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www.image-net.org

22K categories and **15M** images

- Animals
 - Bird
 - Fish
 - Mammal
 - Invertebrate
- Plants
 - Tree
 - Flower
- Food
- Materials
- Structures
- Artifact
 - Tools
 - Appliances
 - Structures
- Person
- Scenes
 - Indoor
 - Geological Formations
- Sport Activities

Deng, Dong, Socher, Li, Li, & Fei-Fei, 2009

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

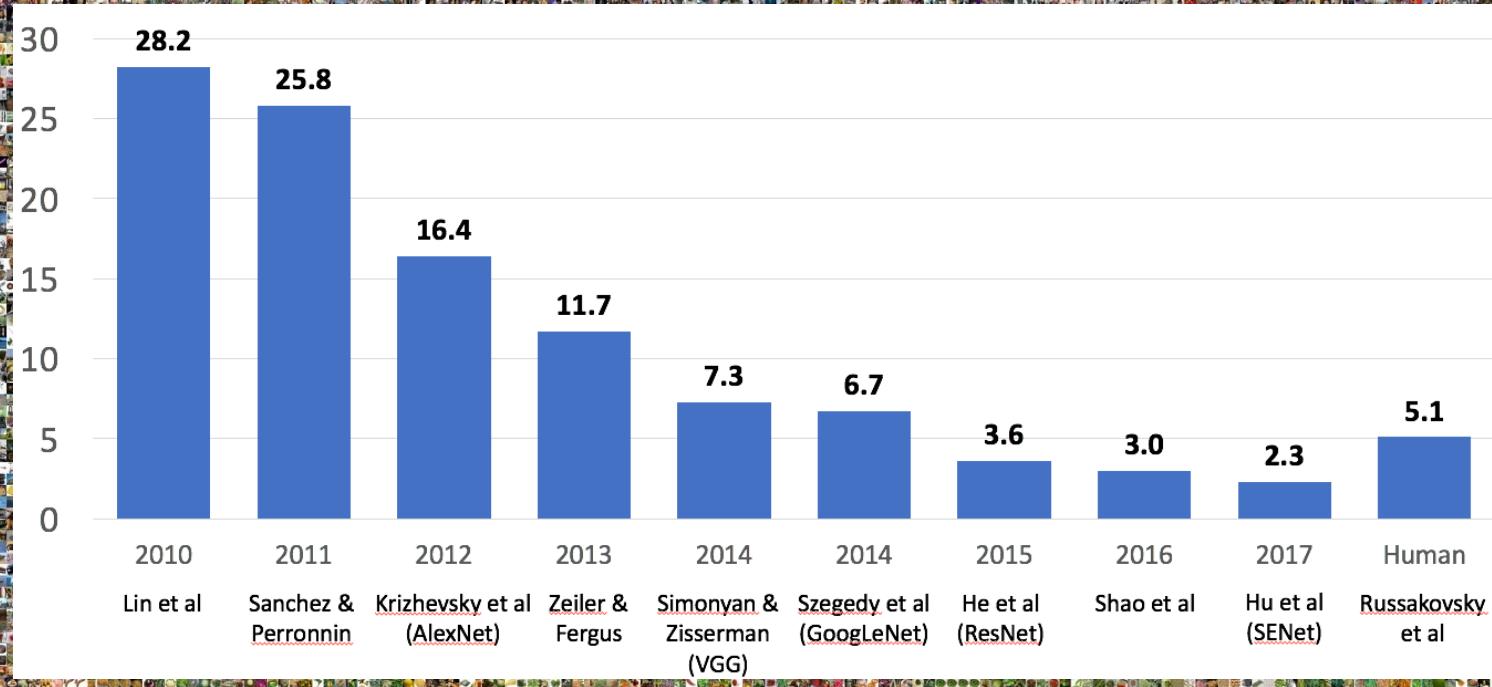


Output:
Scale
T-shirt
Giant panda
Drumstick
Mud turtle



Russakovsky et al. IJCV 2015

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



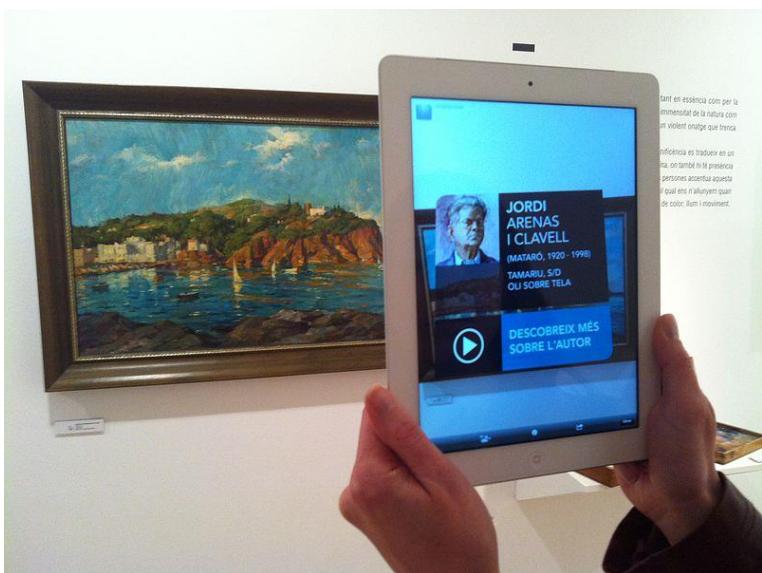
Russakovsky et al. IJCV 2015



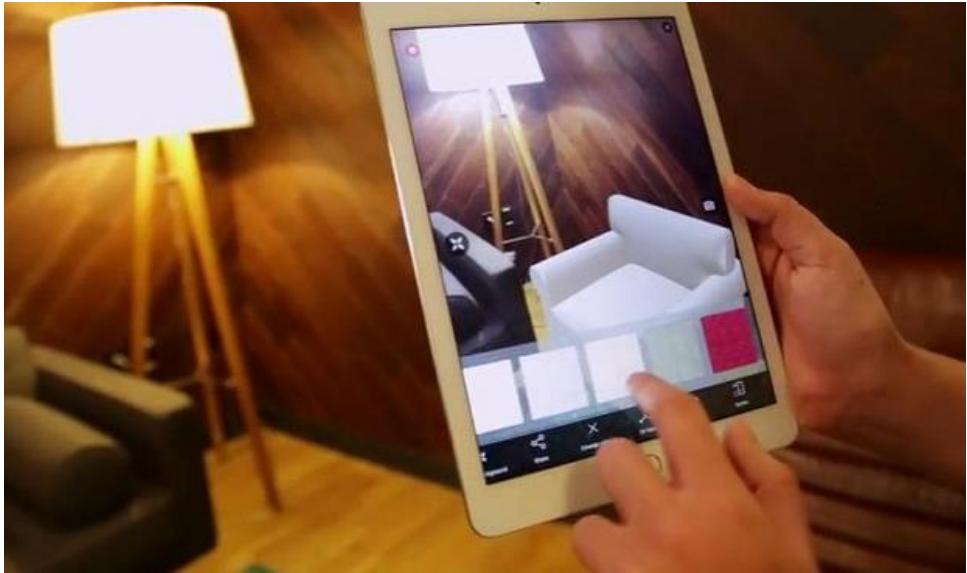
[Image by US Army](#) is licensed under CC BY 2.0



