

Statistical Measures and Concepts

Descriptive Statistics

1. **Mean:** $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$
2. **Median:** Middle value (sorted)
 - Odd: $(n + 1)/2$
 - Even: Average of $n/2$ and $(n/2) + 1$
3. **Mode:** Most frequent value
4. **Minimum/S:** $S = \min(x_1, x_2, \dots, x_n)$
5. **Maximum/L:** $L = \max(x_1, x_2, \dots, x_n)$
6. **Range:** $R = L - S$
7. **Coefficient of Range:** $\frac{L-S}{L+S}$
8. **MD Mean:** $\frac{1}{n} \sum_{i=1}^n |x_i - \bar{x}|$
9. **MD Median:** $\frac{1}{n} \sum_{i=1}^n |x_i - \text{median}|$
10. **Standard Deviation:** $s = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2}$
11. **Variance:** $s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$
12. **Coefficient of SD:** $\frac{s}{\bar{x}}$
13. **CV:** $\frac{s}{\bar{x}} \times 100\%$
14. **IQR:** $Q_3 - Q_1$
15. **QD:** $\frac{Q_3 - Q_1}{2}$
16. **Midrange:** $\frac{L+S}{2}$
17. **Quartiles:** Q_1, Q_2, Q_3
 - Q1: 25th percentile
 - Q2: 50th percentile (median)
 - Q3: 75th percentile
18. **Deciles:** D_1 to D_9
19. **Percentiles:** P_1 to P_{99}

Statistical Formulas

1. **Central Moments (μ_r):** $\mu_r = \frac{1}{n} \sum_{i=1}^n (x_i - A)^r$
2. **Raw Moments (μ'_r):** $\mu'_r = \frac{1}{n} \sum_{i=1}^n x_i^r$
3. **Coefficient of Skewness (Moments):** $\gamma_1 = \frac{\mu_3}{\mu_2^{3/2}}$
4. **Kurtosis (Percentiles):** $K = \frac{0.5(Q_3 - Q_1)}{P_{90} - P_{10}}$
5. **Excess Kurtosis (Moments):** $\gamma_2 = \frac{\mu_4}{\mu_2^2} - 3$
6. **Covariance:** $\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})$
7. **Pearson Skewness:** $\frac{\bar{x} - \text{Mode}}{s}$ or $\frac{3(\bar{x} - \text{Median})}{s}$
8. **Bowley Skewness:** $\frac{Q_3 + Q_1 - 2Q_2}{Q_3 - Q_1}$
9. **Correlation:** $r = \frac{\text{Cov}(X, Y)}{s_X s_Y}$
10. **Regression byx:** $b_{yx} = \frac{\text{Cov}(X, Y)}{\text{Var}(X)}$
11. **Regression bxy:** $b_{xy} = \frac{\text{Cov}(X, Y)}{\text{Var}(Y)}$
12. **Chebyshev's Inequality:** $P(|X - \mu| \geq k\sigma) \leq \frac{1}{k^2}$
13. **Normal PDF:** $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$

Statistical Concepts and Tools

1. **PMF:** $P(X = x)$
2. **PDF:** $f(x)$
3. **CDF:** $F(x) = P(X \leq x)$
4. **Expected Value:** $E(X) = \sum xP(x)$ or $E(X) = \int xf(x)dx$
5. **Variance:** $\text{Var}(X) = E[(X - E(X))^2]$
6. **R-squared:** $R^2 = \frac{\text{Explained Variance}}{\text{Total Variance}}$

Inferential Statistics

1. **Regression Analysis** (Implicit - Use of Regressions)

Visualization tools:

1. **Histogram**
2. **Boxplots**
3. **Bargraphs**