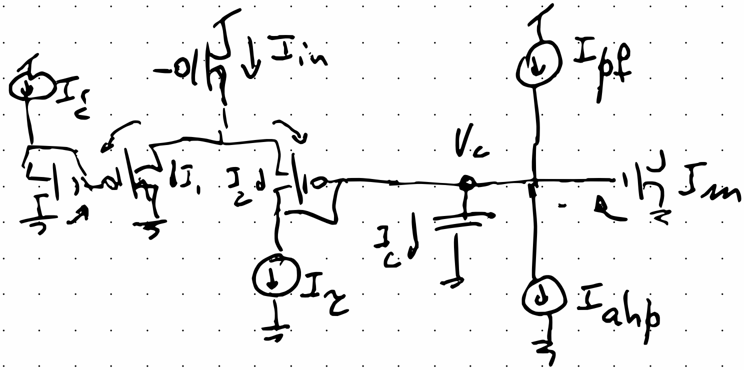
DPI Neuron Equations



$$I_m = I_0 e^{\kappa V_c / U_T}$$

$$I_c = C \frac{d}{dt} V_c$$

$$\dot{I}_m = \frac{\kappa}{U_T} I_m \cdot \frac{dV}{dt}$$

$$\tau \triangleq \frac{C U_T}{\kappa I_\tau}$$

$$\Rightarrow I_c = \tau \frac{I_\tau}{I_m} \dot{I}_m$$

$$I_g \cdot I_1 = I_2 \cdot I_m \qquad I_1 + I_2 = I_{in}$$

$$I_2 = I_c + \underbrace{I_\tau + I_{ahp} - I_{pf}}_{I_{sum}}$$

$$I_g (I_{in} - I_{sum} - I_c) = (I_{sum} + I_c) \cdot I_m$$

$$I_g (I_{in} - I_{sum}) - I_g \cdot \underline{\tau \frac{I_\tau}{I_m}} \dot{I}_m = I_{sum} \cdot I_m + \underline{\tau I_\tau \dot{I}_m}$$

$$\tau I_\tau \left(\frac{I_g}{I_m} + 1 \right) \dot{I}_m = I_g I_{in} - I_g I_{sum} - I_m I_{sum}$$

$$\boxed{\tau \left(\frac{I_g}{I_m} + 1 \right) \dot{I}_m = \alpha (I_{in} - I_{sum}) - \frac{I_{sum} I_m}{I_\tau}}$$

$$\alpha \triangleq \frac{I_g}{I_\tau}$$