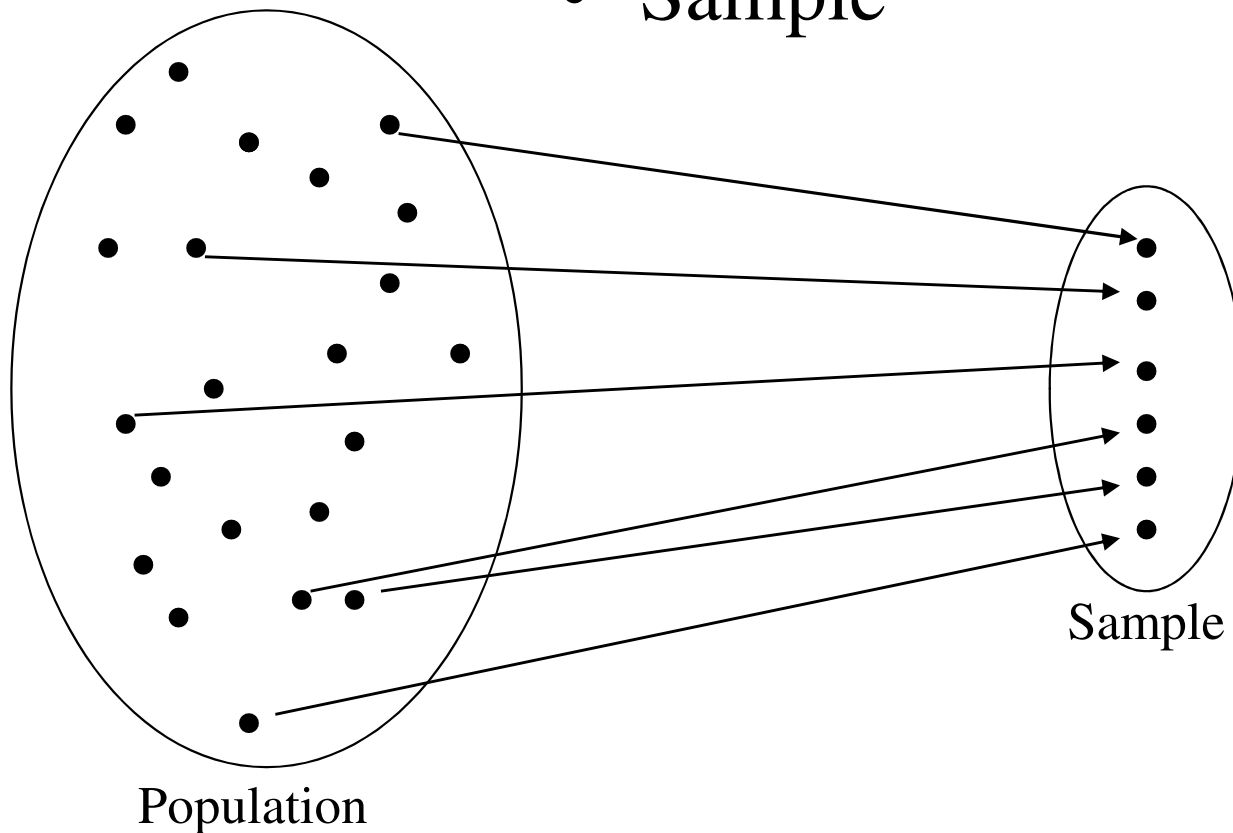


Statistics Basic

- Observation
- Population
- Sample



Distribution

Characteristics of Specific Data

Type: Natural number, Integer, Proportion number, Square Number, etc.

Central tendency: Mean, Median, Mode

Variation: Standard Deviation, Variance

Data : 48 numbers

163	173	185	161	177	175	174	177
185	181	178	174	183	180	173	169
201	166	164	176	171	173	184	173
173	175	171	184	173	172	172	174
177	168	173	173	172	169	179	178
164	179	182	178	168	162	168	173

Define by Distribution and use as substitution.

