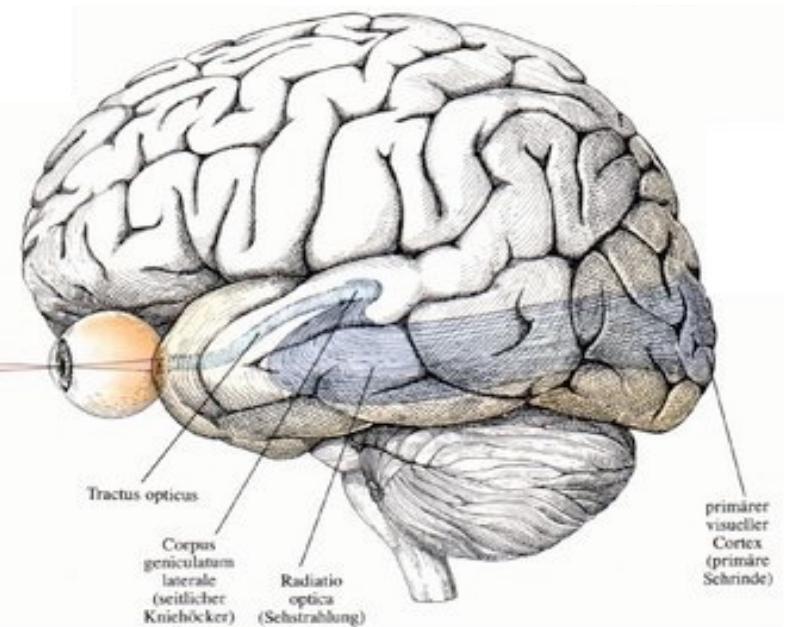
Computer vision as an AI task



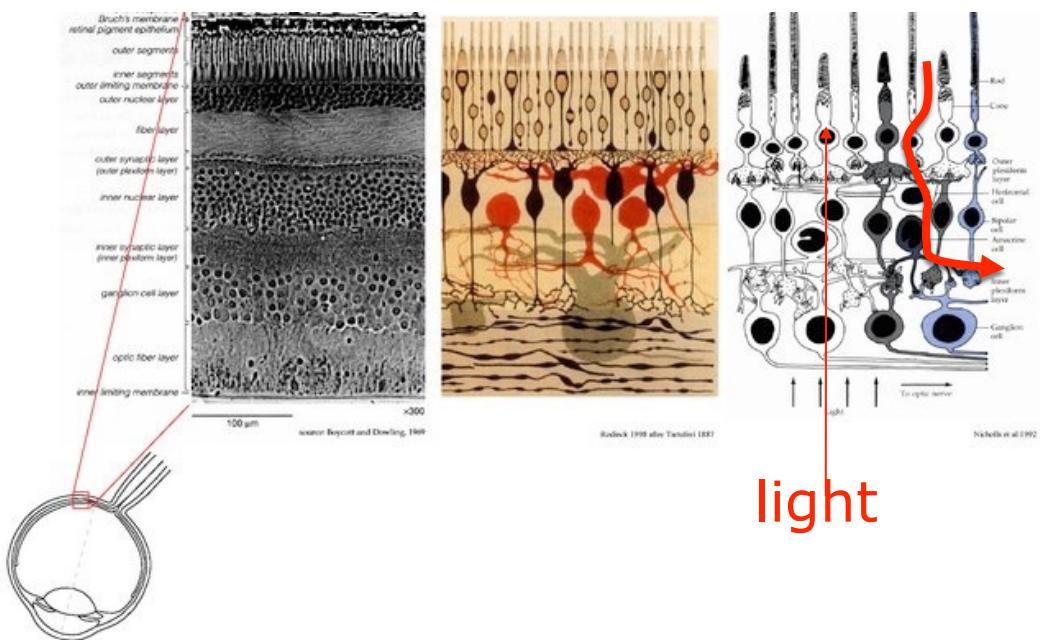
“It seems a human!”



