Bayesian Inference MRN063

<u>Product Rule</u> $$P(qr|p) = \frac{P(r|qp)\,P(q|p)}{P(q|qp)}$$

Bayes Thm for prop q given old data H and new data p

<u>step 1</u> use product rule to write $P(pq|H)$ two different ways (interchanging roles of q and p)

<u>step 2</u> rearrange to get

$$\frac{P(q|pH)\,P(q|qH)}{P(q|H)\,P(p|qH)} = \frac{P(p|pH)}{P(p|H)}$$

<u>step3</u> now note $P(q|qH) = P(p|pH) = 1$ and re-arrange

$$P(q|pH) = \frac{P(q|H)\,P(p|qH)}{P(p|H)}$$

$$\frac{(\text{prior info.})\,(\text{likelihood})}{(\text{null})}$$

$q = m$
$p = d_1$
$H = d_0$
} more usual names

$$P(m|d_1 d_0) = \frac{P(m|d_0)\,P(d_1|m\,d_0)}{P(d_1|d_0)}$$

$m = 1, 2 \ldots 6$
$d_0 = \text{odd}/\text{even}$
$d_1 = <4$

$$P(1, \text{odd} <) = P(1|\text{odd})\,P(<|1\,\text{odd})\,/\,P(<|\text{odd}) =$$
$$\tfrac{1}{2} = \tfrac{1}{3} \quad 1 \;/\; \tfrac{2}{3} = \tfrac{1}{2}$$

$P_{AB} = P(A) / P(B|A)$

$P(qr|p) = \cancel{P(q|p)\, P(r|qp)} \,/\, P(q/qP)$

$P(qr|p) = P(r|qP)\, P(q|P) \,/\, P(q|qP)$

$P_{AB} = P_B P_{A|B} = P_A P_{B|A}$

$P(qr|p) = P(q|p)\, p(r|qp)$

$P(pq|H) = P(p|H)\, P(q|pH)$

$P(pq|H) = P(q|H)\, P(p/qH)$

$P(q, pH) = \frac{P(q|H)\, P(p|qH)}{P(p|H)}$

$P_{AC} = P_C P_{A|C} = P_A P_{C|A}$

$P_{BC} = P_C P_{B|C} = P_B P_{C|B}$

$$P_{AB} = P_A \, P_{B|A} = P_B \, P_{A|B}$$

$$P_{XY|Z} \stackrel{?}{=} P_{X|Z} \, P_{Y|XZ}$$

$$P_{XYZ} = P_{XZ} \, P_{Y|XZ} = P_Y \, P_{XZ|Y}$$

$$= P_Z \, P_{X|Z} \, P_{Y|XZ} = P_Y \, P_{Z|Y} \, P_{Z|XY}$$

Bill,

Here is a xerox copy for you of the Adirondack fission track paper I mentioned.

Maryann Malinconico