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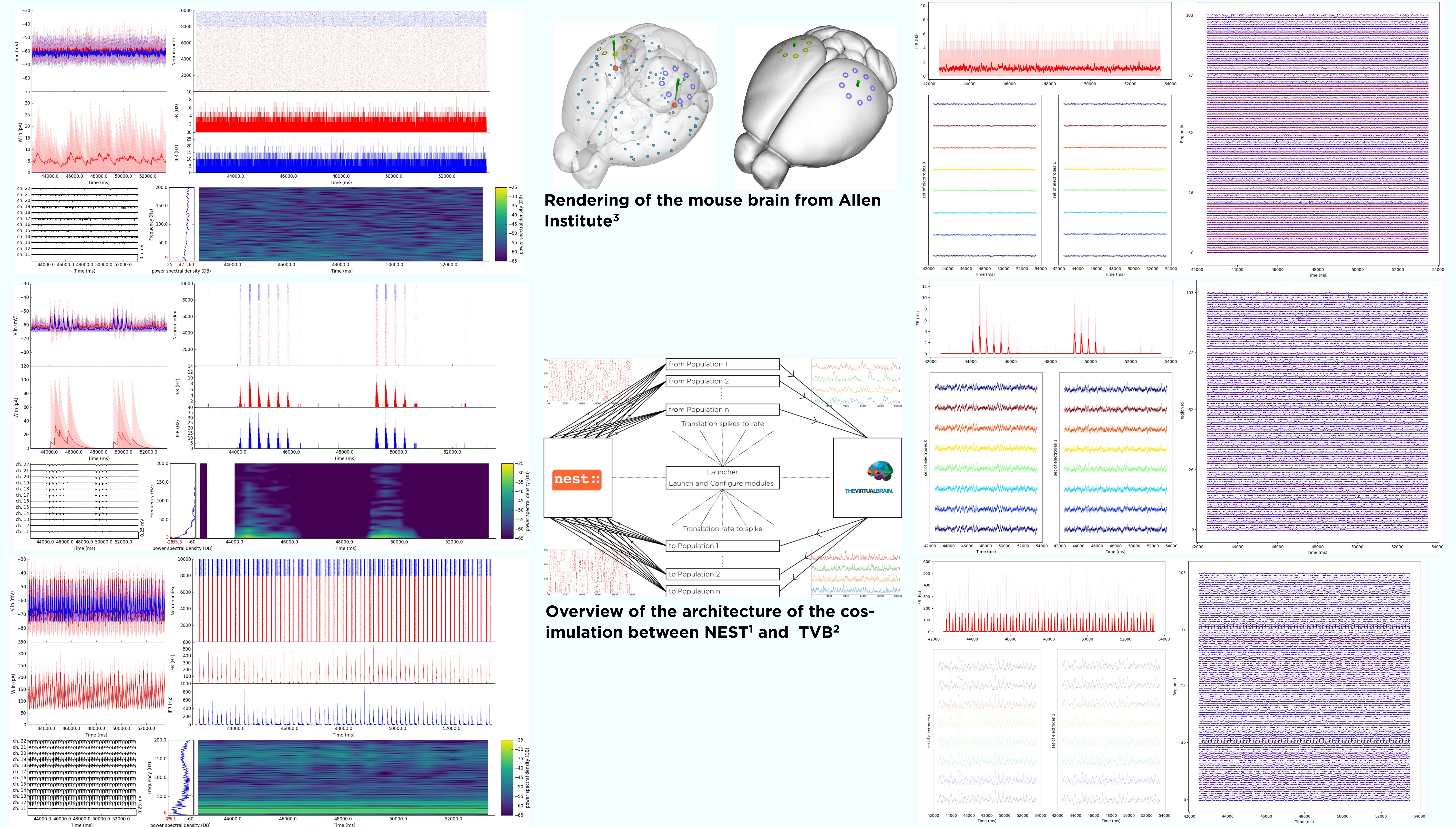
# Co-simulation framework for brain simulations: a multi-scale mouse brain model with TVB<sup>1</sup> and NEST

