

Study of the Sequential nature in neuronal dynamics

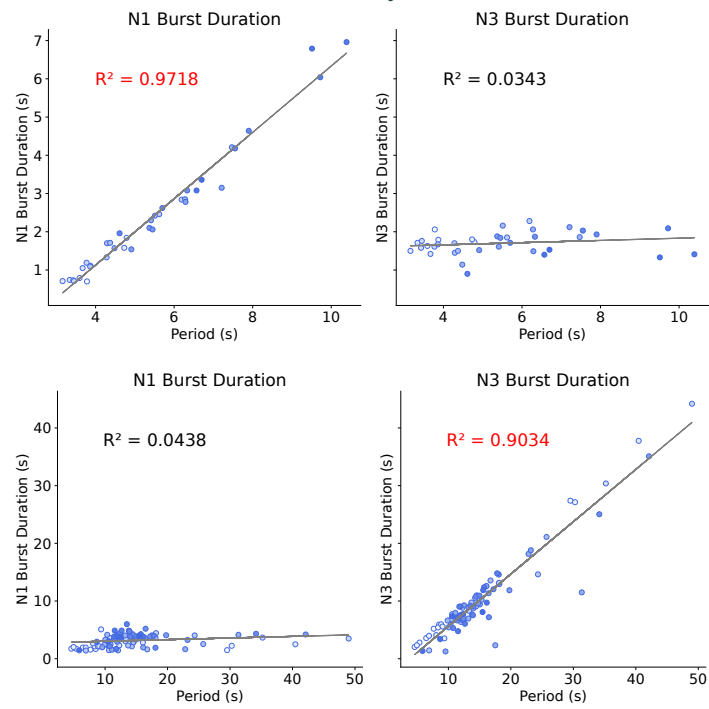
Case study

Feeding CPG
Lymnaea stagnalis

Experimental approach

Computational approach

1.