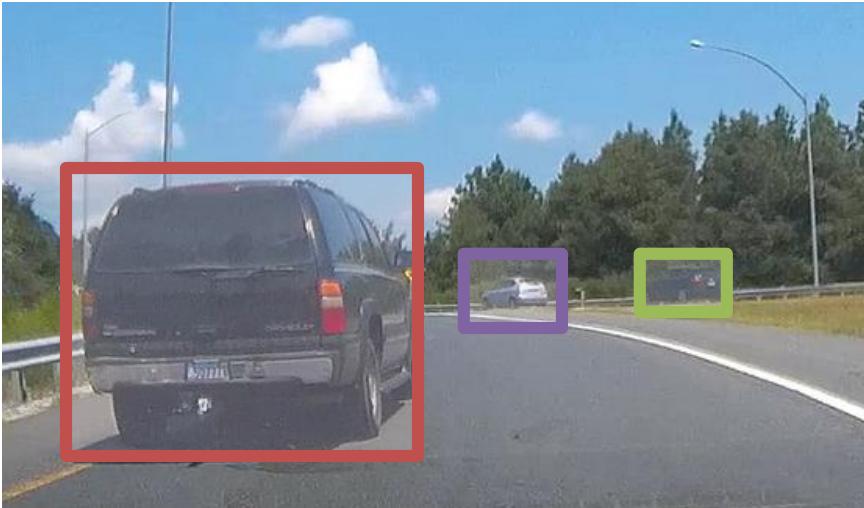
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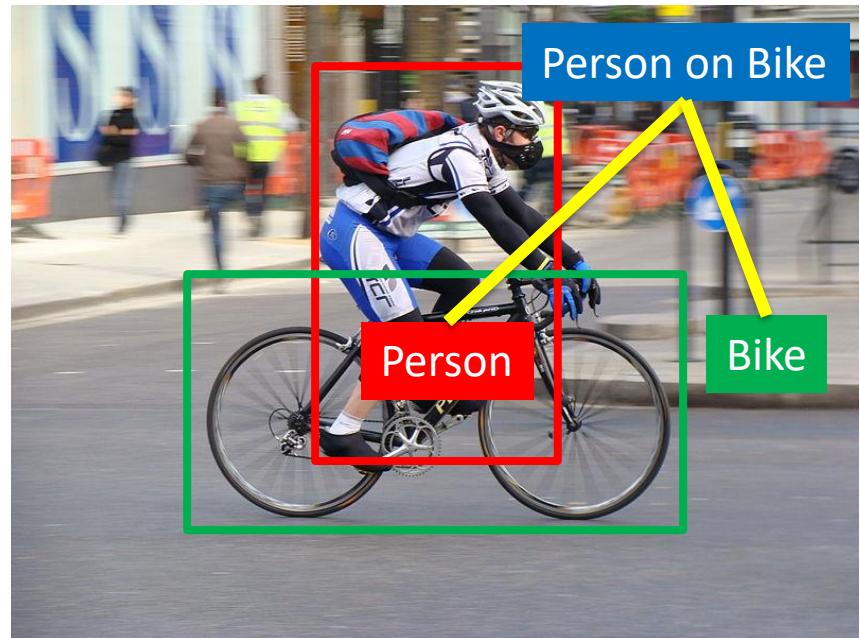
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Person
Hammer

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- Object detection
- Action classification
- Image captioning
- ...

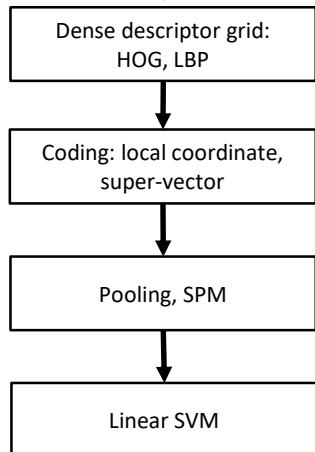


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IMAGENET Large Scale Visual Recognition Challenge

Year 2010

NEC-UIUC

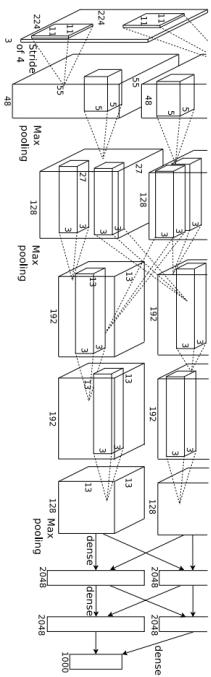


[Lin CVPR 2011]

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Year 2012

SuperVision



[Krizhevsky NIPS 2012]

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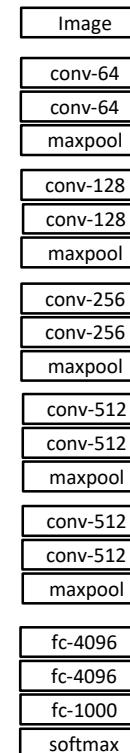
Year 2014

GoogLeNet



[Szegedy arxiv 2014]

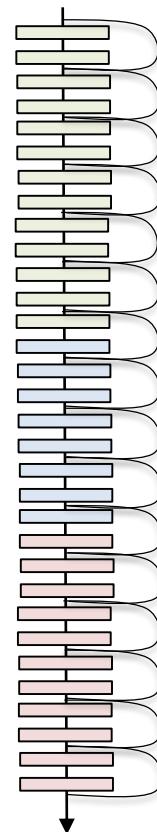
VGG



[Simonyan arxiv 2014]

