

딥러닝 소개

컴퓨터 비전 중심으로

Sept 2020

컴퓨터 비전을 위한 딥러닝

컴퓨터 비전을 위한 딥러닝

- 시각 데이터를 처리하고, 인지하고, 추론하는 인공지능 시스템을 만드는 것

컴퓨터 비전을 위한 딥러닝

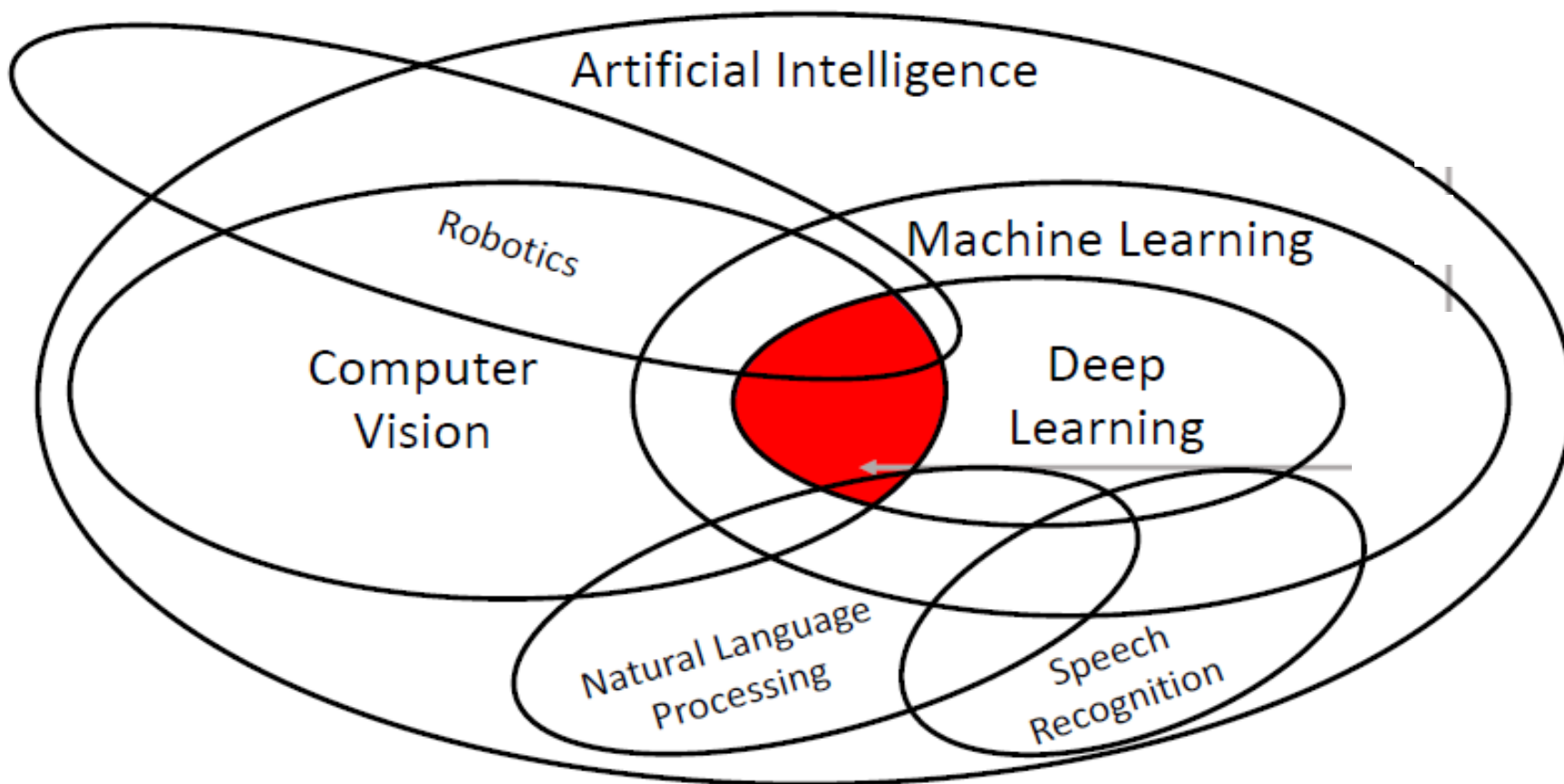
- 데이터와 경험으로부터 학습하는 인공지능 시스템을 만드는 것

컴퓨터 비전을 위한 딥러닝

- 뇌에 의해 (느슨하게) 영감을 받아 많은 계층을 가진 계층적 학습 알고리즘

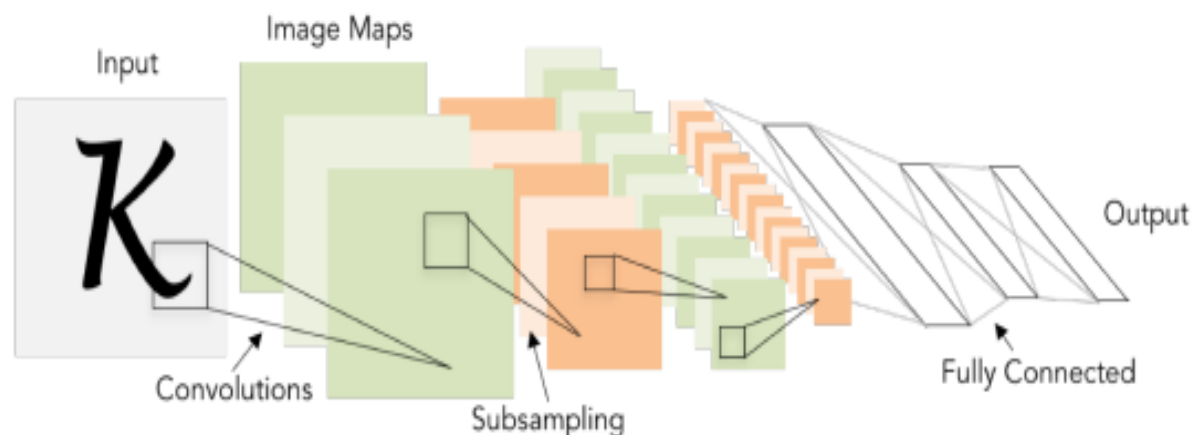
컴퓨터 비전을 위한 딥러닝

- 인공지능 체계



합성곱넷: LeCun 등 (1998)

