Here is the recurrence for $V_{minmax}(s, d)$:

$$V_{minmax}(s,d) = \begin{cases} Utility(s), & IsEnd(s) \\ Eval(s), & d = 0 \\ \max_{a \in Actions(s)} V_{minmax}(Succ(s,a), d), & Player(s) = Pac\ Man \\ \min_{a \in Actions(s)} V_{minmax}(Succ(s,a), d), & Player(s) = ghost \\ \min_{a \in Actions(s)} V_{minmax}(Succ(s,a), d-1), & Player(s) = last\ ghost \end{cases} \quad (1)$$

Here is the recurrence for $V_{exptmax}(s, d)$:

$$V_{exptmax}(s,d) = \begin{cases} Utility(s), & IsEnd(s) \\ Eval(s), & d = 0 \\ \max_{a \in Actions(s)} V_{exptmax}(Succ(s,a), d), & Player(s) = Pac\ Man \\ \sum_{a \in Actions(s)} \pi_{ghost}(s,a) V_{exptmax}(Succ(s,a), d), & Player(s) = ghost \\ \sum_{a \in Actions(s)} \pi_{ghost}(s,a) V_{exptmax}(Succ(s,a), d-1), & Player(s) = last\ ghost \end{cases} \tag{2}$$

We can also get:

$$V_{exptmax}(s,d) = \begin{cases} Utility(s), & IsEnd(s) \\ Eval(s), & d = 0 \\ \max_{a \in Actions(s)} V_{exptmax}(Succ(s,a), d), & Player(s) = Pac\ Man \\ \frac{\sum_{a \in Actions(s)} V_{exptmax}(Succ(s,a), d)}{len(Actions(s))}, & Player(s) = ghost \\ \frac{\sum_{a \in Actions(s)} V_{exptmax}(Succ(s,a), d-1)}{len(Actions(s))}, & Player(s) = last\ ghost \end{cases} \tag{3}$$

Question 4.b, Pac-Man, CS221

My evaluation function:

f = getScore() + 1 / remainingFood + 1 /remainingCapsules + 10 / closetFoodDistance + 50 / closestCapsuleDistance + 150 / closestScaredGhost

High-level motivation:

- Try to avoid normal ghost, get closer to scared ghost.
- Try to get closer to food and capsules.
- Try to decrease food and capsules.

I've tried the following features:

- Remaining food
- Remaining capsules
- Closest ghost distance
- Closest food distance
- Closest capsule distance
- Closest scared ghost distance

Surprisingly, "Closest scared ghost distance" feature accounts for more weights than other distances. Also, "Closest ghost distance" doesn't work well, this seems due to the ghosts including scared and not scared ones.