Biomedical Informatics: Sequence Analysis

Xiaoman Shawn Li
xiaomanshawnli@gmail.com
Office: HEC210
Phone: 823-4811
Office hour: MW1:00-2:00pm

http://www.cs.ucf.edu/~xiaoman/fall/
The big picture
One of the best Bioinformatics work

Phoebus Levene identified the nucleotide unit: base, sugar, and phosphate.

Erwin Chargaff’s rule: #A=#T, #G=#C

Rosalind Franklin: X-ray structure of DNA

Linus Pauling: Triple structure model of DNA
Why you want to know CB

- CB to you is like the computer to the people in the 70th.
- Computational biology training will be one of the routine training for biologists.
- You are looking for answers to some questions, which may be addressed from the data people already generated.
- What you have taught in the past and what you take for granted may be completely wrong.
- You will be paid much higher
- You want to be the next Richard Karp, Wing Wong, Walter Gilbert
Bioinformatics courses offered at UCF

- *Introduction to Bioinformatics
- *Algorithms in Bioinformatics
- Machine Learning in Bioinformatics
- Algorithms in Comparative Genomics
- *Biomedical Informatics: Sequence Analysis
- Biomedical Informatics: Structure Analysis
Topics will be covered

- Retrieval of gene information
- Sequence analysis
- Programming
- Gene regulation analysis at the transcriptional level
- Next generation sequencing
- Current trends in bioinformatics
Graduate Assignments

- Choose one topic you are interested in and read three papers. The preferred topics include but not limited to miRNA, epigenomics, metagenomics, chromatin structure, gene transcriptional regulation. The papers must be from Science, Nature, Nature Genetics, Nature biotech, Nature methods, or cell after 2013. All three papers should utilize next generation sequencing data for their analyses. The instructor should be informed of the selected topic before Sept 13 and the slides should be submitted by email no later than Oct 4 (20%).

- If you present methodology papers applied on biological problems, you can choose papers from other journals with impact factor larger than 5 and published after 2009.

- Present your topics in 20 minutes and lead the discussion (40%).

- Write a 1 page of your thoughts on future directions of the topics you presented (30%). The essay must include at least two points about what can be done for future research by yourself, not from the papers. You don’t need to solve the problems. Due on Dec 4.

- The teacher’s evaluation based on your class presence (5%), participation in class and questions during others’ presentations (5%).
Undergraduate Assignments

• Choose one topic and read 1~2 papers on the selected topic. The preferred topics include but not limited to: miRNA, epigenomics, metagenomics, chromatin structure, gene regulation. The main paper selected must be from Science, Cell, or Nature, Nature Biotechnology, Nature Genetics, Nature Methods and must be published after 2013. The main paper should use the next generation sequencing data. Make slides for 20 minute presentation. The topic choice is due on Sep 13. Your presentation ppt file is due on Oct 4 (20%).
• Present your topics and lead the discussion (40%).
• Write a 1 page of your own thoughts (not from the paper(s)) on future directions of the topics you presented (30%). You don’t need to solve the problems. Due on Dec 4.
• The teacher’s evaluation based on your class presence (5%), participation in classes and questions during others’ presentations (5%).
Grade criteria

- A: 95-100; A-: 90-94; B+: 87-89; B: 83-86; B-: 80-82; C+: 77-79; C: 73-76; C-: 70-72; D+: 67-69; D: 63-66; D-: 60-62; F: <60
- If you miss a lecture, you lose a point. After five lectures, you can at most get an A-.
- If you provide the topic later than Sept 14, you will lose 3 points. If you provide your topic after Oct 1st, you lose 5 points.
- You need to make your own slides. If you use other person’s slides, you will lose 5 to 10 points.
- You are expected to explain the slides you made instead of reading the slides. If you read more than 50% of time, you will lose 10 points.
- You should have at least 15 slides when you submit on Oct 5. Otherwise, you will lose 1 to 5 points.
- In the final essay, you are expected to point out one or more directions for further research. An essay with only the points from the paper will lose 10 points.