- 르넷의 등장: 역전파, 손글씨, CNN과 유사

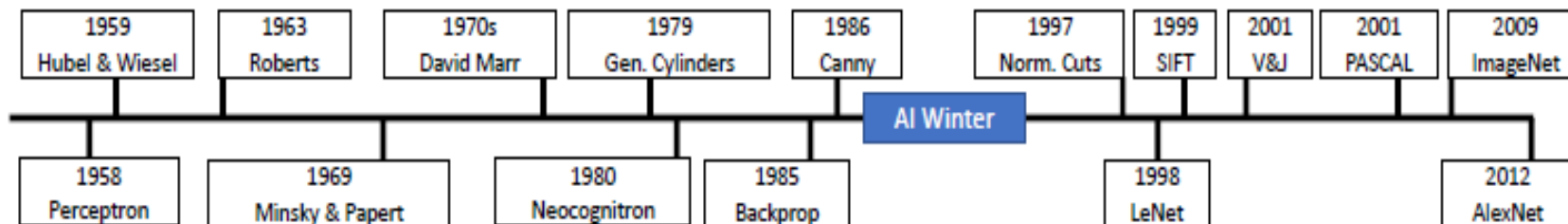


Applied backprop algorithm to a Neocognitron-like architecture

Learned to recognize handwritten digits

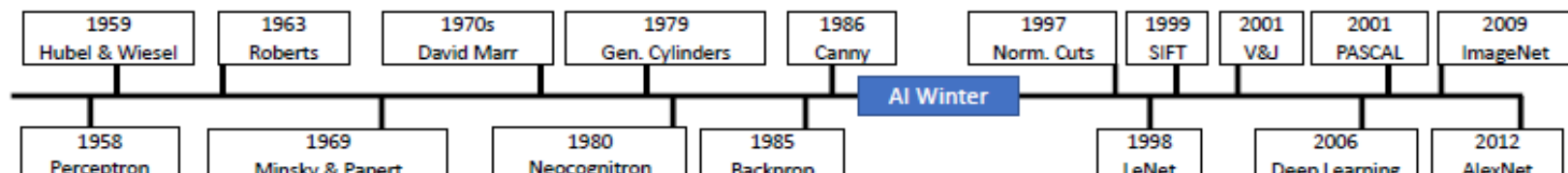
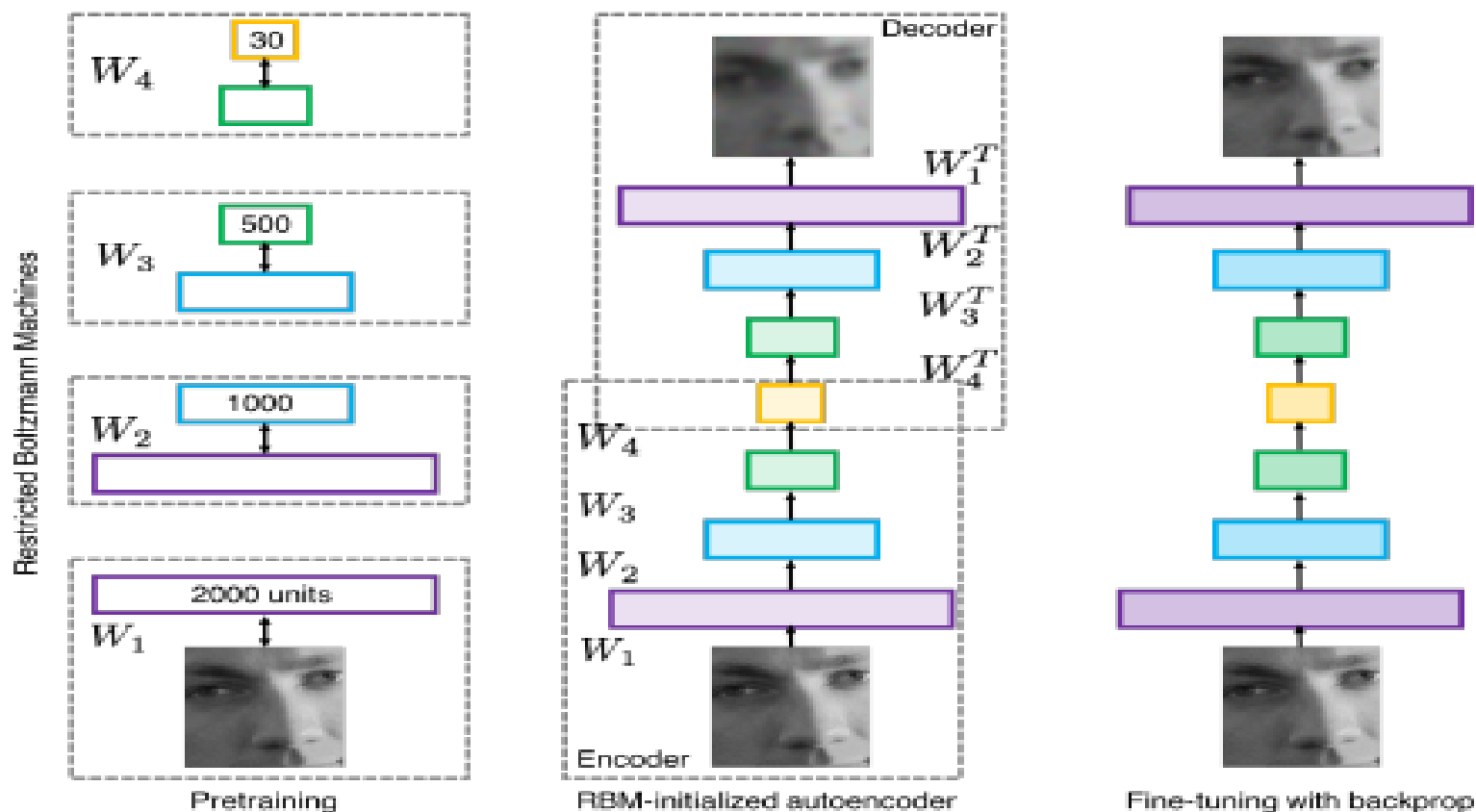
