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Distribution.

- Random Variable,

$$X \in \{0, 1\}$$

Variable

↑
value

两个随机变量.

$$X \\ \{0, 1\}$$

$$Y \\ \{0, 1, 2\}$$

$X \backslash Y$	0	1	2
0	0.2	0.2	0
1	0	0.1	0.5

Joint Distribution $P(X, Y)$

若已知 $X=0$

$$P(Y | X=0) = \frac{P(0, Y)}{\sum_{Y=0}^2 P(0, Y)}$$

↑
conditional distribution.

如果有 n 个变量, 每个有 2 个值,
一共有 2^n 个状态, 指数增长.

stats VS Machine Learning

complexity

direct calculate

efficient

两种类: Bayes net work & Markov

Independence between variables.

Model 和 Distribution 的区别

Normal Distribution

$$P(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$$

x : example
 μ, σ : parameters

改变, μ 和 σ 得到 parametric family

Model 指的是这个 family.

A Graphical ^{model} is use graph to represent the family

How can we use graph to represent the family ?

Graph

$$P(A, B, C) = P(A) P(B|A) P(C|A)$$

factorization.

↙ not always true here, $B \perp C | A$.

