

CSC 315-01, Genomic Data Analysis
Fall 2022
Eastern Connecticut State University

Instructor: Dr. Garrett Dancik (he/him/his)
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Office Hours: MF: 2-4:00 PM
W: 2-3:00 PM; or by appointment

Course information:

Title: Genomic Data Analysis
Day/Time: MWF 11:00 – 11:50 AM (Science Rm 135)
Section: 01
Credit: 3 hours

Course Materials:

1. Software: R (<http://www.r-project.org>) and RStudio (<http://www.rstudio.com>)
2. Course notes and class website: <https://gdancik.github.io>
3. Additional course material: <https://easternct.blackboard.com/>
4. Piazza (<https://piazza.com>) will be used for online discussion. A mobile app is available from the App store (iPhone/iPad) or Google Play (Android devices)

Course Description

Bioinformatics is an interdisciplinary science that involves the development and use of computational and statistical tools to store and analyze large biological datasets such as genomic sequences and gene expression profiles. This course will cover core concepts in biology, statistics, and programming as related to the analysis of genomic data, with a focus on gene expression data. Students will gain proficiency in (1) programming in *R*, a statistical computing language, (2) statistical analyses using *R* and related theory, and (3) the analysis of gene expression data including data processing, identification of differentially expressed genes, clustering, and predictive modeling. The analysis of sequencing data will also be discussed.

Online discussion: We will use Piazza (<https://piazza.com>) as an online discussion and question and answer forum in this course. Shortly after the beginning of the semester, you will receive an e-mail with registration instructions sent to your Eastern e-mail address. Piazza allows for students to post and answer questions, anonymously if desired. The class benefits by seeing questions asked by other students (who often have the same questions as you) and by contributing answers. As the instructor, I will answer questions and can endorse correct student answers as well. For these reasons, all non-personal (e.g., not grade-related) questions should be posted to Piazza rather than e-mailed to me. Questions regarding homework assignments should be posted to Piazza. Questions about homeworks must be specific and may contain no more than *several* lines of code. Note that posts not meeting these criteria will be deleted and the poster penalized if warranted. Assignments where online discussion is required will be posted and/or announced in class.

Grading

Labs / Exercises	25%
Final Project	15%
Exam I	20%
Exam II	20%
Exam III	20%

Assignment Policy: We will devote some class time to completion of assignments. All assignments are due at the beginning of the class on the due date unless specified otherwise. However, a 48 hour grace period is allowed for one eligible assignment of your choice. In this case, you may turn in an assignment up to 48 hours late with no penalty. No assignment will be accepted after the grace period without prior approval. Late assignments will also not be accepted if you have already used your grace period. However, the lowest assignment grade will be dropped. If you know ahead of time that you will be missing class or that you will not be able to complete an assignment on time, please talk to me and if appropriate, additional arrangements will be made. The grace period can be applied to any assignment, unless the assignment specifically states otherwise. Only one grace period can be used for each student. The grace period does not apply to any exams or the final project.

Exam Policy: Make-up exams will only be given if you have a valid reason for missing the due date. If you know ahead of time that you will miss an exam, please talk to me before the exam to make arrangements for taking it. Missing **two** or **more** exams without official excuses will result in your dismissal from the course with a grade of **F**.

Grading Scale

93-100: A	90-92: A-	
87-89: B+	83-86: B	80-82: B-
77-79: C+	73-76: C	70-72: C-
65-69: D+	60-64: D	59 and below: F

Academic Honesty

You are encouraged to discuss projects and exercises with one another unless specified otherwise. However, copying answers from another student (unless otherwise specified) is *cheating* and this will not be tolerated. A student found cheating will automatically receive a grade of “F” on the assignment and will be reported to the department head with further potential consequences. In addition, students are responsible for familiarizing themselves with the University’s numerous policies and procedures contained in the University Catalog and Student Handbook. The Code of Conduct policies and the Policy on Academic Misconduct are of special significance, since cheating, plagiarism, and personal misconduct are strictly prohibited and carry severe penalties. Students should read and understand Eastern's Academic Misconduct Policy, which can be found in the student handbook: www.easternct.edu/academic-misconduct. All violations will be handled under the procedures established in this policy.

Classroom civility and safety

In general, follow the Golden Rule and treat others with respect and the way you want to be treated. In addition, students are expected to adhere to current health and safety protocols as regularly updated on Easternct.edu. Any student who fails to follow safety protocols during class will be referred to the Office of Student Conduct for disciplinary review. In response to state or university restrictions, the professor may deem it necessary to revise assignments and due dates articulated here.

Special Accommodations

Eastern Connecticut State University is committed to following the requirements of the Americans with Disabilities Act (ADA) of 1990, the ADA Amendment Act of 2008, and Section 504 of the Rehabilitation Act of 1973, as amended in 1998. If you are a student with a disability (or think you might have a disability) and require accommodations or assistance evacuating a building in the case of an emergency, please contact the Office of AccessAbility Services (OAS) at 860-465-0189 to discuss your request further. Please note that accommodations are not retroactive and must be communicated through a Letter of Accommodation, which is drafted by the OAS. Please visit the Office of Accessibility Website at <https://www.easternct.edu/accessability/index.html> for more information on how to register with our office.