Year 2015

MSRA

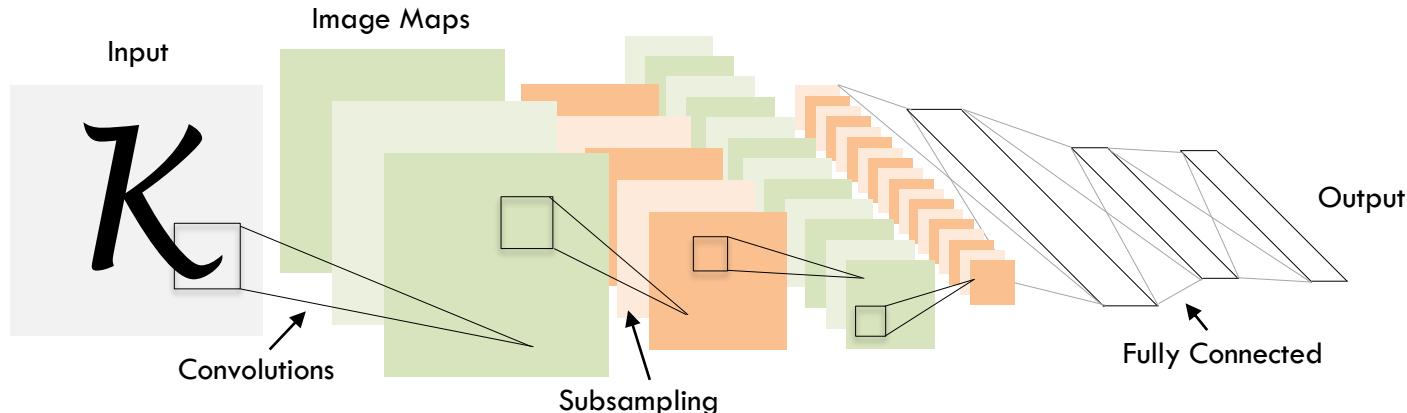


[He ICCV 2015]

Convolutional Neural Networks (CNN)
were not invented overnight

1998

LeCun et al.



of transistors



10^6

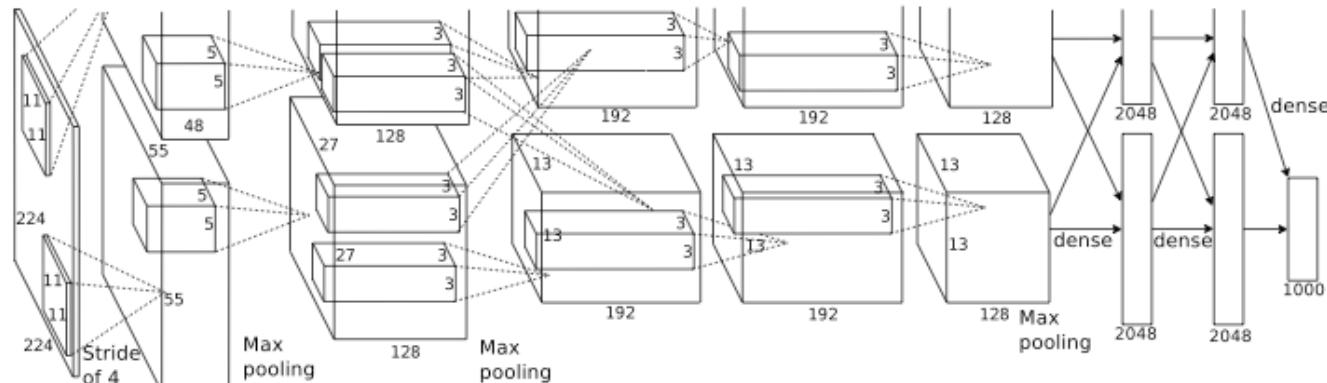
pentium® II

of pixels used in training

10^7 **NIST**

2012

Krizhevsky et al.



