

Living computers

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We are working on designing the first living processor. The goal is to use living neurons instead of transistors. I describe the whole process we use, starting from cells and ending with algorithms interacting with living brain organoids. I also present the various strategies which are tested in order to reach our next goal which is to master training of the brain organoids, and put them in relation with training strategies already performed with artificial neural networks.

For this we designed a system that enables to perform easily in-vitro electrophysiological and neuromodulators experiments. The operations that can be performed include current stimulations, action potential readings, real-time visualization of electrical activity, real-time imaging of nervous tissue, real-time monitoring of environment, control of micro-fluidics, control of UV light for molecular uncaging and automatic generation of graphical representations of results. Moreover, all those operations are scripted in Python, which enables to automate experiments, perform exhaustive screenings or gradient-based optimization of any experimental parameters while keeping a detailed log of what was tested, and even give power to LLM agents to perform their own experiments.