

## CSCI 1020

# Introduction to Computer Science: Bioinformatics

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# 1 Overview

## 1.1 Catalog 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.

## 1.2 Prerequisites

None

## 1.3 Student Learning Outcomes

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

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

## 1.4 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

## 2 Course Administration

### 2.1 The Staff

**Instructor:** Dr. Michael Goldwasser  
**Email:** michael.goldwasser@slu.edu  
**Web:** <http://cs.slu.edu/~goldwasser/>  
**Office:** Ritter Hall 355  
**Phone:** (314) 977-7039  
**Office hours:** Monday 10–11am  
                  Tuesdays 1–2pm  
                  Fridays 12–1pm  
                  or by appointment

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

### 2.2 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.

**Time:** Mon/Wed/Fri, 11:00-11:50am  
**Place:** Ritter Hall 115

### 2.3 Textbook

The textbook upon which we will organize the class is

**Title:** Exploring Bioinformatics: A Project-based Approach, *Second Edition*  
**Authors:** Caroline St. Clair and Jonathan E. Visick  
**Publisher:** Jones & Bartlett Learning, 2015  
**ISBN-13:** 978-1-284-03424-0 (paperback)  
**Companion website:** <http://biology.jbpub.com/bioinformatics/2e/>  
(Requires one-time code sold with 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 on 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.

## 3 Online Resources

### 3.1 CSCI 1020 Web Page: [cs.slu.edu/~goldwasser/1020](http://cs.slu.edu/~goldwasser/1020)

With the exception of the first day's printed handout, most of the information for this course will be distributed only by means of the course web page. This web site will contain all assignments, a schedule of lectures, detailed lecture notes and links to many other sources of information.

The web page contains some information (e.g. solutions, submitted assignments, individual grades) that is more sensitive and will be password protected. The username is `slu` and the password is a particular college mascot (singular and lowercase).

### 3.2 Email with Instructor

Face-to-face contact in class and 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.

### 3.3 Electronic Assignment Submission

To allow the student and instructor to exchange electronic files for programming assignments, we will rely on a version control system known as `git`, and a web-based system known as `gitlab` and available at [git.cs.slu.edu](http://git.cs.slu.edu). For further documentation of the use of this system, please see the course webpage.

## 4 Graded Work

### 4.1 Homework Assignments (35%)

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.

## 4.2 Labs (10%)

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.

## 4.3 Exams (55%)

- **First Exam (15%)**, tbd, 11:00–11:50am
- **Second Exam (15%)**, tbd, 11:00–11:50am
- **Final Exam (25%)**, Monday, 13 May 2019, **8:00–9:50am**

## 4.4 Course Grades

Letter grades will be based on each students overall percentage of awarded points according to the following formula.

- Student percentage above 90% will result in a grade of A or better.
- Student percentage above 87% will result in a grade of A- or better.
- Student percentage above 83% will result in a grade of B+ or better.
- Student percentage above 80% will result in a grade of B or better.
- Student percentage above 77% will result in a grade of B- or better.
- Student percentage above 73% will result in a grade of C+ or better.
- Student percentage above 70% will result in a grade of C or better.
- Student percentage above 67% will result in a grade of C- or better.
- Student percentage above 60% will result in a grade of D or better.
- Student percentage below 60% will result in a grade of F.

Any modification to this scale at the end of the year will be *in favor of the students*. That is we may later decide to award an A to a student who is slightly below the above cutoff, but we certainly will not deny an A from someone who is above the cutoff.

## 4.5 Extra Credit

Assignments will generally include a small extra credit challenge. Please notice, however, that the actual extra credit given for these challenges is relatively insignificant. Students who are seriously concerned about improving their overall grade would be best advise to focus all efforts on doing as well as possible on the required work and in preparing for exams.

Our true reason for including these opportunities is to provide some fun and encouragement for students who wish to dig a bit deeper than was required in an assignment. For those students, the chosen extra credit challenges provide a good next step.

## 4.6 Late Policies

All exams must be taken 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.

All lab writeups must be submitted at the required time (typically 24 hours after the lab period).

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 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 which 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 over 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%
- work turned in two full days late receives less than 76%
- work turned in five days late receives less than 50%

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

## 5 Academic Integrity and Collaboration Policy

### 5.1 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.

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. Specific College of Arts and Sciences Academic Honesty Policies and Procedures may be found at: [www.slu.edu/arts-and-sciences/student-resources/academic-honesty.php](http://www.slu.edu/arts-and-sciences/student-resources/academic-honesty.php)

In addition to those general statements, we wish to discuss our policy in the context of this course. When it comes to learning and understanding the **general course material**, you may certainly use other reference materials and you may have discussions with other students in this class or other people from outside of this class. This openness pertains to material from the text and practice problems.

However, for **work that is submitted for this course**, you are not to use or search for any direct assistance from unauthorized sources, including but not limited to:

- other texts, books, or solution manuals
- online information other than that referenced by course materials
- other students in this class (other than when collaboration is explicitly allowed, as described below)
- students or acquaintances who are not in this course

Acceptable sources of information include consultations with the instructor, teaching assistants, or members of organized tutoring centers on campus, as well as any materials explicitly authorized in an assignment. Even in these cases, if you receive significant help you should make sure to document both the source of the help as well as the extent.

Any violations of these policies will be dealt with seriously. Penalties will apply as well to a student who is aiding another student. Any such violations will result in a minimum penalty of a zero on the given assignment which cannot be dropped, and severe or repeated violations will result in an immediate failing grade in the course. Furthermore all incidents will be reported in writing to the Department and/or the Dean, as per the College procedure.

## 5.2 Collaboration Policy

On certain programming assignments, we will explicitly allow students to work in pairs. In this case, conversations between partners is both permissible and required. Furthermore, all students are expected to contribute significantly to the development of the submitted work. It is unethical to allow a partner to “sign on” to a submission if that partner did not significantly contribute to the work.

## 6 Additional Information

### 6.1 Title IX Statement

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 misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX coordinator, Anna R. Kratky (DuBourg Hall, room 36; [akratky@slu.edu](mailto:akratky@slu.edu); 314-977-3886) and share the basic fact of your experience with her. 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.

If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK. To view SLU's sexual misconduct policy and for resources, please visit the following web address: [www.slu.edu/here4you](http://www.slu.edu/here4you).

### 6.2 Supporting Student Success

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, a one-stop shop, which assists students with academic and career related services, is located in the Busch Student Center (Suite 331) and the School of Nursing (Suite 114). Students can visit [www.slu.edu/success](http://www.slu.edu/success) to learn more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring services, university writing services, disability services, academic coaching, career services, and/or facets of curriculum planning).

### 6.3 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](mailto:Disability_services@slu.edu) or 314-977-3484 to schedule an appointment. Confidentiality will be observed in all inquiries. Once approved, information about 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.