

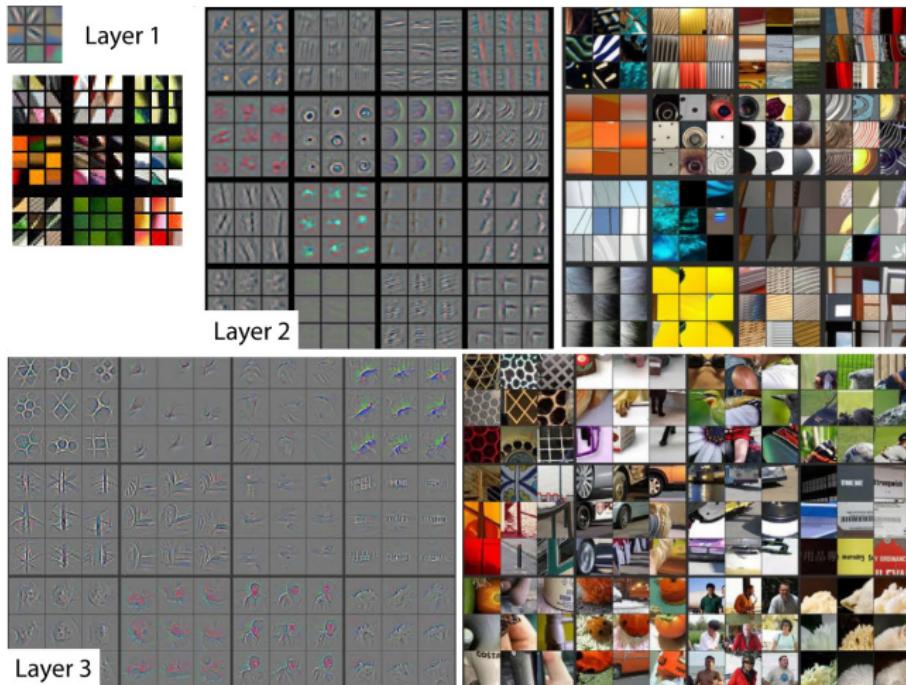
EE-559 – Deep learning

1.3. What is really happening?

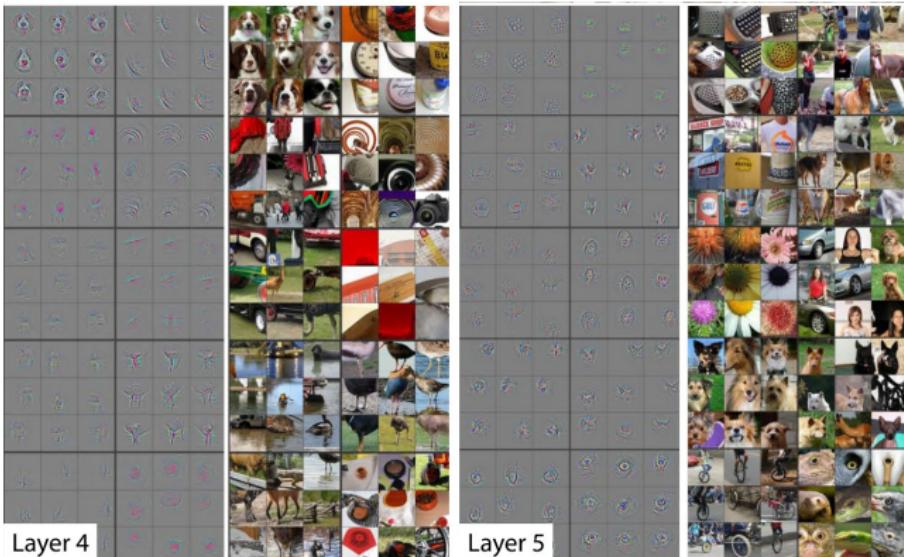
François Fleuret

<https://fleuret.org/ee559/>

Wed Aug 29 14:56:56 UTC 2018



(Zeiler and Fergus, 2014)



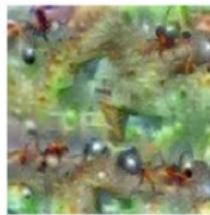
(Zeiler and Fergus, 2014)



Hartebeest



Measuring Cup



Ant



Starfish



Anemone Fish



Banana



Parachute



Screw

(Google's Deep Dreams)



Horizon



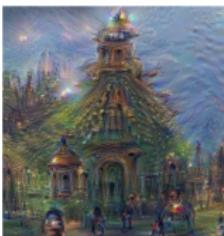
Trees



Leaves



Towers & Pagodas



Buildings



Birds & Insects

(Google's Deep Dreams)



