From Neurons to Computers
A Different Perspective

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From Neurons
to Computers

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Facts about Brain

Math
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Deep Neural
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References

Outline

Why do we need this introductory talk?

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What is a Neuron?

Our Brain is consists of vast collection of **Neurons**

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What is a Neuron?

Our Brain is consists of vast collection of **Neurons**
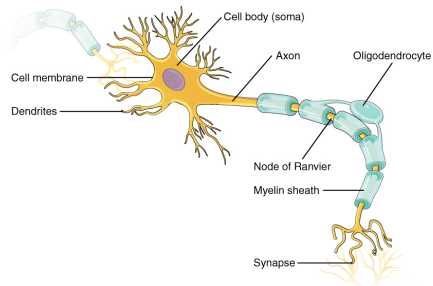
Figure: `https://commons.wikimedia.org/wiki/File:1206_The_Neuron.jpg`

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Types of Neurons

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Types of Neurons

- **Sensory neurons** are sensitive to various non-neural stimuli. There are sensory neurons in the skin, muscles, joints, and organs that indicate pressure, temperature, and pain.

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Types of Neurons

- **Sensory neurons** are sensitive to various non-neural stimuli. There are sensory neurons in the skin, muscles, joints, and organs that indicate pressure, temperature, and pain.
- **Motor neurons** are able to stimulate muscle cells throughout the body, including the muscles of the heart, diaphragm, intestines, bladder, and glands.

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Types of Neurons

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- **Interneurons** are the neurons that provide connections between sensory and motor neurons, as well as between themselves. The neurons of the central nervous system, including the brain, are all interneurons.

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Three Fun Facts about Brain

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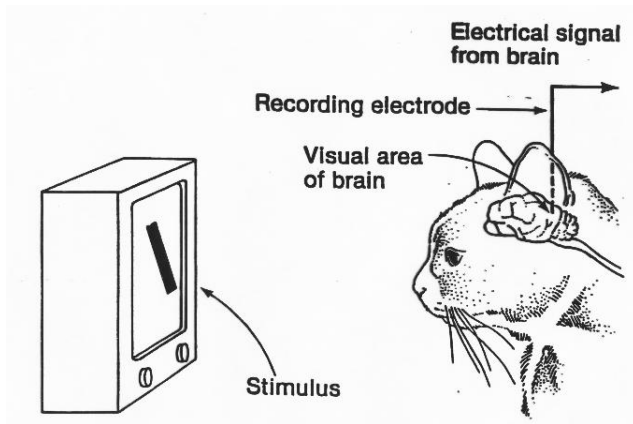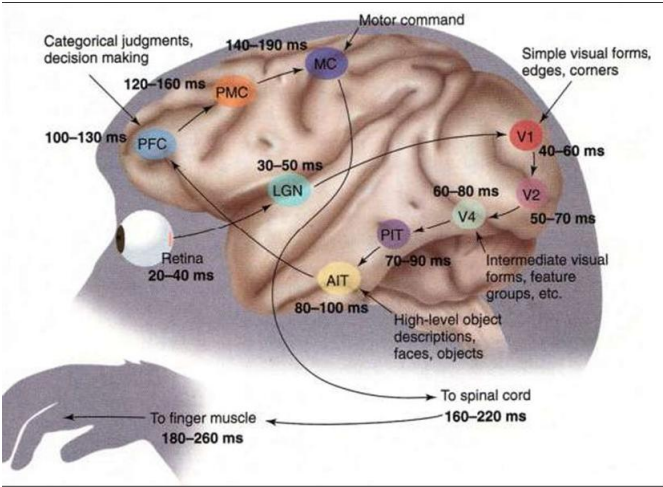
References

Hubel and Wiesel Cat Experiment

Figure: https://goodpsychology.files.wordpress.com/2013/03/
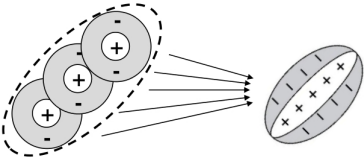hubel-experiment.jpg?w=640&h=423

