

Neuromorphic computation and neuro-simulation projects

Max Talanov

ITIS/Neurobiology laboratory, KFU

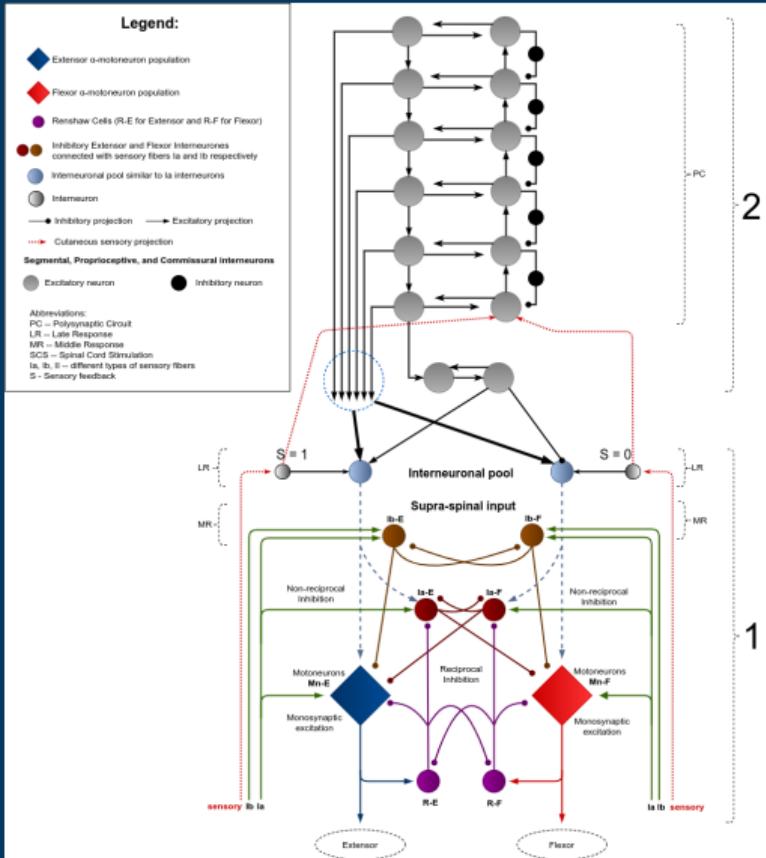
