

Stanford CS231n — Convolutional Neural Networks for Visual Recognition

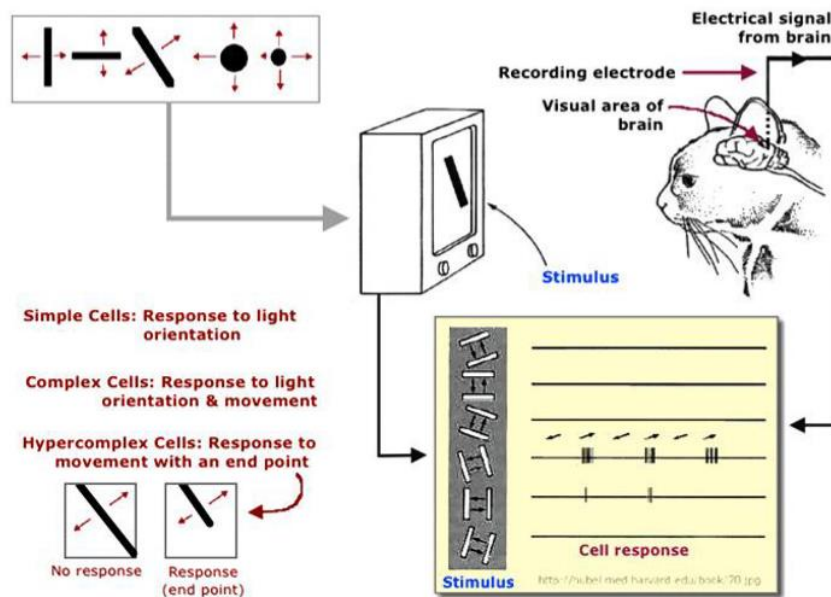
Lecture 1: Introduction

Computer Vision courses @ Stanford:

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<h3>Computer Vision courses @ Stanford</h3> <ul style="list-style-type: none">• CS131 (fall, 2015, Profs. Fei-Fei Li & Juan Carlos Niebles):<ul style="list-style-type: none">– Undergraduate introductory class• CS231a (spring term, Prof. Silvio Savarese)<ul style="list-style-type: none">– Core computer vision class for seniors, masters, and PhDs– Topics include image processing, cameras, 3D reconstruction, segmentation, object recognition, scene understanding• CS231n (this term, Prof. Fei-Fei Li & Andrej Karpathy & Justin Johnson)<ul style="list-style-type: none">– Neural network (aka “deep learning”) class on image classification• And an assortment of CS331 and CS431 for advanced topics in computer vision		
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A brief history of computer vision:

How does the vision work in our biological brain?

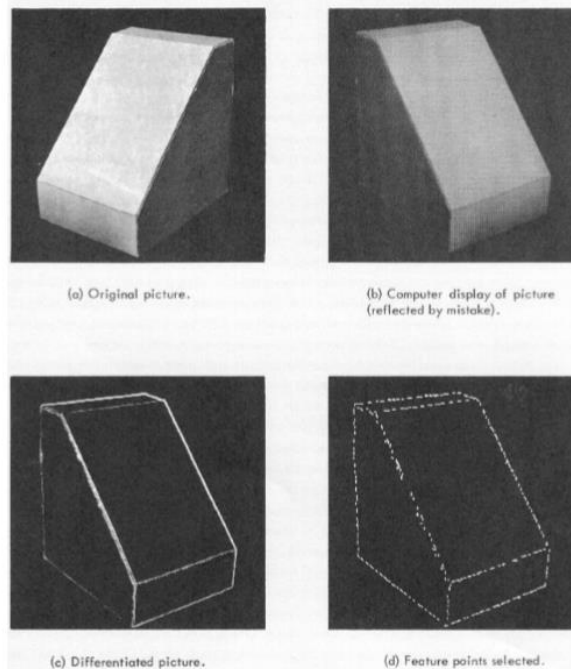


Hubel & Wiesel, 1959

Computer vision beginning:

Block world

Larry Roberts, 1963



MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PROJECT MAC

Artificial Intelligence Group
Vision Memo. No. 100.

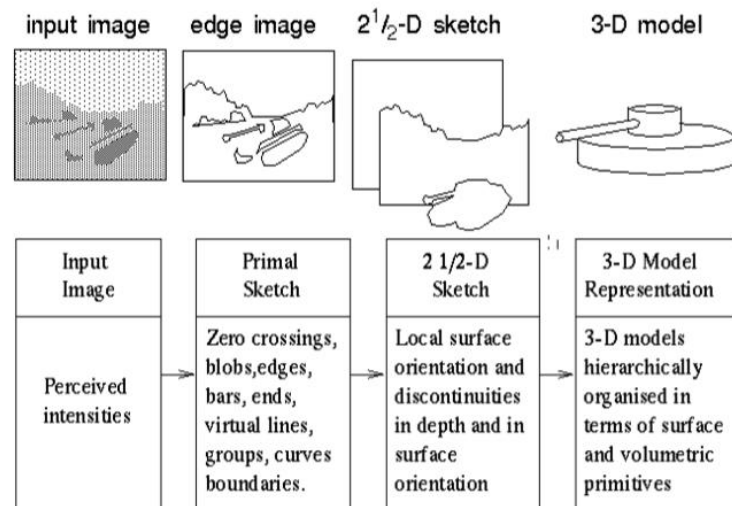
July 7, 1966

THE SUMMER VISION PROJECT

Seymour Papert

The summer vision project is an attempt to use our summer workers effectively in the construction of a significant part of a visual system. The particular task was chosen partly because it can be segmented into sub-problems which will allow individuals to work independently and yet participate in the construction of a system complex enough to be a real landmark in the development of "pattern recognition".

