hide notes

A Graphical Version of Monty Hall

Draw a table of the joint probabilities of the hidden vs. observed variable for Monty Hall, in which the vertical columns are the three possible hidden states ($\delta = A$, $\delta = B$, $\delta = C$) and the horizontal rows are the two possible observed states (we assume that you initially picked door A, so they are B^- and C^-).

- In each cell in the table write the joint probability of that specific pair of states.
- Finally, circle the two regions of the table that constitute the Venn diagram subset and superset whose ratio defines the conditional probability $p(\delta = A|B^-)$.

Observational Independence, Take 3

Consider the following argument: "If the likelihood of an event *obs* remains constant regardless of whether hypothesis *h* is true or not, then observing *obs* will not change my original probability estimate of *h*" i.e. $p(h|obs) = p(h)$, applied to the hypothesis *h*: door A (the one you chose) contains the prize; and the observation *obs*: Monty opens another door, showing you it's empty.

Assess whether this argument is valid and applies to this case:

1. The argument is valid for this case, so $p(h|obs) = p(h)$.
2. The argument is not valid for this case, so $p(h|obs) \neq p(h)$.
3. insufficient data.

Summation II

Assume that a random variable B has disjoint possible values $\{b_1, \ldots, b_n\}$. Which of the following expressions if any are equal?

1. $\sum_{i=1}^{n} p(A|B = b_i)$.
2. $\sum_{i=1}^{n} p(A, B = b_i)$.
3. $\sum_{i=1}^{n} p(A|B = b_i)p(B = b_i)$.
4. $\sum_{i=1}^{n} \frac{p(A)}{p(B=b_i)}$.
5. $\sum_{i=1}^{n} p(A)p(B = b_i)$.
6. $p(A)$
7. $p(B)$

Using Posteriors as Priors

A scientist first observes an event X_1 then another event X_2, and wishes to calculate the posterior probability of a hypothesis $p(H|X_1, X_2)$. Since she already calculated the posterior based on her first observation, i.e. $p(H|X_1)$, she proposes to speed up the calculation of $p(H|X_1, X_2)$ by simply using $p(H|X_1)$ as the prior and X_2 as the *obs*. Choose the statement that best characterizes the validity of this proposal.

1. Yes, this is valid, i.e. it will always give the same result as using the original prior and X_1, X_2 as the *obs*.
2. No, this is never valid.
3. It depends.