Syllabus

Course Title

Introduction to Genomic Technologies

Course Instructor(s)

Steven Salzberg, Ph.D. and Jeff Leek, Ph.D.

Course Description

This course introduces you to the basic biology of modern genomics and the experimental tools used to measure this biology. It will cover how next-generation sequencing (NGS) technology is used to "read" DNA or RNA, which in turn creates the data that provides the raw material for genome analysis. The course will also give a brief introduction to key concepts in computing and statistics that you will need to understand how NGS data are analyzed.

Course Content

Introduction

Why genomics?
What is genomics?
What is computational genomics?
Overview of the Genomic Big Data Specialization
What are our MOOCs?

Molecular Biology

Just enough molecular biology
The genome
Writing a DNA sequence
Central dogma
Transcription
Translation
DNA structure and modifications

Measurement Technology

Next generation sequencing
Applications of sequencing

Computing Technology

What is computer science?
Algorithms
Memory and data structures
Efficiency
Software engineering
What is computational biology software?

Data Science Technology

What is reproducibility?
Methods, software, analysis and applications
Why you should care about statistics

Types of genomics analysis questions
The central dogma of inference
What is analysis code?
Testing
Multiple testing
The central dogma of prediction
Types of variation in genomics
Experimental design
Confounding
Power and sample size
Correlation and causation
Researcher degrees of freedom

Weekly quizzes
There are four weekly quizzes. You may begin submitting them as soon as the course opens. Quiz 1 is due at the end of the first week, Quiz 2 is due at the end of the second week, Quiz 3 is due at the end of the third week, and Quiz 4 is due at the end of the fourth week.
Quiz Scoring
You may attempt each quiz up to 3 times in 8 hours. The score from your most successful attempt will count toward your grade.
The Course Project
The Course Project is available from the first day that the class is open. It is due during the fourth week of the class.
Grading policy
You must receive a final grade of 70% or better on each assignment (quizzes and project) to pass the course.
Your final grade will be calculated as follows:
Quiz 1 = 15%
Quiz 2 = 15%
Quiz 3 = 15%
Quiz 4 = 15%
Course project = 40%

Differences of opinion
Keep in mind that currently data analysis is as much art as it is science - so we may have a difference of opinion - and that is ok! Please refrain from angry, sarcastic, or abusive comments on the message boards. Our goal is to create a supportive community that helps the learning of all students, from the most advanced to those who are just seeing this material for the first time.
Plagiarism
Johns Hopkins University defines plagiarism as "...taking for one's own use the words, ideas, concepts or data of another without proper attribution. Plagiarism includes both

direct use or paraphrasing of the words, thoughts, or concepts of another without proper attribution." We take plagiarism very seriously, as does Johns Hopkins University.

We recognize that many students may not have a clear understanding of what plagiarism is or why it is wrong. Please see the following guide for more information on plagiarism:

http://www.jhsph.edu/academics/degree-programs/master-of-public-health/current-students/JHSPH-ReferencingHandbook.pdf

It is critically important that you give people/sources credit when you use their words or ideas. If you do not give proper credit -- particularly when quoting directly from a source -- you violate the trust of your fellow students.

The Coursera Honor code includes an explicit statement about plagiarism:

I will register for only one account. My answers to homework, quizzes and exams will be my own work (except for assignments that explicitly permit collaboration). I will not make solutions to homework, quizzes or exams available to anyone else. This includes both solutions written by me, as well as any official solutions provided by the course staff. I will not engage in any other activities that will dishonestly improve my results or dishonestly improve/hurt the results of others.

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