Diversity Statement

Eastern Connecticut State University values the diversity of its students, faculty, and staff. Differences in race, ethnicity, national origin, class, religion, learning styles,

gender, gender identity and expression, sexual orientation, age, ideology, and other aspects of human variation and characterization, including but not limited to those protected by law and CSCU policies, enrich the educational experiences and social and intellectual development of students and create a rich cultural environment. Eastern is committed to ensuring that regardless of their differences, all members of the Eastern community are challenged to achieve their full potential and are supported in their pursuit of that goal in a campus environment that is free from discrimination and harassment.

Assistance at the Writing Center

The Eastern Writing Center, located in the ASC and staffed by trained peer tutors, is available to help all students with their writing. The Writing Center supports the liberal-arts mission of Eastern by helping students with their writing from any class, at any stage, from brainstorming and drafting to revision to proofreading and editing. We help students do their own work, and do it more comfortably and confidently. Any student can and should use the Writing Center. The process of talking with readers about writing and getting feedback on student writing is something all writers do and can benefit from. Students can either drop into the Center or make an appointment by going to the “Useful Links” column on the Current Students webpage and selecting “GradesFirst” (<http://www.easternct.edu/index/current-students/>). Students are asked to bring copies of any assignment sheets to the Writing Center, so tutors know what is expected of the assignment. Assistance with Academic Advising and Subject Tutoring at the Academic Service Center Students are encouraged to use the support services offered by the Academic Services Center (ASC) located on the ground floor of the Library. Advising Services and tutoring in math, writing, and other subjects are available. The ASC also offers assistance with study techniques, time management, and “Eastern in 4” graduation planning.

Student Sexual Misconduct Policy

Title IX of the Education Amendment of 1972, as well as the Board of Regents Policy on Sexual Misconduct Reporting, Support Services and Processes, prohibit acts of sexual misconduct – sexual harassment, sexual assault, sex-based discrimination, dating violence, domestic violence, stalking, and inappropriate relationships between employees and students. If you or someone you know has been or experiences harassment or assault, resources are available within the Title IX Office and with the Sexual Assault & Interpersonal Violence Response Team (SAIV-RT). Alleged violations should be reported to the Title IX Coordinator in the Office of Equity and Diversity at 860-465-5012. Reports to law enforcement can be made to Eastern Connecticut State University Police Department at 860-465-5310. To receive support and advocacy, please contact the Co-Chair of the Sexual Assault & Interpersonal Violence Response Team (SAIV-RT) at 860-465-4314. You may also visit the SAIV-RT website at <https://www.easternct.edu/sexual-assault-and-interpersonal-violence/index.html> for more information including a list of confidential resources.

Statement from Counseling and Psychological Services (CAPS)

Mental Health and Wellness: Eastern Connecticut State University faculty and staff recognize that mental health concerns can impact academic performance and interfere with daily life activities. Please notify your faculty member or academic advisor for academic assistance, as needed. Counseling and Psychological Services (CAPS) can also provide support if you're feeling stressed, overwhelmed, anxious, depressed, lost or are struggling with other personal issues.

Please call or visit the [Counseling and Psychological Services \(CAPS\) website](#) for more information. These professional services are free, confidential, and support non- traditional, graduate, and undergraduate students. Call 860-465-0181 to schedule an appointment. Same day urgent hours are M-F, 1-3.

Students in crisis and/or experiencing suicidal thoughts, free 24/7 crisis support in the US, call:

- Suicide & Crisis Lifeline at 9-8-8
- Suicide Prevention Lifeline at 1-800-273-8255
- Text HOME to the Crisis Text Line at 741 741
- Trevor Project 1-866-488-7386 for LGBTQ youth
- 211 (mental health emergency)

***Tentative course schedule**

Week	Week of	Topic	
1	8/29/22	R Programming Fundamentals	
2	9/5/22	<i>Labor Day – No Class Monday</i>	Exploring Data with Graphs and Numerical Summaries
3	9/12/22	Associations: Between Qualitative Variables	
4	9/19/22	Associations: Correlation and Regression	
5	9/26/22	Advanced R Programming Concepts	Review / Exam I
6	10/3/22	Basic Concepts in Probability and Probability Distributions	<i>Fall Break - No Class Friday</i>
7	10/10/22	Normal Probability Distribution	
8	10/17/22	Statistical Inference	
9	10/24/22	Review / Exam II	
10	10/31/22	Gene Expression and RNASeq, Normalization Methods for Count Data	
11	11/7/22	Retrieving Genomic Data from Xena	
12	11/14/22	Identification of Differentially Expressed Genes Using <i>limma</i>	
13	11/21/22	Classification (kNN)	<i>Thanksgiving – No Class Wednesday or Friday</i>
14	11/28/22	Functional and Gene Set Enrichment Analysis	
15	12/5/22	Advanced Topics and Review	
	12/12/22	Exam III (11:00 – 1:00)	

***This is a tentative schedule and is subject to change**