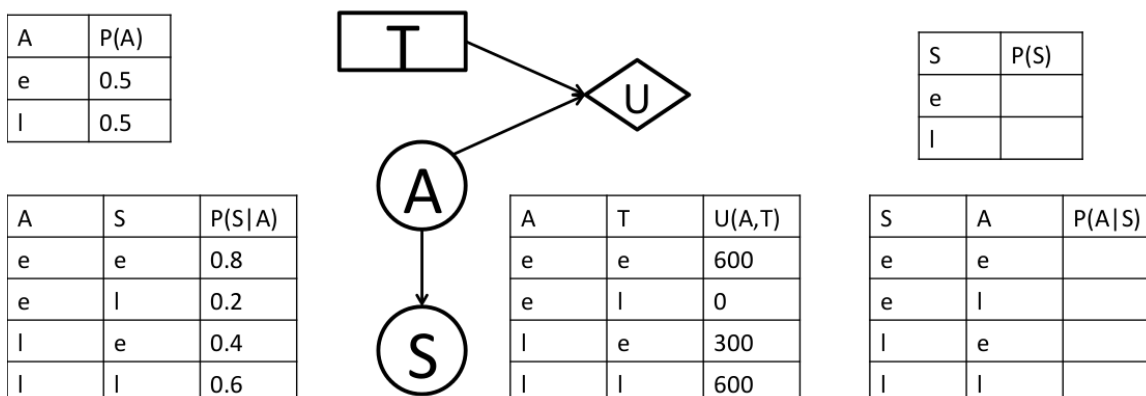


Please use the \LaTeX template to produce your writeups. See the Homework Assignments page on the class website for details. Hand in via gradescope.

1 Decision Networks and VPI



Your parents are visiting you for graduation. You are in charge of picking them up at the airport. Their arrival time (A) might be early (e) or late (l). You decide on a time (T) to go to the airport, also either early (e) or late (l). Your sister (S) is a noisy source of information about their arrival time. The probability values and utilities are shown in the tables above.

- Fill in the above empty table entries by computing $P(S)$, $P(A|S)$ and then compute the quantities below.

S	$P(S)$
e	$0.8 * 0.5 + 0.4 * 0.5 = 0.6$
l	$0.2 * 0.5 + 0.6 * 0.5 = 0.4$

S	A	$P(A S)$
e	e	$(0.8 * 0.5) / 0.6 = 0.667$
e	l	$(0.4 * 0.5) / 0.6 = 0.333$
l	e	$(0.2 * 0.5) / 0.4 = 0.25$
l	l	$(0.6 * 0.5) / 0.4 = 0.75$

(a) $EU(T = e) = \sum_a P(a) * EU(a, T = e) = 0.5 * 600 + 0.5 * 300 = 450$

(b) $EU(T = l) = \sum_a P(a) * EU(a, T = l) = 0.5 * 0 + 0.5 * 600 = 300$

(c) $MEU(\{\}) = \max(EU) = 450$

(d) Optimal action with no observations: **Go early.**

- Now we consider the case where you decide to ask your sister for input.

(a) $EU(T = e | S = e) = \sum_a P(a) * EU(a, T = e, s = e) = 0.667 * 600 + 0.333 * 300 = 500$

- (b) $EU(T = l|S = e) = \sum_a P(a) * EU(a, T = l, S = e) = 0.667 * 0 + 0.333 * 600 = 200$
- (c) $MEU(\{S = e\}) = \max(EU|S = e) = 500$
- (d) Optimal action with observation $\{S = e\}$: **Go early**
- (e) $EU(T = e|S = l) = \sum_a P(a) * EU(a, T = e, S = l) = 0.25 * 600 + 0.75 * 300 = 375$
- (f) $EU(T = l|S = l) = \sum_a P(a) * EU(a, T = l, S = l) = 0.25 * 0 + 0.75 * 600 = 450$
- (g) $MEU(\{S = l\}) = \max(EU|S = l) = 450$
- (h) Optimal action with observation $S = l$: **Go late**
- (i) $VPI(S) = (0.6 * 500) + (0.4 * 450) - 450 = 30$