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Neuronale Netze
Intro

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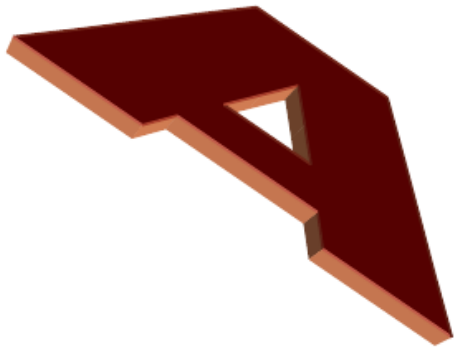
Computation



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Computation

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Computation

$$\sqrt[3]{796405397 3}$$

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The brain is:

- A Supercomputer
  - speed estimated from 100TFlops to over 10000TFlops
  - largest Cluster: 8000 TFlops
- contains:
  - 100 billion neuron
  - 100000 billion connections
- small (1400g), low powered (20W)
- good at:
  - Vision, Speech, Memory
  - Language, Moter control, Adaption
- poor at:
  - Arithmetic, risc assessment, Memory

Neuron

- Cell body
- Dendrites
- Node of Ranvier
- Axon
- Synapse

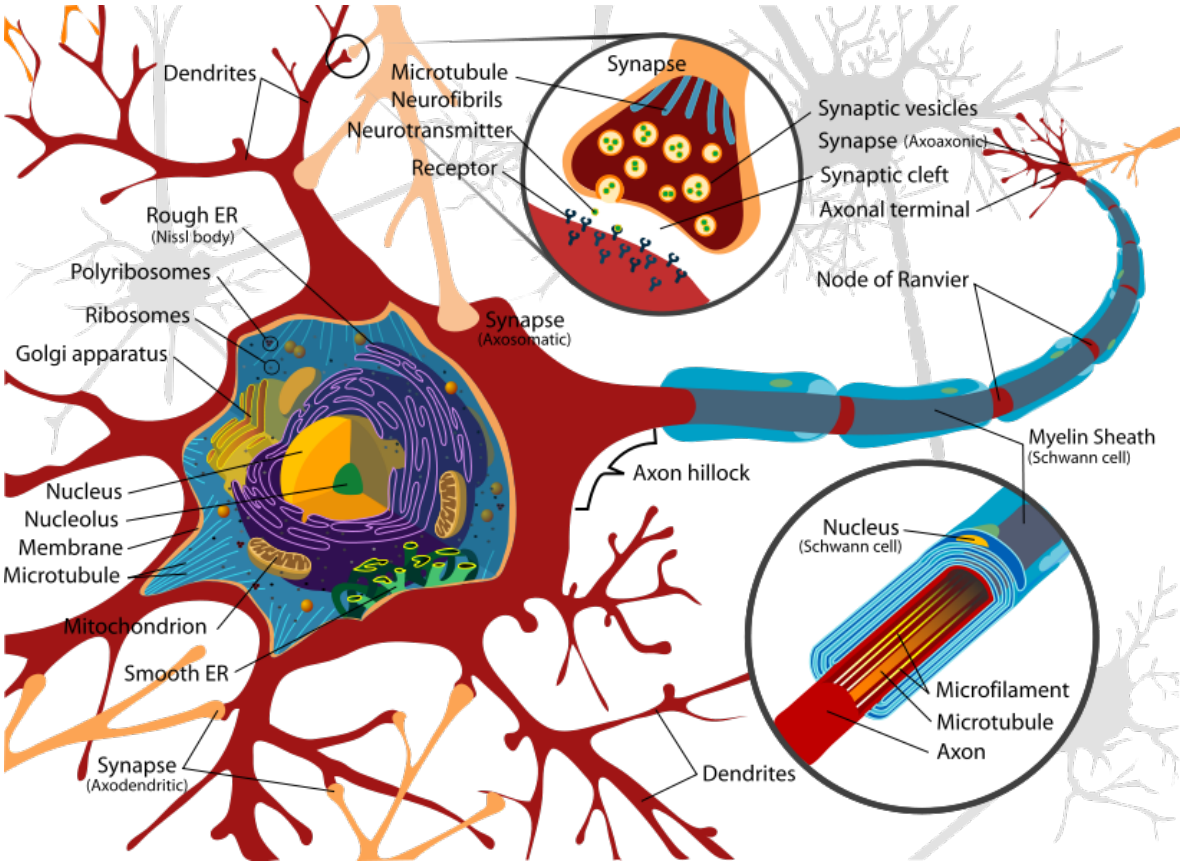

Diagram of neurons (nerve cells). Image thanks to: wikimedia.org

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Neural Networks

- Terminology
  - Artificial Neural Networks
  - Perceptron
  - Connectionist Models
  - Parallel Distributed Processing (PDP)
    - units, connection schematic, rules, enviroment
  - Massive Parallel Processing
  - Multi-layer Perceptron (MLP)

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Von Neumann PC - Neural Computation

	Von Neumann PC	Neural Computation
Processing:	Sequential	Parallel
Processors:	One	Many
Communication:	Poor	Rich
Processors:	Fast, Accurate	Slow, Sloppy
Knowledge:	Local	Distributed
Hardware:	General Purpose	Dedicated
Design:	Programed	Learned

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Why Neural Networks

- Massive parallelism.
- Massive constraint satisfaction for ill-defined input.
- Simple computing units.
- Many processing units, many interconnections.
- Uniformity (-> sensor fusion)
- Non-linear cassifiers/ mapping (-> good performance)
- Learning/ adapting
- Brain like ??

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Why Neural Networks

- Classification
- Prediction
- Function Approximation
- Continuous Mapping
- Pattern Completion
- (nonlinear) Dimensionality Reduction