Human vision



Hubel 1985

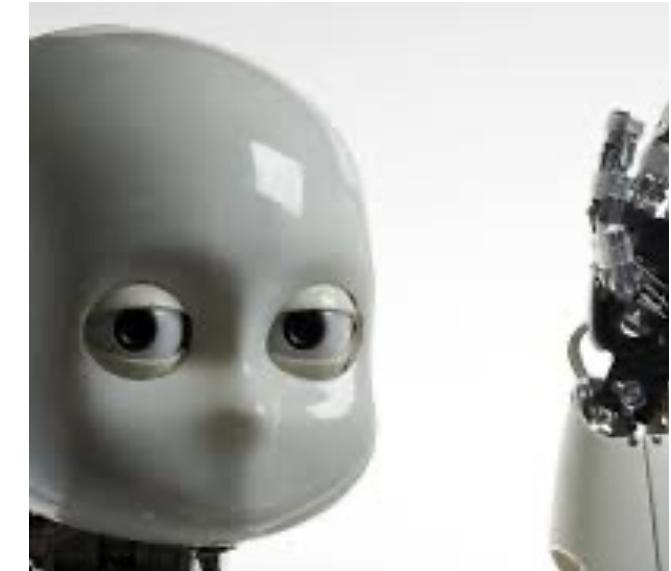


Rodnick 1998 after Tarczky 1887

Nicholls et al 1992

Computer vision

A camera can play the role of the computer “eye”



- The acquired *images* are ***meaningless***, until they are processed by computer vision algorithms
- Similarly, the image formed on the retina needs to be interpreted by the brain

98	103	102	110	118	118	119	119	118	118	109	88
98	105	101	110	118	118	119	118	116	113	105	84
92	98	96	109	116	121	130	130	142	141	151	145
95	98	98	104	110	112	124	127	148	147	157	159
95	98	98	104	110	112	124	127	148	147	157	159
103	104	107	111	116	121	128	128	137	135	146	169
101	106	106	110	116	119	128	128	134	133	145	166
99	109	106	118	127	131	143	145	154	153	155	168
102	110	110	121	131	136	148	148	157	157	160	169
102	110	111	124	136	140	153	154	164	165	167	174
105	113	112	124	130	135	147	147	159	159	167	175
104	113	112	125	134	137	144	147	161	161	169	177
102	110	108	122	131	131	140	140	149	150	157	168
103	109	109	121	128	131	139	140	149	148	156	167
101	106	103	116	127	133	144	143	148	148	149	159
84	94	91	103	113	118	132	134	145	146	146	149
85	92	91	103	114	119	134	135	146	145	146	149
70	82	81	91	97	100	112	115	131	130	139	142
70	82	81	91	97	100	114	115	131	132	139	142
77	76	76	82	89	89	100	101	115	113	127	135
111	85	84	79	81	81	90	90	102	100	111	125
107	86	88	79	79	79	88	88	100	101	110	126

