

## Sarsa (on-policy TD control) for estimating $Q \approx q_*$

Algorithm parameters: step size  $\alpha \in (0, 1]$ , small  $\varepsilon > 0$

Initialize  $Q(s, a)$ , for all  $s \in \mathcal{S}^+, a \in \mathcal{A}(s)$ , arbitrarily except that  $Q(\text{terminal}, \cdot) = 0$

Loop for each episode:

    Initialize  $S$

    Choose  $A$  from  $S$  using policy derived from  $Q$  (e.g.,  $\varepsilon$ -greedy)

    Loop for each step of episode:

        Take action  $A$ , observe  $R, S'$

        Choose  $A'$  from  $S'$  using policy derived from  $Q$  (e.g.,  $\varepsilon$ -greedy)

$$Q(S, A) \leftarrow Q(S, A) + \alpha [R + \gamma Q(S', A') - Q(S, A)]$$

$S \leftarrow S'; A \leftarrow A'$ ;

    until  $S$  is terminal