max.talanov@gmail.com

March 7, 2018

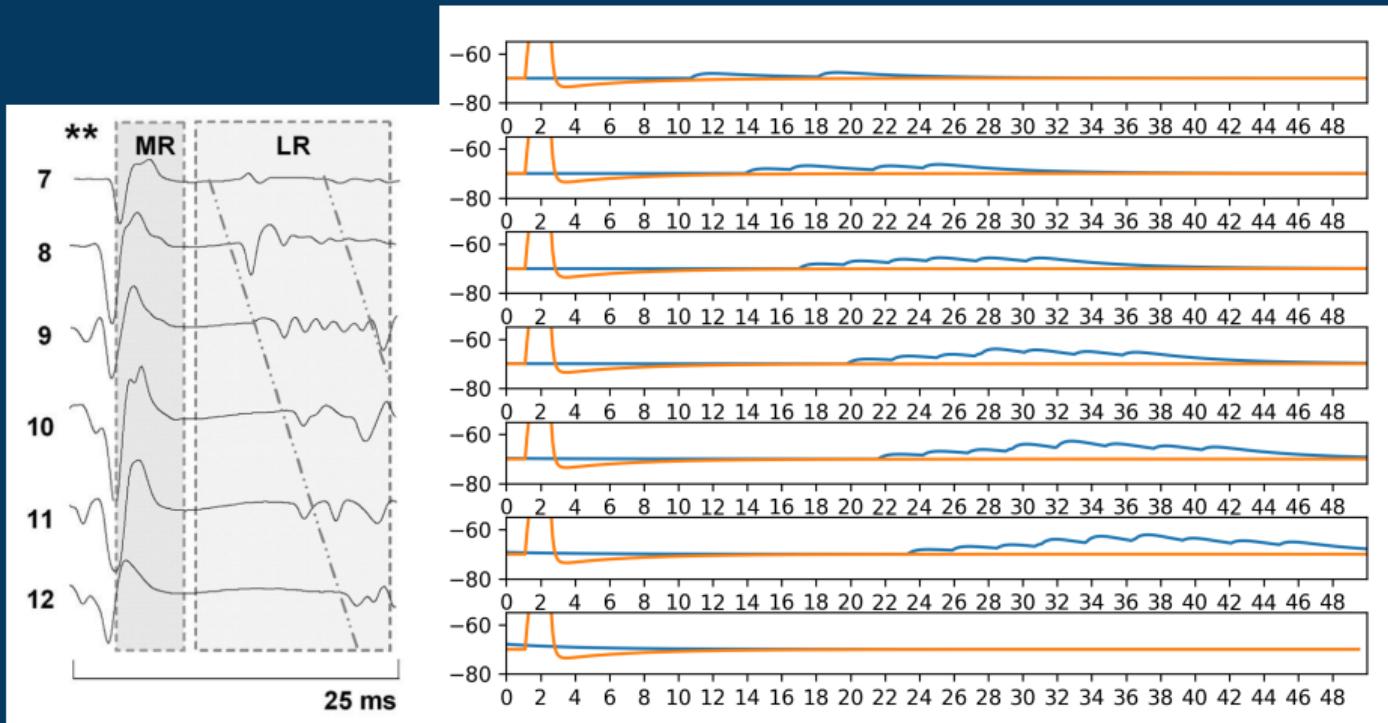
Memristive spinal cord



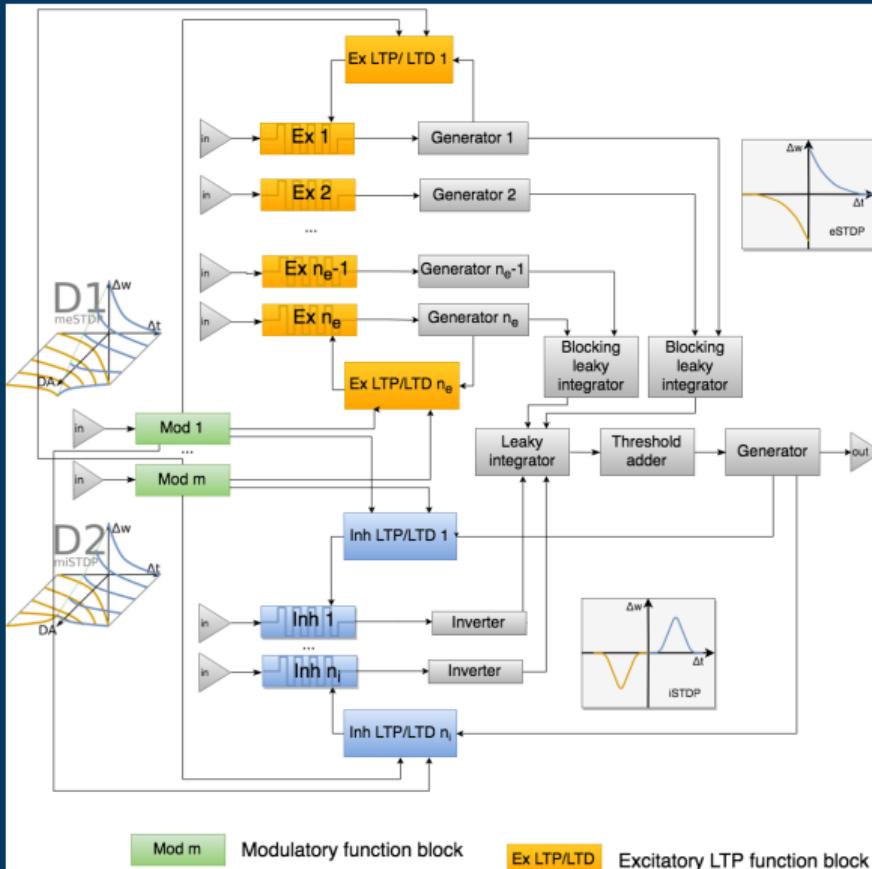