Computer Vision

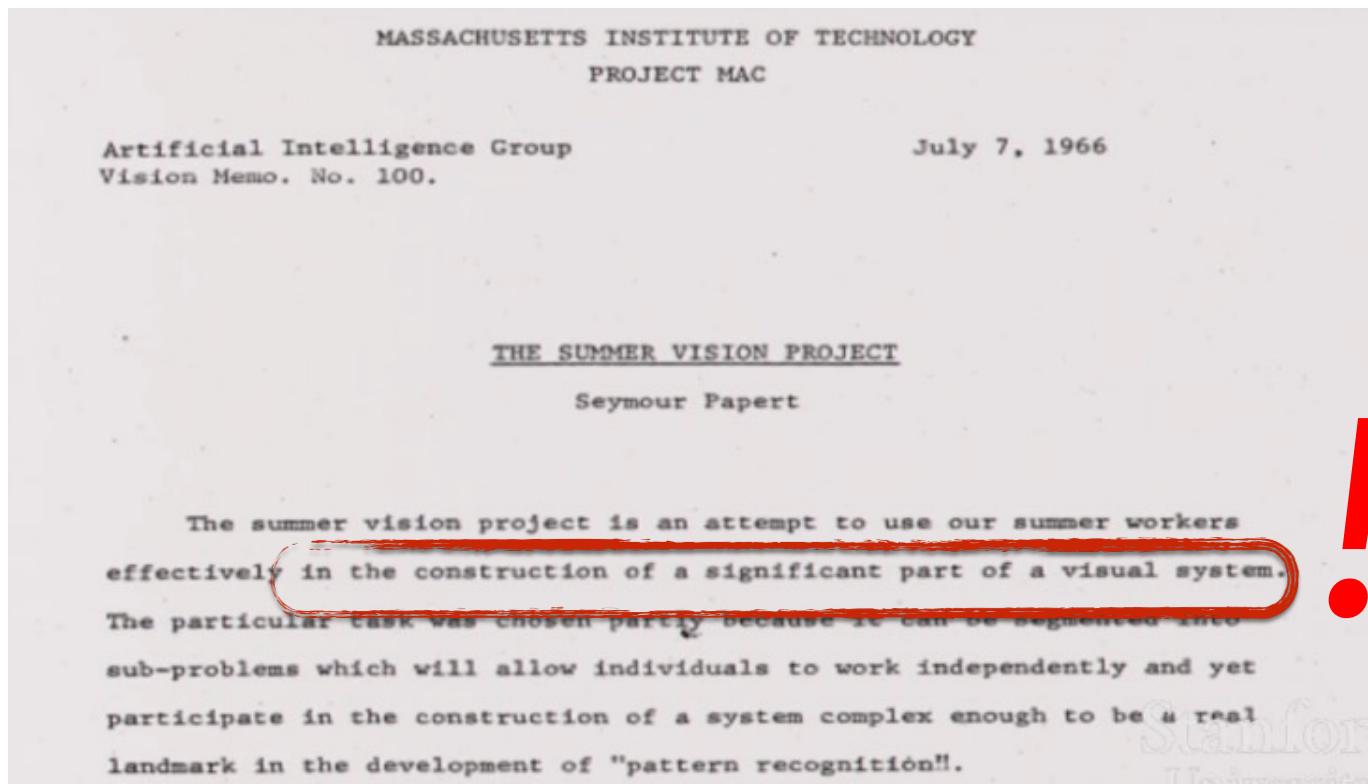
Definition

Computer vision is about extracting a **description** of the world starting from images or image sequences

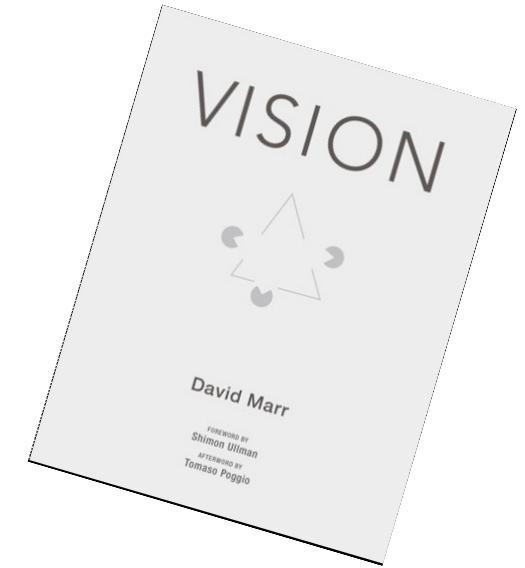
“Description” is a vague term, including geometry (shapes, distances,...), dynamics (motion, actions, ...), semantics (categories, properties, ..)