Was deployed in a commercial system by NEC, processed handwritten checks

Very similar to our modern convolutional networks!



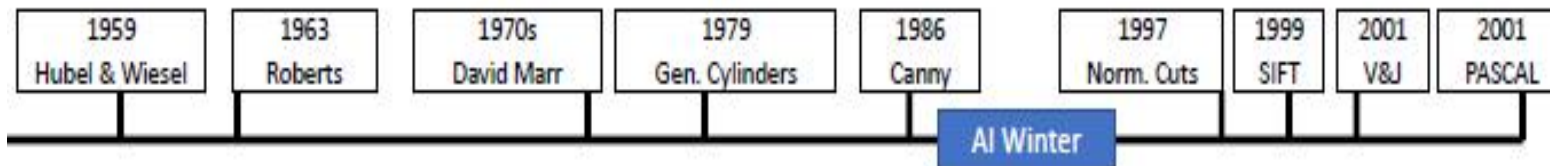
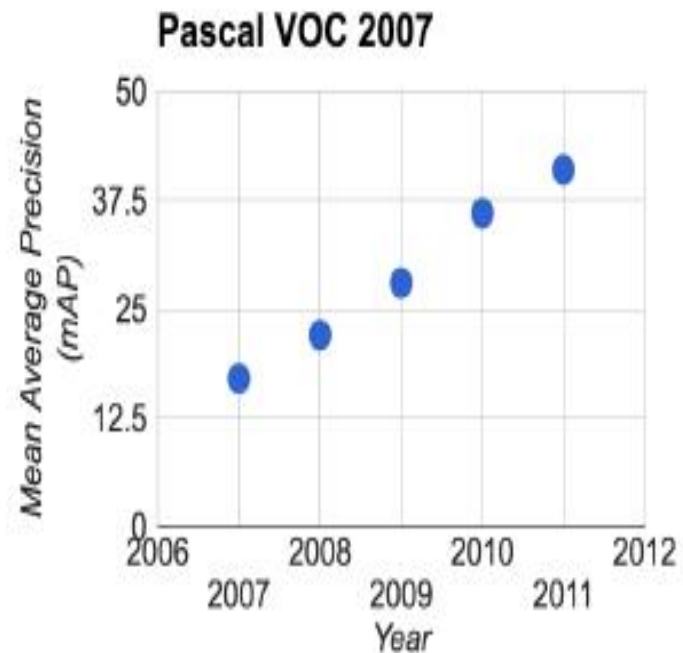
2000년 대의 딥러닝

- 2000년대의 딥러닝 등장: 이 때는 대세는 아니었다.



