

Atomic Event

Has the form random var = value

Ex) Cavity = false

Can build up propositions from atomic events

Ex) Cavity = false \wedge Toothache = true

Prior Probabilities
(Unconditional)

- probability in the absence of additional info

write as

$$P(a)$$

Ex) Might write $P(\text{Cavity} = \text{true}) = 0.1$
or $P(\text{Cavity}) = .1$

IF write in bold face:

$$\underline{P}(\text{Weather}) = \langle .7, .2, .08, .02 \rangle$$

↑ ↑ ↑ ↑
sunny rainy cloudy snowy

mean probability distribution

Joint distributions

$$\underline{P}(\text{Weather, Cavity})$$

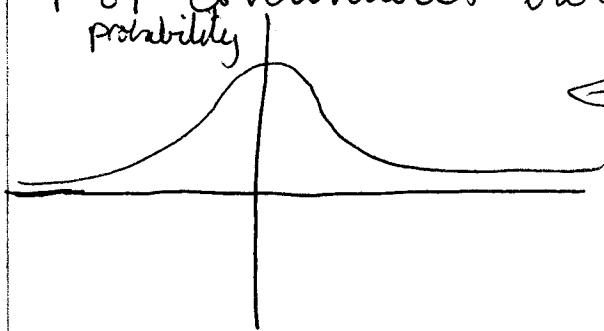
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$$\langle .07, \dots \rangle$$

↑
 $\langle \text{sunny, cavity} = \text{true} \rangle$

← vectors of ^{probability values} ~~atomic events~~
for ~~the~~ ~~all~~ ~~possible~~ ~~values~~ of all random variable values

For continuous variable use a density ϕ^n



← bell curve at 0

Conditional Probability

$P(a|b)$ means the probability of a given b

Defined as:

$$P(a|b) = \frac{P(a \cap b)}{P(b)}$$

$$P(b) > 0$$

Ex) $P(\text{Late for Class} | \text{Sleep In})$

$P(\text{Sleep In}) = 0.5$

$P(\text{Late for Class} | \text{Sleep In}) = 0.3$

$= \frac{0.3}{0.5}$

$= 0.6$

$= 0.6$

can also write as

$$P(a \cap b) = P(a|b)P(b)$$

or in terms of distributions

$$P_{\sim}(x, y) = P_{\sim}(x|y)P_{\sim}(y)$$

↑ pointwise mult.

~~Notes~~

Axioms of Probability

① $0 \leq P(a) \leq 1$

② $P(\text{true}) = 1$
 $P(\text{false}) = 0$

③ $P(a \cup b) = P(a) + P(b) - P(a \cap b)$

Some things that can be derived

$$P(A \cup \neg A) = P(A) + P(\neg A) - P(A \cap \neg A)$$

$$P(\neg A) = P(A) + P(\neg A)$$

$$P(\neg A) = 1 - P(A)$$

→ false so 0