BOT 6276C – Phylogenomics

Catalog Description

An advanced course in phylogenetic methods and theory, focusing on coalescent methods, their statistical background, and techniques for analyzing datasets of many taxa and loci.

Credit Hours

3 credits

Pre-requisites and Co-requisites

A course in phylogenetics or molecular systematics.

Course Objectives

By the end of the course, the student will be able to do the following:

- Explain the coalescent process and how it is used in phylogenomic analyses.
- Explain maximum likelihood and Bayesian inference statistical approaches, and how they are used in phylogenetics/phylogenomics.
- Implement common software to perform phylogenomic analyses (may include: ASTRAL, BUCKy, BPP, SVD-quartets, among others).
- Use the UF high-performance computing cluster, HiPerGator, to perform these analyses.

Instructor Information

Name: Emily Sessa
Office location: Bartram 521A
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Office hours: By appointment

Name: José Miguel Ponciano
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Office hours: By appointment

Course Meeting Times and Location

TR, periods 3–4 (9:35–11:30 am)
Carr 521

Course Website

Course materials and related information will be posted on the course E-Learning (Sakai) website at http://lss.at.ufl.edu. You are responsible for all announcements made in class and/or posted on the course website for this course.

Readings

Required: Required readings will be posted on Canvas.
Recommended: We strongly recommend that you purchase the book: Felsenstein, J. 2003. *Inferring Phylogenies*, 2nd Edition. Published by Sinauer.

Attendance Policy and Expected Conduct in Class

- Students are expected to be on time for class, and attendance in all class periods is mandatory. Please contact the instructor at least a week in advance if you must be absent. The policies for allowable absences and make-up work follow the university attendance policies: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx
- Only approved electronic devices may be used in class. Approved electronic devices are laptop computers (when used to take notes or otherwise participate in classroom activities) and voice

recording devices. Unapproved electronic devices include cell phones, MP3 players, etc.The policies for allowable absences and make-up work follow the university attendance policies: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx. The student will remain responsible for scheduling any make-up work with the instructor.

Grading
- Homeworks: XX @ XX points each (XX% of final grade)
- Presentations: 1 @ XX points each (XX% of final grade)
- Class Participation: XX points (XX% of final grade

Grading Scale & Policies

Point Range (%)	Letter Grade		Point Range (%)	Letter Grade
≥ 90.00	A		70.0 – 73.2	C
86.7 – 89.9	A-		66.7 – 69.9	C-
83.3 – 86.6	B+		63.3 – 66.6	D+
80.0 – 83.2	B		60.0 –63.2	D
76.7 – 79.9	B-		56.7 – 59.9	D-
73.3 – 76.6	C+		< 56.7	E

Note that a "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html

UF Counseling Services
- Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
  - Career Resource Center, Reitz Union, 392-1601, career and job search services.
- Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their web site: http://www.counsel.ufl.edu/.

Honesty Policy
- All students registered at the University of Florida have agreed to comply with the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."
- In addition, on all work submitted for credit the following pledge is either required or implied: "*On my honor I have neither given nor received unauthorized aid in doing this assignment*."
- If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at: http://www.dso.ufl.edu/judicial/procedures/academicguide.html.

Accommodation for Students with Disabilities
- Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: http://www.dso.ufl.edu/drp/services/.
- It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

Software Use
All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

U Matter, We Care
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Basic Needs and Security
Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in this or any other course, is urged to contact the Dean of Students for support (https://dso.ufl.edu). Please also notify the professor if you are comfortable in doing so.

UF has a food pantry on campus (located near the HUB) that is available to all students. No proof of need is required; all you need is a UF ID card. Field & Fork Food Pantry: https://pantry.fieldandfork.ufl.edu/

Course Outline

Week	Date	Topic	Reading
1	Jan 7	Introduction	Taper & Ponciano, 2015
	Jan 9	Probability models, simple binomial, intro to ML	
2	Jan 14	Simple multinomial, simple phylogenetic multinomial	Swofford et al., ch. 11 (Phylogenetic inference)
	Jan 16	Questions/problems based on lecture	
3	Jan 21	Wright Fisher, part 1	JMP lecture notes
	Jan 23	Wright Fisher, part 2	
4	Jan 28	Coalescent, part 1	Felsenstein, ch. 26 JMP lecture notes
	Jan 30	Coalescent, part 2	
5	Feb 4	Coalescent, part 3	Simmons & Gatesy, 2015
	Feb 6	Coalescent, part 4	
6	Feb 11	Maximum likelihood	Felsenstein, chapter 16
	Feb13	Maximum likelihood, cont.	
7	Feb 18	Bayesian inference	Felsenstein, chapter 18
	Feb 20	Bayesian inference, cont.	
8	Feb 25	MCMC	JMP lecture notes Nascimento et al., 2017
	Feb 27	Bootstrap vs. Posterior Probabilities	
	Mar 3, 5	SPRING BREAK	
9	Mar 10	Mito DNA MCMC dataset	JMP homework/notes
	Mar 12	Mito DNA MCMC dataset, cont.	
10	Mar 17	ASTRAL, BUCKy	ASTRAL paper BUCKy paper
	Mar 19	ASTRAL, BUCKy, cont.	
11	Mar 24	SVDquartets	Simmons & Gatesy, 2015 Chou et al.,
	Mar 26	Coalescent methods wrapup	
12	Mar 31	Species delimitation: BPP, ABC	BPP paper ABC paper
	Apr 2	Species delimitation: BPP, ABC, cont.	
13	Apr 7	Paper discussion	Discussion papers
	Apr 9	Paper discussion	
14	Apr 14	Work on projects in class	No readings
	Apr 16	Work on projects in class	
15	Apr 21	Presentations	No readings