Advanced Topics in Computational Biology(YSC4211C) 2020

Module coordinator: Nathan Harmston Email: nathan.harmston@yale-nus.edu.sg

The course will explore the development and application of computational and statistical approaches to understand biology – with a focus three main areas:

1. The development of CRISPR technologies – from identification of bacterial repeat sequences to statistics for large CRISPR screens.
2. The theory and implementation of machine learning techniques for studying sequence information.
3. The use of single-cell sequencing techniques to study inter-cell variability and signalling.

We will also be be having external speakers come in to talk about their own work and be discussing topics of interest as the course progresses. At a minimum this will include a discussion on splicing analysis and the phylogeny of SARs.

This course will require students to read the primary scientific literature; apply and implement sections of published analyses and to present papers in class. The readings for this course are an important/integral component.

Readings will include a variety of articles, reviews, textbook chapters etc.

Assessment

	N	%	Σ
Individual in-class participation		15	15
Problem sets / Individual work	5	8	40
Essays / Review	1	15	15
Group Projects / Group in-class exercises	2	15	30

Essay/Review

The topics for the essay/review will be given at the start of the semester and will be due at the end of the semester.This will be a 2500 words (with two figures) on a specific application of computational/statistical techniques to address a biological question centred on the three main focus areas of this course. Titles will be discussed individually with students, but will be things like "How has scRNA-seq improved our understanding of cancer?" or "How has CRISPR changed basic genetics research?" ..... .

I will only read **one** draft of this before you submit it at the end of the semester (at **least** two weeks before the deadline).

Problem Sets / Individual work

- there will be individual problems sets throughout this course - all of these will involve programming in R
- components of some of these will involve presenting results to the rest of the cohort
- will involve investigating the basics of techniques used in the primary literature that is discussed in class

Group projects

- the size/magnitude of the group projects depends primarily on the number of students who sign up for this class
- this will be group work to recreate all part of a published analysis from the literature and present on it in class
- a fraction of this grade will be evaluation by your peers

Office hours

- TBC

Absence Policy

Part of the grade for this course is based on participation. Students are expected to attend all classes, and to notify me in advance if you will be absent. It is your responsibility to get class notes from your peers and be prepared to rejoin the class after your absence. You will not be penalized for absences if you receive a Medical Certificate or AD Note.

Late Submission Policy

Deadlines are hard for problem sets and projects unless there are extenuating circumstances or you have spoken to me prior to the deadline.

Contact

Email or canvas .... Nathan or Prof. Nathan

I do not check/respond to e-mails on Saturdays - I will endeavour to respond to emails / messages on canvas within one day.