Algorithm: IPPO

Initialize: θ the parameters of individual actors $\pi_i(.;\theta)$, ϕ the parameters of individual critics $V_i(;\phi)$
while $t < T$ **do**
  Initialize a rollout buffer $\mathcal{D}$ // $(episode_1, episode_2, \dots)$
  for a number of episodes **do**:
    $current\_episode = \{\}$
    while $\mathbf{o}_t$ is not *done* **do**
      Collect observations $\{o_1^t, \dots, o_n^t\}$
      Sample an action $a_i^t \sim \pi_i(.|o_i^t)$ for each agent i
      Execute joint action $\mathbf{a}^t = (a_1^t, \dots, a_n^t)$
      Collect r^t, $done^t$
      Store $(\mathbf{o}^t, \mathbf{a}^t, r^t, done^t)$ in $current\_episode$
    end while
    Store $current\_episode$ in the rollout buffer $\mathcal{D}$
  end for
  Process the rollout buffer for batch training // Episodes with different lengths
  Compute the advantages A_i and TD targets y
  Compute the actor losses:

$$\mathcal{L}(\theta) = \frac{1}{|\mathcal{B}|} \sum_b \frac{1}{L^b} \sum_t \frac{1}{n} \sum_i \min\left(\frac{\pi(a_i^t \mid o_i^t;\theta)}{\pi(a_i^t \mid o_i^t;\theta_{\text{old}})} A_i^t, \right.$$
$$\left. \text{clip}\left(\frac{\pi(a_i^t \mid o_i^t;\theta)}{\pi(a_i^t \mid o_i^t;\theta_{\text{old}})}, 1-\varepsilon, 1+\varepsilon \right) A_i^t \right)$$

  Compute the entropy bonus

$$\mathcal{H}(\theta) = \frac{1}{|\mathcal{B}|} \sum_b \frac{1}{L^b} \sum_t \frac{1}{n} \sum_i \mathcal{H}_i(\theta)$$

  Compute the critic losses:

$$\mathcal{L}(\phi) = \frac{1}{|\mathcal{B}|} \sum_b \frac{1}{L^b} \sum_t \frac{1}{n} \sum_i \left(y_i^{t,b} - V_i(\mathbf{o}_i^{t,b};\phi) \right)^2$$

  Update θ and ϕ using:

$$\mathcal{L}(\theta,\phi) = -\mathcal{L}(\theta) + \alpha^{critic}\mathcal{L}(\phi) - \alpha^{entropy}\mathcal{H}(\theta)$$

end while