Simple Flowchart for Statistics Used in Biology

Parametric Assumptions:
1. Data are normally distributed
2. Samples are unbiased and independent

What type of data are they?

Discrete or Categorical

Continuous

Statistical Question

Chi-Square Test: One and Two Sample

$$X^2 = \sum \frac{(o-e)^2}{e}$$

Is there a difference between the means?

Is there a relationship between two variables?

How many treatment groups?

Two treatments

More than two treatments

Linear Regression Test

$$r = \frac{\sum_{i=1}^{n}\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)}{n-1}$$

Measurements in each treatment are paired with each other

Measurements in each treatment are independent of each other

Paired *t*-Test

Unpaired *t*-Test

$$t_{\text{obs}} = \frac{|\bar{x}_1 - \bar{x}_2|}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Analysis of Variance (ANOVA)

ANOVA Table

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	24.2	2	12.1	27.8	P < 0.01	3.28
Within Groups	14.36	33	0.435			
Total	338.92	35				