

BME 132/232: Evolutionary Genomics Course Syllabus

Instructor Information

Instructor: Shelbi Russell

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Office Hours: By Appointment

Grading

Oral Presentation (25%) Students will prepare and give one 15-minute presentation of one of the readings provided by the instructor. Presentations will either be individual or in groups depending on the course enrollment.

Weekly Participation (40%) Students will be graded on their participation in class discussions of the primary literature to test their reading and comprehension of the topics covered during lectures. Daily attendance, which will be reflected in participation, will be based on handing in a summary of each reading. You may miss up to two classes without penalty or explanation, any additional classes beyond two will not be excused regardless of the reason.

Project Proposal (5%) By the end of week 5, students will submit a project proposal for a topic they wish to address and a complete outline of the approach that they will use to address it. Graduate students will present a novel analysis of their data or publically available data selected with input from the instructor. Undergraduate students will present a thorough review of a topic in evolutionary genomics that was not covered directly in class or may select to instead present a novel analysis.

Project Outline (5%) By the end of week 8, students should submit an outline of their proposed project. This should include approximately one sentence per major idea.

Project Rough Draft (5%) By the end of week 9, students will submit a rough draft of their final project for feedback prior to writing up the final project. Final results may still be pending for graduate students and undergraduates electing to do a research project.

Project Final Write-Up (30%) By the final time scheduled for this class, students will submit a write-up of their project, including specifically addressing the changes required based on the rough draft comments. Projects will be graded based on the completeness of their analysis and on their ability to identify key features of their data or analysis that limit the scope of their conclusions.

Late Work No late assignments will be accepted for credit.

Class date	Week	paper #	Day	Topic	Paper/reading
9/23/22	1	NA	F	Syllabus/introductions/expectations Statistics basics (permutation, likelihood)	Gillespie Chapter 1
9/26/22	2	NA	M	Genetic variation/genetic drift/HWE/inheritance/HGT	Gillespie Chapter 2
9/28/22	2	NA	W	Intro to coalescent theory Genealogical thinking/linkage disequilibrium	Nielsen et al. 2017
9/30/22	2	0	F	Simulating genetic variation (forward/backward) Demographic inference (PCA/STRUCTURE)	Rosenberg et al. 2002
10/3/22	3	1	M	Neanderthal mtDNA sequence	Krings et al. 1997 Nordborg et al. 1998
10/5/22	3	2	W	Neanderthal genome sequence	Green et al. 2010
10/7/22	3	3	F	Neanderthal ancestry in modern humans	Sankararaman et al. 2014
10/10/22	4	4	M	Genetic cost of neanderthal admixture	Harris and Nielsen. 2015
10/12/22	4	5	W	Adaptive introgression in butterflies	Heliconius Genome. 2012
10/14/22	4	6	F	Epistasis within species	Corbett-Detig et al. 2013
10/17/22	5	7	M	Protein convergence in echolocation	Parker et al. 2013
10/19/22	5	8	W	No convergence in echolocating mammals: Defining a null tree topology	Zou and Zhang. 2015
10/21/22	5	9	F	No convergence in echolocating mammals: Defining null species comparisons	Thomas and Hahn. 2015
10/24/22	6	10	M	Detecting selection using polymorphism and divergence data	Macdonald and Krietman 1992
10/26/22	6	11	W	Natural selection in flies	Sattath et al. 2011
10/28/22	6	12	F	Natural selection in humans	Hernandez et al. 2011
10/31/22	7	13	M	Synonymous mutations are most non-neutral in yeast	Shen et al. 2022
11/2/22	7	14	W	Synonymous mutations are not deleterious in yeast	Kruglyak et al. 2022
11/4/22	7	15	F	Genome-Wide Patterns of Polymorphism: flies	Begun and Aquadro 1992
11/7/22	8	16	M	Genome-wide patterns of polymorphism: multi-species	Corbett-Detig et al. 2015
11/9/22	8	17	W	Sex chromosome origins: autosomal	Lahn and Page. 1999
11/11/22	8	NA	F	no class Veterans day	
11/14/22	9	18	M	Sex chromosome origins: Bacterial	Leclercq et al. 2016
11/16/22	9	19	W	Sex chromosome evolution: Dosage	Ellison and Bachtrog.

				compensation	2013
11/18/22	9	20	F	Genome Structure: Inversions/behavior distortion	Wang et al. 2013
11/21/22	10	21	M	Genome Structure: Introns	Huff et al. 2016
11/23/22	10	22	W	Horizontal gene transfer among genomes: the complexity hypothesis	Jain et al. 1999
11/25/22	10	NA	F	no class Thanksgiving holiday	
11/28/22	11	23	M	Horizontal gene transfer (HGT) drives tardigrade genome evolution/ No evidence for HGT in the tardigrade genome	Boothby et al. 2015 Koutsovoulos et. al. 2016
11/30/22	11	24	W	Bacterial gene flow and ecological differentiation	Shapiro et al. 2012
12/2/22	11	25	F	SARS-CoV2 origin	Zhou et al. 2020

Final: 12/7/22 2-5 pm

Sign up for your paper presentation right away.

Link to paper presentation sign-up spreadsheet:

<https://docs.google.com/spreadsheets/d/1-qkfp8dthVjFjYtjvvx9d5pDIZGMPa-CX41zGLrMRs/edit?usp=sharing>