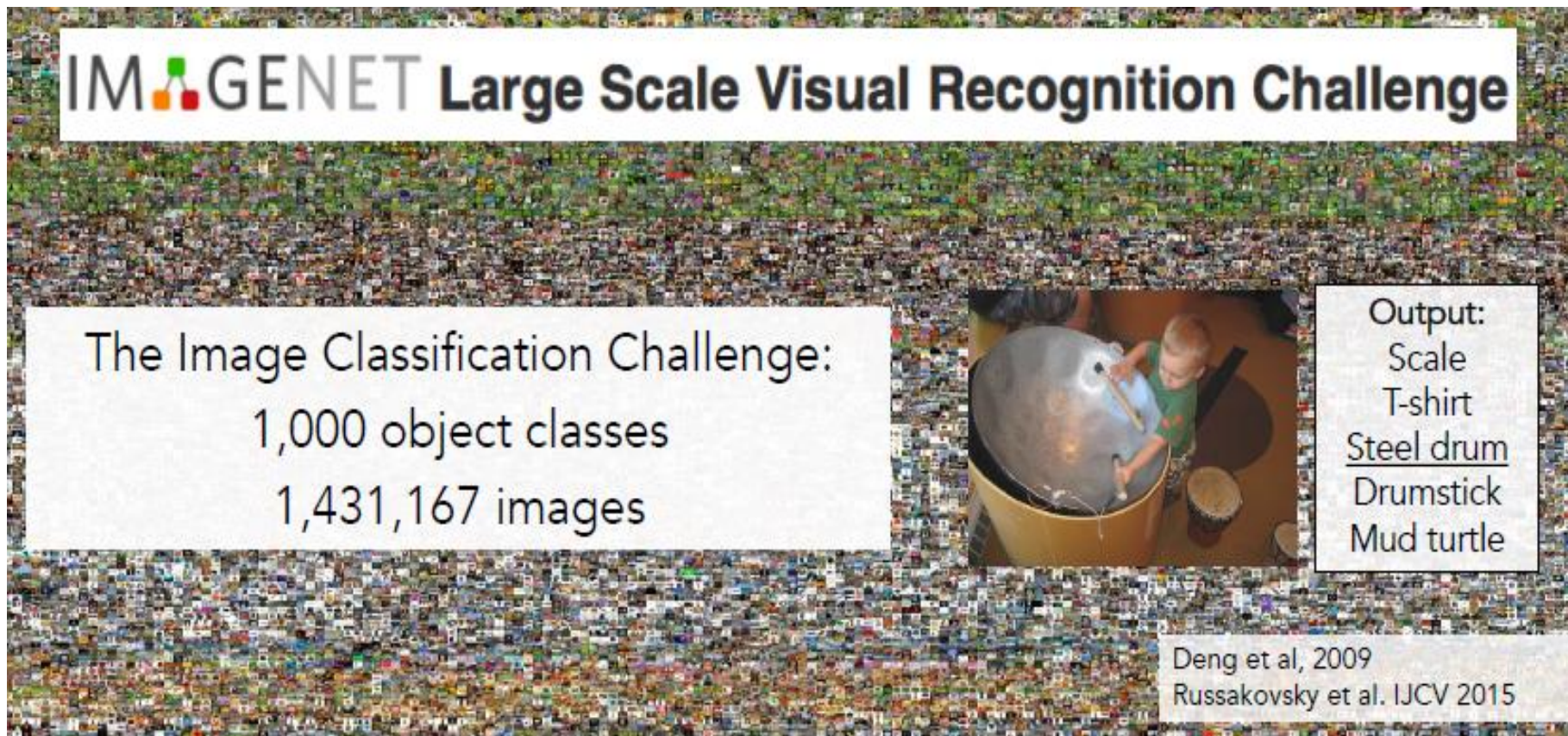
컴퓨터 비전 경연대회

- PASCAL 시각 객체 경연대회



컴퓨터 비전 경연대회

- 이미지넷 (대규모 시각 인지 경연대회)



The banner for the IMAGENET Large Scale Visual Recognition Challenge features a background of a dense, colorful mosaic of small images. Overlaid on this are several text boxes and a central image. The top box contains the challenge title. A large white box in the center-left describes the challenge. A central image shows a child playing a steel drum. To the right, a box lists the output labels for that image. At the bottom, a timeline of computer vision milestones is shown, with 'AI Winter' highlighted in blue.