Model of Lavrov



Simulation results



Modulatory, inhibitory memristive neuron



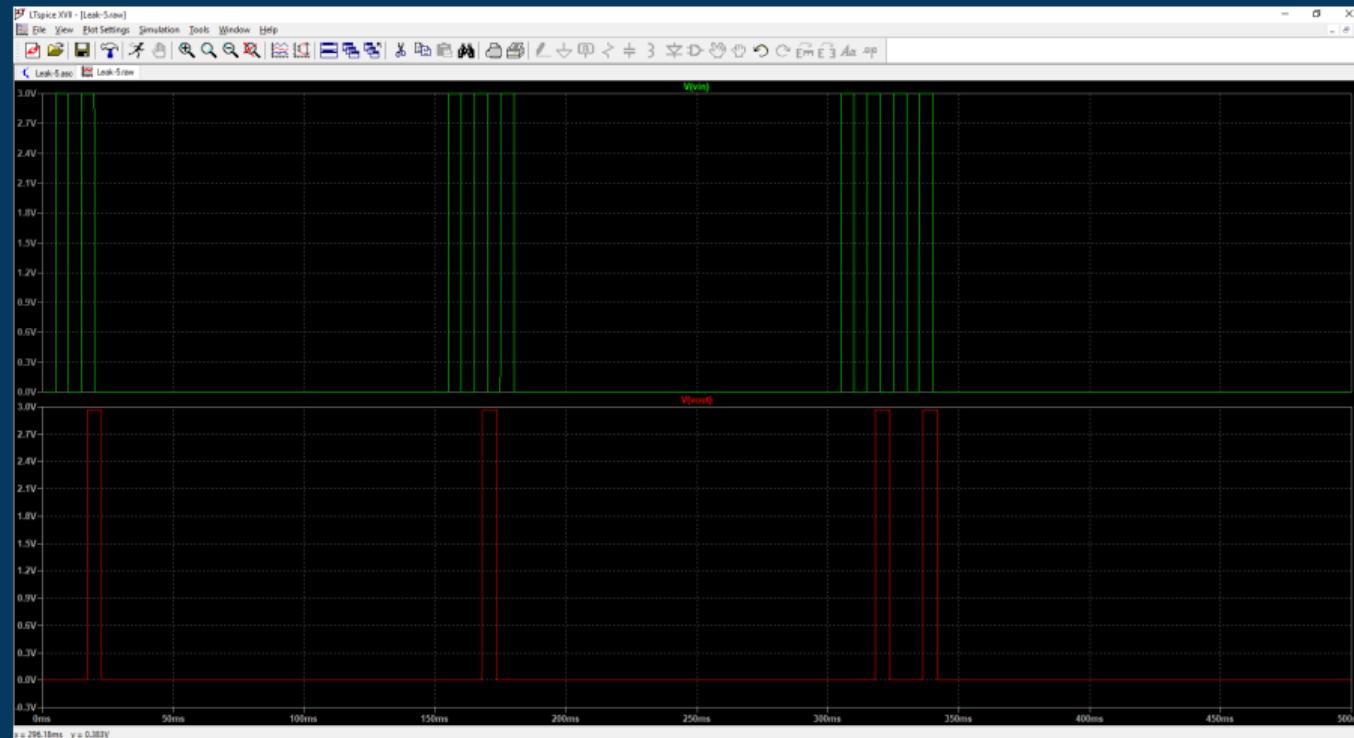
Mod m

