BCB 5250: Introduction to BIOINFORMATICS II

Catalog Description:
Introduce the broad frontiers of bioinformatics topics from fundamental algorithms to practical tools. The main objective of the course is to provide the student with a solid foundation for conducting further research in bioinformatics and computational biology.

Class Meeting Time/Location:
Time: Tue, Thu 11:00am-12:15pm
Location: 115 Ritter Hall (Linux Classroom)

Instructor:
Tae Hyuk (Ted) Ahn, PhD
Assistant Professor
Department of Computer Science
Program of Bioinformatics and Computational Biology
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Office: 305 Ritter Hall (Lab: 302 Ritter Hall)
Phone: (314) 977-3633
Office Hour: Mon 11:00am-12:30pm, Tue 9:00-10:30am, or by appointment

Credits/Pre-requisites:
Credits: 3 Credits
Pre-requisites:
- Undergraduate course in Genetics are required.
- Introduction to Bioinformatics I

Course Description
Introduction to Bioinformatics I and II are designed to introduce senior/graduate students to the fundamental concepts, methods, and research topics in Bioinformatics for analyzing large and complex biological data. In the course, we will intensely study specific research topics including genome assembly, metagenomics, RNA-Seq analysis, network analysis, and modeling and simulation. In the Introduction to Bioinformatics II course, students will be divided into groups and work on their proposed projects.

Topical Outline:
- Introduce new trends of tools and environments for Bioinformatics
- Genome assembly and genome/gene annotation
- Metagenomics
- RNA-Seq Analysis
- Biological Modeling and Simulation

Student Learning Outcomes:
After successfully complete this course, students are expected to:
- Know fundamental concepts of bioinformatics;
- Understand underlying basic bioinformatics algorithms;
- Run bioinformatics applications and tools to study diverse and complex omics data;

- Recognize how to apply different bioinformatics tools;
- Understand cutting edge bioinformatics research topics;
- Write pipeline scripts to automate existing applications;
- Increase the ability to propose new algorithms and implement software tools;
- Able to evaluate peer's research works and understand the importance of peer review process;
- Study the knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic in a literature;
- Practice and improve presentation skills including logical format of contents, ordered in clear manner, effective information, and so on;
- Conduct a research as a project to answer or analysis of a biological problem as a group for obtaining a successful, high-quality, collaborative experience.

Course Textbook and Resources:
No textbook is required for this course. Assigned materials will be posted on class website. Optional reference books are as below:

- Bioinformatics and Functional Genomics 2nd or 3rd Edition by Jonathan Pevsner (Hoboken, N.J., Wiley-Blackwell, c2009)
- Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids by Richard Durbin et al. (1st Edition)
- R Cookbook by Paul Teetor (O'Reilly Cookbooks)
- Bioinformatics Programming Using Python: Practical Programming for Biological Data (O'Reilly)
- Bioinformatics Data Skills: Reproducible and Robust Research with Open Source Tools 1st Edition by Vince Buffalo (O'Reilly)
- An Introduction to Bioinformatics Algorithms (Computational Molecular Biology) 1st Edition by Neil C. Jones (Cambridge, Mass, MIT Press, c2004)
- Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology 1st Edition by Dan Gusfield (Univ. of Cambridge)

Blackboard will be used to
- Post lectures and other materials
- Assign and submit homework
- Grade and post homework and exam scores

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. We will 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, our response will be more informative if you can point out the specific problem you have encountered, and if we are able to see all of your source code. Therefore, I strongly suggest that you either attach all relevant files to the email.

Computer and Cell Phone Policy
Computers will be an integral part of this course, both inside and outside of class. However, out of courtesy to both the instructor and other students, please do not use the lab computers for non-class

related activity. In particular, you do not need to be using a computer unless an exercise or in class activity requiring them is in progress.

You are unlikely to need cell phones during the course of lecture. Please ensure that your cell phone is set to vibrate or silent during lecture, and do not send text messages of any kind.

Grading:

Lab and Homework Assignments (35%)
- There will be labs and assignments in a variety of format such as (but not exclusively) in-class labs and take-home assignments.
- We will usually give you a week time frame to submit the homework. Check the due in the online system.

Literature Review and Presentation (15%)
- Submit literature review report (one paragraph or less than 1 page) for each reference paper with your critiques.
- Present assigned reference paper and Q&A.