IMAGENET Large Scale Visual Recognition Challenge

The Image Classification Challenge:
1,000 object classes
1,431,167 images

Output:
Scale
T-shirt
Steel drum
Drumstick
Mud turtle

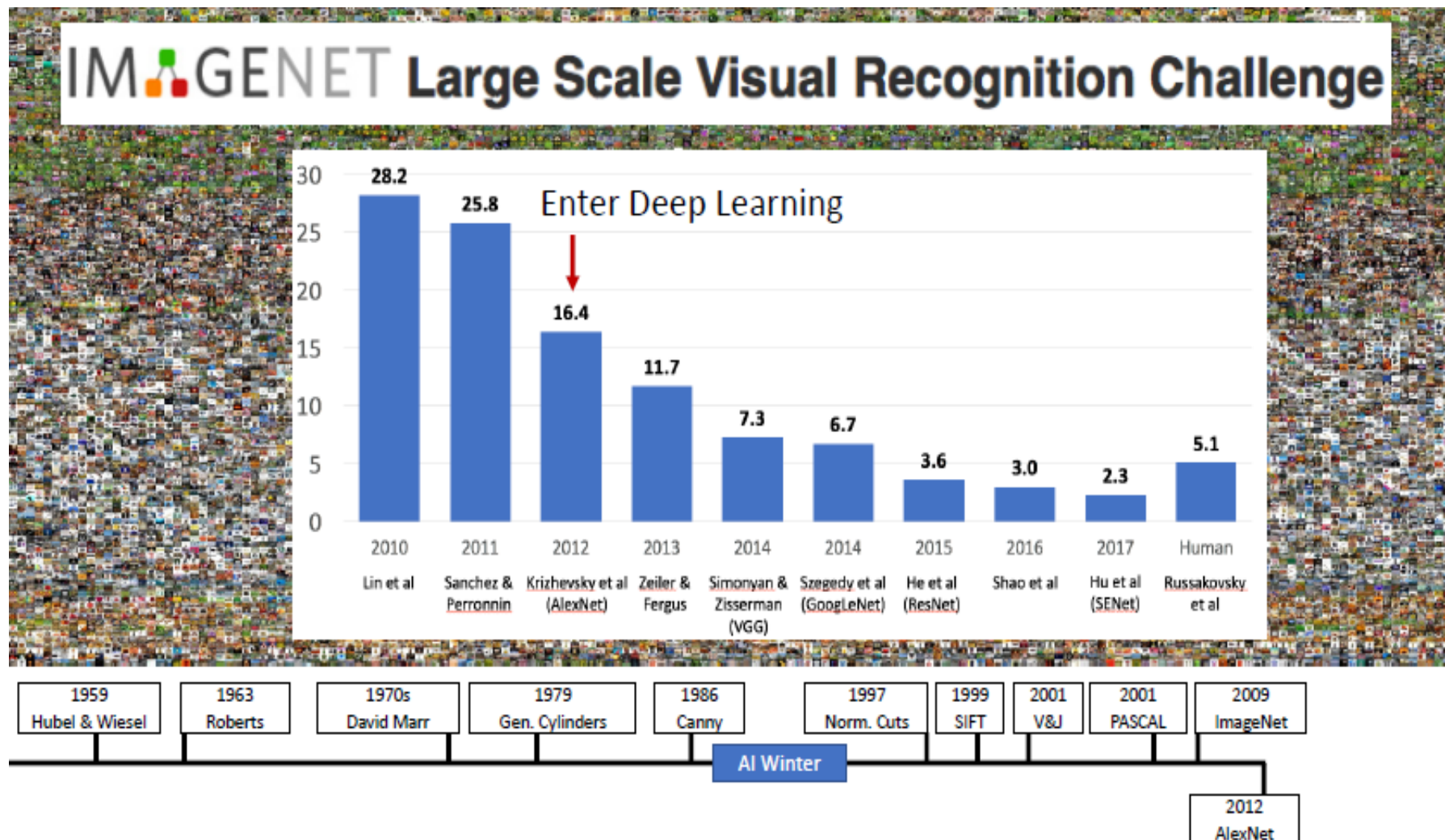
Deng et al, 2009
Russakovsky et al. IJCV 2015

Year	Event/Work
1959	Hubel & Wiesel
1963	Roberts
1970s	David Marr
1979	Gen. Cylinders
1986	Canny
1997	Norm. Cuts
1999	SIFT
2001	V&J
2001	PASCAL
2009	ImageNet

