CSE 549: Computational Biology

Class Description

CSE549 will cover commonly used machine learning algorithms and their applications to computational biology. The class is structured so that problem motivates the application of the methods. Problems are divided into sections according to corresponding types of data: sequence, matrix, graphs, and 3D structure. In each of the sections problems will be described, then example machine learning method used to solve the problem will be discussed. The class will involve combination of book & slides to describe the problems and machine learning methods and paper reading to see how it is actually applied. There will be a midterm exam and a semester project of your choosing. The final project will not be limited to topics in computational biology, but will require you to apply methods and ideas that have been discussed in class.

Instructor

Assistant Professor **Sael Lee**
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Meeting time : Mon/Wed 13:30~16:50 Academic Bldg. B204

Office Hours: TBD

Prerequisites: NA

Major Topics Covered in Course

We will learn about **entropy, relative entropy, and mutual information** in the context of solving DNA-binding site identification; learn about **mixture models** in the context of finding nucleosome positions; learn about **graph structure learning** in context of gene network construction; learn **about graph searching** in context of biomolecule searching; learn about **feature selection** in biomarker discovery; and **feature extraction** in context of protein surface analysis.

TextBook (Not required but useful**)**

- Pattern Recognition and Machine Learning, 2007, C.M. Bishop
- Information Theory, Inference and Learning Algorithms, D. MacKay (http://www.inference.phy.cam.ac.uk/mackay/itila/)
- Elements of Information Theory. T.M. Cover, J.A. Thomas
- Bioinformatics: Sequence and Genome Analysis, David W. Mount
- Introduction to Bioinformatics, 2008, A. M Lesk

Course Webpage: http://www3.cs.stonybrook.edu/~sael/teaching/cse549/ (will be available soon)

Grading: Midterm: 30%; Final Exam: 30%; Project: 40%

Class Policies

Attendance & participation policy

Everyone is strongly urged to attend class regularly and actively participate. You will be responsible for learning all the materials covered in class. Lecture slides and supplementary handouts will cover most of the material; however, in-class participation through engaging in discussions and asking questions should be valued learning activity.

The SUNY Korea Attendance Policy states “If a student has over 20% unexcused absence, the student’s final course grade will be an ‘F’.”

Assignments grading policy

Assignment will be handed out in class and are due at the start of class of the due date. Legible handwritten copies of the assignments should be turned in.

Total points of each assignment will be different depending on the difficulty of the problems. However, the maximum total point of an assignment will be less than or equal to two times the minimum total point of an assignment. Expect to see difficult problems towards the end of semester.

I will drop the lowest grade from among your assignment scores. No late assignments will be accepted.

Project grading policy

You will be required to propose and execute a final project based on the contents we will learn in class. The class grading will be based on 10% of the content of the proposal, 25% on the final report, and 5% project presentation which add up to 60% of your grade. SUNY-SB Blackboard facility will be used for submissions. The Blackboard facility will mark your time of submission. It is your responsibility to check if the uploads are done properly and to check if you received a proper grade. Grades will be e-mailed to you individually in a timely fashion.

Academic misconduct policy

There is no excuse in cheating. Cheating will be considered as an academic misconduct and handled according to the Stony Brook regulations. If cheating has occurred during exam or is evident in submitted assignments and projects, you will get a grad of F. Discussion of assignments is acceptable, however, returned assignments must show originality. This means near duplicate assignments with your peers or duplications of materials found on the web will be considered cheating. All involved personals in cheating will be penalized.

University Policies

Americans with Disabilities Act

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC(Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.https://web.stonybrook.edu/newfaculty/StudentResources/Pages/DisabilitySupportServices.aspx.

Academic Integrity

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website athttp://www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.