

## Stat 882: Statistical Phylogenetics

### Instructors:

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**About the course:** The field of phylogenetics seeks to study the evolutionary history for a collection of organisms. Phylogenetic techniques can be applied to a range of problems, including problems in epidemiology, forensic medicine, studies of parasite-host relationships, and the systematic classification of organisms. In this course, we will discuss the statistical models and algorithms that are used to infer phylogenetic trees using genetic data. Topics covered will include phylogenetic inference using parsimony, maximum likelihood, and Bayesian techniques, models for DNA sequence evolution, and models relating gene trees and species trees, with particular attention to the coalescent model.

**Optional Text:** *Inferring Phylogenies*, by Joseph Felsenstein, Sinauer Associates, 2004.

**Grading:** Homework, class participation, and a final project.

**Special Accommodations:** All students who feel they may need accommodations based on the impact of a disability should contact the instructor privately to discuss their specific needs. Students with documented disabilities must also contact the Office of Disability Services (ODS) in 150 Pomerene Hall (phone: 292-3307) to coordinate reasonable accommodations for the course. ODS forms must be given to your instructor as early in the quarter as possible to be filled out and returned to you.

**Tentative Schedule:**

<b>Tuesday (Lecture)</b>	<b>Reading</b>	<b>Thursday (Lab)</b>
<b>Week 1 (LK)</b> Intro to phylogenetics, The parsimony criterion	Ch. 1-3, 9	Analysis using parsimony in PAUP*
<b>Week 2 (DP)</b> Evolutionary models, Maximum likelihood	Ch. 13, 14, 16, 19	Using ModelTest for model selection
<b>Week 3</b> No formal lecture/lab		<b>Project ideas due</b>
<b>Week 4 (LK)</b> <b>Guest speaker: Dr. Elizabeth Housworth</b> Algorithms for finding optimal trees	Ch. 4-5	ML analysis using GARLI
<b>Week 5 (DP)</b> Bayesian phylogenetics	Ch. 18	MrBayes <b>Plans for project due</b>
<b>Week 6 (LK)</b> Coalescent theory	Ch. 26-28	Coalescent simulation: COAL, ms
<b>Week 7 (DP)</b> Inferring species trees	Ch. 28	BEST
<b>Week 8 (DP)</b> Guest speaker: TBA Alignment	Ch. 29	Clustal X
<b>Week 9 (LK)</b> Guest speaker: TBA Phylogenetic comparative methods	Ch. 23-25	R software for comparative method
<b>Week 10</b> Student presentations		Student presentations