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Latences neuronales pour le ttt visuel (Thorpe & Fabre-thorpe, 2001)

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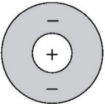
On-Center
Off-Surround
Receptive Field
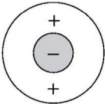
Off-Center
On-Surround
Receptive Field

LGN Cells   V1 Cell

Phantom Limb

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Phantom Limb

Figure: https://3c1703fe8d.site.internapcdn.net/newman/csz/news/800/2018/anewtheoryfo.jpg

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Phantom Limb
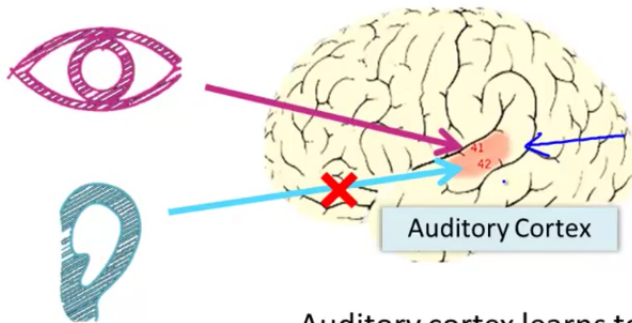
Auditory cortex learns to see

Figure: https://lh3.googleusercontent.com/-10RtXp4f5Zk/TrZXapARQKI/
AAAAAAAABGQ/Ns2tb_bFNt0/w530-h306-n/auditory_cortex_learns_to_see.jpg

OK Plateau

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OK Plateau

Try New Ways

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OK Plateau

Try New Ways
Create *new* path ways in your **Brain**

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How can we use these simple ideas?

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All is number

Pythagoras - 600 BC

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What is a Artificial Neuron?
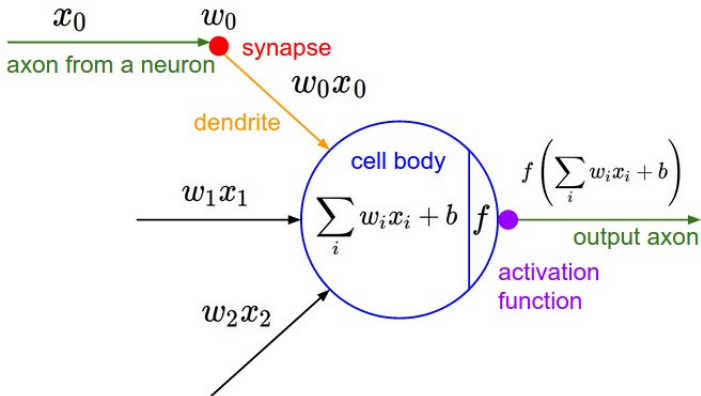
Figure: http://cs231n.github.io/assets/nn1/neuron_model.jpeg

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Neuron Model
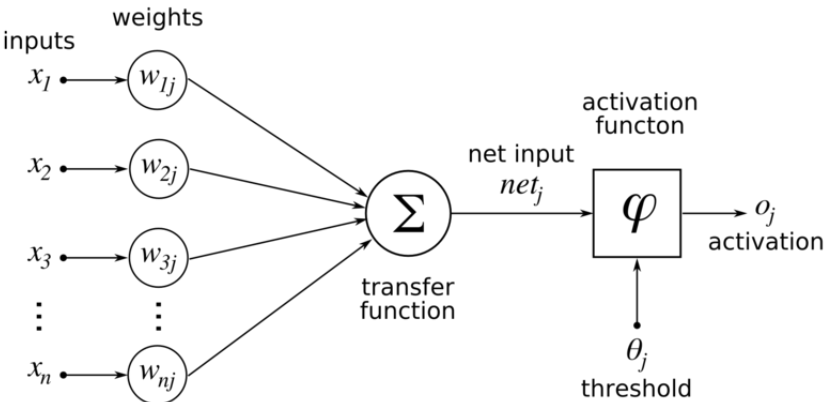Deep Neural
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What is a Artificial Neuron?

