

## Intro to CNN

massive amount of visual data produced

"dark matter": Comprises the majority of bits flying around the internet

## Computer Vision History

540 million yrs ago : "evolution's Big Bang"

the first animals developed eyes = Onset of Vision  
∴ Evolved for survival

Camera Obscura → Modern Cameras

Simple cells → Complex cells (Hubel & Wiesel, 1959)

- Cat brain OR using 'electrophysiology'

Block World (Larry Roberts, 1963)

- The 1st PhD thesis of CV where the visual world was simplified into simple geometric shapes

MIT "The Summer Vision Project" (1966)

\* VISION (David Marr, 1970s)

↳ Input Image

Primal Sketch: Zero crossings, blobs, edges, bars, ends, virtual lines, groups, curves boundaries [simple cells]

2½-D sketch: Local surface orientation and discontinuities in depth and in surface orientation

3-D Model Representation: 3-D models hierarchically organized  
in terms of surface and volumetric primitives

Generalized Cylinder (Brooks & Penford, 1979)

Pictorial Structure (Fischler and Elschlager, 1973)

60-80년대까지 'object recognition' 관점에서 접근과 연구

but real world에 적용 어려움

So, 'object recognition' → 뒤로 이동한 'object segmentation' 브이!

Object Segmentation: task of taking image and group the  
pixels into **meaningful** areas

Face Detection (Viola & Jones, 2001)

↑ AdaBoost

SVM, boosting, graphical models ...

2006 Fujifilm

실시간 얼굴인식 Camera 층

Feature based object recognition

- "SIFT" (David Lowe, 1999)
- Spatial Pyramid Matching (Lazebnik, 2006)

PASCAL Visual Object Challenge (2006-2012)

- Dataset composed of 20 object classes

IMAGENET

- 22K categories 14M images
- Large Scale Visual Recognition Challenge (1000 obj., 1.4M images)

2012년 AlexNet: Convolutional Neural Network aka. Deep Learning

CS231n - Image Classification, Object Detection, Image Captioning

Convolutional Neural Network (CNN)

1998 Yann LeCun digit recognition

2012 Krizhevsky AlexNet

① 하드웨어 발전

② Labeled data 증가

∴ CNN 성과!