Human Brain Project

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## Example of co-simulation : Three different activities of CA1 in mouse brain with 2 polytrode electrodes and 16 ElectroCorticoGraphy electrodes



Rendering of the mouse brain from Allen Institute<sup>3</sup>

Overview of the architecture of the co-simulation between NEST<sup>1</sup> and TVB<sup>2</sup>

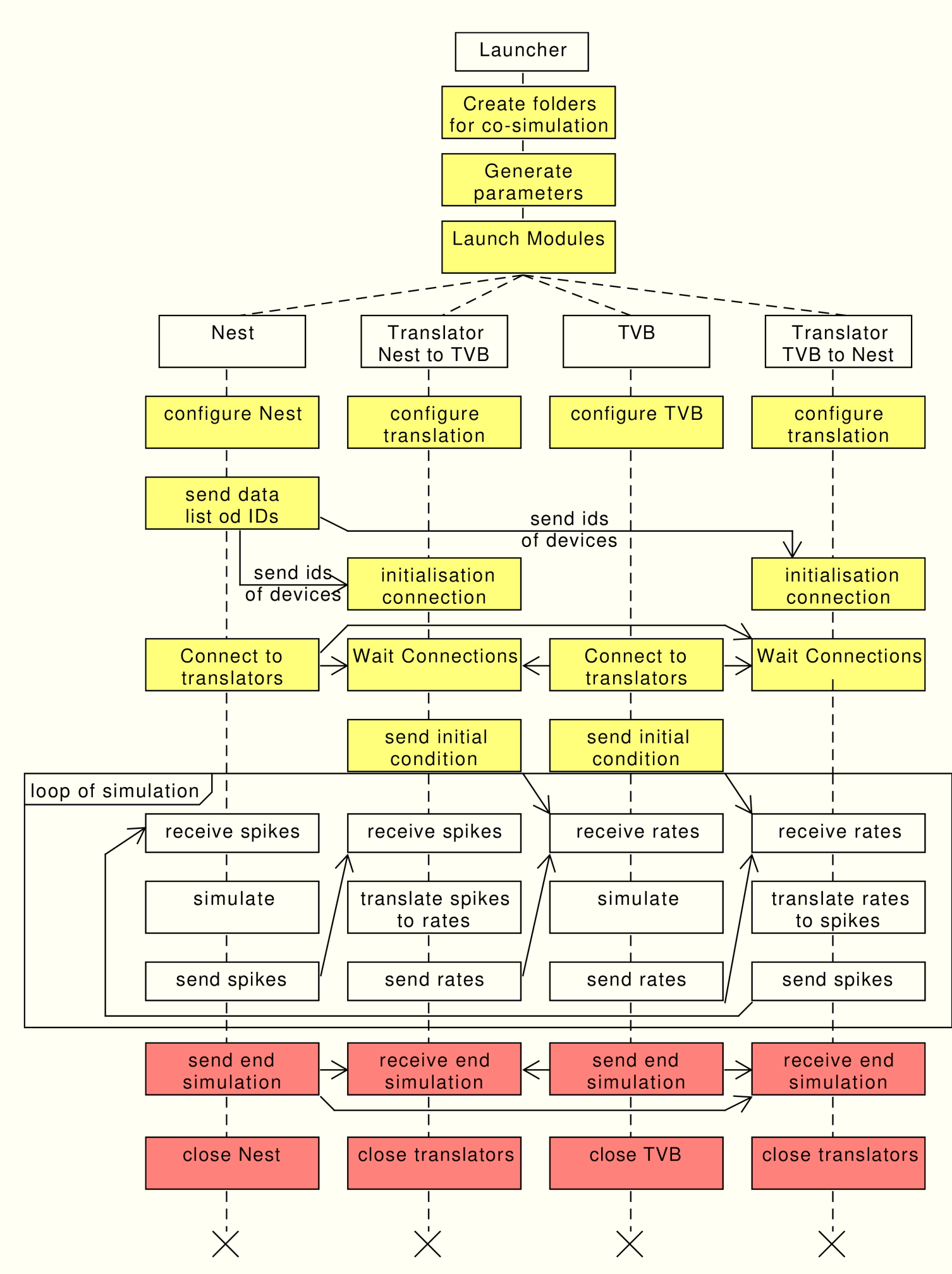
### Recording from the spiking neural network

Examples of time series from 10 adaptive exponential leaky and integrator neurons<sup>4</sup> (voltage membrane and adaptation), local field potential from the 12 sites in the middle line of the left polytrode (using hybridLFPy<sup>5</sup>), spike trains of the left CA1 with the histogram and the frequency analysis associate of it.

