LIVEWIRE
FOR LIVE CAREERS

BUSINESS ANALYTICS

PROBABILITY THEORY

- Possibilities of an event to occur
- Probability of an event = $\frac{\text{No of favorable occurrences}}{\text{No of all possible occurrences}}$

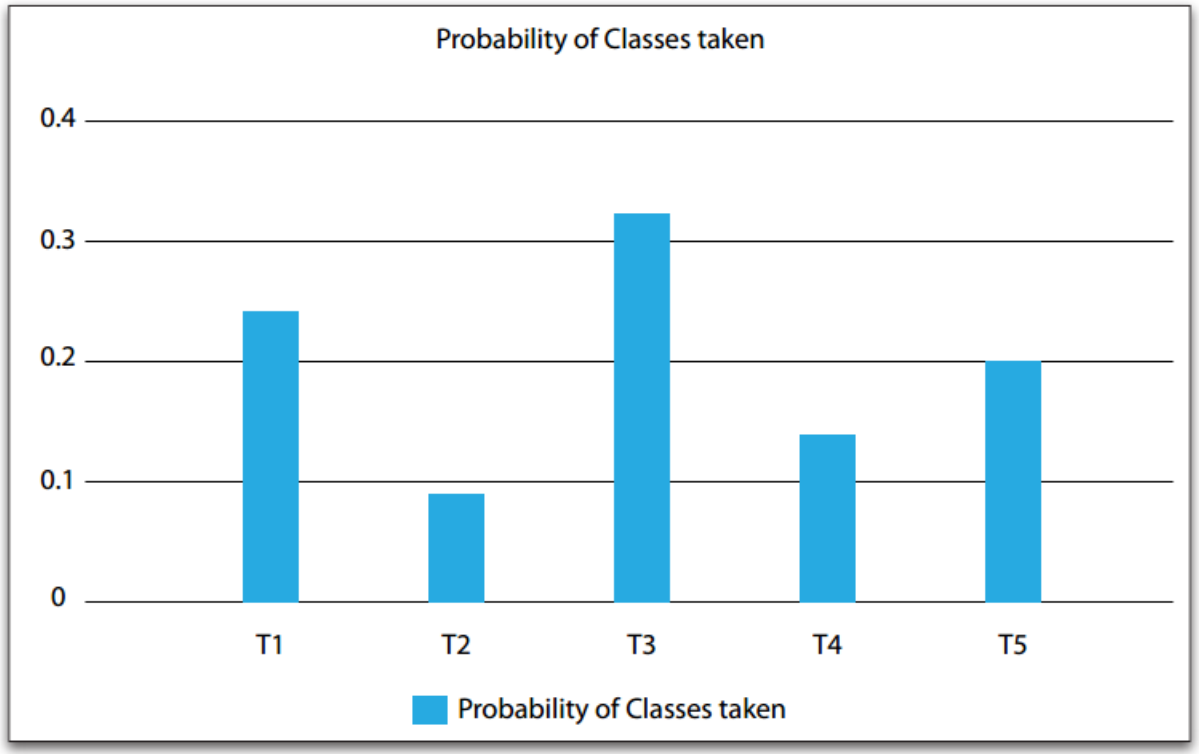
- Probability range: 0 to 1
- Probability methods:
  - Classical Method
    (ie. Constant output, Tossing a coin, Rolling a dice)
  - Relative Frequency Method
    (ie. Experiment conducted based on historical data)
  - Subjective Method
    (ie. It is based on judgement)

PROBABILITY DISTRIBUTION

How the probabilities are distributed?

$$\sum_{r} P(r) - 1 \text{ for discrete and } \int_{-\infty}^{\infty} f(x)\,dx - 1 \text{ for continuous}$$

Event	No of classes	Probability
Trainer 1	20	0.25
Trainer 2	7	0.0875
Trainer 3	26	0.325
Trainer 4	11	0.1375
Trainer 5	16	0.2
Total probability		1



Binomial Distribution

- Frequency distribution of the possible number of successful outcomes in a given number of trials
- Fixed number of trials
- Each trial is independent of others
- Probability of outcomes remains constant with same probability of success for each trial
- It always have 2 outcomes

$$p(r, N, p) = \binom{N}{r} p^r (1-p)^{N-r}$$

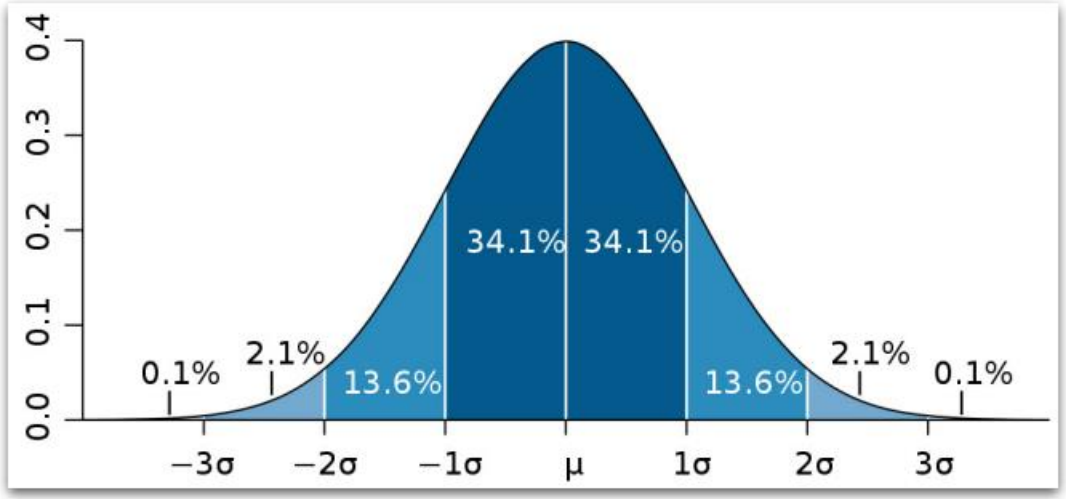
Example:

- Tossing a coin 10 times for occurrences of head
- Rolling a die to check for occurrence of a 2
- Surveying a population of 100 people to know if they watch television or not

Normal Distribution

- **Normal** (or **Gaussian**) **distribution** is a very common continuous probability **distribution**
- Most important distribution in statistics
- Plotting of whole population

$$f\left(x:\mu,\sigma^2\right)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$



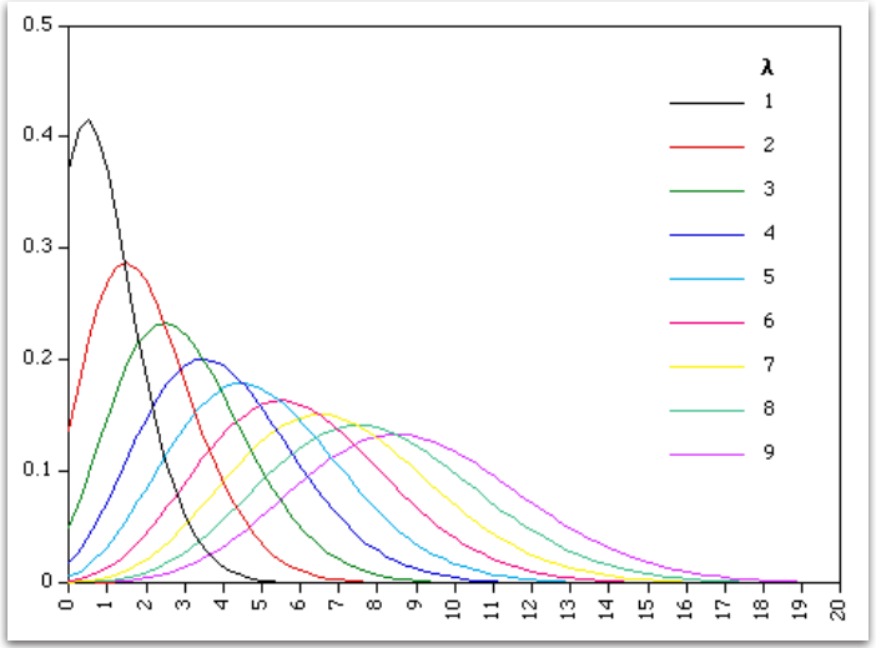
Example:

- Heights of people
- Size of things
- Errors in measurements
- Blood pressure
- Marks on a test

Poisson Distribution

- Discrete frequency distribution which gives the probability of a number of independent events occurring in a fixed time

$$p(r:\mu) = \frac{\mu^r e^{-\mu}}{r!}$$



Poisson experiment is a statistical experiment that has the following properties:

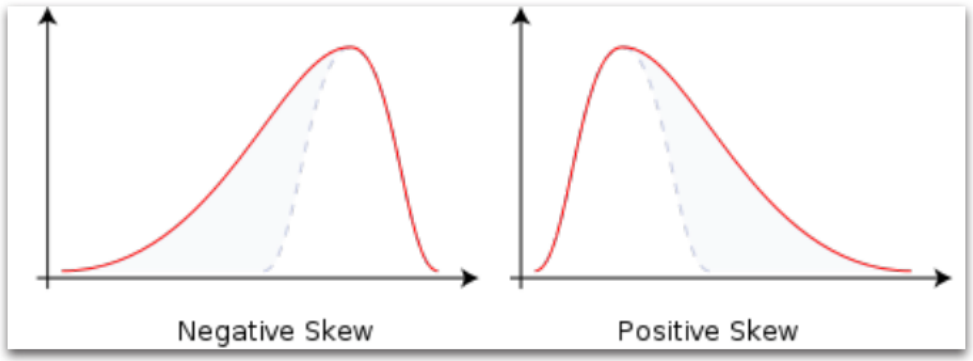
- Outcome will be either successes or failures
- Average number of successes (μ) that occurs in a specified region is known
- Probability that a success will occur is proportional to the size of the region
- Probability that a success will occur, in an extremely small region is virtually zero

Example:

- Car accidents
- Traffic flow and ideal gap distance
- Number of typing errors on a page
- Failure of a machine in one month

Skewness & Kurtosis

- Measure of symmetry
- Symmetrical distribution has a skewness of zero
- Normal, Right or Left tail



- Measure of flatness
- Gaussian distribution has a kurtosis of 0
- By Prism, Gaussian distribution is expected to have 3 as kurtosis
- High, Depth or Flat