Neural Modeling and Computational Neuroscience

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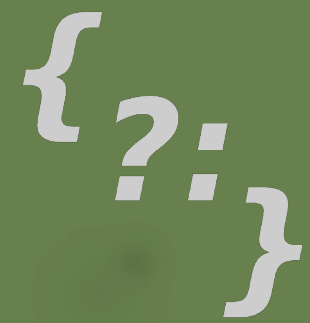

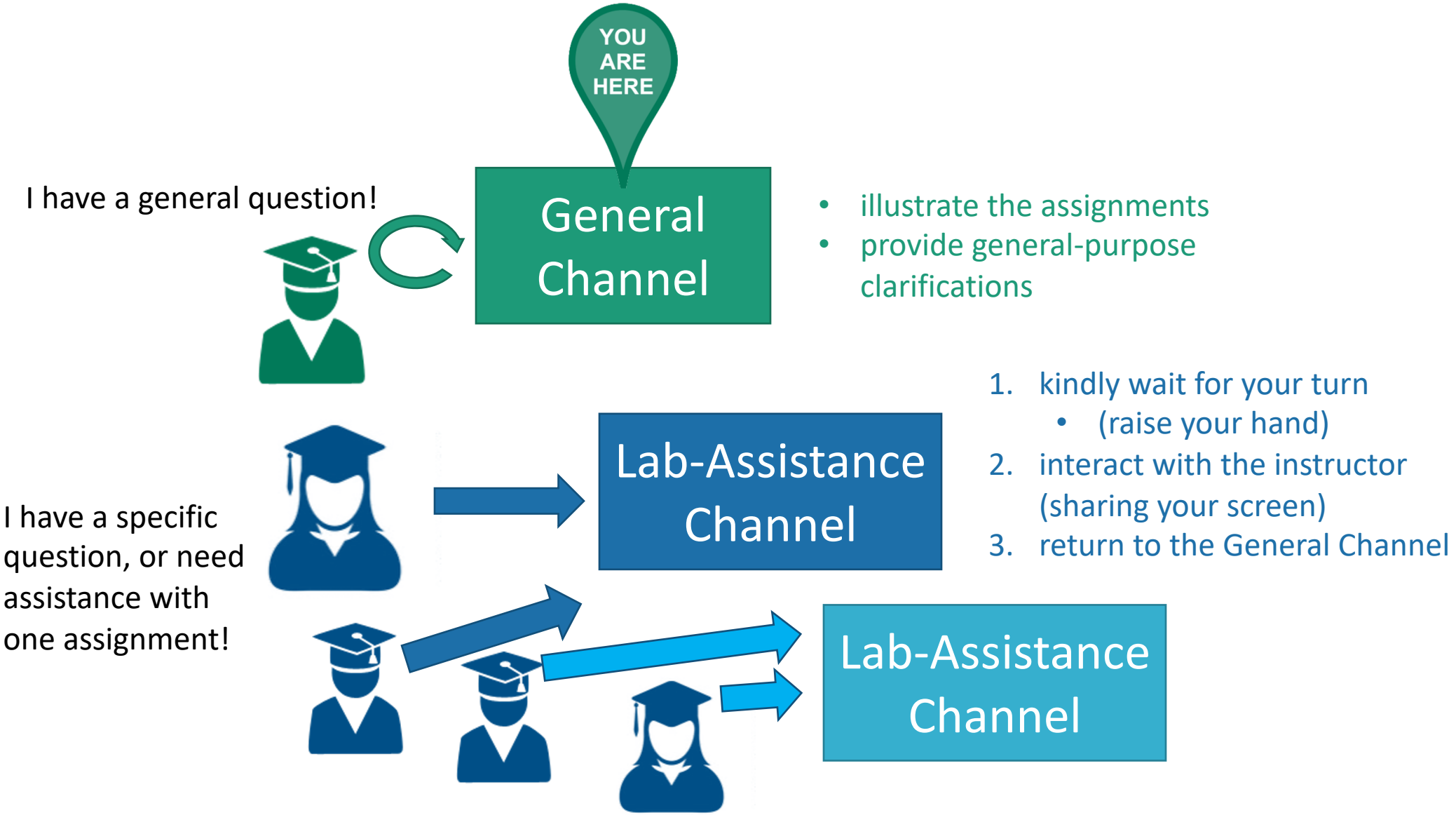
YOU ARE HERE
I have a general question!
General Channel
• illustrate the assignments
• provide general-purpose clarifications
I have a specific question, or need assistance with one assignment!
Lab-Assistance Channel
1. kindly wait for your turn
• (raise your hand)
2. interact with the instructor (sharing your screen)
3. return to the General Channel
Lab-Assistance Channel

Something about the assignments

Basic Hebb Rule

differential equation

$$\tau_w \frac{d\boldsymbol{w}}{dt} = v\,\boldsymbol{u}$$

t refers to the learning dynamics
t refers to the different input patters

$$\tau_w \frac{d\boldsymbol{w}}{dn} = v\,\boldsymbol{u}$$

Discrete-time - Basic Hebb Rule (Naïve)

differential equation

$$\tau_w \frac{d\boldsymbol{w}}{dn} = v\,\boldsymbol{u}$$

iterated map

$$\tau_w \Delta\boldsymbol{w}(n) = v(n)\,\boldsymbol{u}(n)$$

$$v(n) = \boldsymbol{w}(n)^T \boldsymbol{u}(n)$$

$$\boldsymbol{w}(n+1) = \boldsymbol{w}(n) + \Delta\boldsymbol{w}(\mathrm{n})$$

$$\Delta\boldsymbol{w}(n) = \boxed{\frac{1}{\tau_w}} v(n)\,\boldsymbol{u}(n)$$

$$\Delta\boldsymbol{w}(n) = \eta\, v(n)\,\boldsymbol{u}(n)$$

learning rate

Discrete-time - Basic Hebb Rule (Euler)

differential equation

$$\tau_w \frac{d\boldsymbol{w}}{dn} = v\,\boldsymbol{u} \quad \Rightarrow \quad \frac{d\boldsymbol{w}}{dn} = \frac{1}{\tau_w} v\,\boldsymbol{u} = \mathrm{f}(\boldsymbol{w})$$

$$\boldsymbol{w}(n+1) = \boldsymbol{w}(n) + hf(\boldsymbol{w})$$

$$\boldsymbol{w}(n+1) = w(n) + \boxed{h\frac{1}{\tau_w}} v(n)\boldsymbol{u}(n)$$

$$\Delta\boldsymbol{w}(n) = \eta\, v(n)\, \boldsymbol{u}(n)$$

learning rate