Study of the Sequential nature in neuronal dynamics

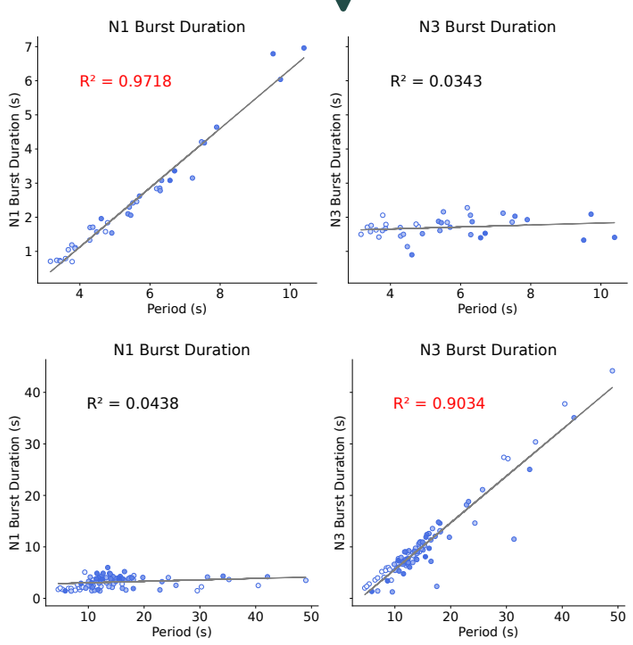
Case of study

Feeding CPG
Lymnaea stagnalis

Experimental approach

Computational approach

1.