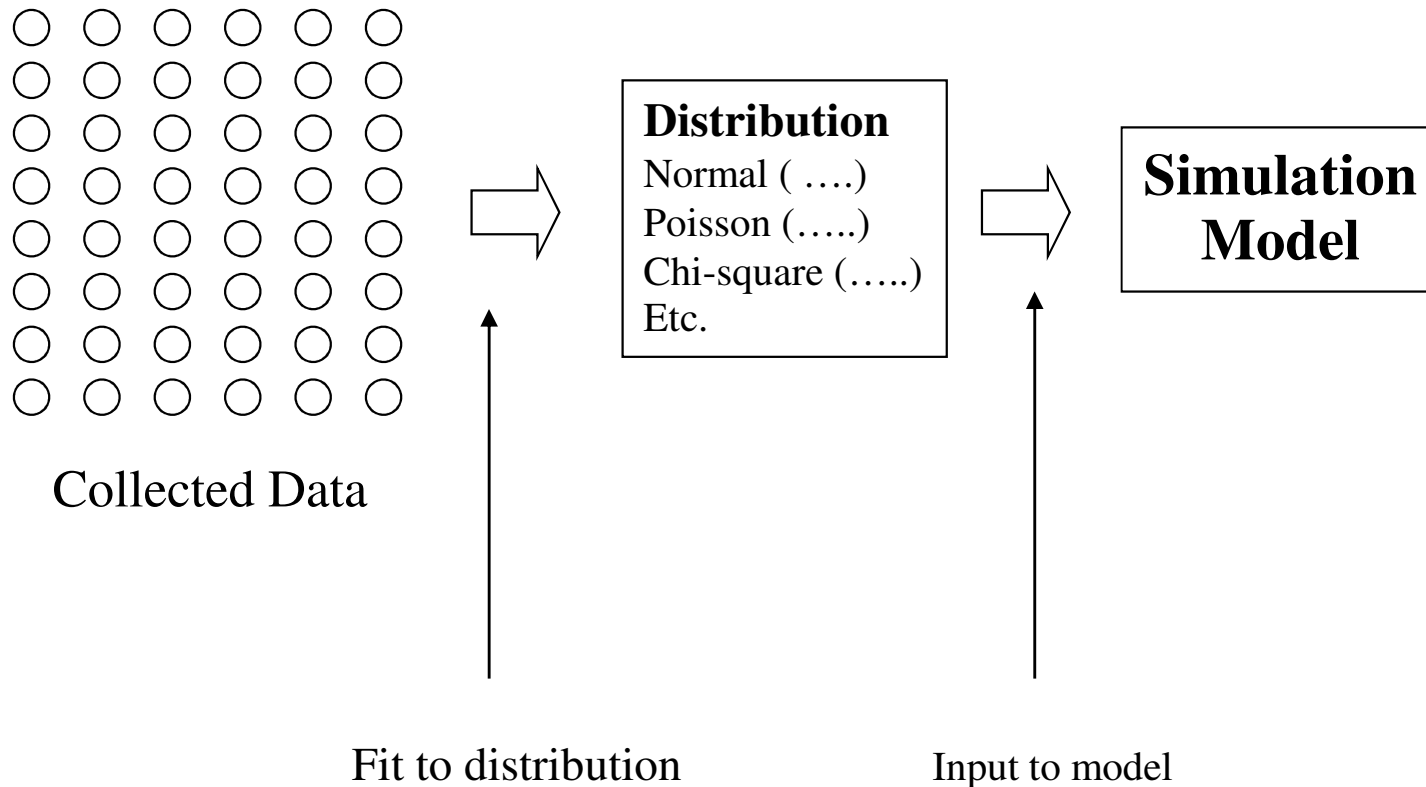
Such as; Normal (179,12)

Exponential (150)

Uniform (162,201)

Etc.

Distribution used in Simulation



Work shop 1

Give Example for these variable;

- 1) Defect from process.
- 2) Machine down time.
- 3) Quantity of material arrive to process.
- 4) Customer come in service area.
- 5) Operator for each day.

2 Type of Simulation Parameter Data

Continuous
Uniform
Exponential
Gamma
Weibull
Normal
Lognormal
Beta
Triangle

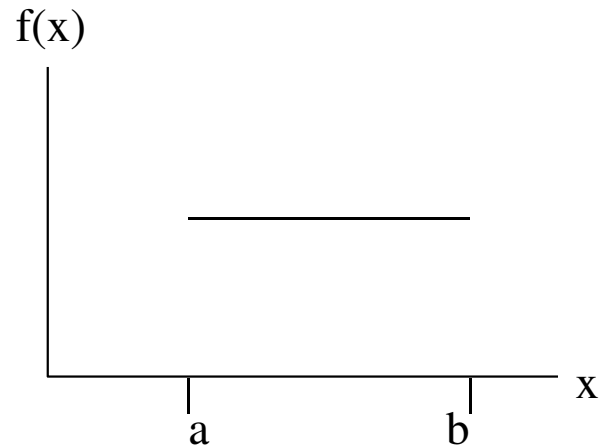
Discrete
Bernoulli
Discrete Uniform
Binomial
Geometric
Poisson