It all started

In 1966 Marvin Minsky, one of the fathers of AI, underestimates the visual perception complexity and assigns a project to a summer intern requiring to “solve the vision of a computer”



The birth of a new discipline



VISION by David Marr “A computational investigation into the human representation and processing of visual information”

It defines the building blocks at the basis of modern computer vision

Interesting projects in classical CV

Image based rendering The Matrix (1997)

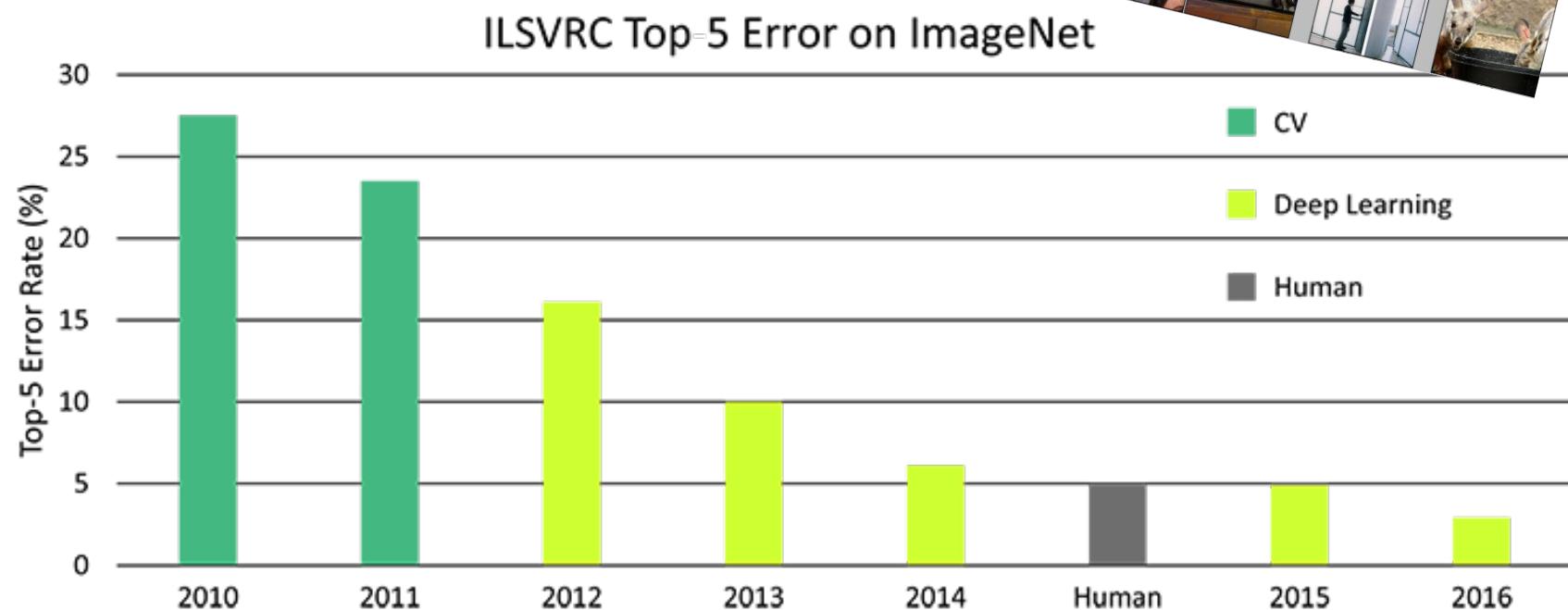
Have a look at Pauldevebec.com 1997

Image stitching / panoramas



Machine learning and Deep Learning in CV

Larger amount of data needed



COOL STUFF

Deep dream



“Initially it was invented to help scientists and engineers to see what a deep neural network is seeing when it is looking in a given image. Later the algorithm has become a new form of psychedelic and abstract art.”