Quiz (10%)
- We will have two quizzes (5% each) on Tuesdays of a week ahead of midterm and final weeks.
- The quizzes will be true/false, multiple choice, and some short answer.

Project and Presentation (35%)
- Midterm Proposal Presentation and Midterm Report (15%)
- Final Project Presentation and Final Report (20%)
  - Report should include below sections:
    - Abstract
    - Introduction
    - Methods
    - Results
    - Discussion
    - References

Attendance and Class Activities (5%)
Course attendance is not mandatory, but please try to attend all lectures. If you could not attend the lecture, please inform me in advance. **I will check the attendance in multiple random days to give scores.** Your class activities will be also evaluated.

Extra Credit
There is no extra credit. 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.

Grading Scale:
Final grades for the course will be based on the following scale. 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.

Letter Grade	F	D	C-	C	C+	B-	B	B+	A-	A
%	<60	≥60 <70	≥70 <73	≥73 <77	≥77 <80	≥80- <83	≥83 <87	≥87 <90	≥90 <93	≥93

Late Policies

Late homework or programming assignments will suffer a penalty of 20% for every day they are late. For example, homework which is submitted between midnight and 11:59pm next day will be worth at most 80% of the total credit. After five days of the due, submission will get zero point as the formula. For the lab session, 1 point reduction for every day if they are late.

Regrade Requests

I am happy to regrade any assignments, programs, quizzes or exam problems which you think were unfair or incorrect. Please bring me the original assignment, plus a written explanation of your question or complaint, within two weeks of the time the paper in question is graded and returned to you.

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 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; 314-977-3886) and share the basic facts 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 addresses: www.slu.edu/here4you and https://www.slu.edu/general-counsel.

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 to Disability Services.

Academic Integrity and Honesty

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.

Basic Needs Security

Students in personal or academic distress and/or who may be specifically experiencing challenges such as securing food or difficulty navigating campus resources, and who believe this may affect their performance in the course, are encouraged to contact the Dean of Students Office (deanofstudents@slu.edu or 314-977-9378) for support. Furthermore, please notify the instructor if you are comfortable in doing so, as this will enable them to assist you with finding the resources you may need.

Tentative schedules

Week	Dates	Topic	Presenter
1	01/15/2019	Welcome and Introduction	
	01/17/2019	Genome Assembly and Annotation 1	

2	01/22/2019	Genome Assembly and Annotation 2	
	01/24/2019	Genome Assembly and Annotation 3	1. Scott
3	01/29/2019	Genome Assembly and Annotation 4	
	01/31/2019	Genome Assembly and Annotation 5	2. Paul
4	02/05/2019	Genome Assembly and Annotation 6	
	02/07/2019	Genome Assembly and Annotation 7	3. Keenan
5	02/12/2019	Metagenomics 1	
	02/14/2019	Metagenomics 2	4. Sara
6	02/19/2019	Metagenomics 3	
	02/21/2019	Metagenomics 4	5. Kyle
7	02/26/2019	Metagenomics 5, Quiz 1	
	02/28/2019	Metagenomics 6	6. Yongjun
8	03/05/2019	RNA-Seq Analysis 1	
	03/07/2019	Project – Midterm Presentation (20 min presentation including Q/A for each group)	
9	03/12/2019	Spring Break (No Class)	
	03/14/2019	Spring Break (No Class)	
10	03/19/2019	RNA-Seq Analysis 2	
	03/21/2019	RNA-Seq Analysis 3	7. Charissa
11	03/26/2019	RNA-Seq Analysis 4	
	03/28/2019	RNA-Seq Analysis 5	8. Jason
12	04/02/2019	RNA-Seq Analysis 6	
	04/04/2019	RNA-Seq Analysis 7	9. Jiao
13	04/09/2019	RNA-Seq Analysis 8	
	04/11/2019	Modeling and Simulation 1	10. Angela
14	04/16/2019	Modeling and Simulation 2	
	04/18/2019	Easter Break (No Class)	(No Class)
15	04/25/2019	Modeling and Simulation 3	
	04/25/2019	Modeling and Simulation 4	11. Bryan
16	04/30/2019	Modeling and Simulation 5, Quiz 2	
	05/02/2019	Modeling and Simulation 6	12. Yu
17	05/09/2019	Project – Final Presentation (12:00-2:00pm) (30 min presentation including Q&A for each group) Final Report Due (11:59 PM)	