AI Winter

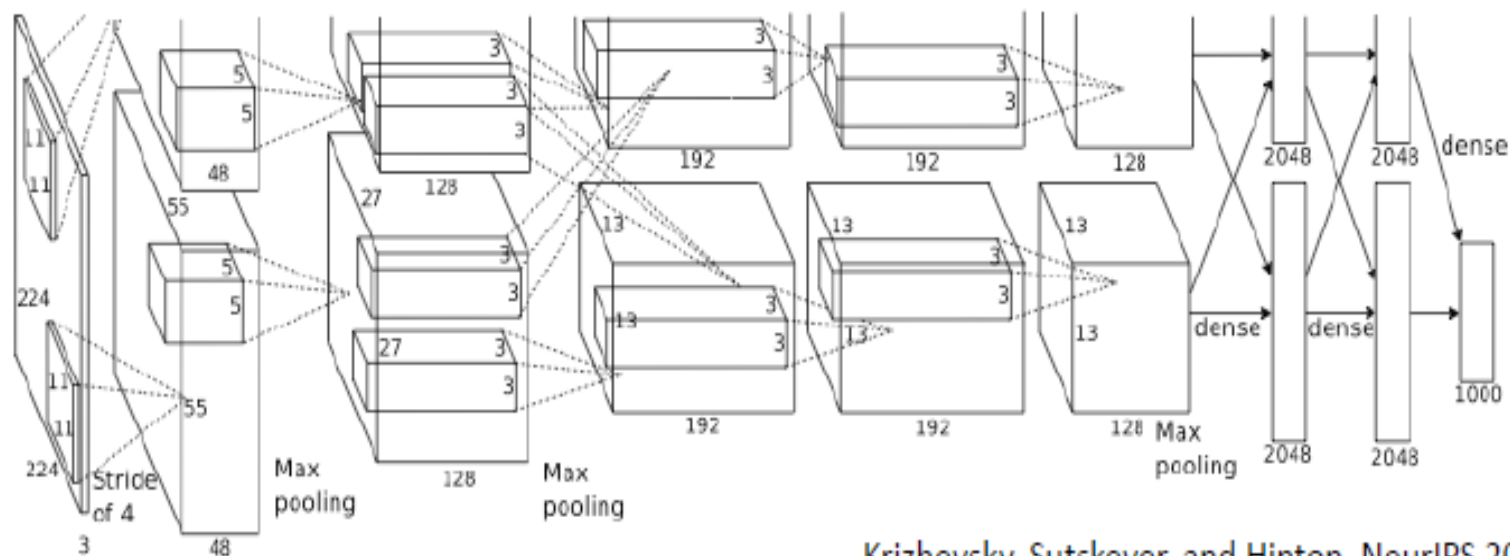
컴퓨터 비전 경연대회

- 이미지넷 (대규모 시각 인지 경연대회)

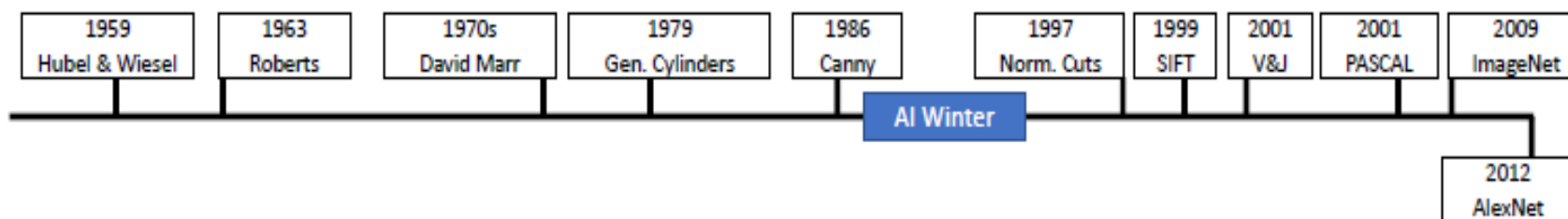


알렉스넷(AlexNet): 딥러닝이 대세로

- 알렉스넷이 등장한 2012년이 원년이 된다.