Deepdreamgenerator.com

Body Pose estimation



Deeplabcut.com

Computer Vision application domains

OCR

Quality control

Video-surveillance

HMI / VR / AR

Medical

Sports

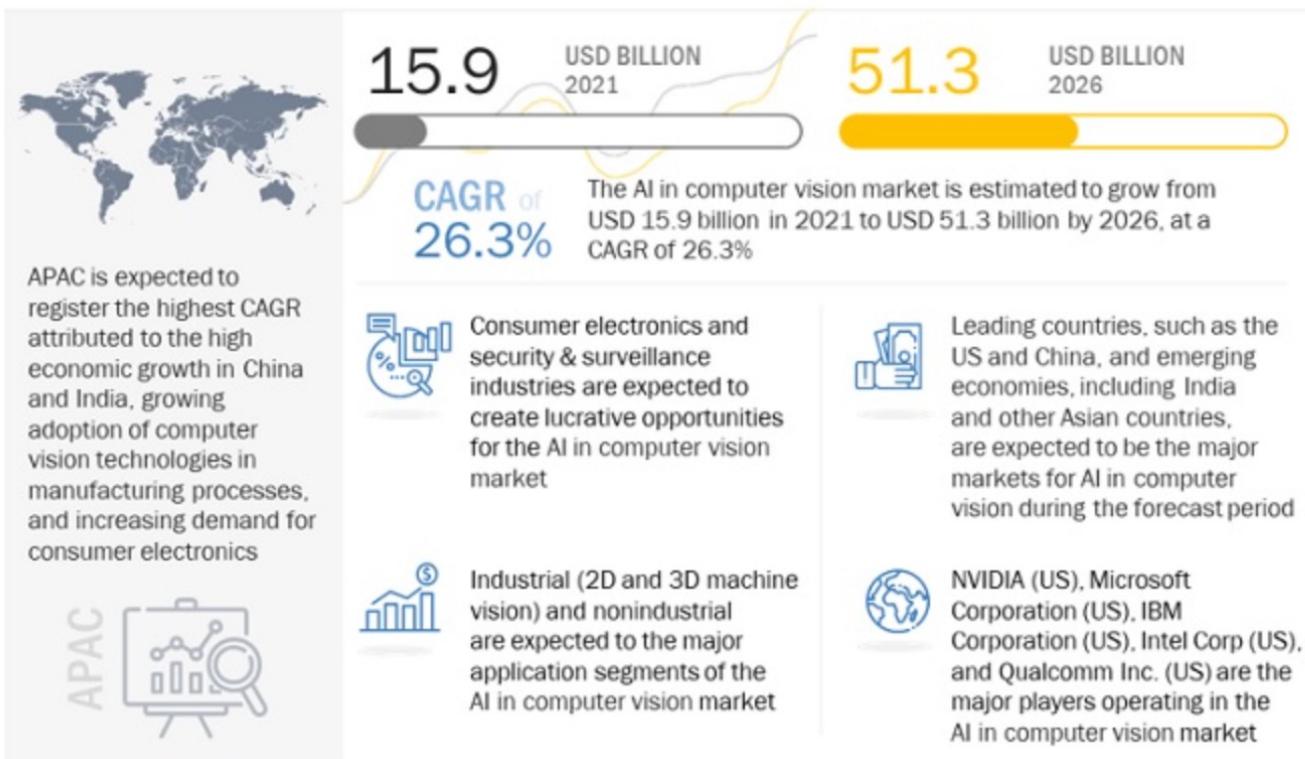
Smartphones and apps

Movies and media

Driving assistance

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Attractive Opportunities in AI in Computer Vision Market



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

About this course

CVCC Objectives

To provide a practical introduction to main building blocks in the CV domain.

Classes will cover a broad spectrum of concepts

Hands-on activities will help us focusing on specific sub-tasks and example algorithms.

Timeline

MONDAY

(this) intro & digital images fundamentals
image formation

TUESDAY

from filters to features (class and lab)

WEDNESDAY

The many faces of image similarity: design and implementation of a proof-of-concept (team work)

THURSDAY

Dealing with more than one image (class and lab)

FRIDAY

CV in the Deep Learning era (overview class and lab)

Do you need extra credits/ final exam?

... Don't miss wednesday team activity!

UniGe

