

1) Set up minimax algorithm:

$$V_{\max, \min} = \begin{cases} \text{Utility}(s) & \text{IsEnd}(s) \\ \text{Eval}(s) & d=0 \\ \max_{a \in \text{Actions}(s)} V_{\max, \min}(\text{Succ}(s, a), d) & \text{Player} = \text{Pacman} \\ \min_{a \in \text{Actions}(s)} V_{\max, \min}(\text{Succ}(s, a), d) & \text{Player} = \text{Ghost (not last)} \\ \min_{a \in \text{Actions}(s)} V_{\max, \min}(\text{Succ}(s, a), d-1) & \text{Player} = \text{Last Ghost} \end{cases}$$

$a_0 \rightarrow$
 $a_1 - a_{n-1} \rightarrow$
 $a_n \rightarrow$

3a)

$$V_{\text{exptmax}} = \begin{cases} \text{Eval}(s) & d=0 \\ \text{Utility}(s) & \text{IsEnd}(s) \\ \max_{a \in \text{actions}(s)} V_{\text{exptmax}}(\text{succ}(s, a), d) & \text{Player} = \text{Pacman } (a_0) \\ \text{average}_{a \in \text{actions}(s)} V_{\text{exptmax}}(\text{succ}(s, a), d) & \text{Player} = \text{Ghost, not last } (a_1 - a_{n-1}) \\ \text{average}_{a \in \text{actions}(s)} V_{\text{exptmax}}(\text{succ}(s, a), d) & \text{Player} = \text{Ghost Last } (a_n) \end{cases}$$

- Just taking average value since all agent moves have equal probability.