ECO 602
Analysis of Environmental Data

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Course Highlights

The topics we covered are hard:

Probability theory

Mathematical functions

Statistical inference

Model building and interpretation

And more…

Data

Data types, scales

Descriptive and inferential statistics

Populations/samples

Parameters/statistics

Model Thinking

Conceptual

Mental

Mathematical

Statistical

Deterministic

stochastic

Model Thinking

Predictor and response variables

Null models

Associations

Samples and populations

Ecological Population

Statistical Population

Sample

Sampling Unit: depends on context

Fish, bays, lakes, Massachusetts, New England

Probability, uncertainty, distributions

Probability theory:

sample space, events, independent events

Sources of uncertainty, error

Continuous and discrete distributions

Deterministic functions/models

Model of the means

Phenomenological and mechanistic

Linear, nonlinear functions

Uncertainty: Stochastic models

Residuals, errors

Uncertainty, variability, noise

Stochastic process

Inference

Null and alternative hypotheses

Frequentist, Bayesian, nonparametric paradigms

Confidence, confidence intervals, credibility intervals

Dual-model paradigm

P-values

Inference

Type I and II errors

False positive/negative

Alpha, beta, power

Sampling distribution

Standard error (of the mean)

Inference

Model goodness-of-fit

Parameter estimation

Bootstrapping

Maximum likelihood

Assumptions

Statistical Models

Constellation of methods*

- Linear Models
- Extended linear techniques
- Nonparametric methods
- Multivariate methods

* We only mentioned a small fraction of the statistical models. The McGarigal slides contain good overviews of many of the types.

Statistical Models: Some possible assumptions

1. Independent observations
2. Linear (in the parameters)
3. Normally distributed errors
4. Constant variance

Various modeling techniques exist to deal with violations of all these assumptions

Linear Model Interpretation

Model Coefficient Tables

Analysis of Variance Tables

Model Thinking

I think this is the most important concept in this course!

All the technical details of analyses stem from how we describe our model.

Always keep the big picture in mind, and make sure you can describe what you do in everyday terms.

Thank you!

Continuation: ECO 636

- Applied Ecological Statistics, Spring 2020
- Meg McLean