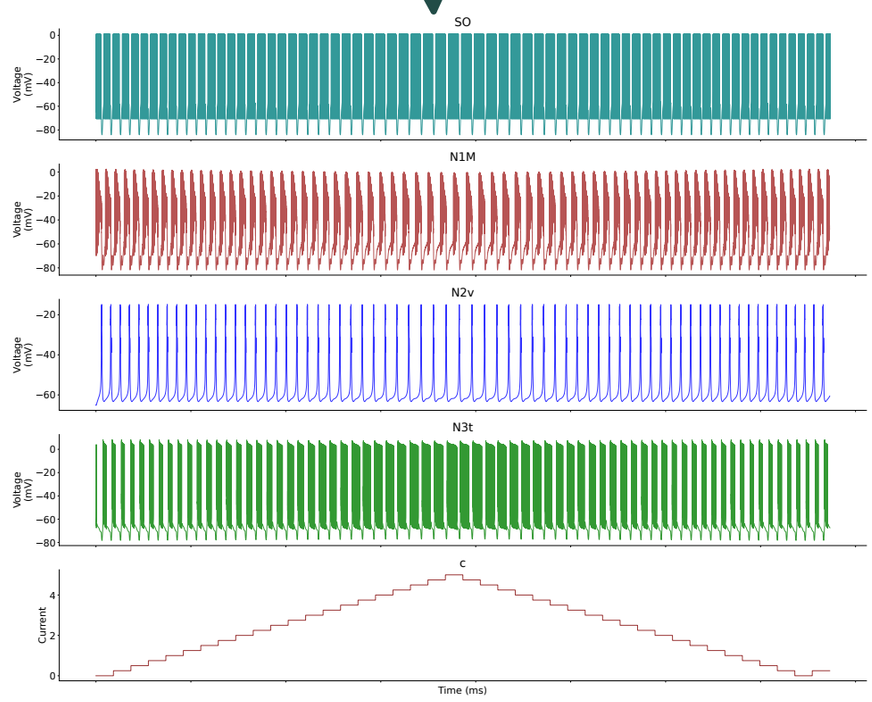


Presence of dynamical invariants under different cases of stimulation

Universality of sequential dynamical invariants

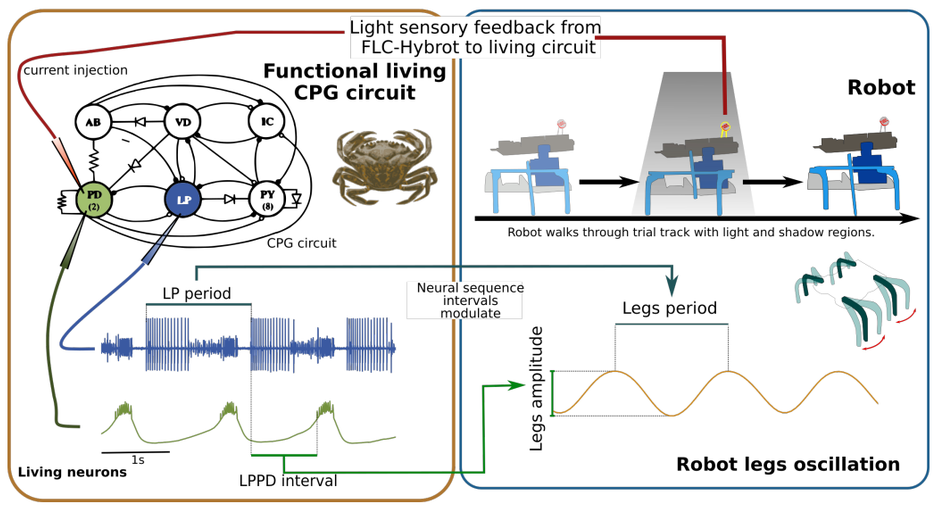
The variability distribution is dependent on the CPG activity context

2.



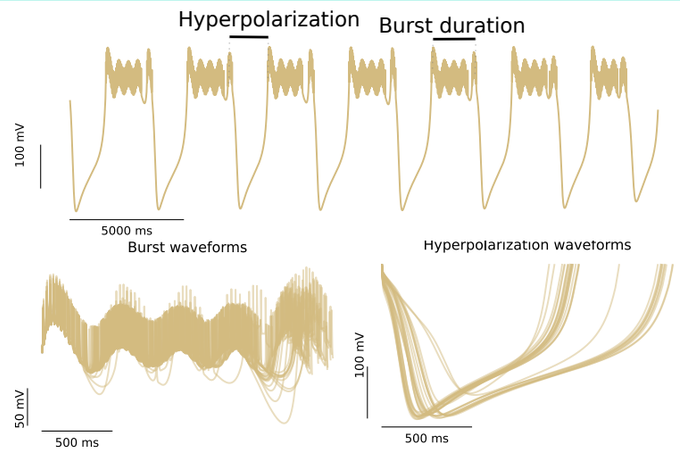
3.

Transformation of sequential intervals into effective robot movement



4.

Importance of reproducing the functional variability in computational models

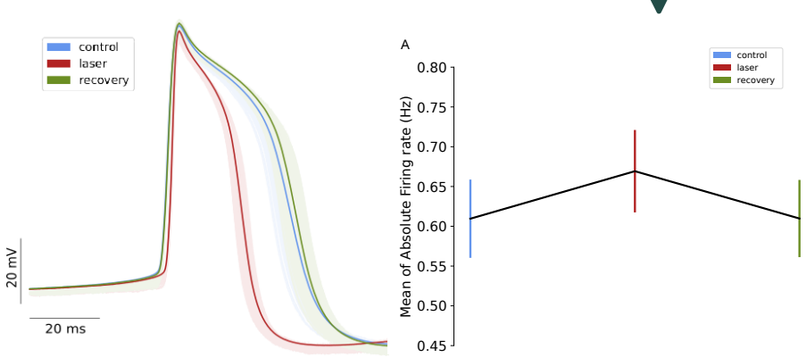


Stimulation Technique to study it

CW-NIR Infrared laser

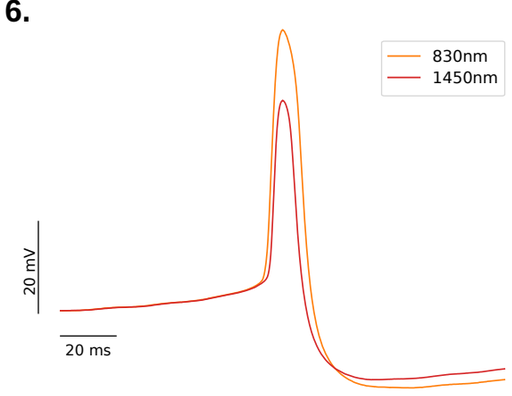
Sustained illumination

5.



Sutained laser stimulation accelerates the action potential

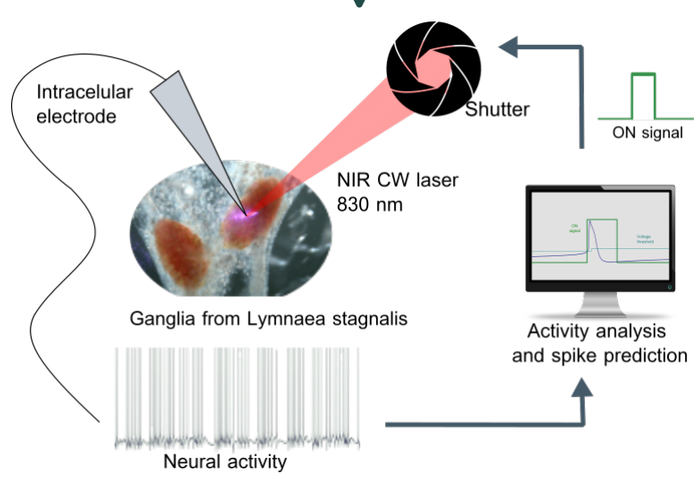
6.



