Learning from Trees (BIO 597)

Instructor: Dudu (Hitchner Hall 347, jose.meireles@maine.edu)
When: Wednesday and Fridays
11am to 12:15pm
Where: Shibles Hall 316

Evolutionary trees are widely used to understand biological diversification, rates and constraints in the evolution of phenotypes, and to explain local and global patterns of diversity distribution over different timescales. **In this course you will learn how to construct phylogenies and use them to answer a variety of different questions in evolution and ecology.**

Requirements

- A laptop on which you can install and run software
- A cool biological question that involves phylogenies – preferably related to your thesis – that you can turn into a class project.

Grading

Grades will be based on the quality of your work and participation in course activities and discussions using the following tentative rubric (maybe be modified upon mutual agreement).

- *Participation* (**50%**)
    - *Leading* and *engaging* in paper discussions (**25%**)
    - In-class and take-home *assignments* (**25%**)
- *Project* (**50%**)
    - Proposal: *one-pager* and *presentation* (**20%**)
    - Final *paper* and *presentation* (**30%**)

Absences and late assignments: Please reach out to me ASAP if you are anticipating absences (e.g., field work or conferences), or in the event of unplanned absences (e.g., illness or family emergency). Late submission is not feasible for some assignments (e.g. in class presentations). In unexcused cases, I will dock late assignments 10% per day for up to three days, after which the assignment will not be accepted. Excused absences may entail alternative assignments at my discretion.

Tentative Schedule*

* subject to change

Date	Topic
Jan 22	Introductions; Course overview; Why we care about trees
Jan 24	**Lab:** Coding style, Version control, Code sharing
Jan 29	Introduction to Phylogenies – terminology, types, interpretation, file formats **Reading due:** Maddison 1997
Jan 31	**Lab:** Reading, manipulating, and visualizing trees in R
Feb 5	Inferring (or stealing) phylogenies; tree space **Reading due:** Holder and Lewis 2003
Feb 7	**Lab:** Basic probability, Maximum Likelihood, Bayes, Understanding MCMC
Feb 12	Homology, DNA alignment, DNA substitution models **Reading due:** Posada and Crandall 2001
Feb 14	**Lab:** Aligning DNA sequences, comparing models of evolution, partitioning molecular data
Feb 19	Assessing clade credibility and summarizing trees: Bootstrapping, Clade posterior prob., and Consensus trees. **Reading due:** Felsenstein 1985
Feb 21	**Lab:** Inferring phylogenies with uncertainty
Feb 26	**All project written proposals due.** **Four students present their proposal (randomly chosen)**
Feb 28	**Remaining students present their proposal**
Mar 4	Molecular clocks and time calibration **Reading due:** Drummont et al 2006
Mar 6	**Lab:** Time calibrating phylogenies with BEAST
Mar 11	Review. Getting ready to use morphological, ecological, and spatial data with phylogenies
Mar 13	**Work on your own. Dudu will be out giving an invited talk**
Mar 18	**No Class**; **Spring Break**
Mar 20	**No Class**; **Spring Break**

Mar 25	Trait evolution, phylogenetic signal, niche conservatism. Brownian motion, PGLS **Readings due:** Losos 2008; Felsenstein 1985
Mar 27	**Lab:** Brownian motion models, Blomberg's K, Pagel's lambda, PGLS
Apr 1	Evolution of continuous traits: Brownian motion & Ornstein-Uhlenbeck process, Convergent Evolution **Readings due:** Butler and King 2004, O'Meara 2006
Apr 3	**Lab:** Modeling the evolution of continuous traits
Apr 8	Evolution of categorical traits, Ancestral state reconstruction **Reading due:** Readings: Maddison and FitzJohn 2015
Apr 10	**Lab:** Modeling the evolution of categorical traits
Apr 15	Phylogenetics, community ecology, and biogeography **Reading due:** Cavender-Bares et al. 2009; Ronquist and Sanmartin 2011
Apr 17	**Lab:** Phylogenetic over and under dispersion. Biogeographic models.
Apr 22	Diversification of life, LTT, SSE models **Reading due:** Ricklefs 2007; Beaulieu and O'Meara 2016
Apr 24	**Lab: Diversification analysis**
Apr 29	**All final papers due** **Four students present their paper (randomly chosen)**
May 1	**Remaining students present their paper**

Academic Honesty

Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

Inclusiveness

The University of Maine is dedicated to the goal of supporting an inclusive student body prepared to live and work in a global society. Our class will make every effort to respect, appreciate, and solicit input from the multiplicity of voices present in our society, regardless of class, gender, sexuality, disability, age, ethnicity, race, religion, and culture. All members of the U Maine community have value and bring unique perspectives worthy of consideration.

Prefered Name/Pronouns

We will respectfully honor your request to address you by an alternate name or gender pronoun. Please advise us of your preference early in the semester so that we can make appropriate changes to our records.

Students with disabilities

If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581.2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible. Course Schedule Disclaimer (Disruption Clause): In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Observance of Religious Holidays/Events

The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student’s grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, your teacher is required to report this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

For confidential resources on campus: Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000. For confidential resources off campus: Rape Response Services: 1-800-871-7741 or Spruce Run: 1-800-863-9909.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

For support services on campus: Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or see the OSAVP website for a complete list of services at http://www.umaine.edu/osavp/