Why use nonparametric tests at all?

Nonparametric tests **always** have less power than their parametric counterpart because you **always throw out information** by using only rank (and not magnitude) so type II > β

Why use nonparametric tests at all then?

• when used correctly a nonparametric test should give an actual Type I error rate = α

This seems kinda lame, right?

 But if you used a parametric test in its place (which would be using the parametric inappropriately since it doesn't meet the requirements), the parametric test will give a type I error > α

Nonparametric Tests

	Parametric	Nonparametric
Assumptions not met	Type I > α	Type I = α
Assumptions met	Type II = β	Type II > β

ACTUAL: indicated by Type I, Type II

STATED: indicated by α , β

Modern Statistics Methods

Hypothesis testing

Parametric

t-test

*one sample

*paired

*two sample

ANOVA

Regression

Correlation

Non-Parametric

X² GOF

X² Contingency

Sign test

Mann-Whitney U

Kruskall-Wallis test

Spearman

Possible Null distributions:

- Binomial
- X²
- Normal
- Poisson
- F
- student's t

Hypothesis testing

X² GOF X² Contingency Mann-Whitney U *t*-test Sign test Kruskall-Wallis test **ANOVA** Regression Correlation Spearman

But there are many biologically interesting phenomenon that are not easily described by the tools we have examined so far....

Sometimes there is no standard method

Computers have dramatically expanded the toolkit of statistics/research

Computational methods:

- When assumptions of best method available can't be met
 - Random sampling is still assumed

No standard method exists

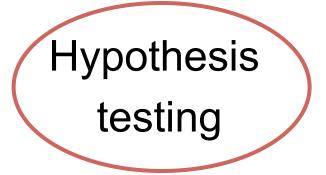
Massive amount of calculations

When we don't know the null distribution

Modern Statistical Methods

Sampling distributions:

- 1. Simulation hypothesis testing
- 2. Randomization/permutation (technically chapter 13)



Precision of estimates:

3. Bootstrapping

t-test

ANOVA

Regression

Correlation

Null distributions:

- Binomial
- Normal
- Poisson

 X^2 GOF

X² Contingency

Mann-Whitney U

Sign test

Kruskall-Wallis test

Spearman

Null sampling distributions:

- 1. Simulation hypothesis testing
- 2. Randomization/Permutation

Precision of estimates:

3. Bootstrapping – sampling distribution of estimate; the values for the parameter estimates that we might obtain and their probabilities. Usually rely on normal approximation for the sampling distribution.