And some Output Analysis Distribution

Chi-square

Student t

Uniform distribution



Uniform (a,b)

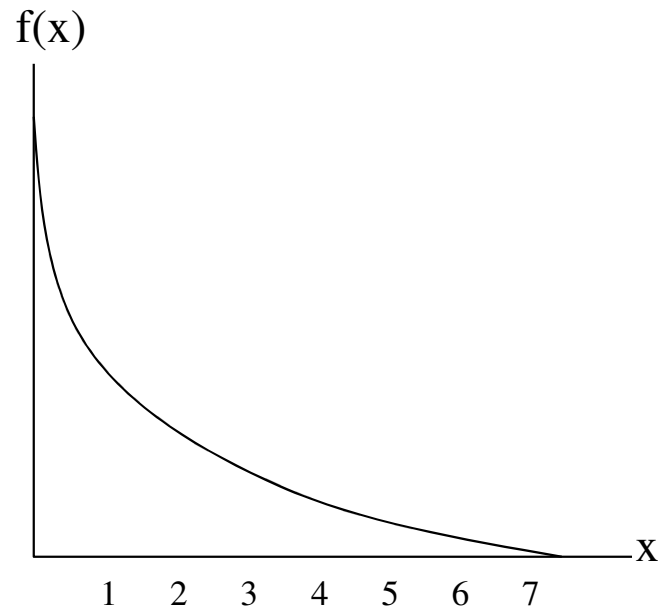
Range : [a , b]

Parameter : a , b

Characteristic : uniform probability

Example :

Exponential distribution



Expo(β)

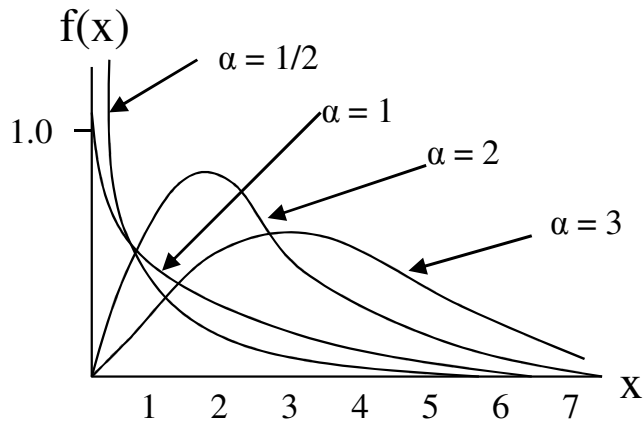
Range : [0, ∞)

Parameter : β

Characteristic : around zero value at positive side

Example :

Gamma distribution



Gamma (α , β)

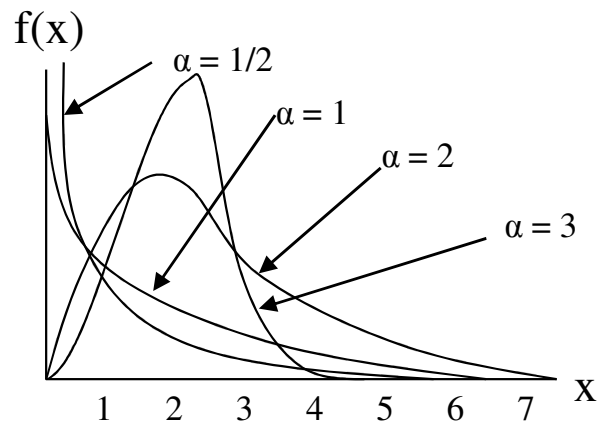
Range : $[0, \infty)$

Parameter : α , β

Characteristic : not less than zero

Example :

Weibull distribution



Weibull (α , β)

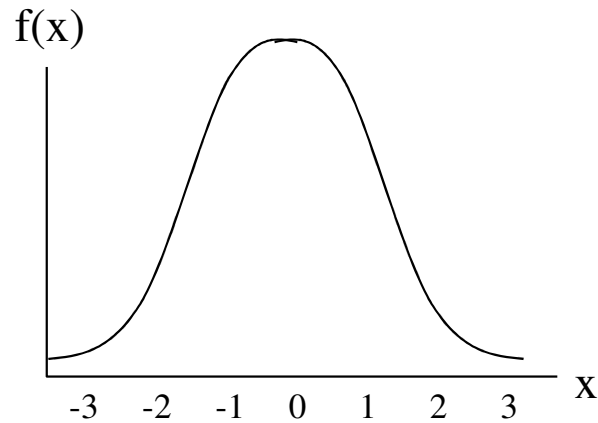
Range : $[0, \infty)$

Parameter : α , β

Characteristic : around zero value at positive side

Example :