Modulatory function block

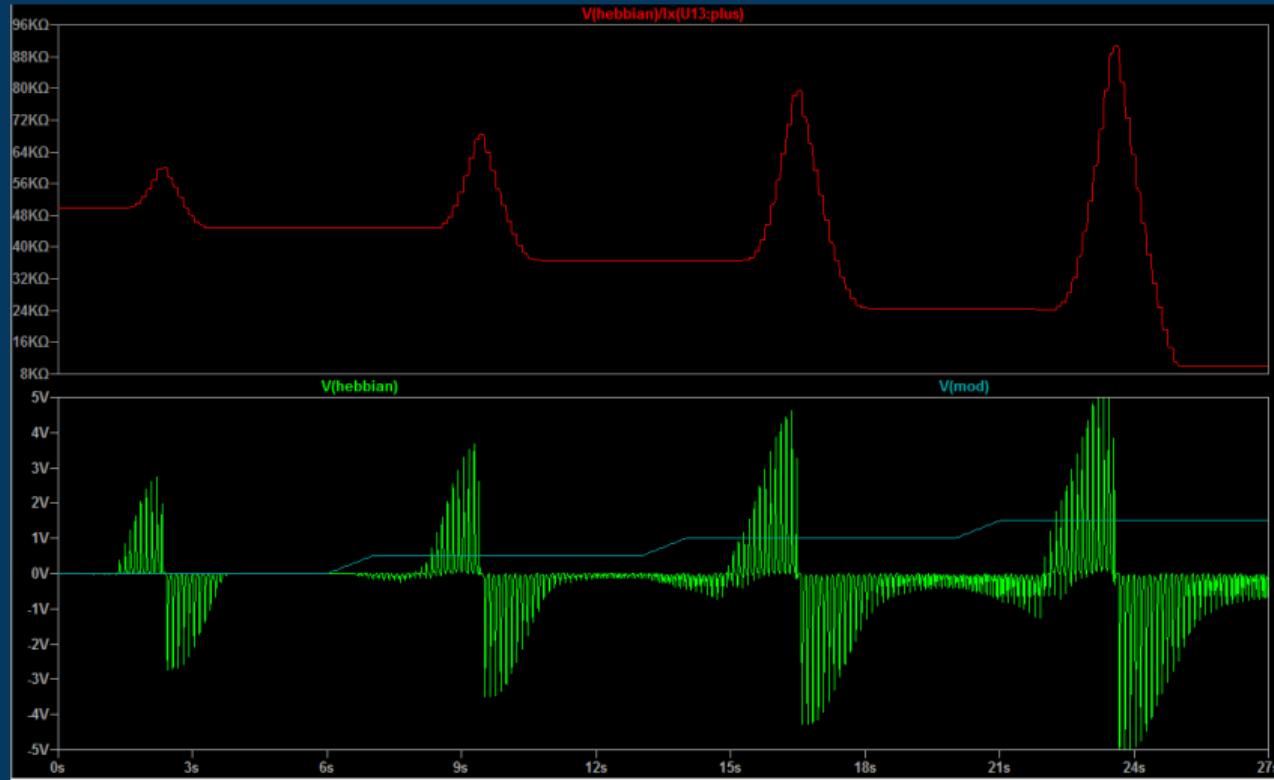
Ex LTP/LTD

Excitatory LTP function block

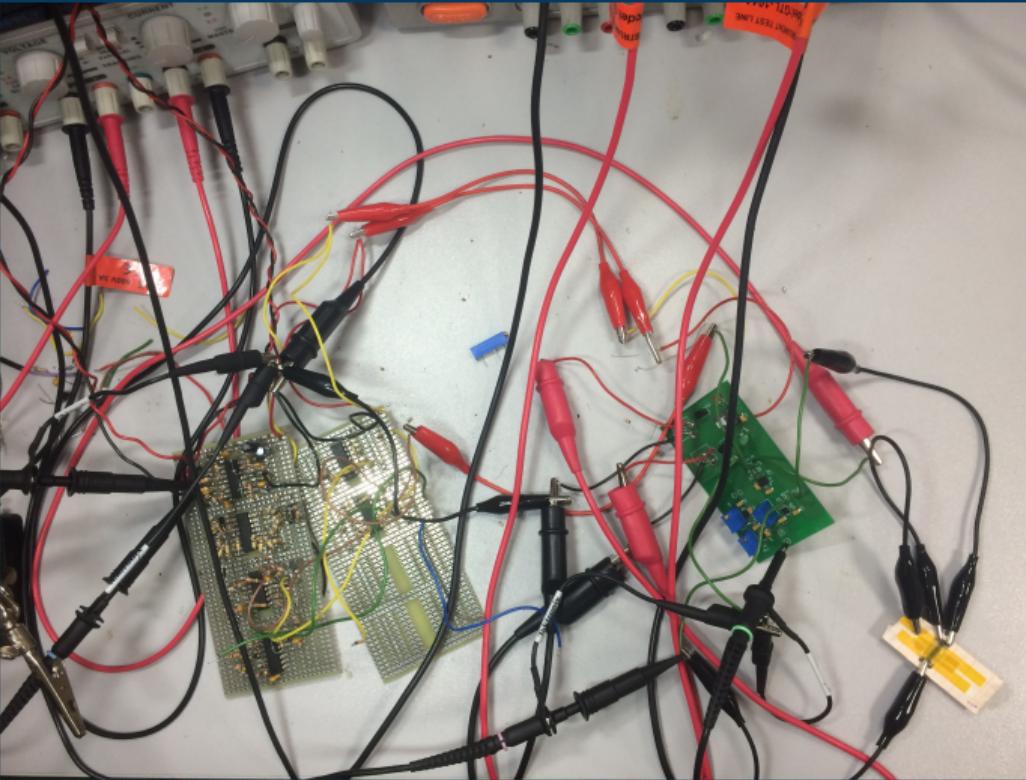