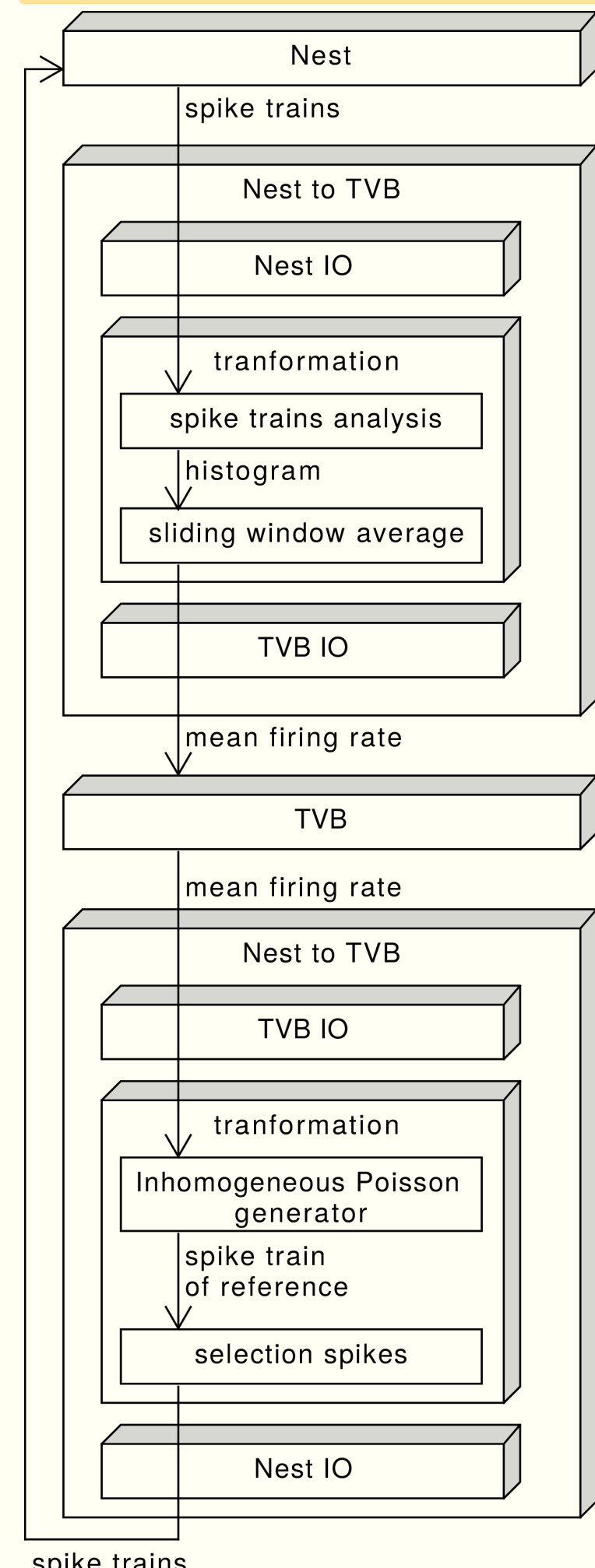
### Recording from the brain network :

Mean firing rate from the left CA1, the recoding from 16 ECOG electrode, the mean firing rate of the inhibitory (blue) and excitatory (red) of all the brain regions.

