CSCI-1020: Introduction to Computer Science: Bioinformatics

Syllabus

Fall 2020

Instructor Contact Information

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Program of Bioinformatics and Computational Biology
Saint Louis University
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Office Hour: Thursday, 10:00 am-12:00 pm, or by appointment. The meetings will be held on Zoom (Same link as the class meeting)

Note: Please make sure to take advantage of office hours, as they offer a wonderful opportunity for individual attention.

Class Meetings

The material will be presented in three weekly lectures. Attendance is expected and class participation is most welcome. These meetings will offer learning opportunities that cannot be re-created purely from readings. In fact, you will get the most out of the meetings if you read the appropriate material in the textbook before the class meeting in which it will be discussed, and come prepared with any questions that you have. Information on the lecture topic can be found on the course schedule web page on Canvas.

- Class Periods: Mon/Wed/Fri, 09:00am-09:50am
- Classroom: Ritter Hall 115

Although attending lectures in the classroom is suggested, students that have requested attending online lectures also can join the lectures via Zoom. The lectures will be recorded and posted on Canvas for asynchronous learning.

https://slu.zoom.us/j/95263082358?pwd=NElaWFdBdG15ZTd5VmhrbkdxY3ZqZz09
Meeting ID: 952 6308 2358
Password: 659898

Course Description

An introduction to computer programming motivated by the analysis of biological data sets and the modeling of biological systems. Computing concepts to include data representation, control structures, text processing, input, and output. Applications
to include the representation and analysis of protein and genetic sequences, and the use of available biological data sets.

Pre-requisites

- None

Student Learning Objectives

After successfully completing this course, students will be able to:

1. Describe discrete representations of various biological structures.
2. Manually simulate some fundamental bioinformatics algorithms on small data sets.
3. Author simple Python code that performs basic bioinformatics algorithms and analyses.
4. Make use of existing implementations to perform basic analyses of biological data sets.

Topical Outline

Major themes within the course will include

- Central Dogma of molecular biology
- Sequence alignment and dynamic programming
- Phylogenetic trees and clustering algorithms
- DNA sequence assembly
- Gene prediction
- Protein structure

Course Textbook/Reading Materials

The *recommended* (but not required) textbook upon which we will organize the class is:

  - Caroline St. Clair and Jonathan E. Visick
  - Jones & Bartlett Learning, 2015.
  - Companion website: biology.jbpub.com/bioinformatics/2e/
    - (Requires one-time code sold with the book or sold separately by publisher.)

Note well that this is the *Second Edition* of the book, and there were very significant changes between editions so it really is the second edition that is relevant. We also note that the book has a surprisingly high list price of $217 however, in reality, it seems that they really make new copies available through some venues for a more reasonable price. At one point the publisher indicated a promotional price of $79.95 (I'll try to get details of that). When looking at Amazon, I've seen new copies in the ballpark of $80-$100. I am also working on getting a new copy on reserve at SLU's library.
Online Resources

Course Work

Most of the information for this course will be distributed only by means of the course web page, including all assignments, a schedule of lectures, detailed lecture notes and links to many other sources of information.

Email with Instructor

Zoom meeting in office hours is most desirable. Yet email is a convenient form of communication as well. I try to respond to email promptly, including at least once each evening when possible.

If your question involves your progress on a current programming assignment, my response will be more informative if you can point out the specific problem you have encountered, and if I am able to see all of your source code. Therefore I strongly suggest that you either attach all relevant files to the email or submit preliminary versions of such files through our online system.

