**Algorithm 3** Adaptive $\tau$ scheduler

*// We omit the client's index $k$ in the notation.*

**Input**: Scaling factor of previous round is $\tau^{(t-1)}$, performance from the previous round $p^{(t-1)}$, performance from the current round $p^{(t)}$, update patience $patience$, update direction $s$, number of consecutive improved rounds $r_{good}$, number of consecutive deteriorated rounds $r_{bad}$, multiplicative factor $\rho_\tau$, minimum scaling factor $\tau_{min}$, and maximum scaling factor $\tau_{max}$

**Output**: Scaling factor of current round $\tau^{(t)}$

**if** $p^{(t)} \geq p^{(t-1)}$ **then**
  $r_{good} \leftarrow r_{good} + 1$
  $r_{bad} \leftarrow 0$
**else**
  $r_{bad} \leftarrow r_{bad} + 1$
  $r_{good} \leftarrow 0$
**end if**
**if** $r_{good} > patience$ **then**
  $\tau'^{(t)} \leftarrow \rho_\tau^s \cdot \tau^{(t-1)}$
  $r_{good} \leftarrow 0$
**else if** $r_{bad} > patience$ **then**
  $s \leftarrow (-1) \cdot s$
  $\tau'^{(t)} \leftarrow \rho_\tau^s \cdot \tau^{(t-1)}$
  $r_{bad} \leftarrow 0$
**else**
  $\tau'^{(t)} \leftarrow \tau^{(t-1)}$
**end if**

$$\tau^{(t)} \leftarrow \begin{cases} \tau_{min} & \text{if } \tau'^{(t)} \leq \tau_{min}, \\ \tau'^{(t)} & \text{if } \tau_{min} < \tau'^{(t)} \leq \tau_{max}, \\ \tau_{max} & \text{if } \tau'^{(t)} > \tau_{max}. \end{cases}$$