vision is hierarchical:

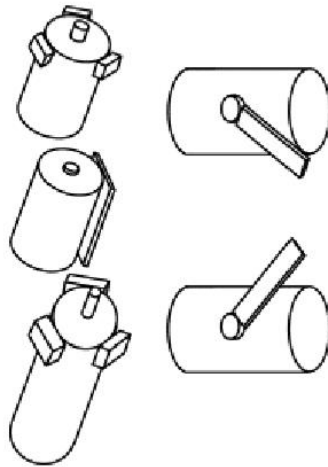


Stages of Visual Representation, David Marr, 1970s

1st vision model:

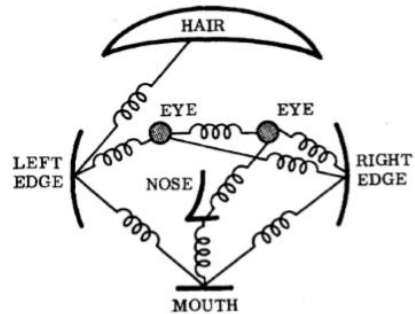
- Generalized Cylinder

Brooks & Binford, 1979



- Pictorial Structure

Fischler and Elschlager, 1973



perception grouping:

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<p>Normalized Cut (Shi & Malik, 1997)</p> <p>The grid displays 18 different images, including people, buildings, and landscapes. Each image has yellow outlines that segment the objects from the background, demonstrating the results of the Normalized Cut algorithm for image segmentation.</p>									
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Viola Jones Face Detector:



Face Detection, Viola & Jones, 2001

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Lecture 1 - 17

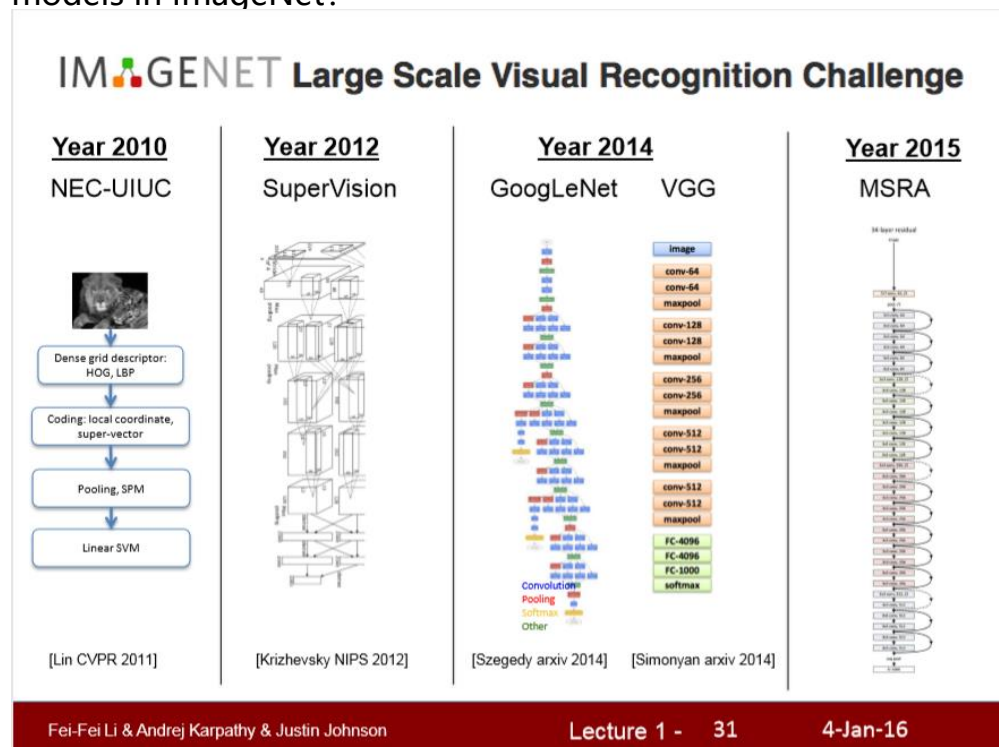
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features:
PASCAL Visual Object Challenge
ImageNet

CS231n overview:

one of the most important problems of visual recognition — image classification

CNN models in ImageNet:



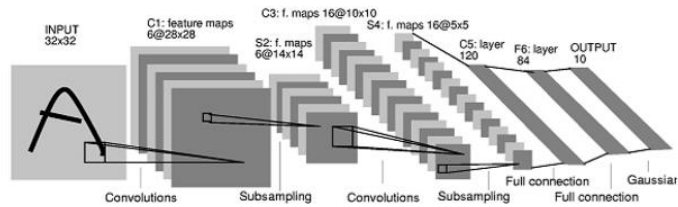
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1998

LeCun et al.



of transistors



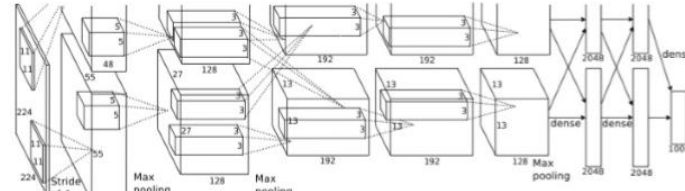
10^6

of pixels used in training

10^7 NIST

2012

Krizhevsky et al.



of transistors GPUs



10^9



of pixels used in training

10^{14} IMAGENET