Grading Scheme

<table>
<thead>
<tr>
<th>Course Item</th>
<th>Percent of Final Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Homeworks</strong></td>
<td>35%</td>
<td>There will be a series of assignments during the semester, approximately once per week or two. These will include both questions that involve hand-written simulations of algorithms, and Python programming challenges. We expect there to be about 6-8 such assignments during the course. At the end of the semester, we will throw away your lowest of the homework grades, with the remaining scores contributing equally to this portion of the grade.</td>
</tr>
<tr>
<td><strong>Labs</strong></td>
<td>10%</td>
<td>We will have in-class lab activities, approximately once per week or two. Students must attend to get full credit for a lab, although the actual lab writeups will be due 24 hours after the lab period. We expect there to be about 6-8 such assignments during the course. At the end of the semester, we will throw away your lowest of the lab grades, with the remaining scores contributing equally to this portion of the grade.</td>
</tr>
<tr>
<td><strong>Final Project</strong></td>
<td>10%</td>
<td>We have one final project that requires the integration of several major topics in class for problem-solving. Students need to use existing codes that have been used in previous labs/homeworks to develop a pipeline for protein structure prediction.</td>
</tr>
<tr>
<td><strong>Midterm</strong></td>
<td>30%</td>
<td>First Exam (15%), tbd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second Exam (15%), tbd</td>
</tr>
<tr>
<td><strong>Final</strong></td>
<td>15%</td>
<td>Thursday, December 3, 8 to 9:50 a.m.</td>
</tr>
<tr>
<td><strong>Course Participation</strong></td>
<td>5%</td>
<td>Attendance in class/zoom and interaction in or out of class will be counted for 5 %.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
The final grades for the course will be based on the following scale. Letter grades will be based on each student's overall percentage of awarded points according to the following formula. The instructor reserves the right to make adjustments to grades based on overall performance in the course. There will be no opportunity for “extra credit” to improve grades that have already been earned. Bargaining for grades will not be tolerated.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>F</th>
<th>D</th>
<th>C-</th>
<th>C</th>
<th>C+</th>
<th>B-</th>
<th>B</th>
<th>B+</th>
<th>A-</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage(%)</td>
<td>&lt;60</td>
<td>≥60</td>
<td>≥67</td>
<td>≥70</td>
<td>≥73</td>
<td>≥77</td>
<td>≥80</td>
<td>≥83</td>
<td>≥87</td>
<td>≥90</td>
</tr>
</tbody>
</table>

**Attending Policy**

All exams must be taken promptly at the required time. Requests for rescheduling an exam will only be considered if the request is made prior to the start of the exam, or else in an "emergency" situation with appropriate documentation.

For homework assignments, we wish to allow students to continue to work comfortably beyond the official deadline when a little more time will result in more progress, while at the same time discourage students from falling significantly behind the pace and jeopardizing their success on future assignments. Our solution is the following exponentially decaying late formula (some have suggested that we should offer extra credit to anyone who fully understands this formula).

We will consider an assignment submission "complete" when any part of the assignment is last submitted or modified. Any assignment that is not complete promptly by its due date and time will be assessed a penalty based on the formula $S = R \cdot e^{-h/173}$, where $S$ is the grade given, $R$ is the grade the work would have received had it been turned in on time, and $h$ is the amount of time (in hours or fractions thereof) that the work was late.

Examples:

- work turned in 1 hour late receives 99.6% of its original credit
- work turned in 5 hours late receives over 97% credit
- work turned in one full day late receives less than 88% credit
- work turned in two full days late receives less than 76% credit
- work turned in five days late receives less than 50%

The above policies will be waived only in an "emergency" situation with appropriate documentation.

**Syllabus Statements**

**Title IX**

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual harassment, including sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. If you speak with a faculty member about an incident that involves a Title IX matter, that faculty member must notify SLU’s Title IX Coordinator and share the basic facts of your experience. This is true even if you ask the faculty member not to disclose the incident. The Title IX Coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

Anna Kratky is the Title IX Coordinator at Saint Louis University (DuBourg Hall, room 36; anna.kratky@slu.edu; 314-977-3886). If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK or make an anonymous report through SLU’s Integrity Hotline by calling 1-877-525-5669 or online at
IMPORTANT UPDATE: SLU’s Title IX Policy (formerly called the Sexual Misconduct Policy) has been significantly revised to adhere to a new federal law governing Title IX that was released on May 6, 2020. Please take a moment to review the new policy and information at the following web address: https://www.slu.edu/about/safety/sexual-assault-resources/index.php. Please contact the Anna Kratky, the Title IX Coordinator, with any questions or concerns.

