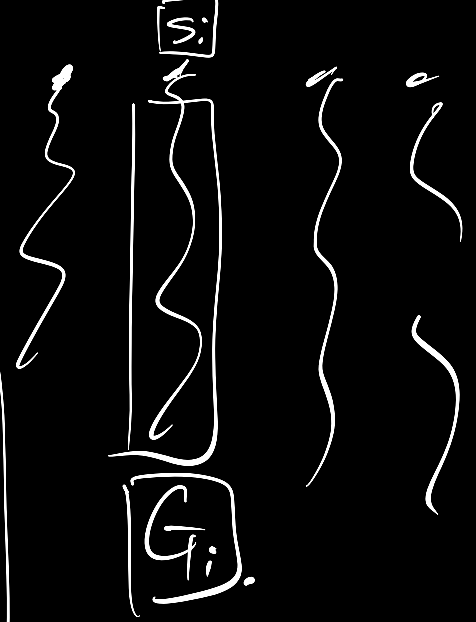
$$\underset{\theta}{\arg\min}\ \mathbb{E}_{s,G}\left[\left(\phi^T(s)\theta - G\right)^2\right].$$

$$\| \qquad V^\pi(s). \qquad \|$$

$$\mathbb{E}_{s,G}\left[\left(\phi^T(s)\theta - \mathbb{E}[G|s]\right)^2\right]$$

$$+\ \mathbb{E}_{s,G}\left[\left(\mathbb{E}[G|s] - G\right)^2\right].$$



$\{(s_i, G_i)\}$

$$V^\pi(s) \approx \phi(s)^T\theta.$$

V_{k+1} (V_k)

$\downarrow$

$$V = \mathcal{T}^\pi V'$$

$\Downarrow$

$$V(s) = (\mathcal{T}^\pi V')(s)$$

$$= \mathbb{E}_{\substack{r \sim R(s,\pi) \\ s' \sim P(\cdot|s,\pi)}}\left[r + \gamma \cdot V'(s')\right].$$

$$= \mathbb{E}\left[r + \gamma V'(s') \,\middle|\, s\right].$$

$$= \underset{f \in \mathbb{R}^S}{\operatorname{argmin}} \mathbb{E}\left[\left(f(s) - (r + \gamma V'(s'))\right)^2\right].$$

stop-grad

$$\approx \underset{V_\theta}{\operatorname{argmin}} \frac{1}{T} \sum_{t=1}^{T} \left(V_\theta(s_t) - (r + \gamma V_\theta(s_{t+1})) \right)^2.$$

$$V_\theta(s_{t+1}) = V_{\theta'}(s') = \phi(s')^T \theta'$$

SGD: $\theta \leftarrow \theta - \alpha \left(V_\theta(s_t) - (r_t + \gamma \underline{V_\theta}(s_{t+1})) \right) \nabla V_\theta(s_t)$

TD(0) w/ FA. $\theta \leftarrow \theta - \alpha \left(V_\theta(s_t) - r_t - \gamma V_\theta(s_{t+1}) \right)$

$$\left(\nabla V_\theta(s_t) - \cancel{\nabla V_\theta(s_{t+1})} \right)$$

Δ

$(ax)' = a.$

$\nabla_\theta(\theta^T x) = x.$