Under the effect of different laser wavelengths, the metric changes are different

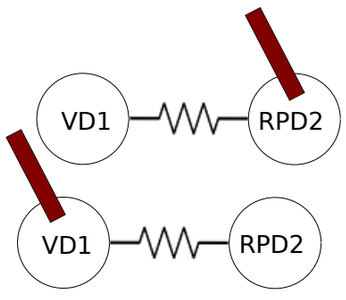
Activity-dependent protocol

9.



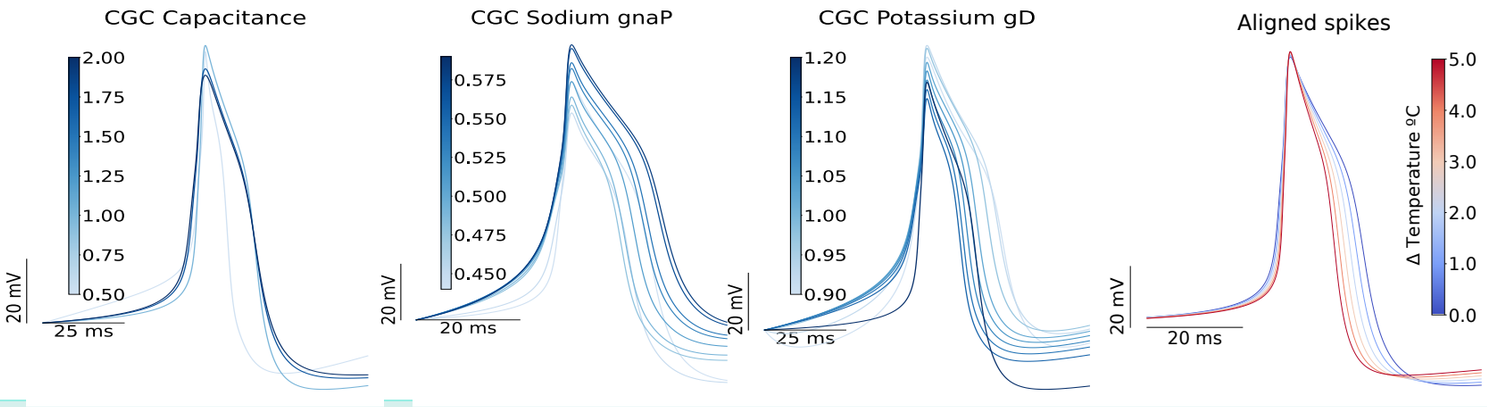
The activity dependent protocol allows to assess the action potential sequential generation at different time instants

7.



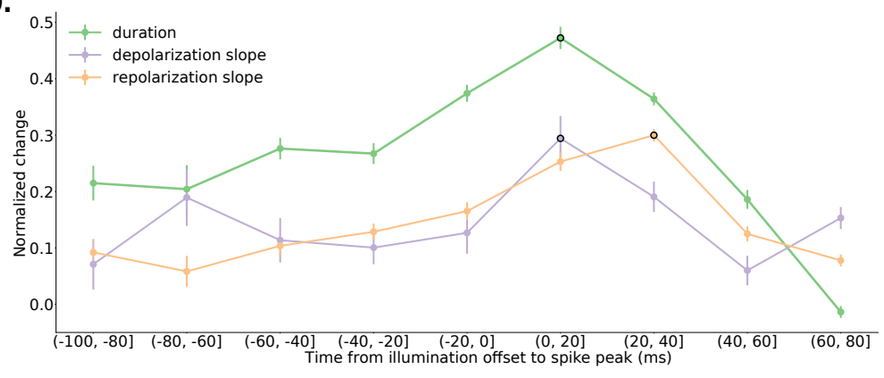
CW-NIR laser stimulation of electrically coupled cells shows the potential of this technique to alter circuits dynamics

8.



No candidate alone in the model could reproduce the effect and a global change when simulating the temperature dependency reproduced better the observed effect

10.



The closed-loop protocol unveiled the CW-laser effect at different phases of the neuron dynamics