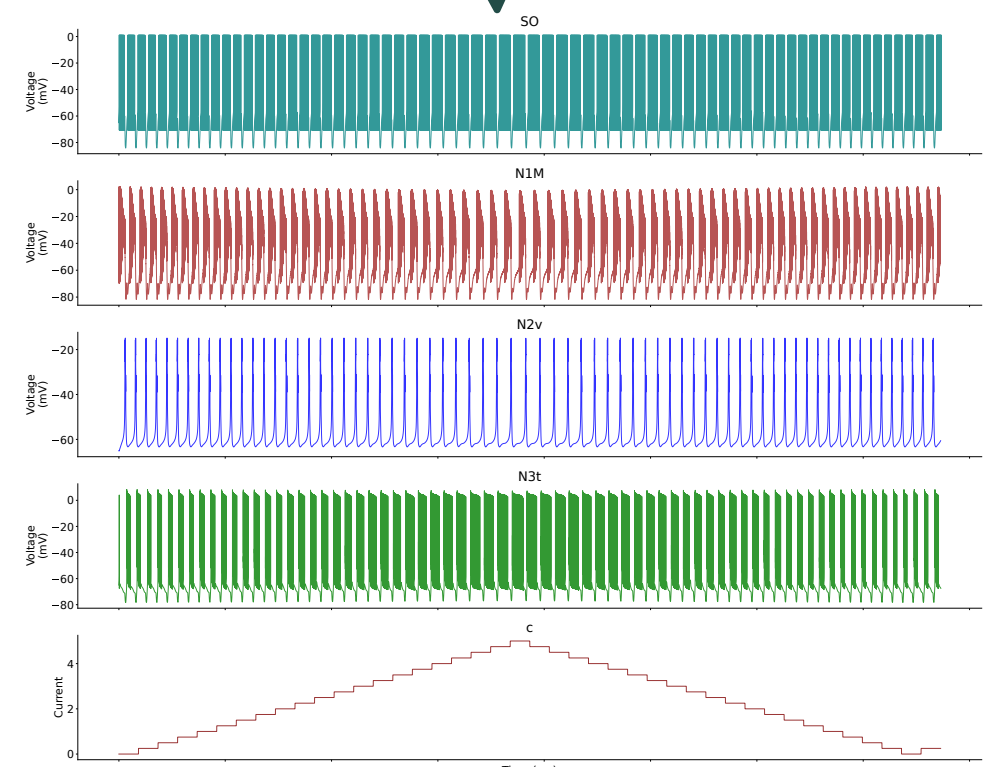


Presence of dynamical invariants under different cases of stimulation

Universality of sequential dynamical invariants

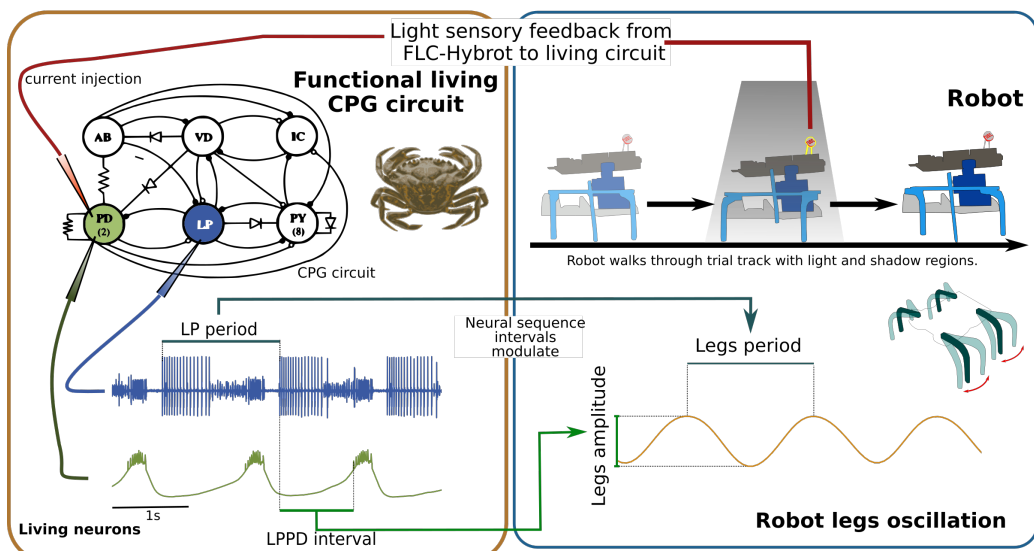
The variability distribution is dependent on the CPG activity context

2.



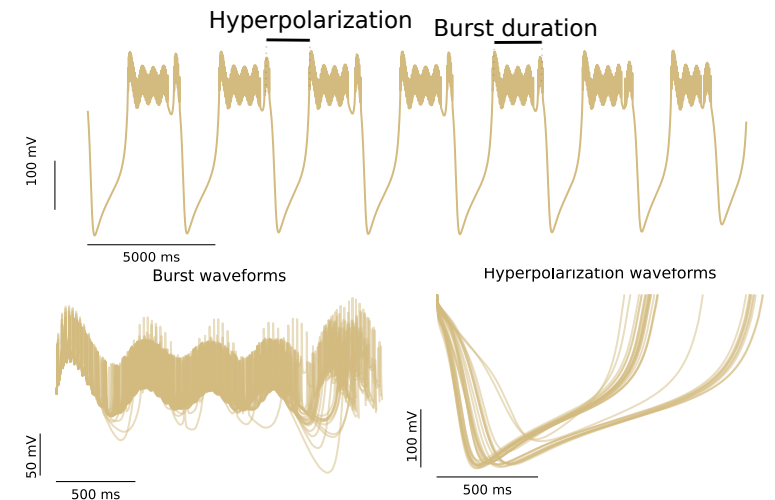
3.

Transformation of sequential intervals into effective robot movement



4.

Importance of reproducing the functional variability in computational models



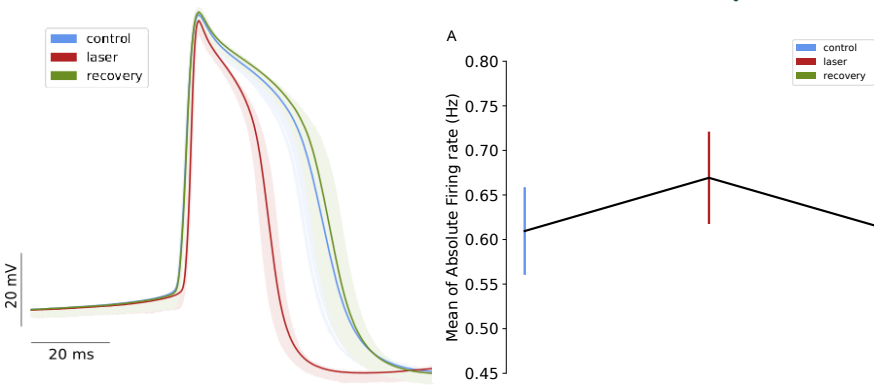
Stimulation Technique to study it

CW-NIR laser stimulation

Sustained illumination

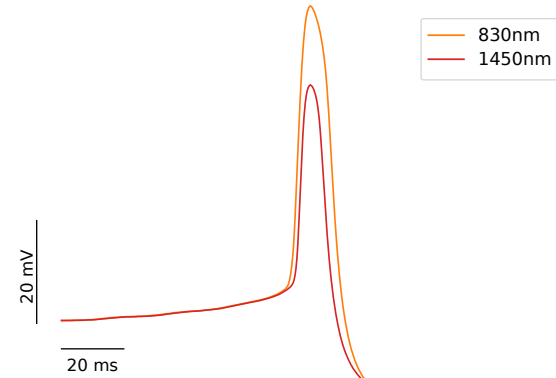
Activity-dependent protocol

5.



