2/14/19 p1

ICLICK 2

1000000 WIDGETS $p(\text{BAD}) = .001$
1000 BAD

FROM 5 WIDGETS, EXPECTED # BAD

$= 5 \times .001 = .005$

RANDOM VAR: OBSERVED # BAD $\alpha = .005$

$$p(k) = \cancel{\frac{k!}{\alpha^k}} \frac{\alpha^k}{k!} e^{-\alpha}$$

BOOK 3.5.1a p135

WE KNOW $(a+b)^n = \sum_{k=0}^{n} \binom{n}{k} a^k b^{n-k}$

eg $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$(a+b+c)^n$?

$$(a+b+c)^n = ((a+b)+c)^n = \sum_{k=0}^{n} \binom{n}{k} \underbrace{(a+b)^k}_{\sum_{i=0}^{k} \binom{k}{i} a^i b^{k-i}} c^{n-k}$$

$$(a+b+c)^n = \sum_{k=0}^{n} \binom{n}{k} \sum_{i=0}^{k} \binom{k}{i} a^i b^{k-i} c^{n-k}$$

$$= \sum_{k=0}^{n} \sum_{i=0}^{k} \underbrace{\binom{n}{k}\binom{k}{i}} a^i b^{k-i} c^{n-k}$$

$$\frac{n!}{k!(n-k)!} \frac{k!}{i!(k-i)!} = \frac{n!}{(n-k)!\,i!\,(k-i)!}$$

WE'RE SUMMING OVER EXPONENTS ON

a, b, c THAT SUM TO n

$$= \sum_{\substack{p,q,r=0 \\ p+q+r=n}}^{n} \frac{n!}{p!\,q!\,r!} a^p b^q c^r$$

3.88a $P(\text{BAD}) = p$

LOOKS BAD

$P(\text{BAD FAILS TEST}) = a$

$P(\cancel{\text{LOOKS}}\ \text{ITEM LOOKS BAD}) = pa$

BECAUSE GOOD ITEMS ALWAYS PASS.

#TESTS UNTIL SEE BAD ITEM:

GEOM DIST PARAM $= ap$.

$P($1ST BAD ITEM WE SEE IS ON K+1 TEST:

$$(1-ap)^k(ap)$$

(b) $P(\text{GOOD}) = 1-p$

$P(\text{BAD + KNOWN BAD}) = \cancel{p(1-a)}\ pa$

$P(\text{BAD + DON'T KNOW}) = p(1-a)$

$P(\text{LOOKS GOOD}) = 1-p+p(1-a)$

$$P(\text{LOOKS GOOD BUT BAD}) = \frac{p(1-a)}{1-p+p(1-a)}$$

A : EVENT THAT SIGNAL PRESENT

B : EVENT THAT WE GOT K PHOTONS

$P(B|A)$ = POISSON ω PARAM λ_1 $\frac{\lambda_1^K}{K!} e^{-\lambda_1}$

$P(B|A')$ = POISSON λ_0 $\frac{\lambda_0^K}{K!} e^{-\lambda_0}$

$P(A) = p$. GIVEN

$P(A|B)$ = WE WANT .

$P(A|B)\,P(B) = P(A \,\&\, B) = P(B|A)\,P(A)$

NEED $P(B)$.

$$P(B) = \underbrace{\underbrace{P(B|A)\,P(A)}_{P(B \& A)} + \underbrace{P(B|A')\,P(A')}_{P(B \& A')}}_{P(B)}$$

BAYES

$$P(A|B) = \frac{P(B|A)\,P(A)}{P(B|A)P(A) + P(B|A')\,P(A')}$$

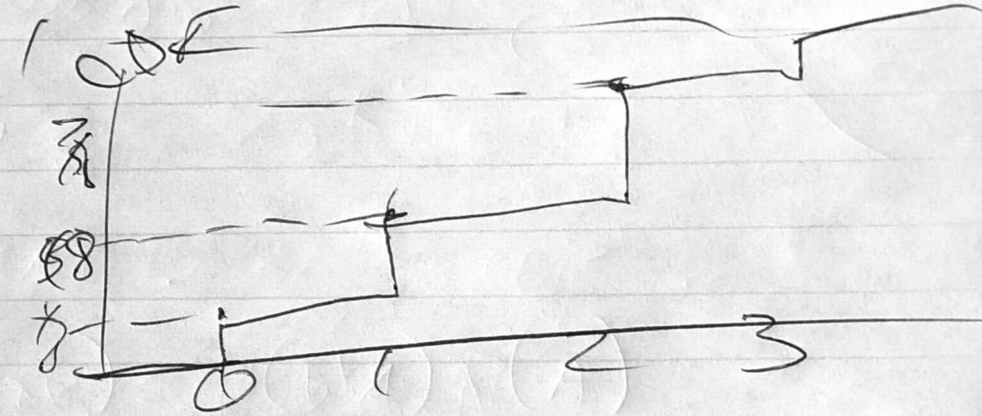
CHAP 4

CDF = CUMUL. DIST. FN.

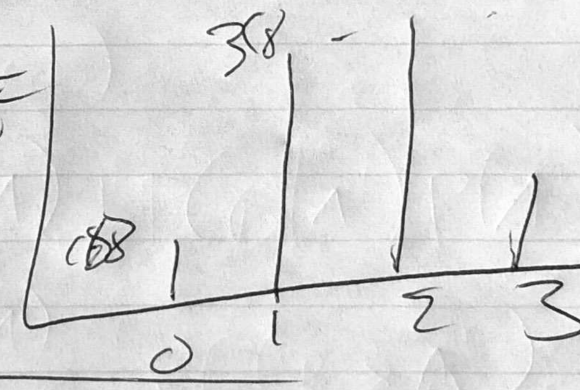
$P(X \leq x_0)$:

e.g. X: # HEADS FROM 3 TOSSES FAIR COIN.

CDF
0 : 1/8
1 : 1/2
2 : 7/8
3 : 1

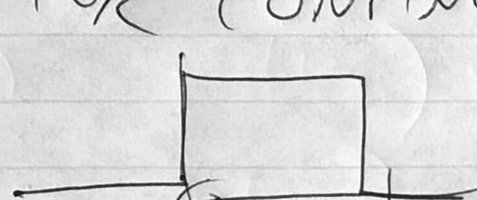


PMF



CDF ALSO GOOD FOR CONTINUOUS FN.

$$p(x) = \begin{cases} 1 & \text{if } 0 \leq x \leq 1 \\ 0 & \text{else} \end{cases}$$



CDF