Formulae

03 September 2024 08:04

HISTOGRAM + FDT

no of bins = $k = \sqrt{n} \,/\, 2\sqrt[3]{n} \,/\, \log_2 n$

width of bins = $h = \frac{\text{Range}}{k} = \frac{2(IQR)}{\sqrt[3]{n}}$

Relative freq. = $\frac{f_i}{\sum f_i}$

Density = $\frac{\text{Relative freq}}{\text{Class width}}$

Outliers

Data $< Q_1 - 1.5(IQR)$

[OR]

Data $> Q_3 + 1.5(IQR)$

CHEBYSHEV'S INEQUALITY

$P(|X-\mu| \geq k\sigma) \leq \frac{1}{k^2}$

$P(|X-\mu| \leq k\sigma) \geq 1 - \frac{1}{k^2}$

QQ Plot

Hazen's method : $\frac{i-0.5}{n}$

CLT

$\bar{X}$: Sample mean

Mean = μ

SD = $\frac{\sigma}{\sqrt{n}}$

S_n : sum of observations

Mean = $n\mu$

SD = $\sigma\sqrt{n}$

$\hat{p}$: Sample proportion

Mean = p

SD = $\sqrt{\frac{pq}{n}}$

MSE

MSE = Variance + $(\text{Bias})^2$

where bias: $\mu_{\hat{\theta}} - \theta$

Mean Squared Error

$E[(\hat{\theta}-\theta)^2]$

Binomial p

$(\text{Bias})^2 = (\mu_{\hat{p}} - p)^2 = 0$

MSE = Variance = $\sigma_{\hat{p}}^2 = \frac{pq}{n}$

$\hat{\mu}$ Poisson

$(\text{Bias})^2 = (\mu_{\hat{\mu}} - \mu)^2 = 0$

MSE = Variance = $V\left(\frac{\bar{X}}{n}\right) = \frac{1}{n^2}(n\mu)$

MSE = $\frac{\mu}{n}$

Normal μ

$$(\text{Bias})^2 = (\mu_{\hat{\theta}} - \mu)^2 = 0$$

$$\text{MSE} = \text{Variance} = \sigma_{\hat{\theta}}^2 = \frac{\sigma^2}{n}$$

MLE

Likelihood fn $\longrightarrow$ pmf / pdf as fn of parameter

Bernoulli $\hat{p} = \frac{\sum x_i}{n} = \bar{x}$

Binomial $\hat{p} = \frac{x}{n}$

Binomial $\frac{p}{1-p} = \frac{x}{n-x}$

Poisson $\hat{\lambda} = \frac{\sum x_i}{n} = \bar{x}$

Normal $\hat{\mu} = \frac{\sum x_i}{n} = \bar{x}$

Normal $\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n} = \hat{\sigma}^2$