Algorithm 1 Neuroplastic Expansion TD3

π_ϕ: All parameters in actor. $Q_{\theta_{\{1,2\}}}$: All parameters in critics, M_l: Sparse mask in layer l.

Neuroplastic Expention (every ΔT)

Calculate growing number at t step
$k \leftarrow cosine\ annealing(t, T_{end})$
for each $l_\phi \in \pi_\phi, l_\theta \in Q_{\theta_{\{1,2\}}}$ **do**
  # Select top k weights from candidates
  $\mathbb{I}_{grow} = \text{ArgTop}k_{i^l \notin \breve{\phi}^l}(|\nabla^l_\phi L^\phi_t|) \cup \text{ArgTop}k_{i^l \notin \breve{\theta}^l}(|\nabla^l_\theta L^\theta_t|)$
  # Collect the weights related to selected dormant neurons
  $Clip(0, \mathbb{I}_{prune}, \omega \times \mathbb{I}^l_{grow}), \mathbb{I}^l_{prune} = f(\breve{\phi}^l_i) \leq 0 \cup f(\breve{\theta}) \leq 0$
  Get indexes from $\mathbb{I}_{grow}, \mathbb{I}_{prune}$
  Generate topology mask map M_{l_ϕ}, M_{l_θ}
  # Update new topology
  $\breve{\theta}_l \leftarrow \theta_l \odot M_{l_\theta}, \breve{\phi}_l \leftarrow \phi_l \odot M_{l_\phi}$
end for

Train the RL policy

$a \leftarrow \pi_{\breve{\phi}}(s)$ (with Gaussian noise)
Observe r and new state s'
Fill D with (s, a, r, s')
# Experience review
if $random(0, 1) > \Delta f(\theta)$ **then**
  sample a batch from bottom $\frac{1}{4}D$
else
  sample a batch from total D
end if
Update $Q_{\breve{\theta}_{\{1,2\}}}, \pi_{\breve{\phi}}$ based on TD3