Krizhevsky, Sutskever, and Hinton, NeurIPS 2012



2012년에서 현재: 합성곱넷 (CNN)이 모든 곳에

- 이미지 분류와 검색

Image Classification

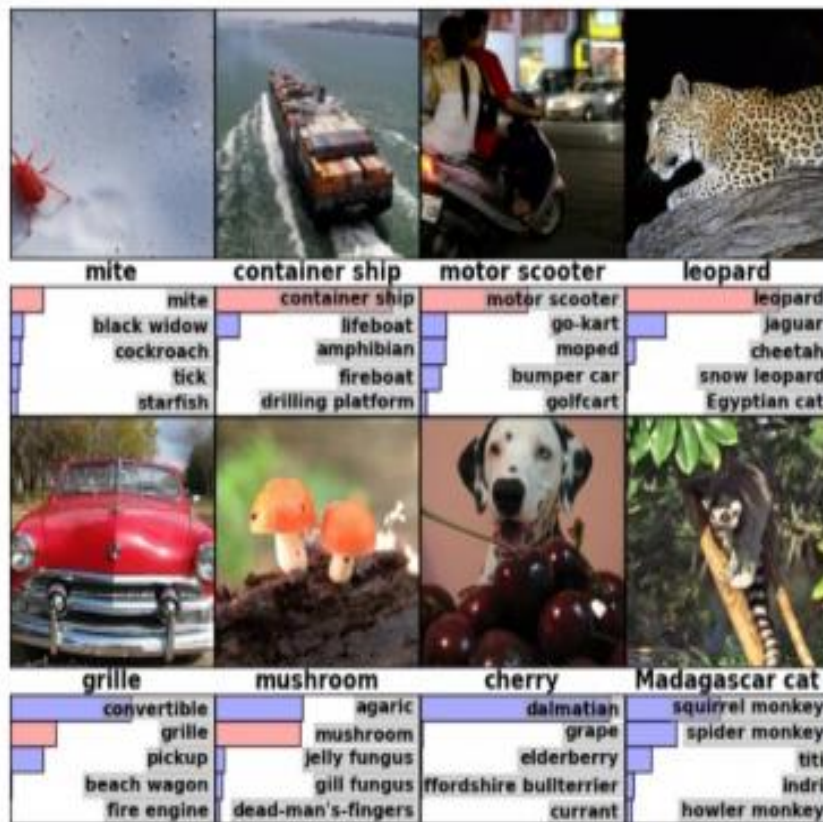


Image Retrieval



Figures copyright Alex Krizhevsky, Ilya Sutskever, and Geoffrey Hinton, 2012. Reproduced with permission.

- 객체 탐지와 이미지 분할

Figure 1 displays four images illustrating object detection results. Each image shows multiple objects with bounding boxes and associated labels and confidence scores:

- Top-left image:** A person on a horse, a dog, and a car. Labels and scores: person: 0.992, horse: 0.993, dog: 0.987, car: 1.000, person: 0.976.
- Top-right image:** A dog and a cat. Labels and scores: dog: 0.994, cat: 0.982.
- Bottom-left image:** A bus. Labels and scores: bus: 0.998, person: 0.736.
- Bottom-right image:** A sailboat with several people. Labels and scores: boat: 0.970, person: 0.985, person: 0.983, person: 0.925, person: 0.986.