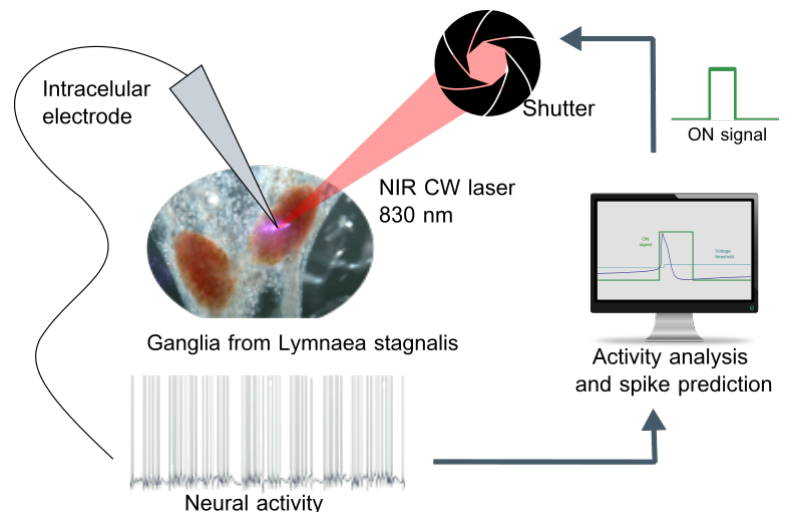
Sutained laser stimulation accelerates the action potential

6.



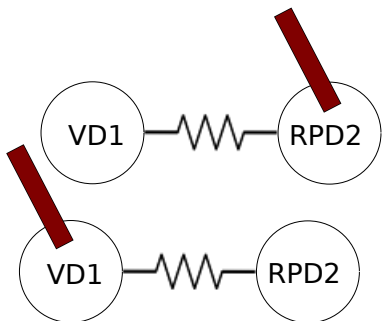
Different wavelengths can unveil different waveform modulations

9.



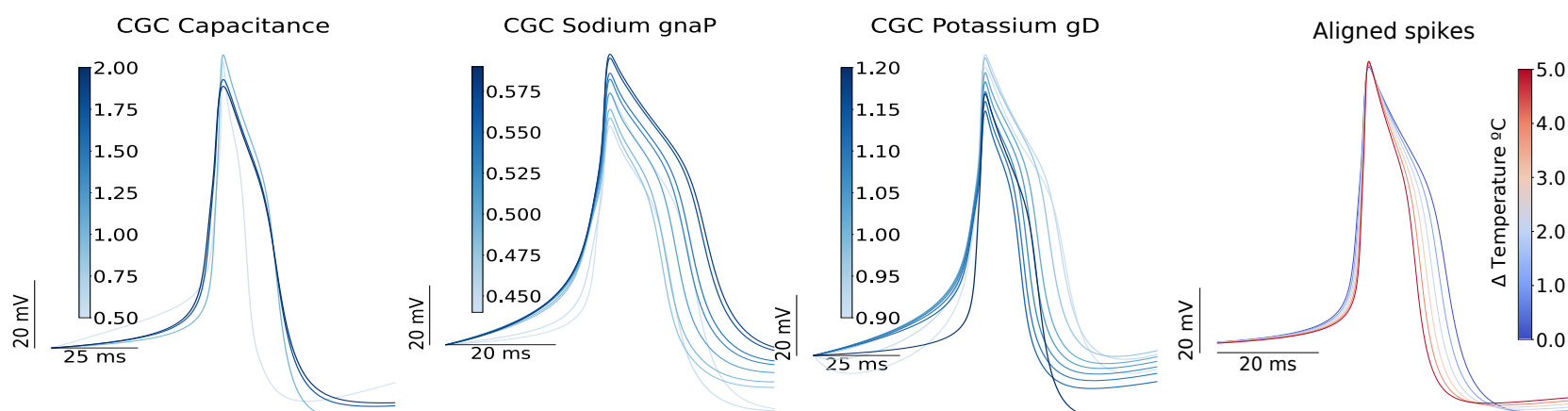
The activity dependent protocol allows to assess the action potential sequential generation at different time instants

7.

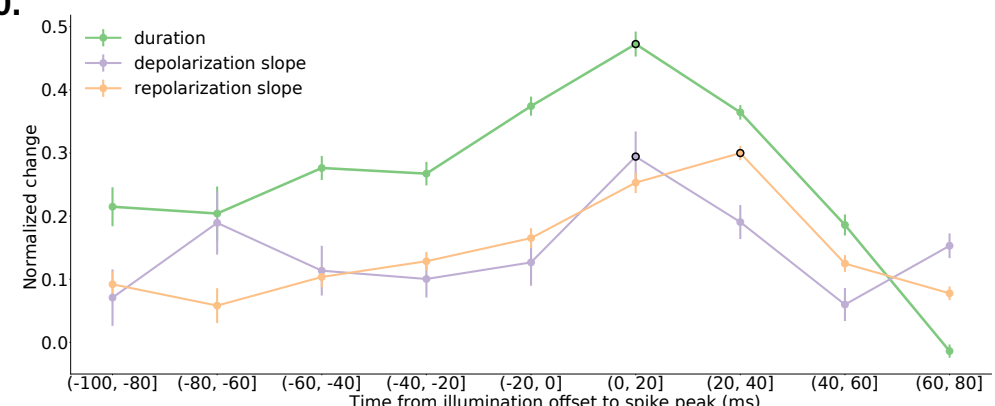


CW-NIR laser stimulation of electrically coupled cells shows the potential of this technique to alter circuit dynamics

8.



10.



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

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