DA modulation: wiring schematic



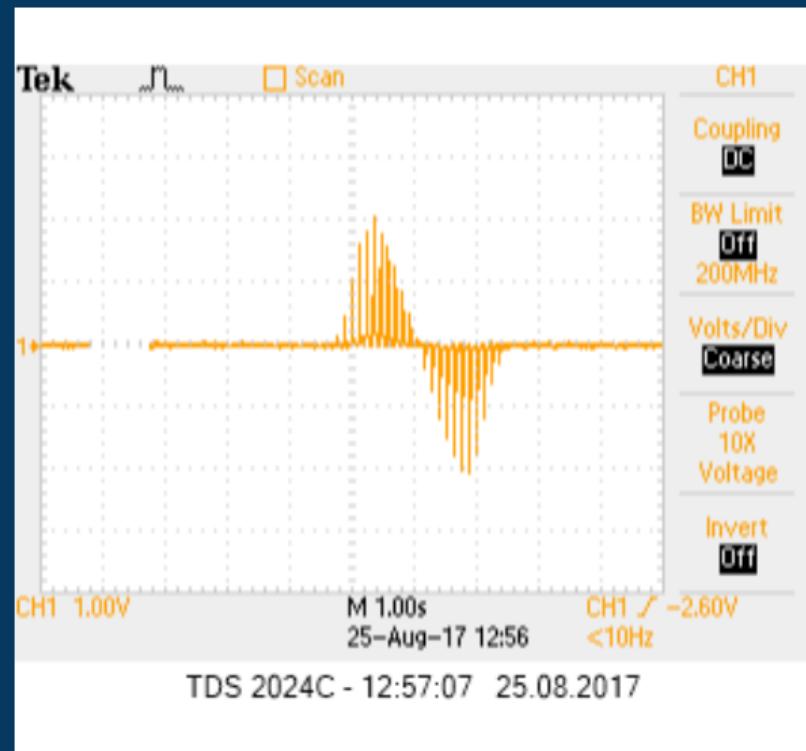
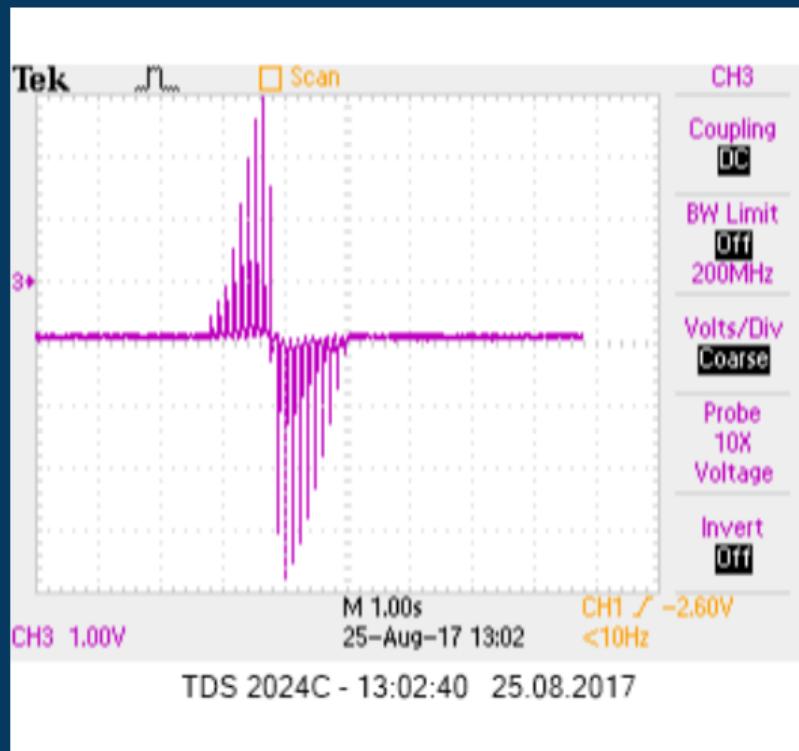
DA modulation: simulation results