of transistors



10^9

GPUs



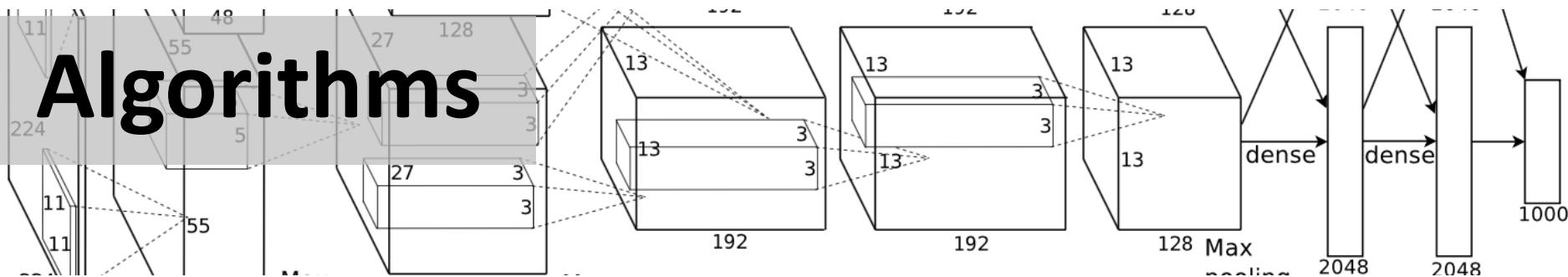
of pixels used in training

10^{14} **IMAGENET**

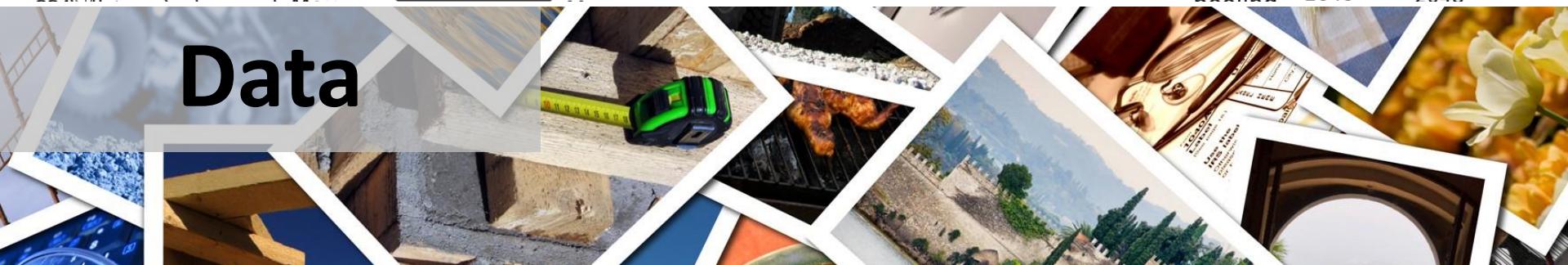
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Ingredients for Deep Learning

