

Introduction to Bioinformatics
CGS 4144 Section 11ZE
Class Periods: MWF, Period 4, 10:40-11:30am
Location: FLG 0230
Academic Term: Fall 2023

Instructor:

Kiley Graim

kgraim@ufl.edu

Office Hours: TBD

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Tina Salehi Torabi, tina.salehitorab@ufl.edu
- Zachary Greenberg, zfg2013@ufl.edu

Course Description

3 Credits. This course covers introductory and intermediate-level topics in computational biology. We study the principles of algorithm design for biological datasets, analyze influential algorithms, and apply these to real datasets. Topics include: sequence and expression analysis, genotype to phenotype relationships, understanding gene function, regulatory network inference, machine learning applications to genomics.

Course Pre-Requisites / Co-Requisites

Programming skills (Python, R, or other) at the level equivalent to COP 3502 or COP 3503 or above.

Course Objectives

By the end of the course, students should have the ability to:

- Identify and formulate a bioinformatics approach to solve a biological problem.
- Understand some of the basic concepts and problems in bioinformatics, including but not limited to: genome assembly, read alignment, and RNA-seq analysis.
- Develop and evaluate a bioinformatics application based on a biologist's specification.

Materials and Supply Fees

NA

Required Textbooks and Software

There is no required textbook for this course.

Recommended Materials

NA

Course Schedule

| Week | Date | Topic | Assignments/Quizzes/Exams |
|------|---------|-------------------------------------------------|---------------------------|
| 1 | Aug 21 | Introduction to the course | |
| 2 | Aug 28 | The role of DNA, RNA, protein | |
| 3 | Sept 4 | Next generation sequencing / R Primer | Assignment 1 |
| 4 | Sept 11 | Sequence databases, search, and genome browsers | Quiz |
| 5 | Sept 18 | Biological networks and pathways | |
| 6 | Sept 25 | Gene expression analysis basics | Assignment 2 |
| 7 | Oct 2 | Midterm | Midterm Exam |
| 8 | Oct 9 | Predictive methods using RNA | |
| 9 | Oct 16 | Predictive methods using DNA / protein | Assignment 3 |
| 10 | Oct 23 | Multiple sequence alignment | Quiz |

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|----|--------|-----------------------------------------|-----------------------------|
| 11 | Oct 30 | Phylogenetics | Assignment 4 |
| 12 | Nov 6 | Population genomics | |
| 13 | Nov 13 | Precision Medicine | Final Project Report |
| 14 | Nov 20 | Bioethics, Recent advances in the field | Final Project Slides |
| 15 | Nov 27 | Final Presentations | Final Project Presentations |
| 16 | Dec 4 | Final Presentations | Final Project Presentations |

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance: Students are encouraged to attend all classes. History indicates that students who do not attend class do poorly on examinations and suffer the consequence of low grades.

Make-up Policy: Extensions on exams and assignments will be given only for excused absences. Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation. Unexcused late assignments will be penalized at a rate of 20% per day. Submissions after 5 days from the due date will not be graded. If possible, the student must contact the instructor beforehand, to state that he/she will not be able to submit the assignment by the due date or attend the exam. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Plagiarism and Cheating: All suspected plagiarism and cheating cases will be evaluated by the SCCR, consistent with University of Florida policy. A grade of zero will be given to all cases of plagiarism and cheating.

Evaluation of Grades

| Assignment | Total Points | Percentage of Final Grade |
|--------------------|---------------------|----------------------------------|
| Assignments (4) | 50 each | 20% |
| Quizzes (2) | 50 each | 10% |
| Exams (2) | 200 each | 40% |
| Final Project | 200 | 20% |
| Final Presentation | 100 | 10% |
| | 1000 | 100% |

Grading Policy

| Percent | Grade | Grade Points |
|----------------|--------------|---------------------|
| 94 - 100 | A | 4.00 |
| 90.0 - 93.9 | A- | 3.67 |
| 87 - 89.9 | B+ | 3.33 |
| 84 - 86.9 | B | 3.00 |
| 80.0 - 83.9 | B- | 2.67 |
| 77 - 79.9 | C+ | 2.33 |
| 74 - 76.9 | C | 2.00 |
| 70.0 - 73.9 | C- | 1.67 |
| 67 - 69.9 | D+ | 1.33 |
| 64 - 66.9 | D | 1.00 |
| 61 - 63.9 | D- | 0.67 |
| 0 - 60.9 | F | 0.00 |

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <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.

Course Evaluation

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.a.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.a.ufl.edu/public-results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

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 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 Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed,

color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- HWC OE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students 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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

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.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.