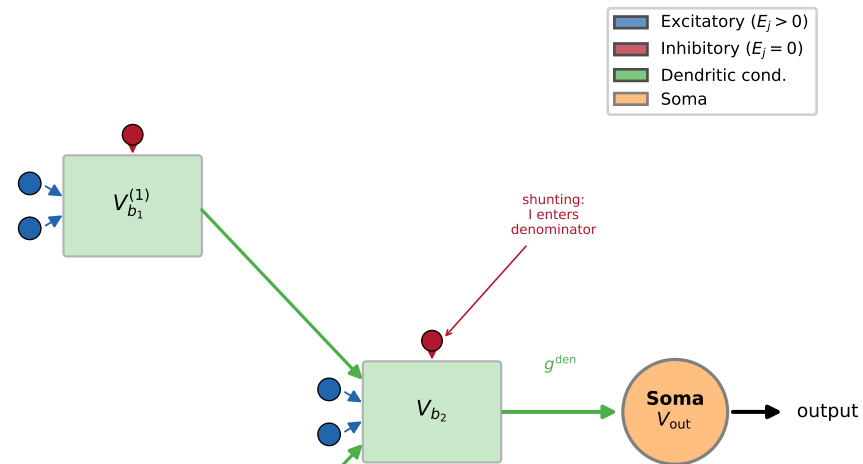


## (A) Compartmental dendritic neuron



$$V_n = \frac{\sum_j E_j x_j g_j^{\text{syn}} + \sum_j V_j g_j^{\text{den}}}{\sum_j x_j g_j^{\text{syn}} + \sum_j g_j^{\text{den}} + 1}$$

(sums include both  $E$  and  $I$  synapses per branch)

## (B) Local learning rule hierarchy

3F

$$\Delta g \propto x_j \cdot (E_j - V_n) \cdot \delta$$

*pre-synaptic × driving force × broadcast error*

4F

$$\Delta g \propto x_j \cdot (E_j - V_n) \cdot \delta \cdot \rho$$

*+ variance / EMA modulator  $\rho$*

5F

$$\Delta g \propto x_j \cdot (E_j - V_n) \cdot \delta \cdot \rho \cdot \phi$$

*+ information-theoretic factor  $\phi$*

Broadcast error  $\delta$ : scalar / per-soma / local mismatch