

Algorithmic Foundations of Computational Biology

Fall 2019
CS 4390/5390

Algorithmic Foundations of Computational Biology

- Focus of the course will be on the *major* algorithmic results that make the current field of computational biology possible.
- Goal will be to explore the algorithms themselves and study the efficiency that makes them practical.
- Some biological background will be presented, but only enough to motivate the algorithmic problem.

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- Course Objectives:
 - Gain an understanding and appreciation for the fundamental algorithms in computational biology.
 - Be able to recognize and distill the underlying computational problem within a given context outside of computer science.
 - Recognize, define and create new algorithms for computational biology and other data intensive fields.

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- Textbook:
 - none required
 - course material will be prepared from many existing texts and primary literature
 - if material is not available from the university copies will be provided

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- Website: UTEP Blackboard
 - all announcements will be posted on the class blackboard page
 - class slides will be available for each session
 - homework and projects will (in most cases) also be submitted online

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- Grading:
 - Homeworks 25%
 - Project 20%
 - Midterm Exam 20%
 - Final Exam 25%
 - Class Participation 10%

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- Exams
 - Both are comprehensive
 - All material presented in class (including discussions), on blackboard, in homeworks, and assigned readings will be included

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- Project
 - Details available by October 1
 - Individually or in pairs
 - Goal is to get hands on experience with computational biology algorithms and datasets
 - Can related to research, but must be distinct

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- Homework
 - 5 homework assignments across the semester
 - goal is to go beyond what's presented in class and encourage algorithmic thinking
 - high-level discussions about the questions with classmates okay, but submissions must be your own
 - any material from a web-source must be properly cited

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- Extra credit
 - up to 7% of extra credit
 - create or drastically improve a wikipedia entry related to the course material
 - the more effort the more credit
 - side note: the International Society for Computational Biology runs a wikipedia competition each year¹ (with cash prizes)
 - see me before you start to discuss the topic you plan to edit

[1] https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Molecular_Biology/Computational_Biology/9th_ISCB_Wikipedia_competition_announcement

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- Important Dates:
 - Homework Due Dates (all Wednesday 11:59pm):
 - September 11
 - September 25
 - October 9
 - November 6
 - November 27
 - Midterm Exam (October 17, in class)
 - Thanksgiving (November 28, no class)
 - Last Regular Class Meeting (December 3)
 - Final Exam (December 10, 1:00-3:45pm)
 - Final Project Due (December 13, 11:59pm)

Late assignments will lose 10% of their value per day

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Week	Tuesday meeting	Thursday meeting
Aug 27–29	Course overview/Exact alignment	Exact alignment (continued)
Sept 3–5	Inexact Alignment	Inexact Alignment (continued)
Sept 10–12	<i>TBD</i>	Inverse Parametric Alignment
Sept 18–20	Multiple sequence alignment	Multiple sequence alignment (continued)
Sept 24–26	Database search	Phylogenomics
Oct 1–3	Intro to Next-generation Sequencing	Genome assembly
Oct 8–10	Genome assembly (continued)	Transcript assembly
Oct 15–17	Midterm Exam Review	Midterm Exam
Oct 22–24	Long-read assembly	Long-read assembly (continued)
Oct 29–31	Alignment-free genomics	Metagenomics
Nov 5–7	Network Biology	Network Biology (continued)
Nov 12–14	Genome Rearrangement	Genome Alignment
Nov 19–21	Motif finding	Protein Structure Prediction
Nov 26–28	Emerging Topics	Thanksgiving Holiday
Dec 3–5	Emerging Topics (continued)	Exam Review
Dec 10	Final Exam	

This is a *tentative* schedule of topics to be covered, speed may change how much we cover.

If there is a topic you see missing that you would like to discuss please tell me!

About me

- My office is CCSB 3.1008
- Office Hours: Tuesday and Wednesday 2:00-3:00pm,
or anytime my door is open (or by appointment)
- Email: dfdeblasio@utep.edu