<u>25-11-2008</u>

* prob: wrt process w/ uncertain outcome

* Sample space: Set of all possible outcomes

* Prob weight assigned to each outcome

* Event: Subset of outcomes

* Prob of event:

$$P(E) = \sum_{x \in E} P(x)$$

- what if $P(E) = P(E|F)$?

- condition F irrelevant to prob of E

- E is <u>independent of F</u>.

* conditional prob

$$P(E \mid F) = \frac{P(E \cap F)}{P(F)}$$

* $P(E)$: (unconstrained) prob of E

* $P(E \mid F)$: Prob of E under condition F

• Def: E independent of F

$$P(E) = P(E \mid F)$$

$$= \frac{P(E \cap F)}{P(F)}$$

$$\Leftrightarrow \quad P(E \cap F) = P(E)\,P(F)$$

True also when $P(F) = 0$

Theorem 5.5

$$p(E_1 \cap E_2 \cap \cdots \cap E_{i-1} \cap E_i)$$

$$= p(E_1 \cap E_2 \cdots \cap E_{i-1})\, p(E_i)$$

$$= p(E_1 \cap \cdots \cap E_{i-2})\, p(E_{i-1})\, p(E_i)$$

$$\cdots\cdots$$

$$= p(E_1)\, p(E_2) \cdots p(E_{i-1})\, p(E_i)$$

$E_i : X_i = a_i$

$$p(x_1 = a_1, x_2 = a_2, \ldots, x_n = a_n)$$

$$= p(x_1 = a_1)\, p(x_2 = a_2) \cdots p(x_n = a_n)$$

Theorem 5.7

S: Sample space $\quad |S| = 2^n$

F: Fixed sequence for $1, 2, \ldots, i-1$

$|F| = 2^{n-(i-1)}$

E: H at stage i

$E \cap F$: Fixed sequence for $1, 2, \ldots, i$

$|E \cap F| = 2^{n-i}$

$$P(E|F) = \frac{P(E \cap F)}{P(F)}$$

$$= \frac{2^{n-i}/2^n}{2^{n-(i-1)}/2^n}$$

$$= \frac{1}{2}$$