Summary of Tableau 8, Part 2

Conditional probability
Additivity; the theorem of total probability

$$\mathbf{P}(H \mid A) = \mathbf{P}(H \cap A) / \mathbf{P}(A)$$

- *Additivity* (simplest case): if A and A^c are both events of positive probability then, for any event H,

$$\mathbf{P}(H) = \mathbf{P}(H \mid A)\,\mathbf{P}(A) + \mathbf{P}(H \mid A^c)\,\mathbf{P}(A^c)$$

- *Total probability* (general case): if $\{ A_j, j \geq 1 \}$ partitions Ω into a finite or countably infinite collection of events of positive probability then, for any event H,

$$\mathbf{P}(H) = \sum_j \mathbf{P}(H \mid A_j)\,\mathbf{P}(A_j)$$

  - Corollary: *Bayes's rule for events* specifies *a posteriori* probabilities via

$$\mathbf{P}(A_k \mid H) = \frac{\mathbf{P}(H \mid A_k)\,\mathbf{P}(A_k)}{\sum_j \mathbf{P}(H \mid A_j)\,\mathbf{P}(A_j)}$$