CHICKEN-OR-EGG

\[ \text{LEARNER} \xrightarrow{\text{DISTRIBUTION}} \]

ALGORITHM

1. Start with some policy \( \pi \)
2. Rollout policy \( \pi \)
3. See state it visits \( s \) \( \sim \) \( \mathcal{D}_\pi(s) \)
4. Train on new data.

\[ \text{Query Expert} \]
\[ \alpha^* \leftarrow \pi^*(s) \]
**Proposed Algorithm**

Init: Random policy \( \pi_0 \)

for \( i = 0 \ldots (N-1) \)

- Collect data \( d_i \) of \( \pi_i \) visits
  
  \( S \sim d_i \)

- Query interactive expert \( \pi^* \): \( \pi^*(S) \rightarrow a^* \)

- Train \( \pi_{i+1} \) on \( (s, a^*) \)
DAGGER Proof

\[ E \prod_{s \sim d_{\pi_c}} 1(\pi(s) \neq \pi^*(s)) \text{ is small} \]

Is there a round \( i \) where \( l_i(\pi_i) \) is small,

\[
\min_{i=1, \ldots, N} l_i(\pi_i) \leq \frac{1}{N} \sum_{i=1}^N l_i(\pi_i) \leq \left[ \frac{1}{N} \sum_{i=1}^N l_i(\pi_i) - \frac{1}{N} \min_{\pi \in \Pi} \sum_{i=1}^N l_i(\pi) \right] + \frac{1}{N} \min_{\pi \in \Pi} \sum_{i=1}^N l_i(\pi) \]

\[
\lim_{N \to \infty} \frac{1}{N} \text{Reg}(\cdot) \to 0 \quad \Rightarrow \quad \lim_{N \to \infty} \frac{1}{N} \min_{\pi \in \Pi} \sum_{i=1}^N l_i(\pi) = 0 \leq \varepsilon
\]