

Morphometrics (ANG6930/ANT4930)

Syllabus – Fall 2024

Lectures: Tuesday 10:40am-11:30am (4 period) – Frazier Rogers 106
Thursday 10:40am-12:35pm (4-5 period) – Frazier Rogers 106

Instructor: Dr. Valerie Burke DeLeon
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Office hours: Turlington B374; Wednesday 10:00am-12:00pm and by appointment

Course Description:

This is an applied workshop course in *Morphometrics*, the statistical analysis of shape. Tuesday classes will include a lecture on theory, and Thursday classes will usually include a discussion period, a demonstration of methods used, and “workshop” time for independent progress on class assignments. Readings will be assigned from the text or posted to the website for each week. Grades are based on timely submission of weekly assignments and the submission and presentation of a final project.

Course Objectives:

- 1) Learn to think critically about the quantification and analysis of shape.
- 2) Gain practical experience in collecting precise and repeatable landmark coordinate data.
- 3) Become familiar with commonly used morphometric software packages and their appropriate use.

Course Materials:

Text:

Zelditch M, *Geometric Morphometrics for Biologists*

Software programs (all freeware):

Fiji

3D Slicer

R and RStudio

MorphoJ

WinEDMA

PAST

Website:

Canvas (ufl.instructure.com)

Communication: Email is the best way to reach Dr. DeLeon (vdeleon@ufl.edu). Please use “Morphometrics” in the subject line.

Final Project: You will use methods discussed in this course to design and implement a research project that includes the statistical analysis of *shape*. You may have overlap between this project and other program requirements (e.g., course projects). The final project should be written in manuscript form and include the following estimates of *text* length. In addition, please include figures, which may be embedded in or follow the text.

Title page

Introduction (statement of hypothesis with relevant, *brief* literature review) ~ 2 page

Materials and Methods (emphasis is on this section; be explicit) ~ 2 pages

Results (include references to tables, figures, and statements of statistical significance) ~ 2 pages

Conclusions (inferences based on the results and possible future directions) ~ 1 page

References

Tables and Figures are **in addition** to these text guidelines

Each student will also prepare and present a 15-minute Powerpoint presentation to the class. Equal time should be allocated to describing 1) data collection and analytic methods, 2) results and interpretation, and 3) advice, tips, and suggestions for your classmates. Presentations are intended to be fun and informative, so please talk to Dr. DeLeon in advance if you have any concerns about this requirement.

Grading: Homework assignments (approximately 12) are equally weighted and count for 60% of your grade. To encourage participation in discussion of articles, 15% of your grade will be based on submission of potential research articles and discussion questions for assigned articles. The final project (written and/or oral presentation portion) counts for 25% of your grade. Grading in this class is consistent with UF policies available at: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Attendance: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>. Our learning environment depends heavily on discussion, and each student has a responsibility to attend and contribute to the class. If you are ill, please stay home. It is your responsibility to communicate with Dr. DeLeon about making up missed work in a timely manner.

Course Evaluations: You are encouraged to share your opinions at any time with Dr. DeLeon in person or by email. In addition, students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

Accommodations: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center: <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

UF Honor Pledge: UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Student Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: ‘On my honor, I have neither given nor received unauthorized aid in doing this assignment.’” The Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>). Written assignments will use the tool Turnitin to assess plagiarism and are subject to [ChatGPT/AI](#) detection. If there is any evidence of violation of the [Student Honor Code](#), the student will receive a grade of zero for the assignment and be reported to [Student Conduct and Conflict Resolution](#) Office. If you have any questions or concerns, please ask me!

