

## The Rise of Digital Twins: a literature review of Deep Learning based models in the field of Visual Neuroscience

### Abstract

The ability to construct accurate quantitative models of how neurons respond to visual inputs is crucial to derive meaningful theoretical insights on how the brain computes this class of stimuli. Modern experimental techniques, such as calcium imaging, enable the recordings of thousands of neurons simultaneously, motivating the need to move beyond traditional models of single neuron activity, and towards novel architectures capable of exploiting the similar nonlinear computations shared by multiple neurons as information travels along the visual pathway. A novel class of models based on advancements in the field of deep learning have been proposed to enable such concurrent simulation of the response of multiple neurons to the same visual input. This class of models has also been termed 'digital twin' since they aim to generate an in-silico copy of the neurons recorded in vivo to extend experimental tasks commonly carried in the lab on organic specimens. This presentation provides an overview of the development process of this novel class of models and the way they have been applied thus far to derive some initial insights in the field of visual neuroscience.

### Speaker

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