Note: due to accreditation requirements, regulatory differences, and/or location-specific resources, the School of Law, the School of Medicine, and SLU Madrid have their own standard language for syllabus statements related to Title IX. Faculty in those units should seek guidance for syllabus requirements from their dean’s office.

Disability Services

Students with a documented disability who wish to request academic accommodations must contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also must notify the course instructor that they wish to access accommodations in the course.

Please contact Disability Services, located within the Student Success Center, at Disability_services@slu.edu or 314.977.3484 to schedule an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student’s eligibility for academic accommodations will be shared with course instructors via email from Disability Services and viewed within Banner via the instructor’s course roster.

Note: Students who do not have a documented disability but who think they may have one are encouraged to contact Disability Services.

Academic Integrity

Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care, and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy was adopted in Spring 2015, and can be accessed on the Provost's Office website at: https://www.slu.edu/provost/policies/academic-and-course/policy_academic-integrity_6-26-2015.pdf.

Additionally, each SLU College, School, and Center has adopted its own academic integrity policies, available on their respective websites. All SLU students are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions, and appeals. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Dean/Director of the College, School or Center in which your program is housed.

Student Success Center

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. The Student Success Center assists students with academic-related services and is located in the Busch Student Center (Suite, 331). Students can visit https://www.slu.edu/life-at-slu/student-success-center/ to learn more about tutoring services, university writing services, disability services, and academic coaching.

University Writing Services

Students are encouraged to take advantage of University Writing Services in the Student Success Center; getting feedback benefits writers at all skill levels. Trained writing consultants can help with writing projects, multimedia projects, and oral presentations. University Writing Services offers one-on-one consultations that address everything from brainstorming and developing ideas to crafting strong sentences and documenting sources. For more information, visit https://www.slu.edu/life-at-slu/student-success-center/ or call the Student Success Center at 314-977-3484.

Face Masks Statement

The University’s Interim Policy on Face Masks (visit https://slu.policystat.com/policy/token_access/2e1e7d4e-49c9-42ba-8055-ca833711bea4/) governs all students, faculty, staff, and campus visitors in all University-owned, leased, or operated facilities.
All persons physically present in any such University facility associated with this course shall comply fully with this policy at all times. Masks must be worn before entry to all such University facilities (as well as outdoors on all University property when six feet of distance is unpredictable or cannot be maintained).

Saint Louis University is committed to maintaining an inclusive and accessible environment. Individuals who are unable to wear a face mask due to medical reasons should contact the Office of Disability Services or Human Resources to initiate the accommodation process identified in the University’s ADA Policy (visit https://www.slu.edu/human-resources/pdfs/policies/americans-disabilities-act-policy.pdf). Inquiries or concerns may also be directed to the Office of Institutional Equity and Diversity (https://www.slu.edu/general-counsel/institutional-equity-diversity/index.php). Notification to instructors of SLU-approved ADA accommodations should be made in writing prior to the first class session in any term (or as soon thereafter as possible).

As the instructor of this course, I shall comply fully with SLU’s policy and all related ADA regulations.

Students who attempt to enter a classroom without wearing masks will be asked by the instructor to wear masks prior to entry. Students who remove their masks at any time during a class session will be asked by the instructor to resume wearing their masks.

*Note: Accordingly, no consumption of any food will be allowed in class.*

Students who do not comply with a request by a SLU instructor to wear a mask in accordance with the University’s Interim Policy on Face Masks may be subject to disciplinary actions per the rules, regulations, and policies of Saint Louis University, including but not limited to the Student Handbook. Non-compliance with this policy may result in disciplinary action, up to and including any of the following:

- dismissal from the course(s)
- removal from campus housing (if applicable)
- dismissal from the University

To immediately protect the health and well-being of all students, instructors, and staff, instructors reserve the right to cancel or terminate any class session at which any student fails to comply with faculty or staff requests to wear a mask in accordance with University policy. Students are strongly encouraged to identify to their instructor any student or instructor, not in compliance. Non-compliance may be anonymously reported via the SLU Integrity Hotline at 1-877-525-5669 (or confidentially via the Integrity Hotline's website at http://www.lighthouse-services.com/slu.

