Note Title 3/7/2011

Q: What is the marginal W.A of X ?

A:

Q: How to compute the marginal distribution of Y ?

Ans:

The computation of the sum is not easy.

Ex: $P(Y=0) =$

$P(Y=1) =$

$\boxed{\text{* The geometric series formulas}}$

* But the concept is straightforward

Q: $P(X^2+Y^2 \le 4)$

Ans:

## Independence

Two (marginal) R.Vs $X$ and $Y$ are independent. If their joint weight assignment is the product of the marginal probabilities. That is

Comparison, if not independent

Note: Relate it to the tree/table method we have learned so far.

* Discrete 2-dim R.V.s.

$$S_{XY} = \left\{ \begin{matrix} (-1,0) & (-1,1) & \cdots \\ (0,0), & (0,1) & \\ (1,0), & \cdots & \end{matrix} \right.$$

all grid points $\}$.

The Joint W.A is specified by

* From joint distribution to marginal distri

$$P(Y=h) = \sum_{k=-\infty}^{\infty} p_{k,h}$$

summing over uninterested variable

focusing on the column

* Expectation of a function of a 2-dim R.V

$$E(f(X,Y))$$

say $f(x,y) = x^2 + y^2 + xy$

$E(X^2 + Y^2 + XY)$

B

Q: $E(U(1-X-Y))$

$$U(1-x-y) = \begin{cases} 1 & \text{if } 1-x-y \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Ans

HW10Q8

$X$ is geometric with $p$.

⟶ The marginal distribution

Given $X = x_0$, $Y$ is a Poisson with

$\alpha = x_0$

⟶ The conditional distribution

Q: $E(X) = ?$

Ans:

Q: $E(Y) = ?$

Ans: We can compute either

①

Or

②

The difference is how you compute the weighted average, in a "① Column by column" way or "② block by block" way

from ②

Summary: For 2-dim R.Vs, there are many ways of "counting the weights" Some are easier than the others.

* Conditional distribution for discrete variables.

$P(X=k \mid Y=h)$ focusing on the $h$-th col.

Exercise: $P(Y=h \mid X=k)$

# Summary

Note Title 3/9/2011

* Discrete 2-dim R.Vs.

$S_{XY} = \{\text{all grid points}\}$

W.A: $p_{k,h}$ (2-dim) <u>joint pmf</u>

Expetation $E(g(X,Y))$

$=$

Marginal pmf $P(X=k) = p_k = \sum_{h=-\infty}^{\infty} p_{k,h}$.

summing over the row of interest.

$P(Y=h) = p_h = \sum_{k=-\infty}^{\infty} p_{k,h}$

Conditional pmf $p_{k|Y=h} = P(X=k \mid Y=h)$

Conditional expectation ?

* Continuous 2-dim Random variables.

$S_{XY} = \{$ all pairs of real numbers

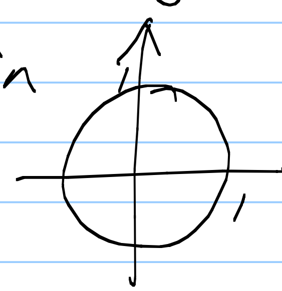
$(-\infty, \infty) \times (-\infty, \infty)$

say $(0.1, 1001.5)$, $(\pi, e)$ . . . . .

The joint W.A is specified by

Ex: HW11Q3. A joint pdf is given as follows

$$f_{XY}(x,y) = \begin{cases} k & \text{if } (x,y) \text{ in} \\ 0 & \text{otherwise.} \end{cases}$$



Q: find the $k$ value.

Q: Find $P(X>0, Y>0)$ ?

Ans :

Ex: $f_{XY}(x,y) = \begin{cases} kxy & \text{if } 0<x<1 \text{ \& } 0<y<1 \\ 0 & \text{otherwise} \end{cases}$

is a joint pdf, ① find $k$ value.

② $P(X+Y \leq 1)$

Ans: ①

Q2:

$P(X+Y \leq 1) =$

Exercise $P(X+Y \leq 1.5) = ?$

Ans: