How to Choose the Right Statistical Test

Type of Analysis

- **Compare Means**
  - **Two Groups**
    - **Same Subjects Measured Twice (Before/After)**
      - **Pairwise Differences Normal** → Paired t test (Parametric Test)
      - **Pairwise Differences Non-Normal** → Wilcoxon Matched Pairs Signed Rank Test (Nonparametric Test)
    - **Each Subject Measured Once**
      - **Each Group Normal and Variances Equal** → Unpaired t test (Parametric Test)
      - **Each Group Normal** → Unpaired t test With Welch's Correction (Parametric Test)
      - **One or Both Groups Non-Normal** → Mann-Whitney Test (Nonparametric Test)
  - **More Than Two Groups (Drug A vs Drug B vs Drug C)**
    - **One Factor (Drug)**
      - **Each Subject Measured More That Once**
        - **Pass Normality**
          - **Assume Sphericity** → ANOVA or Mixed Model (Missing Data)
          - **Don't Assume Sphericity** → ANOVA or Mixed Model (Missing Data) With G-G Correlation
        - **Reject Normality** → Friedman Test (Nonparametric Test)
      - **Each Subject Measured Once**
        - **Pass Normality and Variances Equal** → ANOVA (Parametric Test)
        - **Pass Normality** → Brown-Forsythe or Welch's ANOVA (Parametric Test)
        - **Reject Normality** → Kruskal-Wallis Test (Nonparametric Test)
    - **Two Factors (Drug, Diet)**
      - **Each Subject Measured More That Once**
        - **Pass Normality**
          - **Assume Sphericity** → ANOVA or Mixed Model (Missing Data)
          - **Don't Assume Sphericity** → ANOVA With G-G Correction or Mixed Model (Missing Data) With G-G Correction
        - **Reject Normality** → Consider Transformation
      - **Each Subject Measured Once**
        - **Pass Normality** → ANOVA (Parametric Test)
        - **Reject Normality** → Consider Transformation
    - **Three Factors (Drug, Diet, Time)**
      - **Each Subject Measured More That Once**
        - **Pass Normality**
          - **Assume Sphericity** → ANOVA or Mixed Model (Missing Data)
          - **Don't Assume Sphericity** → ANOVA With G-G Correction or Mixed Model (Missing Data) With G-G Correction
        - **Reject Normality** → Consider Transformation
      - **Each Subject Measured Once**
        - **Pass Normality** → ANOVA (Parametric Test)
        - **Reject Normality** → Consider Transformation

- **Relationship Between X and Y**
  - **Correlation (Strength of Relationship)**
    - **Pass Normality** → Pearson Correlation
    - **Reject Normality** → Spearman Correlation
  - **Linear Regression (Slope)**
    - **Response is Continuous** → Least Squares Regression
    - **Response is a Count** → Poisson Regression
  - **Multiple Regression (More Than One X)**
  - **Nonlinear Regression (Dose Response)**
    - **100+ Nonlinear Model Plus User Defined Models Available**
      - **Response Continuous No Outliers** → Least Squares Regression
      - **Response Continuous With Outliers** → Robust Regression
      - **Response is a Count** → Poisson Regression

- **Categorical Data**
  - **2 x 2 Table**
    - **All Expected Cell Counts at Least 5** → Chi-square Test
    - **Not All Expected Cell Counts at Least 5** → Fisher's Exact Test
  - **2 x Y Table** → Chi-square Test

- **Survival Analysis** → Kaplan-Meier

- **Sensitivity/Specificity** → ROC Curve