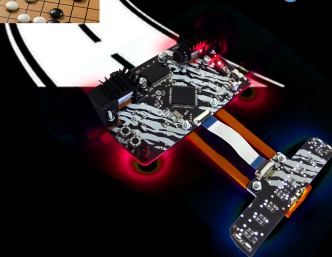
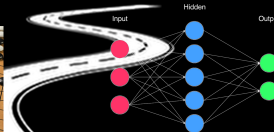


Reinforcement learning

Michal CHOVANEC, PhD

$$Q(s_t, a_t) \leftarrow Q(s_t, a_t) + \alpha [r_{t+1} + \lambda \max_a Q(s_{t+1}, a) - Q(s_t, a_t)]$$

(The New Action Value - The Old Value) + The Learning Rate \times (The New Information - the Old Information)



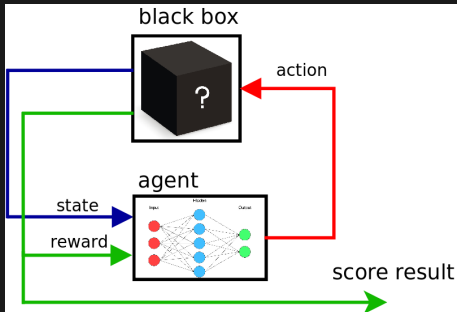
Reinforcement learning

- learn from punishment and rewards
- learn to play a game with unknown rules



Reinforcement learning

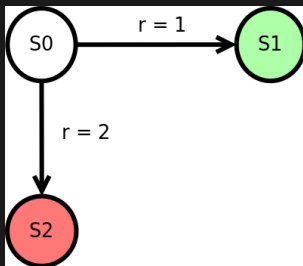
- obtain **state**
- choose **action**
- **execute** action
- obtain **reward**
- learn from **experiences**



Making decisions

two possible strategies

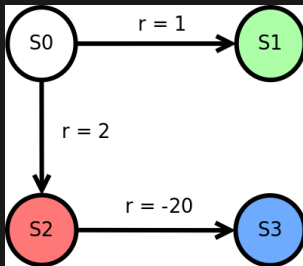
- strategy 1 : $S_0 \rightarrow S_1$, score = 1.0
- strategy 2 : $S_0 \rightarrow S_2$, score = 2.0



Making decisions

two possible strategies, greedy = trap

- strategy 1 : $S_0 \rightarrow S_1$, score = 1.0
- strategy 2 : $S_0 \rightarrow S_2 \rightarrow S_3$, score = $2.0 + (-20.0) = -18$



Usefull links



ImageNet Classification with Deep Convolutional Neural Networks <https://papers.nips.cc/paper/4824-imagenet-classification-with-deep-convolutional-neural-networks.pdf>



Alex Krizhevsky web, <https://www.cs.toronto.edu/~kriz/>



Deep Belief Nets in C++ and CUDA C: Volume III
<https://www.amazon.com/Deep-Belief-Nets-CUDA-Convolutional/dp/1530895189>



Deep Learning (Adaptive Computation and Machine Learning
<https://www.amazon.com/Deep-Learning-Adaptive-Computation-Machine/dp/0262035618>



Densely Connected Convolutional Networks <https://arxiv.org/pdf/1608.06993.pdf>



MNIST dataset <http://yann.lecun.com/exdb/mnist/>



Digital signal processing for STM32 microcontrollers using CMSIS
https://www.st.com/resource/en/application_note/dm00273990.pdf



CMSIS-NN: Efficient Neural Network Kernels for Arm Cortex-M CPUs
<https://arxiv.org/pdf/1801.06601.pdf>

Q&A



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www.youtube.com/channel/UCzVvP2ou8v3afNiVrPAHQGg