1. InputConnection (P->G) [0, 1]:

global parameters: lr, α , β

pre:

$I_{post} \mathrel{+}= w$

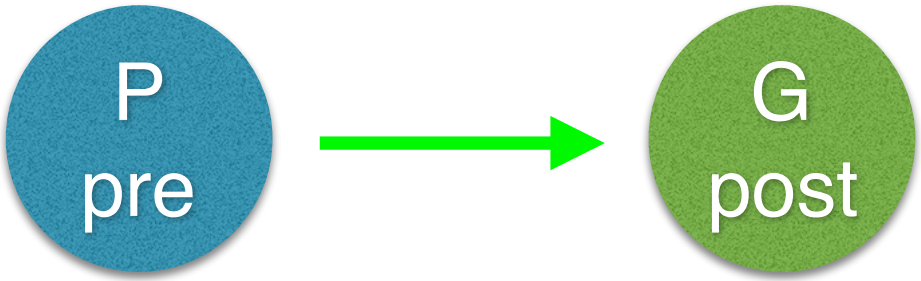
$a_{pre} \mathrel{+}= 1 / (\alpha \, num\_G)$

$\Theta_{pre} \mathrel{+}= 1 / (\beta \, num\_G)$

post:

$\Delta w = -decay + lr \, (a_{pre} - \Theta_{pre})$

$w = clip(w + \Delta w, 0, 1)$



diff_pre \ diff_post	>0	<0
>0	+ Both spike frequently, high correlation	- Pre spikes frequently, Post spikes rarely. Pre starts to have negative connection, high usage of negative weights
<0	- Pre spikes rarely, Post spikes frequently. Pre starts to have negative connection, low usage of negative weights	+ Both spike rarely

2. NegativeConnection (G->G) [-1, 0]:

global parameters: lr_{neg}

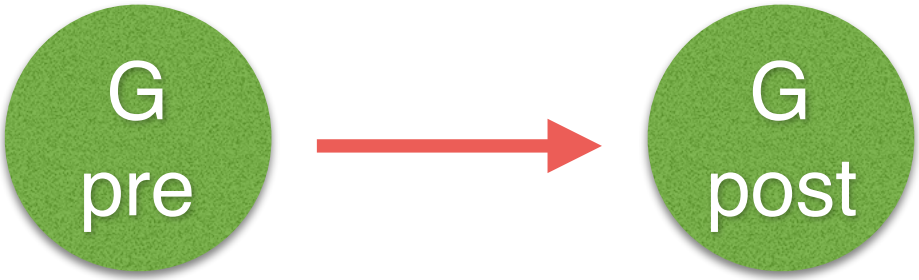
pre:

$$I_{post} \mathrel{+}= w_{neg}$$

$$\Delta w_{neg} = decay + lr_{neg}(a_{post} - \Theta_{post})(a_{pre} - \Theta_{pre})$$

$$w_{neg} = clip(w_{neg} + \Delta w_{neg}, -1, 0)$$

post:



3. OutputConnection (G->H) [0, 1]:

global parameters: lr, lr_{rev}, α, β.

everywhere: G - pre neuron, H - post neuron

pre:

$I_{post} \mathrel{+}= w$

$a_{pre} \mathrel{+}= 1 / (\alpha \, num\_H)$

$\Theta_{pre} \mathrel{+}= 1 / (\beta \, num\_H)$

post:

$a_{post} \mathrel{+}= 1 / (\alpha \, num\_G)$

$\Theta_{post} \mathrel{+}= 1 / (\beta \, num\_G)$

$\Delta w = -decay + lr \, (a_{pre} - \Theta_{pre})$

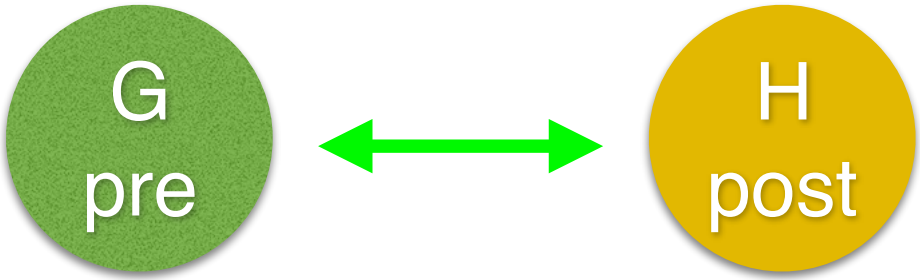
$w = clip(w + \Delta w, 0, 1)$

Reverse part:

$I_{pre} \mathrel{+}= w_{rev}$

$\Delta w_{rev} = -decay + lr_{rev} \, w \, (a_{pre} - \Theta_{pre})$

$w_{rev} = clip(w_{rev} + \Delta w_{rev}, 0, 1)$



4. NegativeConnection (H->H) [-1,0]:

global parameters: lr_{neg}

pre:

$I_{post} \mathrel{+}= w_{neg}$

post:

$\Delta w_{neg} = -lr_{neg}(a_{pre} - \Theta_{pre})$

$w_{neg} = clip(w_{neg} + \Delta w_{neg}, -1, 0)$