Course Schedule:

Aug	22	LECTURE: Morphometrics Overview READING: none WORKSHOP: Review software programs ASSIGNMENT: Install software for use on your personal computer (due 8/29)
	27	LECTURE: Shape READING: Zelditch, Ch 1 and 2 ASSIGNMENT: Describe a research problem wrt shape (due 8/29)
	29	READING: TBD WORKSHOP: Troubleshoot software programs; Working with data in R ASSIGNMENT: Working with data in R (due 9/3)
Sep	3	LECTURE: Landmark Coordinate Data READING: Zelditch, Ch 1 and 2 ASSIGNMENT: Choose landmarks and provide explicit definitions (due 9/10)
	5	DISCUSSION: Landmark definitions WORKSHOP (Fiji): Use Fiji to collect metric data from 2D images
	10	LECTURE: Geometric Morphometrics: Superimposition methods READING: Zelditch, Ch3 ASSIGNMENT: Superimposition worksheet (due 9/17)
	12	READING: <i>Article TBD (Procrustes superimposition)</i> WORKSHOP (3D Slicer): Use 3D Slicer to collect metric data from 3D volumes
	17	LECTURE: Geometric Morphometrics: Shape Space and Procrustes analysis READING: Zelditch, Ch4, skim Ch5 ASSIGNMENT: Format data for import to R. Use R Geomorph to calculate shape coordinates and compare samples (due 9/24).
	19	READING: <i>Article TBD (Group comparisons)</i> WORKSHOP (R geomorph): Use R Geomorph to calculate shape coordinates and compare samples. Address data formatting issues.

	24	LECTURE: Principal Components Analysis READING: Zelditch, begin Ch 6; skim Ch 8 and 9 ASSIGNMENT: Use R to produce a figure and detailed caption illustrating some interesting aspects of the combined dataset in a PCA plot (due 10/1).
	26	READING: <i>Article TBD (PCA)</i> WORKSHOP (Graphics in R): Use R to visualize and explore data
Oct	1	LECTURE: Size, Allometry, and Form Space READING: <i>Article TBD</i> ASSIGNMENT: Produce another figure illustrating how “size” may or may not be related to observed shapes (due 10/8).
	3	READING: <i>Article TBD (Allometry)</i> WORKSHOP (MorphoJ): Use MorphoJ to explore data, including options for superimposition, identifying errors and outliers.
	8	LECTURE: Outlines, Surfaces, and Semilandmarks READING: Zelditch, Ch ASSIGNMENT: Use R Geomorph to compare shape across samples (data provided) (due 10/15).
	10	READING: <i>Article TBD (Semilandmarks)</i> WORKSHOP: Resampling curves (and surfaces); evaluate existing software
	15	LECTURE: Measurement Error READING: von Cramon-Taubadel et al., 2007 ASSIGNMENT: Critically assess your own original data collection vs the mean estimates for the class (due 10/22).
	17	READING: <i>Article TBD (Measurement error)</i> WORKSHOP: Using R to quantify and illustrate measurement error
	22	LECTURE: Asymmetry and Missing Data ASSIGNMENT: Prepare a one paragraph summary outlining question, samples, data, and analyses for final project (due 10/29). Assignment TBD (due 10/29).
	24	READING: <i>Article TBD (Asymmetry)</i> WORKSHOP: Present and discuss plans for final projects
	29	LECTURE: Phylogenetic Effects READING: TBD ASSIGNMENT: Assignment TBD (due 11/5).
	31	READING: <i>Article TBD (Phylogenetic effects)</i> WORKSHOP: Using R to test effects of phylogeny on shape
Nov	5	LECTURE: Modularity and Integration READING: TBD ASSIGNMENT: Assignment TBD (due 11/12).
	7	READING: <i>Article TBD (Modularity or integration)</i> WORKSHOP: Using MorphoJ to assess modularity; Using Geomorph to assess integration
	12	LECTURE: Canonical Variates and Discriminant Function Analyses READING: Zelditch, finish Ch 6 ASSIGNMENT: Compare and contrast PCA and canonical variates analysis from combined data (due 11/19).
	14	READING: <i>Article TBD (CVA or DFA)</i> WORKSHOP: Use R Geomorph to run canonical variates and discriminant functions, test significance, and interpret results.

	19	LECTURE: Euclidean Distance Matrix Analysis (FLEXIBLE) READING: Richtsmeier et al., 2002 ASSIGNMENT: Use the combined dataset to conduct an analysis in WinEDMA, and illustrate and interpret the results (due 12/3).
	21	Presentation of Final Projects (6)
	26	THANKSGIVING – NO CLASS
	28	THANKSGIVING – NO CLASS
Dec	3	Presentation of Final Projects (3)
	10	Final papers DUE

***** Assignments are subject to change, but ample notice will be provided in advance!**