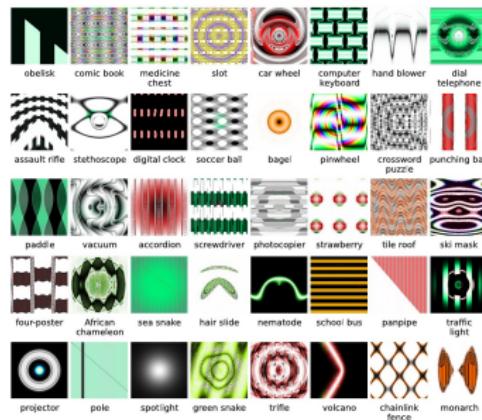
(Thorne Brandt)



(Duncan Nicoll)

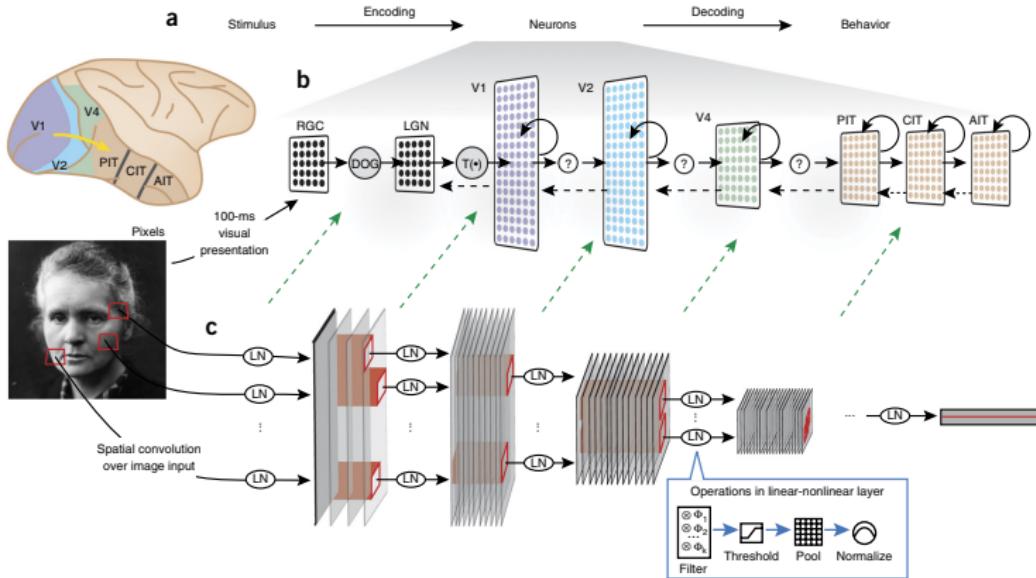


(Szegedy et al., 2014)

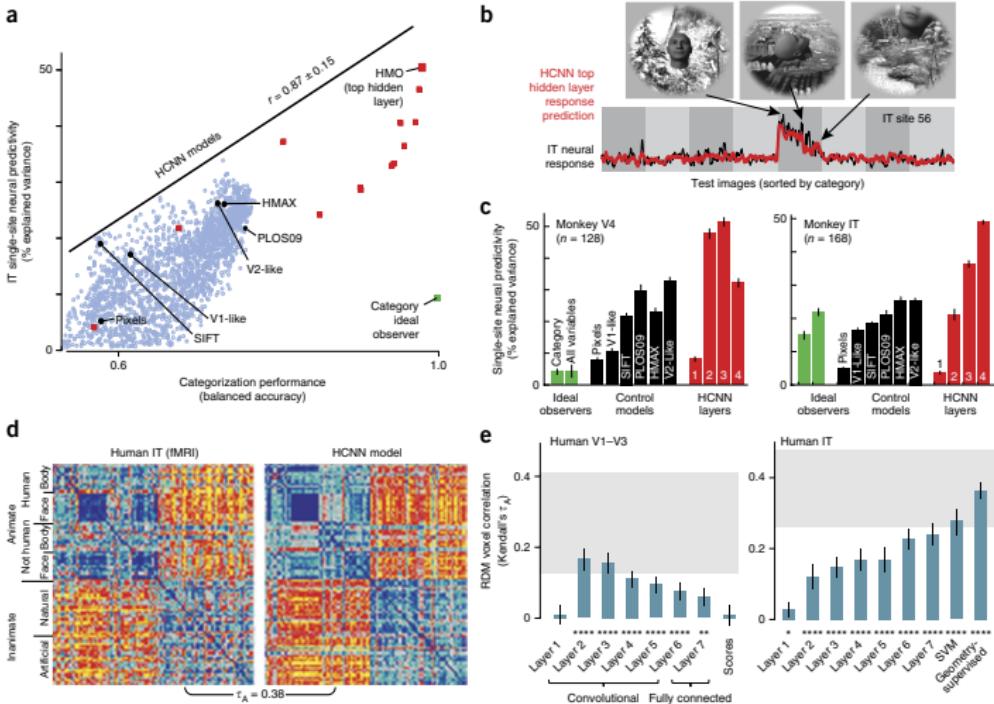


(Nguyen et al., 2015)

