

Fall 2020

BME 598 002: Introduction to Bioinformatics

T/Th 9:30am-10:45am, Remote by Zoom

Instructor: Yan Guo

Office Hours: by appointment

Email: yaguo@salud.unm.edu

Instructor: Huining Kang

Office Hours: by appointment

Email: HuKang@salud.unm.edu

Instructor: Li Luo

Office Hours: by appointment

Email: LLuo@salud.unm.edu

Course Description: This course is designed as an introductory course to bioinformatics. The students will be introduced to the concept of bioinformatics and the basic analysis methods used in bioinformatics.

Course Objectives: Students will learn the following from the course:

1. Concept of Bioinformatics
2. High throughput genomics data format and processing
3. Basic statistics associated with the bioinformatics analysis
4. Gene expression analysis
5. Genome wide association analysis

Remote access by Zoom

Due to pandemic, this class will be offered by zoom. Camera with a microphone is required for the class. Zoom link will be emailed to you at least one day prior to each class. Class may be recorded for later viewing.

Assessment: Students will be assessed on the above outcomes with homework assignments, as well as projects that emphasize the application of the material they have learned. Through assigned homework and projects, students will demonstrate their ability to synthesize knowledge; to apply, calculate and interpret designed experiments.

Quiz: 3-4 quick (10min) will be given in the class. The time of the quiz will be announced 1 week prior by email and in class.

Final Project: A final project will be given to the students. The exact format and content of the final project will be announced during class.

Grading:

CS518/BME 518

Class participation at UNM	20%
Homework	30%
Quiz	20%
Final Project/Presentation	30%
Total	100%

Homework and projects should involve individual effort, although you may work on it in groups. We will use programs based on R for numerically intensive problems, although you are free to use any other

software you are comfortable with (e.g., programmable calculators, Mathematica). All assignments will be collected at the start of class. Homework turned in after class begins will be assigned a maximum grade of 50%. No homework will be accepted after the beginning of the next class.

Final project/presentation: at the conclusion of the course, the students will design a new engineered device that addresses the needs of a developing nation or rural areas of developed nations. The students participating in the optional study abroad component will also give a presentation and demonstration of the device to the class at the end of the semester. Students who did not participate in the study abroad component will be required to attend these presentations (as reflected in the increased class participation contribution to their final grades), but will not participate in the project or presentation itself.

Excused absences: Missing a class on a day that homework is due or a quiz is given will affect your grade (see above). If you know you will miss a class due to a medical reason, you must let me know via email or phone prior to class.

Students with Disabilities If you are a qualified person with disabilities who needs appropriate academic adjustments, please communicate with me as soon as possible, such that we can make appropriate arrangements to meet your needs.

Class Schedule

Lecture	Date	Topic	Instructor
1	8/18/2020	Introduction to Bioinformatics	Yan Guo
2	8/20/2020	Introduction to Human Biology	Yan Guo
3	8/25/2020	High throughput Sequencing Data Format	Yan Guo
4	8/27/2020	High throughput Sequencing Data Processing: DNA	Yan Guo
5	9/1/2020	High throughput Sequencing Data Processing: RNA	Yan Guo
6	9/3/2020	Introduction to R	Huining Kang
7	9/8/2020	Genomic Data Management in R	Huining Kang
8	9/10/2020	Preprocessing of Gene Expression Data	Huining Kang
9	9/15/2020	Unsupervised Data Exploration	Huining Kang
10	9/17/2020	Genomic Data Visualization	Huining Kang
11	9/22/2020	Basic Machine Learning	Yan Guo
12	9/24/2020	Genotyping	Yan Guo
13	9/29/2020	Public data access	Yan Guo
14	10/1/2020	Public data analysis	Yan Guo
15	10/6/2020	Differential Gene Expression Analysis I	Huining Kang
16	10/8/2020	Differential Gene Expression Analysis II	Huining Kang
17	10/13/2020	Pathway analysis	Li Luo
18	10/15/2020	Prediction Analysis of Gene Expression Data I	Huining Kang
19	10/20/2020	Prediction Analysis of Gene Expression Data II	Huining Kang
20	10/22/2020	Basic concepts in population genetics	Li Luo
21	10/27/2020	Basic concepts in genetic epidemiology	Li Luo
22	10/29/2020	Population stratification bias	Li Luo
23	11/5/2020	Population structure in association analysis	Li Luo
24	11/10/2020	Genetic association studies	Li Luo

25	11/12/2020	Statistical analysis of genetic association studies	Li Luo
26	11/17/2020	Rare variant association studies	Li Luo
27	11/19/2020	Mutational signatures in cancer genomics studies	Li Luo
28	11/24/2020	Final Project Discussion	
29	12/3/2020	Project Presentation	