Computational and Systems Biology (YSC3241)

Semester 2 - AY21/22

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

This course concerned with learning to use statistical and computational approaches to ask questions about biology. We will be covering several key areas of computational biology with a focus on analysing data from high-throughput sequencing, including DNA, RNA and ChIP-sequencing, and the analysis of protein structure.

This course is designed as a practical introduction to data analysis for Life Sciences students and as such assessments will be in the form of weekly problem sets and two projects. The majority of these will involve programming using R. By the end of the course students should be able to perform basic analyses and understand how to apply these techniques to biological data.

Week		
1	Introduction to course	Molecular Biology
2	Sequencing technologies	Sequence Alignment I
3	Sequence Alignment II	Sequence Assembly
4	What is a genome?	Looking at genes!
5	DNA I - variation	DNA II - sequence analysis
6	DNA III	Using Linux
7	RNA-seq Analysis I	RNA-seq Analysis II
8	RNA-seq Analysis III	RNA-seq Analysis IV
9	RNA-seq Analysis V	RNA-seq Analysis VI
10	RNA-seq Analysis VII	Epigenetics - histone modifications
11	Epigenetics - chromatin structure	Epigenetics - Motifs
12	Proteomics	Network. Biology
13	Guest lecture	Case studies/Review

Assessment

	N	%	Σ
Problem sets	11	3	30
P1: Genomics/Programming	1	30	30
P2: Transcriptomics/Epigenetics	1	30	30
Participation		10	10
			100

Problem Sets

- 11 problem sets - (best 10 are counted) - each worth 3% of the final grade
- The majority of these questions will involve programming in R ... *but not all*
- Coursework to be submitted as a RMarkdown / R script and the associated output files (html)

- Collaboration on problem sets
  - Allowed, but work independently on each problem **before** discussing it
  - Write solutions on your own
  - Acknowledge sources and collaborators

Office hours

- There will be office hours ..... will be first come, first served! I may end up working with two or more of you at the same time!
- These are there to help you with material from the whole course

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.