Algorithms



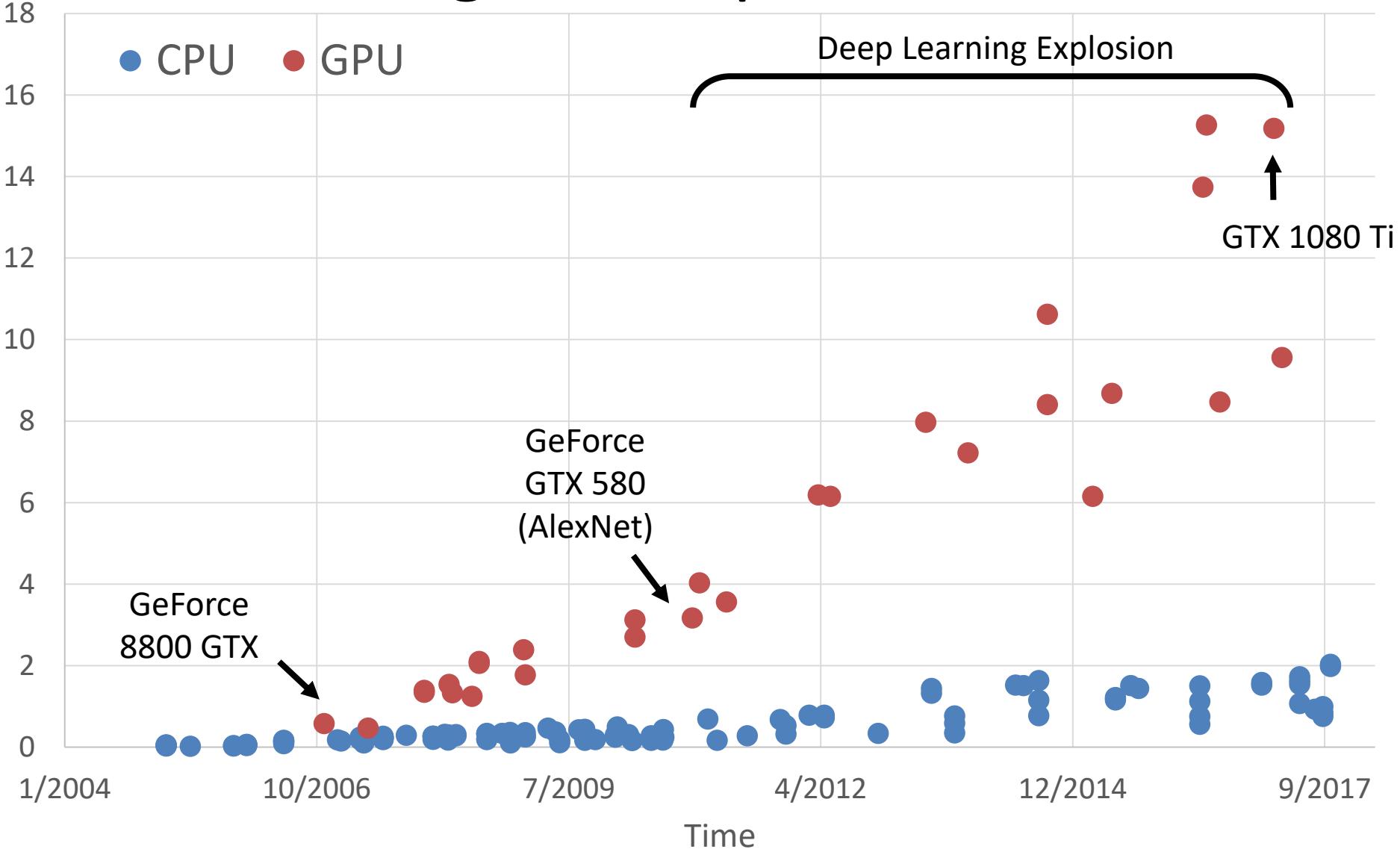
Data



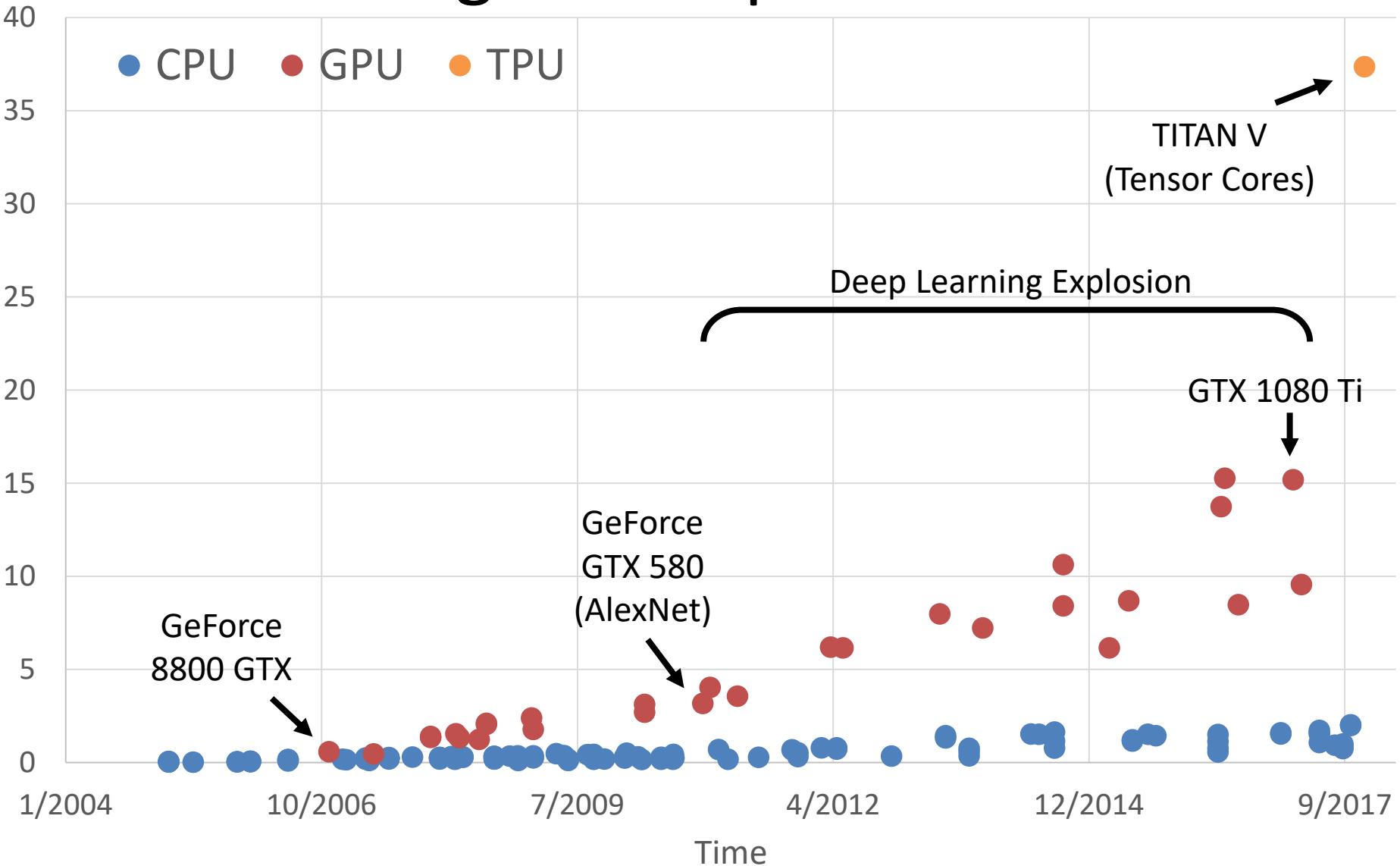
Computation



GigaFLOPs per Dollar



GigaFLOPs per Dollar



The quest for visual intelligence
goes far beyond object recognition...