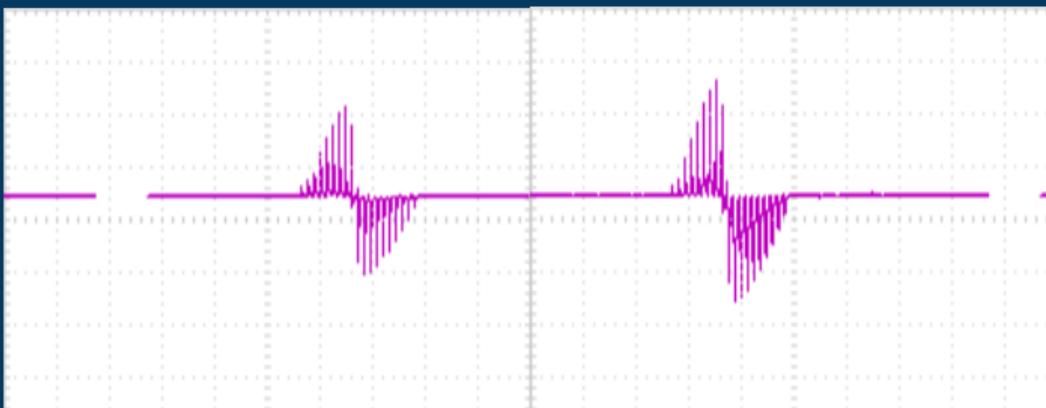
DA modulation: experimental setup



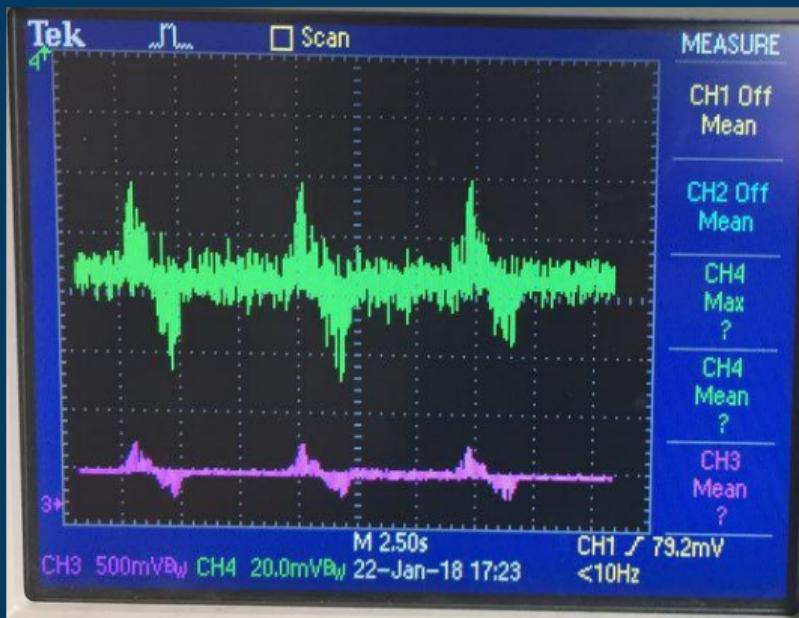
Hebbian STDP; iSTDP



DA modulation: results

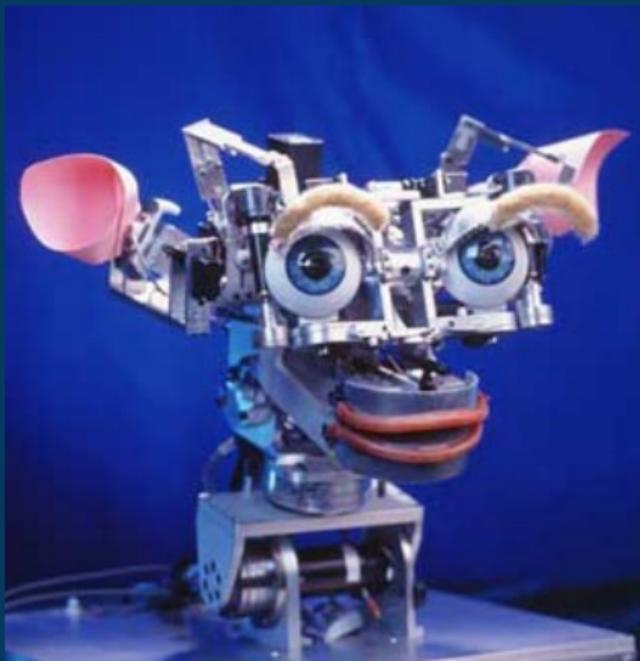


Hebbian STDP



Future plans

- Integrate 2 neurons
- Create simplified nucleus
- Complete simulation to match biological results
- Create a memristive spinal cord segment prototype
- Create a memristive spinal cord segment prosthesis



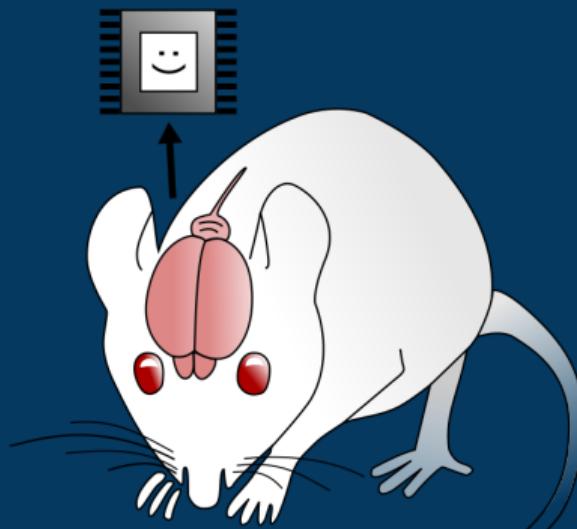
Memristive brain references

Repository:

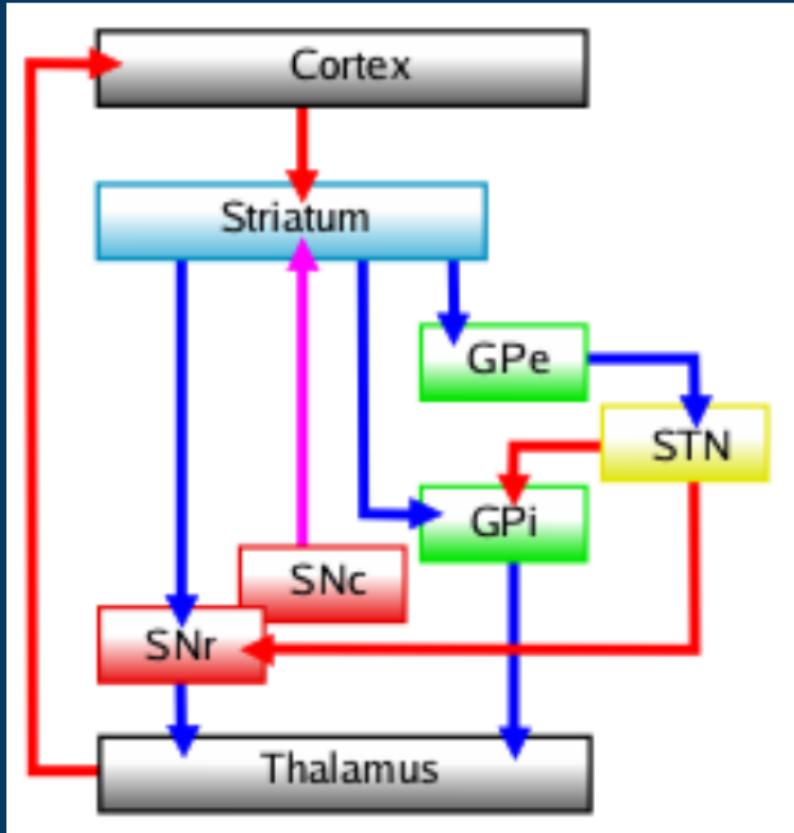
[https://github.com/research-team/
memristive-spinal-cord](https://github.com/research-team/memristive-spinal-cord)

Latest technical report:

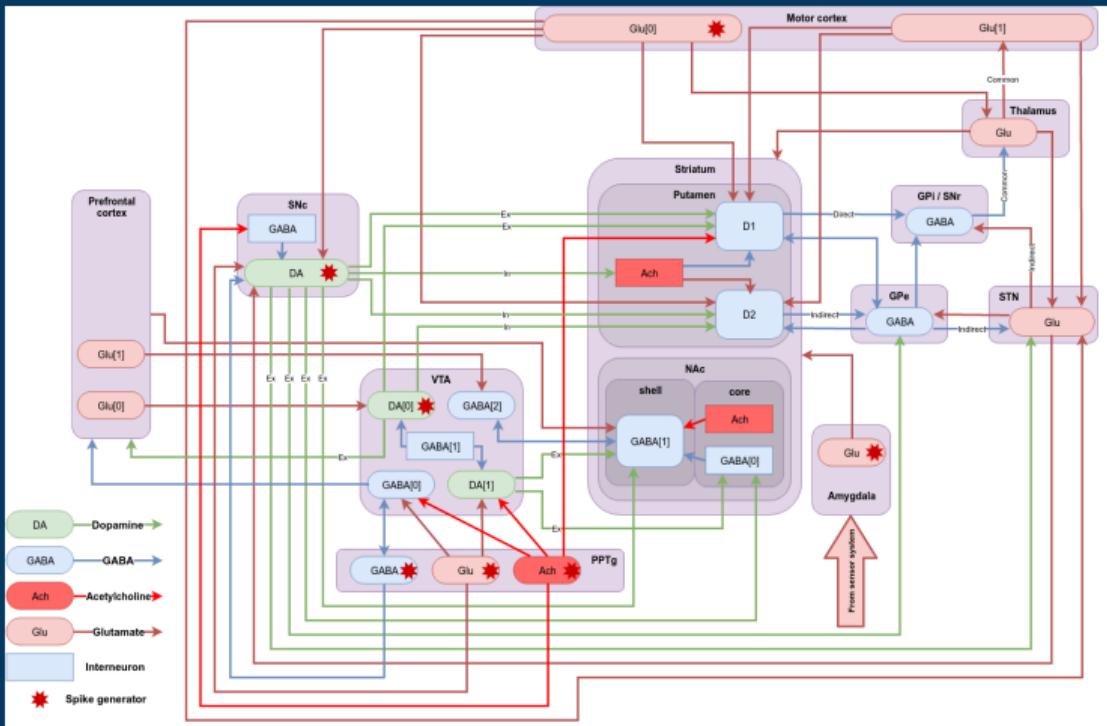
<https://arxiv.org/abs/1709.06325>



DA modulation



DA implementation



5-HT implementation