Normal distribution



Normal (μ , σ^2)

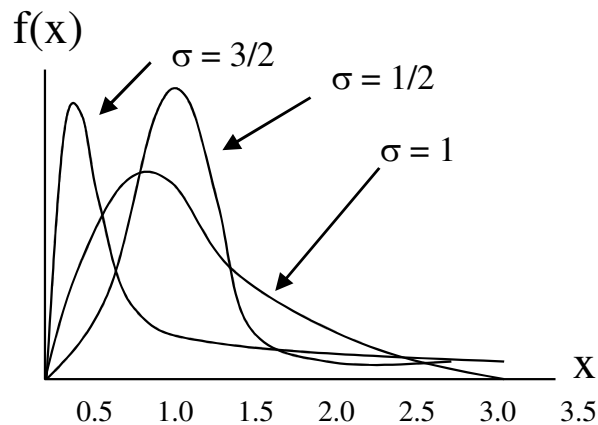
Range : $(-\infty$, $\infty)$

Parameter : μ , σ

Characteristic : bell shape and can be positive/negative

Example :

Lognormal distribution



Lognormal (μ , σ^2)

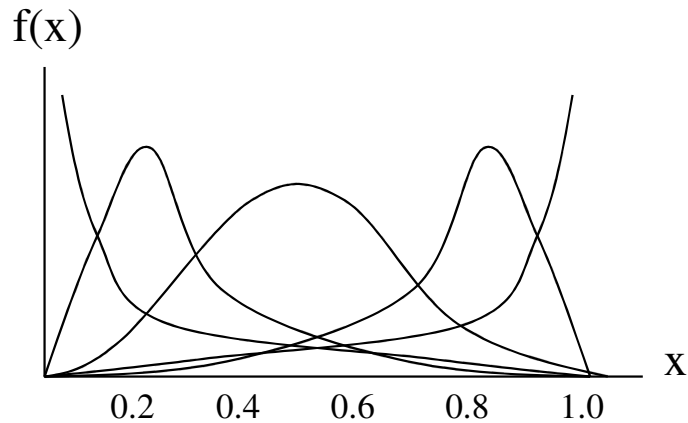
Range : $[0, \infty)$

Parameters : μ , σ

Characteristic : Positive number around 1

Example :

Beta distribution



Beta (α_1 , α_2)

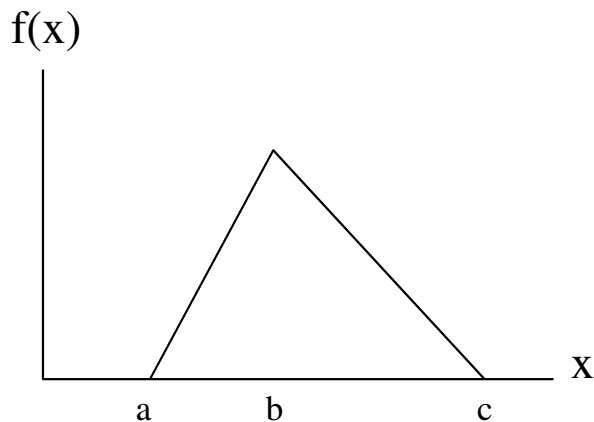
Range : [0,1]

Parameter : α_1 , α_2

Characteristic : various shape

Example :

Triangle distribution



Lognormal (μ , σ^2)

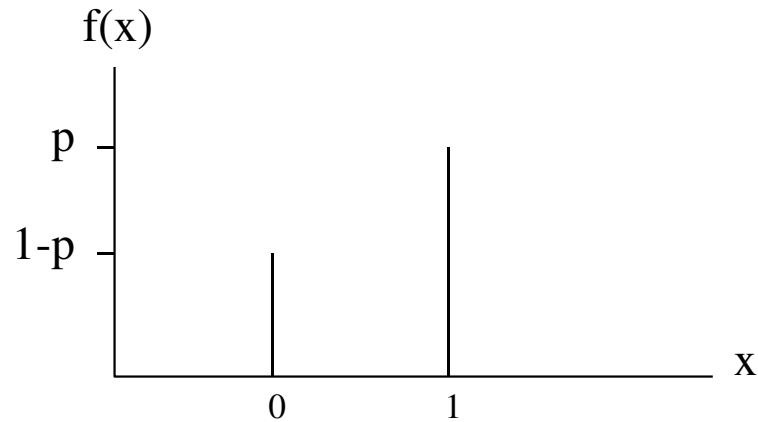
Range : [a , c]