Wall

Laptop

Glass

Desk

Wire

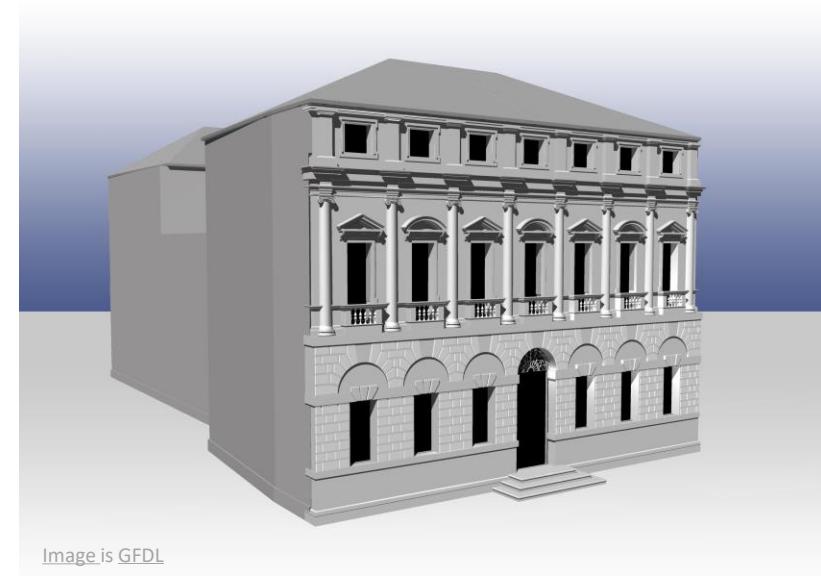
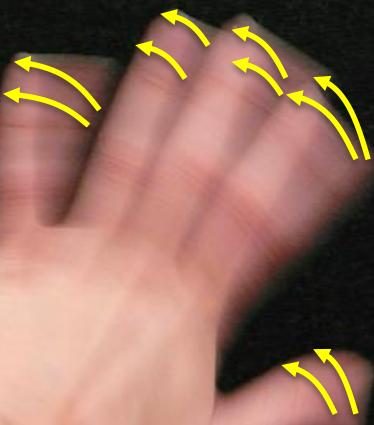
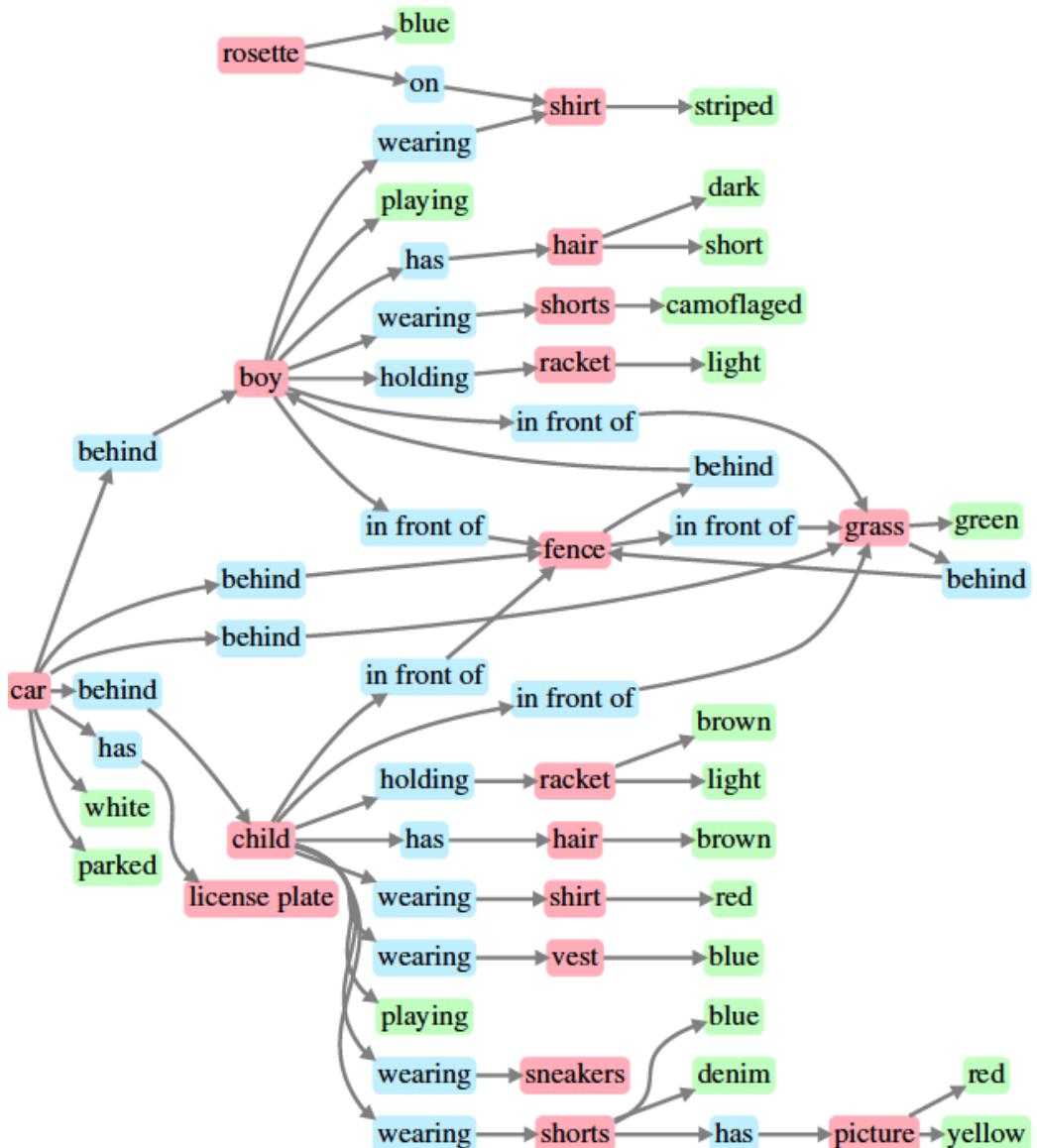
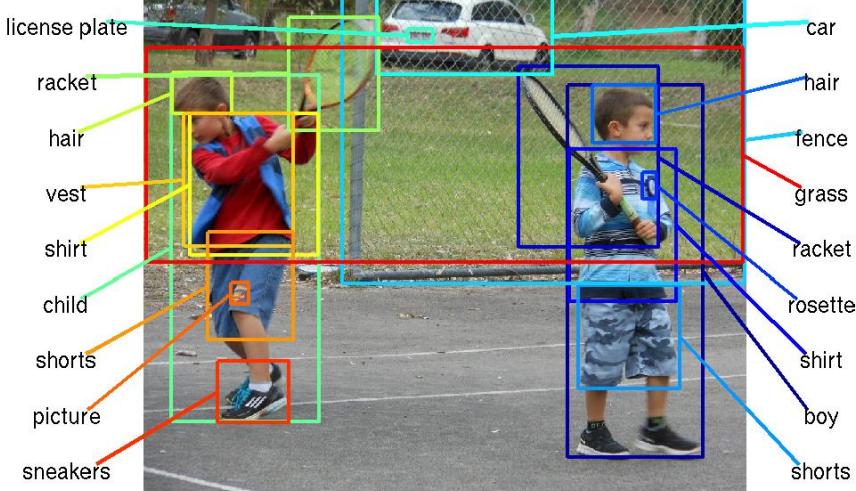


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Waving





Johnson *et al.*, "Image Retrieval using Scene Graphs", CVPR 2015

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PT = 500ms



Some kind of game or fight. Two groups of two men? The man on the left is throwing something. Outdoors seemed like because i have an impression of grass and maybe lines on the grass? That would be why I think perhaps a game, rough game though, more like rugby than football because they pairs weren't in pads and helmets, though I did get the impression of similar clothing. maybe some trees? in the background. (Subject: SM)

Fei-Fei, Iyer, Koch, Perona, JoV, 2007

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Optional Textbook

- Deep Learning by Goodfellow, Bengio, and Courville
- Free online