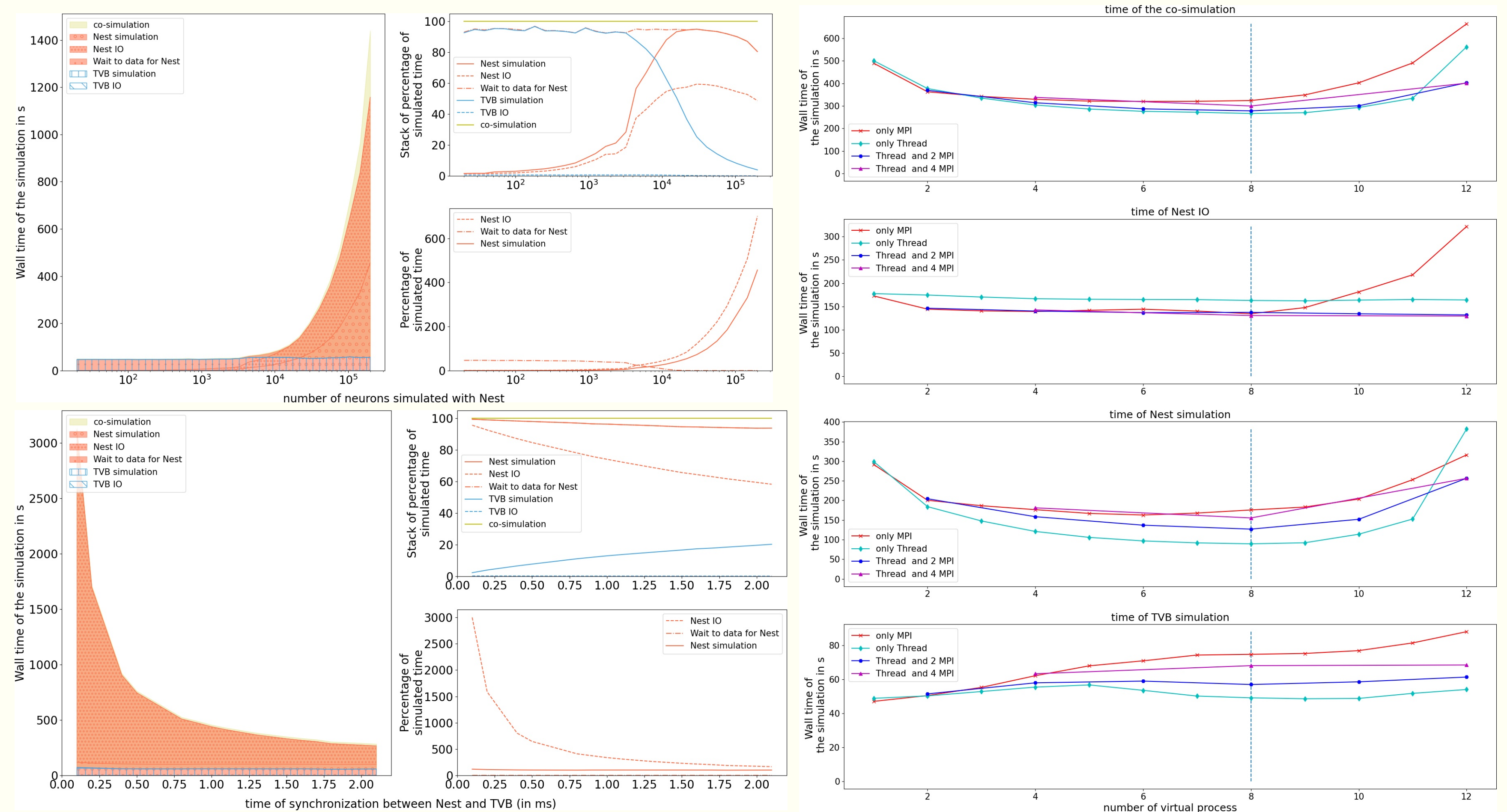
## overview of the co-simulation:



## Transformation functions



## Performance and optimizations



## Conclusion :

This framework opens new research directions including the improvement of synergy between simulators, the integration of data and models across scales, the creation of translation models for passing information across scales, and a new platform for biological hypothesis testing.



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### Main reference :

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