Parameters : a , b , c

Characteristic : -

Example :

Bernoulli distribution



Bernoulli (p)

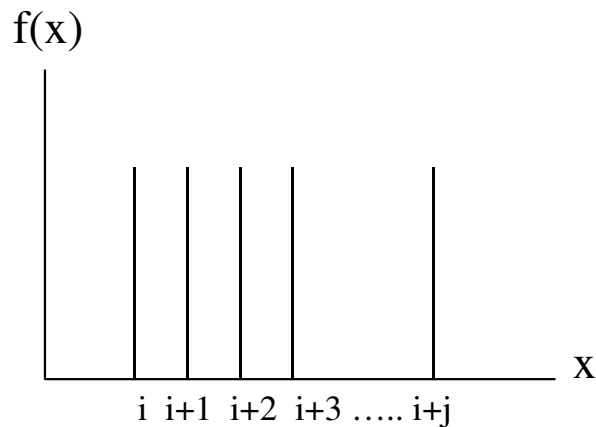
Range : $\{0,1\}$

Parameter : p

Characteristic : -

Example :

Discrete Uniform distribution



Discrete Uniform (i, j)

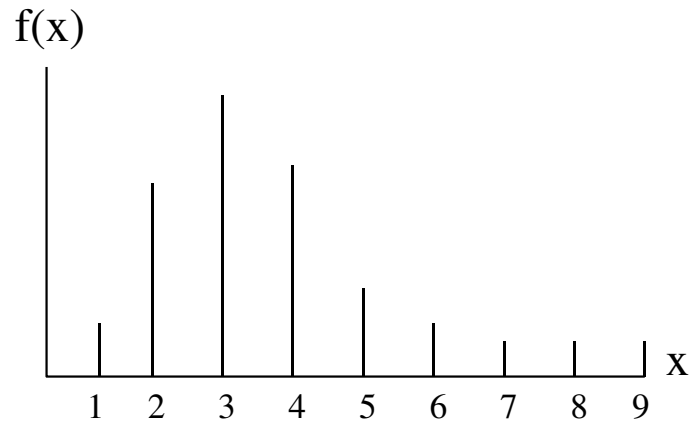
Range : $\{i, i+1, i+2, i+3, \dots, i+j\}$

Parameters : i, j

Characteristic : -

Example :

Binomial distribution



Binomial (t , p)

Range : {0,1,2,.....,t}

Parameter : **t , p**

Characteristic : bell shape

Example :

Geometric distribution



Geometric (p)

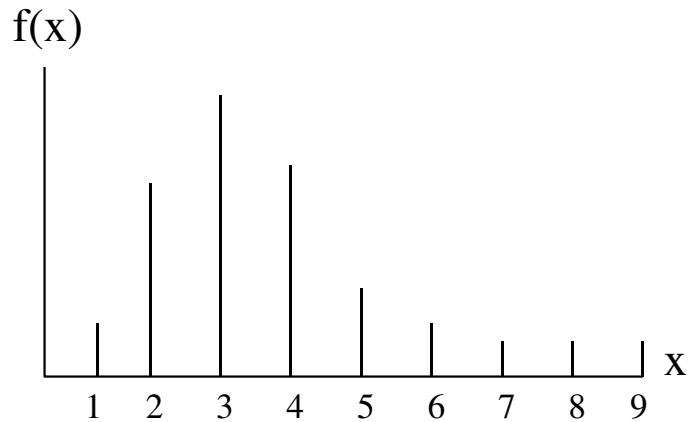
Range : {0,1,2,.....}

Parameters : p

Characteristic : -

Example :

Poisson distribution



Poisson (λ)

Range : $\{0,1,2,\dots\}$

Parameter : λ

Characteristic : bell shape

Example :

Work Shop 2

Specify this data for any distribution

1. inter-arrival time
2. Service time
3. Machine down time
4. Number of operator per day
5. Number of Part per batch
6. Defect proportion