**Attendance**

The health and well-being of SLU’s students, staff, and faculty are critical concerns. Accordingly, the following University policy statements on in-person class attendance are designed to preserve and advance the collective health and well-being of our institutional constituencies.

1. Students who exhibit any potential COVID symptoms (those that cannot be attributed to some other medical condition the students are known to have, such as allergies, asthma, etc.) shall absent themselves from any in-person class attendance or in-person participation in any class-related activity until they have been evaluated by a qualified medical official. Students should contact the University Student Health Center for immediate assistance.
2. Students who exhibit any potential COVID symptoms (those that cannot be attributed to some other medical condition the students are known to have, such as allergies, asthma, etc.) but who feel well enough to a) attend the course synchronously in an online class session or b) participate in asynchronous online class activities, are expected to do so. Those who do not feel well enough to do so should absent themselves accordingly.
3. Students (whether exhibiting any of potential COVID symptoms or not, and regardless of how they feel) who are under either an isolation or quarantine directive issued by a qualified health official must absent themselves from all in-person course activity per the stipulations of the isolation or quarantine directive. They are expected to participate in synchronous or asynchronous online class activities as they feel able to do so, or absent themselves accordingly.
4. Students are responsible for notifying each instructor of an absence as far in advance as possible; when an advance notification is not possible, students are responsible for notifying each instructor as soon after the absence as possible.
5. As a temporary amendment to the current University Attendance Policy, all absences due to illness or an isolation/quarantine directive issued by a qualified health official shall be considered “Authorized” absences (effective August 2020 through May 2021).

**Distance Education Etiquette**

Your actions in distance education contexts are just as important as in on-ground, face-to-face educational contexts – and sometimes require additional attention and commitment, as some distance education technologies might be less familiar to us.
Accordingly, all students are expected to follow the guidelines below:

**Synchronous Video Contexts (Zoom, etc.)**

1. Mute your microphone when you are not speaking. Remember to “un-mute” yourself just prior to speaking. Identify yourself when you begin speaking.
2. Expect a few seconds of delay in getting a response from the instructor or another class member to a question; wait before repeating your question or assuming it was not heard.
3. If possible, position your camera such that your video feed does not capture too much of your surroundings or other activity/sound from your home/location. Be conscious of posters, art, or other surroundings that others might find offensive or inappropriate for an educational context.
4. Use the “Raise Hand” and “Chat” (or similar) features of your video-conferencing tool. This limits verbal interruptions and the confusion generated when multiple people try to speak at once.
5. Just as in an on-ground, face-to-face class, limit side conversations, multi-tasking (on your computer or otherwise), and use of your cellphone.
6. Temporarily turn off your video feed and mute your microphone when engaged in any non-class conversation or activity.
7. Respect and be attentive to the diversity of your classmates and instructor. Before communicating, consider your message in the context of the class’ diversity in race, ethnicity, religion, disabilities, gender, sexual orientation, age, social class, marital status, geography, etc. Consider the diversity you can see or know – as well as that you cannot.
8. Remember that video-based class sessions (including chat transcripts) may be recorded and retrieved for later viewing.

**Non-Video & Asynchronous Contexts (Blackboard, Canvas, Online Chats, Discussion Boards, etc.)**

1. When using the “Chat” or “Discussion Board” (or similar) features of your course management system, remember that your course-related communications to the instructor or other students should be considered “professional” (they are not like texts to your friends). Remember that course context and all related written work – including chat and discussion board transcripts – can be recorded and retrieved.
2. Be cautious when using humor or sarcasm; without the context of facial expressions or other body languages, your tone or intent could be missed or misunderstood by others.
3. Respect and be attentive to the diversity of your classmates and instructor. Before communicating, consider your message in the context of the class’ diversity in race, ethnicity, religion, disabilities, gender, sexual orientation, age, social class, marital status, geography, etc. Consider the diversity you can see or know – as well as that you cannot.
4. Respect others’ time and life circumstances, which often don’t allow for an immediate response to a question or comment.