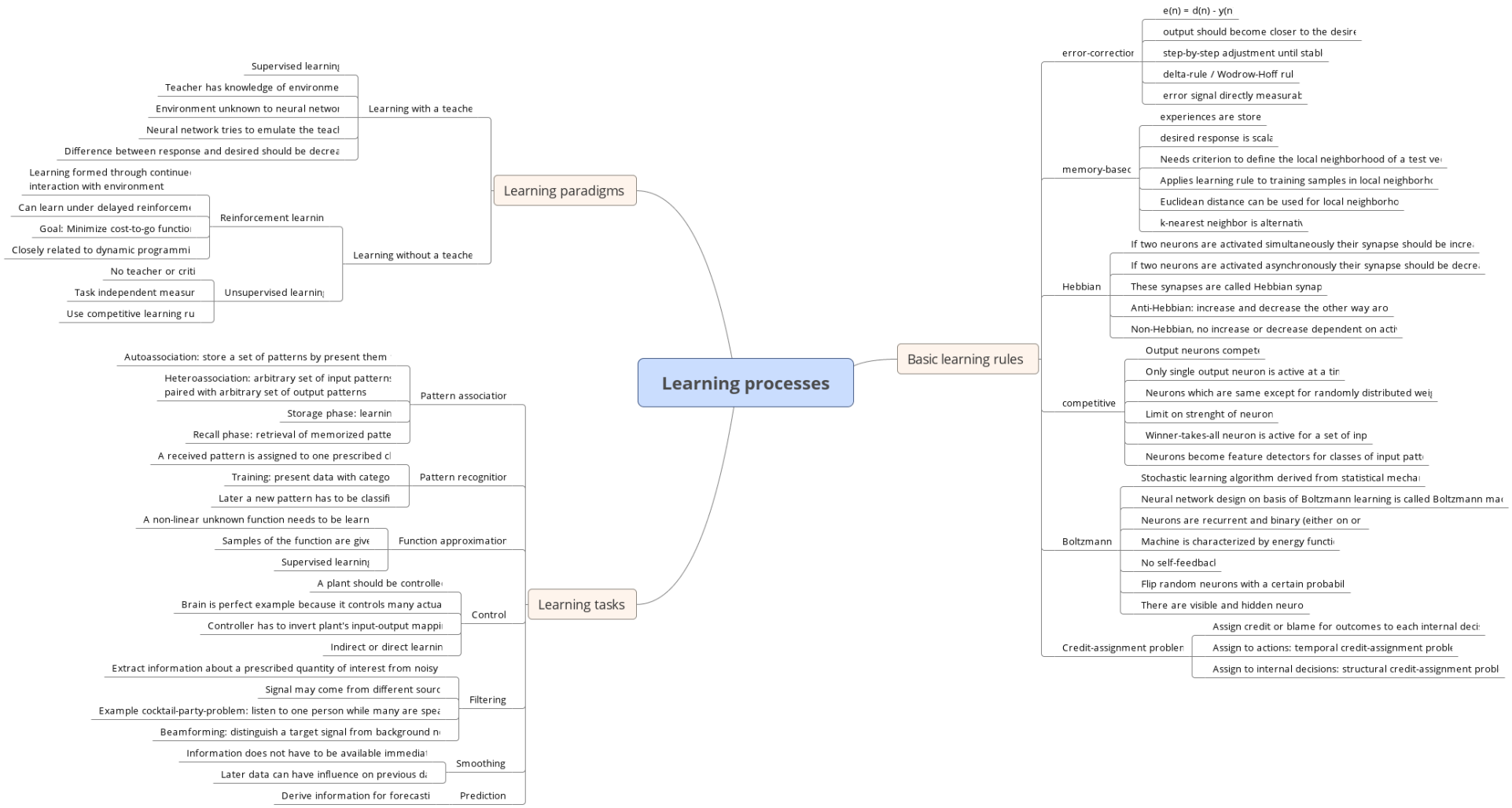
Learning processes
Learning paradigms
Learning with a teache
Supervised learnin
Teacher has knowledge of environme
Environment unknown to neural networ
Neural network tries to emulate the teacl
Difference between response and desired should be decrea
Learning without a teache
Learning formed through continue interaction with environment
Reinforcement learnin
Can learn under delayed reinforcem
Goal: Minimize cost-to-go functio
Closely related to dynamic programmi
Unsupervised learnin
No teacher or criti
Task independent measur
Use competitive learning ru
Learning tasks
Pattern associatior
Autoassociation: store a set of patterns by present them
Heteroassociation: arbitrary set of input patterns paired with arbitrary set of output patterns
Storage phase: learnin
Recall phase: retrieval of memorized patte
Pattern recognitior
A received pattern is assigned to one prescribed cl
Training: present data with catego
Later a new pattern has to be classifi
Function approximatior
A non-linear unknown function needs to be learn
Samples of the function are give
Supervised learnin
Control
A plant should be controlle
Brain is perfect example because it controls many actua
Controller has to invert plant's input-output mappi
Indirect or direct learnin
Filtering
Extract information about a prescribed quantity of interest from noisy
Signal may come from different sourc
Example cocktail-party-problem: listen to one person while many are spea
Beamforming: distinguish a target signal from background n
Smoothing
Information does not have to be available immedia
Later data can have influence on previous da
Prediction
Derive information for forecasti
Basic learning rules
error-correctior
e(n) = d(n) - y(n
output should become closer to the desire
step-by-step adjustment until stabl
delta-rule / Wodrow-Hoff rul
error signal directly measurat
memory-basec
experiences are store
desired response is scala
Needs criterion to define the local neighborhood of a test ve
Applies learning rule to training samples in local neighborh
Euclidean distance can be used for local neighborho
k-nearest neighbor is alternati
Hebbian
If two neurons are activated simultaneously their synapse should be incre
If two neurons are activated asynchronously their synapse should be decre
These synapses are called Hebbian synap
Anti-Hebbian: increase and decrease the other way aro
Non-Hebbian, no increase or decrease dependent on acti
competitive
Output neurons compet
Only single output neuron is active at a tir
Neurons which are same except for randomly distributed wei
Limit on strenght of neuron
Winner-takes-all neuron is active for a set of inp
Neurons become feature detectors for classes of input patt
Boltzmann
Stochastic learning algorithm derived from statistical mecha
Neural network design on basis of Boltzmann learning is called Boltzmann ma
Neurons are recurrent and binary (either on or
Machine is characterized by energy functi
No self-feedbacl
Flip random neurons with a certain probabil
There are visible and hidden neuro
Credit-assignment problen
Assign credit or blame for outcomes to each internal deci
Assign to actions: temporal credit-assignment proble
Assign to internal decisions: structural credit-assignment probl