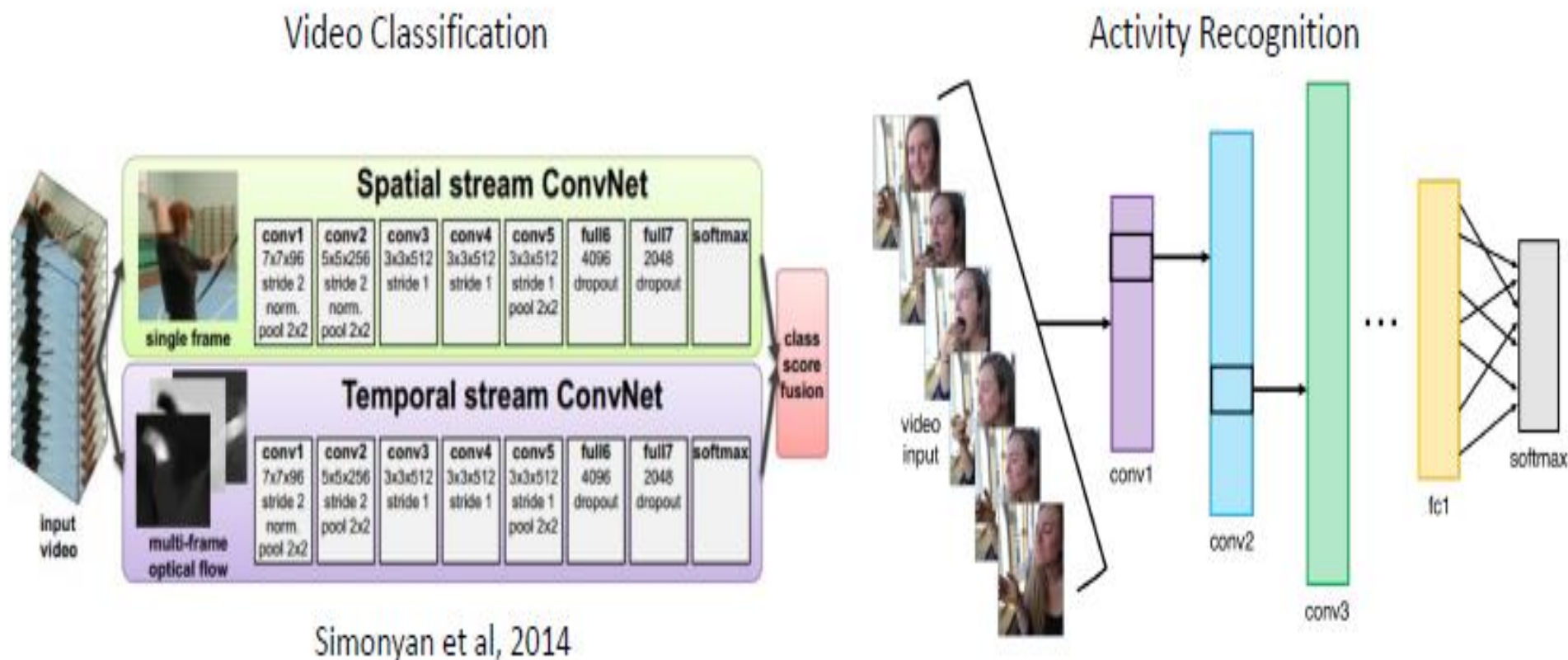
Image Segmentation



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2012년에서 현재: 합성곱넷 (CNN)이 모든 곳에

- 비디오 분류와 활동 인지



2012년에서 현재: 합성곱넷 (CNN)이 모든 곳에

- 자세 인지와 강화학습을 이용한 게임 플레이

Pose Recognition (Toshev and Szegedy, 2014)



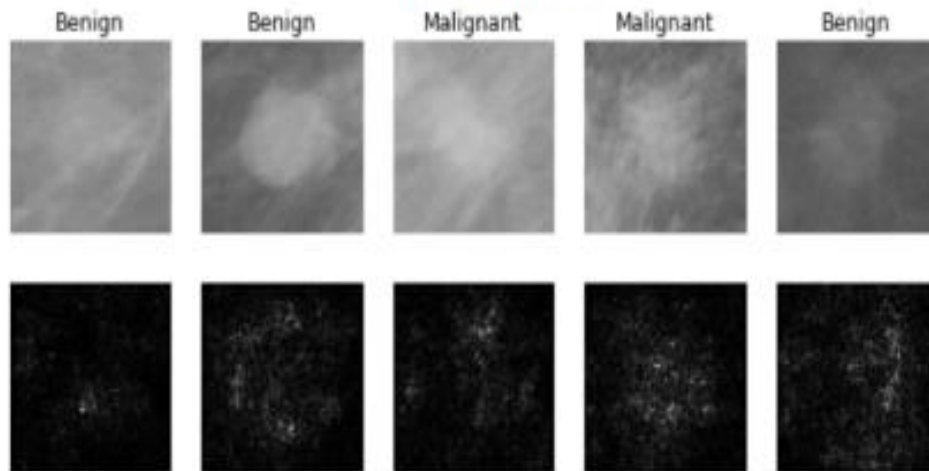
Playing Atari games (Guo et al, 2014)



2012년에서 현재: 합성곱넷 (CNN)이 모든 곳에

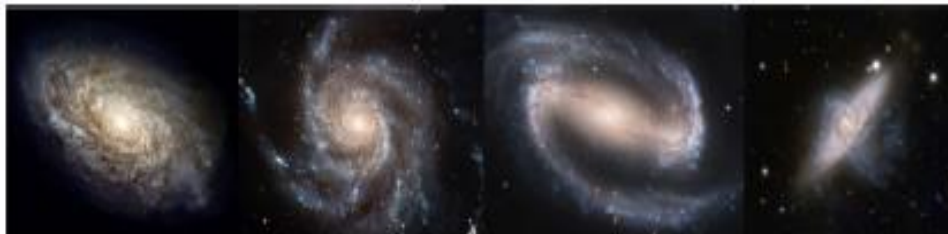
- 의료 영상과 은하계 분류 및 고래 인식

Medical Imaging



Levy et al, 2016 Figure reproduced with permission

Galaxy Classification



Dieleman et al, 2014

From left to right: public domain by NASA, image generated by NASA/ESA, public domain by NASA, and public domain

Whale recognition



[Kaggle Challenge](#)

This image by Clinton Davis is in the public domain and originally came from the U.S. NOAA.

2012년에서 현재: 합성곱넷 (CNN)이 모든 곳에

- 이미지 캡션닝



A white teddy bear
sitting in the grass



A man in a baseball uniform throwing a ball



A woman is holding
a cat in her hand

Image Captioning

Vinyals et al, 2015

Karpathy and Fei-Fei, 2015



A man riding a wave
on top of a surfboard



A cat sitting on a suitcase on the floor



A woman standing on a beach holding a surfboard

[illegible]

2012년에서 현재: 합성곱넷 (CNN)이 모든 곳에

- 예술에도 (Deep Dream)



2000년대의 딥러닝 선구자들

- 2018년 튜링 수상자들

