Some pointers on statistics for your senior thesis

Senior Seminar
February 9, 2006
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General Advice

• Look at the methods used in related work (other papers, especially those by your mentor and their colleagues)

• Talk to your mentor (or their lab managers, graduate students, postdocs, techs, etc.)

• Use the statistical consulting service: consult@stat.columbia.edu

• Read a (portion of a) book!
Author’s Responsibility

• Know what your statistical methods do!
• Be aware of the assumptions and limitations of your statistical tests
• Report all the proper results
• Understand what your results mean
Variation

Frequency

Trait
Reporting variation

• Every measure which summarizes a distribution (e.g., a mean) should include some measure of spread (e.g., a standard deviation)

• A graph without error bars is incomplete and potentially misleading!
Hypothesis testing

• Comparing two or more hypotheses in light of the data
• Scientists generally make a null hypothesis of no effect - any variation in the data is just random
• We reject the null when the data deviate strongly from random. This lends support to the hypothesis that some phenomenon is responsible for part of the variation
Normal Distribution

Frequency

Measurement
Probability

\[ P = \frac{\text{number of outcomes}}{\text{number of trials}} \]