

CS419/519 BB499/599 – Algorithms for Computational Biology– 3 credits

Learner Outcomes –As a result of taking this course the students will:

Correctly understand the fundamentals of algorithms used in computational biology

Pre-requisites and Co-requisites

Professor

David Hendrix

Guest lecture by Stephen Ramsey.

Office Hours

KEC 3079 – MWF 3-4pm

ALS 2077A

Teaching Assistant

No teaching assistant this term due to such a small class.

Text:

“Introduction to Computational Molecular Biology” by Setubal and Meidanis

“Biological Sequence Analysis” by Durbin, Eddy, Krogh, and Mitchison

Grading:

20% - Quizzes – 6 short quizzes, you can drop one of them. Quizzes will be given on Fridays

40% - Mid Term Exam - on Friday May 2nd

40% - Final Exam

Homeworks will be given weekly on Friday, but not collected. The quizzes will be based on the homework.

Syllabus:

Alignment:

Edit Distance

Longest Common Substring

Smith-Waterman Algorithm

Needleman-Wunsch Algorithm

Scoring Matrices, Statistics,

Multiple Sequence Alignment

Assembly Problems:

Shortest Superstring Problem

Genome Assembly

Transcriptome Assembly

Motif finding:

K-means clustering

Gibb’s Sampling

Expectation Maximization
Suffix Trees

HMMs:

Background
Forward and Backward Algorithm
Viterbi Algorithm
CpG Islands
Gene Finding
Genome Annotation

RNA Secondary Structure:

Nusinov Algorithm
Zucker Algorithm

Phylogenetics:

Evolutionary models
Inferring tree topologies
Parsimony
Maximum Likelihood

Final Exam

Learner Expectations

1. Attend lectures (exams will be based on subjects covered in lecture)
2. Prepare for lectures by reviewing lecture notes and readings BEFORE lecture.
3. Attend office hours if there is difficulty in understanding concepts or problems.
4. Talking, eating, chewing gum noisily, using cell phones and other distracting activities are inconsiderate to fellow students and the lecturer; be considerate.

Statement Regarding Students with Disabilities: Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098 (tracy.bentley@oregonstate.edu).

Statement of Expectations for Student conduct: The Student Conduct & Community Standards office has generated a set of standards & expectations for student behavior. This information is at <http://oregonstate.edu/admin/stucon/index.htm>

Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Regulations. Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- cheating – use or attempted use of unauthorized materials, information or study aids
- fabrication – falsification or invention of any information
- assisting – helping another commit an act of academic dishonesty
- tampering – altering or interfering with evaluation instruments and documents
- plagiarism – representing the words or ideas of another person as one's own

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.

“The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student’s freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.”