Figure: https://upload.wikimedia.org/wikipedia/commons/thumb/6/60/
ArtificialNeuronModel_english.png/800px-ArtificialNeuronModel_english.
png

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What is a Neural Network?

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What is a Neural Network?

Figure: http://www.scielo.br/img/revistas/bjmbr/v46n11/
/1414-431X-bjmbr-46-11-993-gf002.jpg

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What is a Deep Neural Network?

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What is a Deep Neural Network?

Figure:
`https://cdn-images-1.medium.com/max/2000/1*1mpE6fsq5LNxH31xeTWi5w.jpeg`

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What is Deep Motivation?

- Brains have a deep architecture

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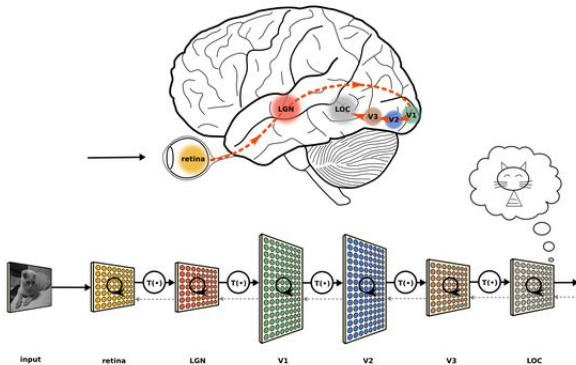
Figure: `https://i.pinimg.com/564x/d3/c3/d5/d3c3d5d70cf507dfb057ec91178caaf7.jpg`

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What is Deep Motivation?

- Brains have a deep architecture
- Humans organize their ideas hierarchically, through composition of simpler ideas

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Convolutional Neural Network

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Convolutional Neural Network
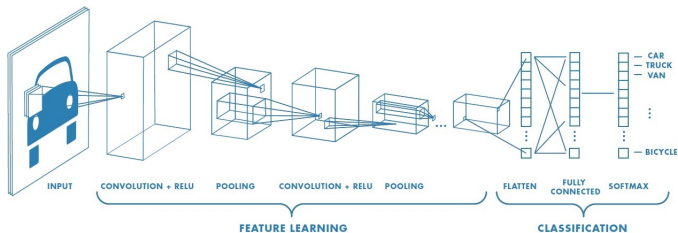
Figure:
https://cdn-images-1.medium.com/max/800/1*XbuW8WuRrAY5pC4t-9DZAQ.jpeg

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Dropout

Remember OK Plateau?

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Dropout

Remember OK Plateau?
Now See Dropout!

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Dropout

(a) Standard Neural Net   (b) After applying dropout.
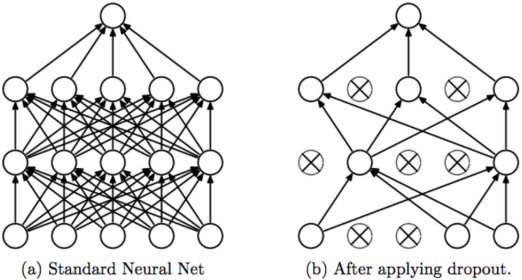
Figure:
https://cdn-images-1.medium.com/max/800/1*iWQzxhVlvadk6VAJjsgXgg.png

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Figure: `https://scholar.google.com/citations?user=JicYPdAAAAAJ&hl=en&oi=ao`

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It's not about your knowledge
It's about your imagination and
ideas

Dr. Darren Griffin

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- Phantoms in the Brain: Probing the Mysteries of the Human Mind by V.S. Ramachandran `click here`
- Dropout: A Simple Way to Prevent Neural Networks from Overfitting `click here`
- Hubel and Wiesel Cat Experiment `click here` `click here`
- Andrew Ng: "Deep Learning, Self-Taught Learning and Unsupervised Feature Learning" `click here`
- The Neuron `click here`

Any Questions?

Thank You!