

S6 Table. Neuron and Synapse Models

Name	Equations
Subthreshold dynamics	$\tau_{\text{memb}} \dot{V}_i(t) = (V_{\text{rest}} - V_i(t))$ $+ (V_{\text{ex}} - V_i(t)) (E_i(t) + E_{\text{ON/OFF},i}(t))$ $+ (V_{\text{inh}} - V_i(t)) I_i(t) + (V_{\text{adap}} - V_i(t)) I_{\text{adap},i}(t)$
Conductances	$\tilde{w}_{ij} = w_{ij} + \phi_j \text{ or } \tilde{w}_{ij} = w_{ij} \times \Phi_j$ <p>Synaptic inputs: Excitatory inputs $E_i(t) = \tau \sum_j \sum_{l \in \mathcal{S}_j} \tilde{w}_{ij} s(t - (t_l + D))$; analogous for $E_j(t)$ and inhibitory inputs I_i External inputs: $E_{\text{ON/OFF},i}(t) = \tau \sum_{l \in \mathcal{S}_{\text{ON/OFF},i}} s(t - t_l)$; for visible units only Adaptation: $I_{\text{adap},i}(t) = \sum_{l \in \mathcal{S}_i} \exp(-\frac{t-t_l}{\tau_{\text{adap}}}) \times (t > t_l)$ Synaptic profile: $s(t) = \exp(-\frac{t}{\tau_{\alpha}}) \times (t > 0)$</p>
Spiking	<p>If $V_i(t) \geq V_{\text{thr}}$:</p> <ol style="list-style-type: none"> 1. Add spike with time-stamp $t_k = t$ to set \mathcal{S}_i 2. Set $V_i(t) = V_{\text{rest}}$