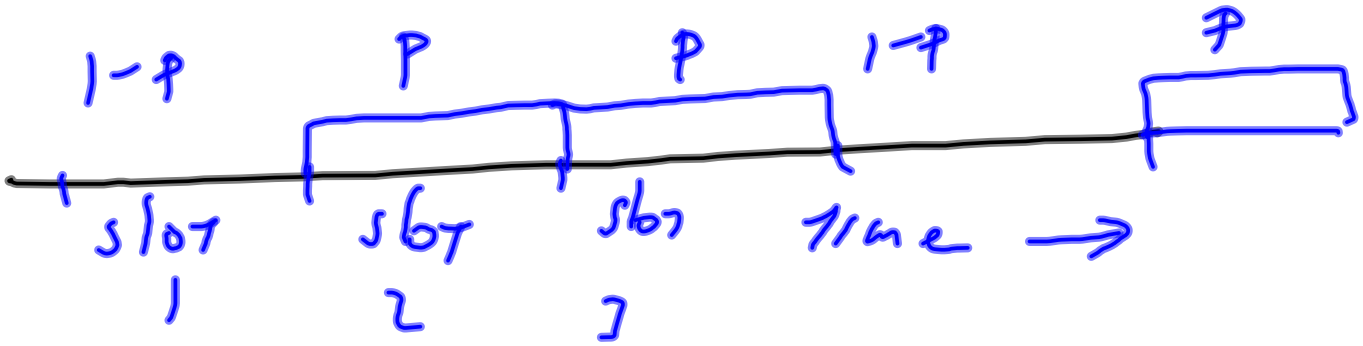
Stony Brook University

the College of Engineering and Applied Sciences

ESE/CSE 346
Probability Distributions

Instructor: Prof. Thomas Robertazzi

Electrical & Computer Engineering



Geom

Bernoulli
Process

Geometric Distribution

$$\boxed{P(\text{1st ARRIVAL is in slot } i)}$$

$$= P(i-1 \text{ empty slots})\, P(\text{one packet in } i\text{th slot})$$

$$= \underbrace{(1-p)(1-p)\cdots(1-p)}_{i-1}\, p = \boxed{(1-p)^{i-1}\, p}$$

$$n = \sum_{i} i\,p(i) = \sum_{i=1}^{\infty} i\,p(1-p)^{i-1}$$

Avg # steps till 1st arrival

$$p\sum_{i=1}^{\infty} i(1-p)^{i-1}$$

$$= \frac{p}{1-p}\sum_{i=1}^{\infty} i(1-p)^{i}$$

$$= \frac{p}{1-p}\sum_{i=0}^{\infty} i(1-p)^{i}$$

$$\sum_{n=0}^{\infty} n x^n = \frac{x}{(1-x)^2}$$

$0 \le x \le 1$

$$\frac{p}{1-p}\cdot\frac{1-p}{p^2} = \frac{1}{p}$$

p	$\frac{1}{p}$
.1	10 steps
.2	5
.5	2
.9	1.1
1.0	1.0

Binomial Distribution

A N A A N

$p(1-p)\,p\,p\,(1-p)$

$p^3(1-p)^2$

i ARRIVALS, N slots,

$N-i$ NON-ARRIVALS

$P\begin{pmatrix}\text{specific}\\ \text{sequence}\end{pmatrix} = p^i(1-p)^{N-i}$

$\mu = Np$

$$P\begin{pmatrix}i \text{ arrivals}\\ \text{in } N \text{ slots}\\ \text{in any order}\end{pmatrix} = \binom{N}{i}\underbrace{p^i(1-p)^{N-i}}_{p(\text{sequence})}$$

$$\binom{N}{i} = \frac{N!}{i!\,(N-i)!}$$