

2/21/2024

Discrete Distributions

Bernoulli, Binomial, Hypergeometric
w/rep w/out rep.



draw n balls
or
draw until
 k R s

Geometric, Negative Binomial
 $k=1$ $k > 1$

Poisson rare events

w/rep $P(R) = \frac{r}{r+g} \approx .001$ small.

Midterm

In class part

4 pages of ^{your} notes
calculator

closed book, no computer,
no phone

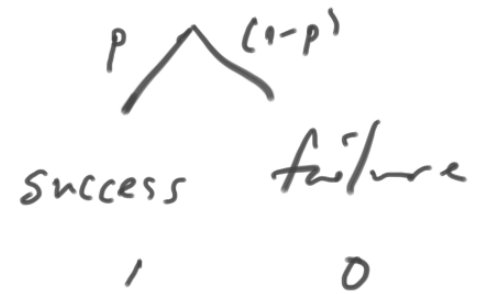
Take-home part

use computer.

Quiz

returned Monday.

Bernoulli Distribution.



Let $X = \#$ of "successes"
in one trial of a
random experiment.

p m.f $P(X=x) = p^x (1-p)^{1-x} \quad x=0, 1$

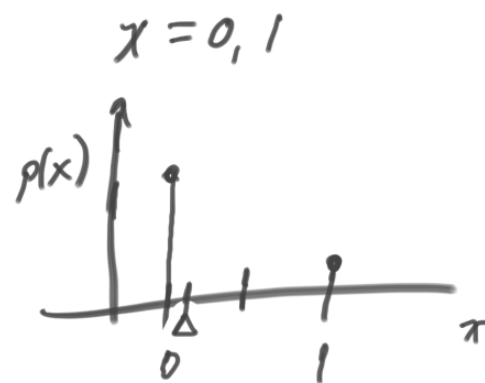
R d binom (x, p)

Ex: inspect one chip from a shipment of computer chips
 $X = \#$ of defectives.

Let $p = P(\text{defective}) = .01$

$$p(x) = (.01)^x (.99)^{1-x}$$

$$p(1) = .01$$



Expected value.

$$\mu = E[X] = \sum_x x \cdot p(x)$$

$$= \sum_{x=0}^{\infty} x [p^x (1-p)^{1-x}]$$

$$= 0 [p^0 (1-p)^1] + 1 [p^1 (1-p)^0]$$

$$= 0 + p$$

$$= p.$$

Variance

$$V(X) = E[(X - \mu)^2]$$

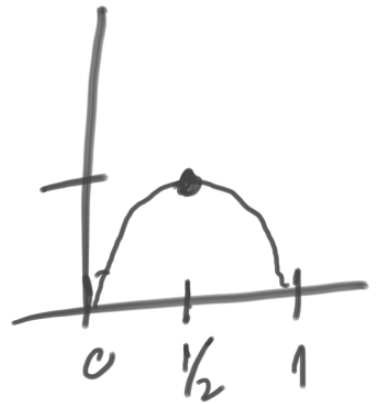
$$= E[X^2] - \mu^2$$

$$= \sum_x x^2 p(x) - \mu^2$$

...

$$= 0 + p - p^2 = p(1-p) \quad \checkmark$$

$$SD(X) = \sqrt{p(1-p)}$$



Midterm

Wed

2:00 pm

3:15 pm

4 questions.

15 mins per problem.

Homework solutions

No R in class.

Random Experiment.

Focus Ch. 2, 3.

Probability.

Counting. Product Rule, Perm, Comb.

Prob. Axioms, Prob. Rules. Mutually exclusive.

Additive Rule
Multiplication Rule



Venn Diagrams

Conditional Prob.

Indep

Random Variable
 X p.m.f.

$E[X]$

$V(X)$