Relations with the biology



(Yamins and DiCarlo, 2016)



(Yamins and DiCarlo, 2016)

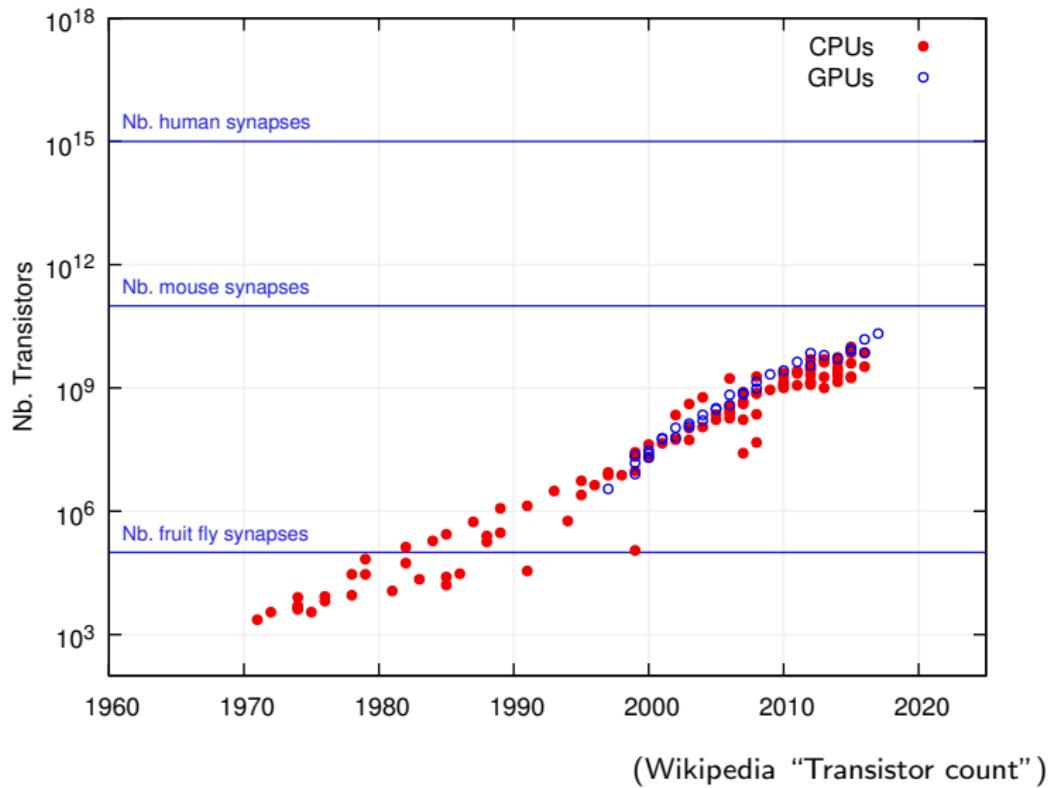
Species	Nb. neurons	Nb. synapses
Roundworm	302	7.5×10^3
Jellyfish	800	
Sea slug	1.8×10^4	
Fruit fly	1.0×10^5	1.0×10^7
Ant	2.5×10^5	
Cockroach	1.0×10^6	
Frog	1.6×10^7	
Mouse	7.1×10^7	1.0×10^{11}
Rat	2.0×10^8	4.5×10^{11}
Octopus	3.0×10^8	
Human	8.6×10^{10}	1.0×10^{15}

(Wikipedia “List of animals by number of neurons”)

Device	Nb. transistors
Intel i7 Haswell-E (8 cores)	2.6×10^9
Intel Xeon Broadwell-E5 (22 cores)	7.2×10^9
AMD Epyc (32 cores)	19.2×10^9
Nvidia GeForce GTX 1080	7.2×10^9
AMD Vega 10	12.5×10^9
NVidia GV100	21.1×10^9

(Wikipedia “Transistor count”)

Number of transistors per CPU/GPU



The end

References

- A. M. Nguyen, J. Yosinski, and J. Clune. Deep neural networks are easily fooled: High confidence predictions for unrecognizable images. In *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2015.
- C. Szegedy, W. Zaremba, I. Sutskever, J. Bruna, D. Erhan, I. Goodfellow, and R. Fergus. Intriguing properties of neural networks. In *International Conference on Learning Representations (ICLR)*, 2014.
- D. L. K. Yamins and J. J. DiCarlo. Using goal-driven deep learning models to understand sensory cortex. *Nature neuroscience*, 19:356–65, Feb 2016.
- M. D. Zeiler and R. Fergus. Visualizing and understanding convolutional networks. In *European Conference on Computer Vision (ECCV)*, 2014.