## INFLUENCE OF DENDRITIC MORPHOLOGY ON SINGLE NEURON ARITHMETIC

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Pyramidal cells are the most abundant type of neurons in the cerebral cortex. Their activity has been associated with higher cognitive and emotional functions. Pyramidal cells have a characteristic structure, consisting of a triangularly shaped soma where from two complex dendritic trees and a long bifurcated axon extend. All the morphological components of the pyramidal neurons exhibit significant variability across different brain areas and layers. Pyramidal neurons receive numerous synaptic inputs on the basal, oblique and tuft dendrites, whose integration in space and time can result in the generation of local dendritic spikes. Different modes of the combined subthreshold synaptic effects are observed: linear, when integration is the sum of individual responses, and nonlinear, when synaptic inputs are integrated in a sigmoid or power function. While both experimental and theoretical work has been performed to characterize the arithmetic of synaptic summation in pyramidal neurons, the role of dendritic morphology in this process remains elusive.

To address this issue, we created compartmental neuronal models combining detailed morphology and biophysical properties of 56 rat PFC pyramidal layer V cells. We used these models to investigate the subthershold integration properties of clustered excitatory synaptic inputs delivered to the basal dendritic tree. The simulations were performed in NEURON and the subsequent statistical analysis in MATLAB.

Preliminary results suggest that: (a) different dendritic branches within a model neuron integrate synaptic inputs in distinct manners, (b) the dendritic integration mode can be linear, superlinear or sigmoid-like, (c) the sigmoid response dominates in the dendrites of more complex basal trees and (d) there is a strong correlation between the specific morphological features (*e.g.* length, diameter, branch order), the passive properties of a dendrite and its mode (linear, superlinear or sigmoid) of synaptic integration.