Combinatorial Methods in Bioinformatics

A short briefing

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Who is Ken Sung?

- Graduated from the department of Computer Science, the University of Hong Kong

- Current position:
  - Professor, School of Computing, National University of Singapore
  - Senior Group Leader, Genome Institute of Singapore

- Research interest: Algorithm and Bioinformatics

Recommended “Prerequisites”

- Data Structures and Algorithms
- Biochemistry of Biomolecules
- Molecular Genetics

Objective

- Bioinformatics is a fast changing area.
- In the post-genome era, many bio-technologies appear and classical algorithms for bioinformatics are no longer enough.
- We intended to study the important algorithms related to the technologies like microarray, SNPs, mass spectrometry, etc.
- Have an in-depth study of a few interesting computational biology problems

- Note: I aim to teach the hard part of bioinformatics. So, we don't talk about how to use software. This is to help your career in the future!

What to do?

- Attend lecture
- Assignments
- Reading
- Final Exam

Attend lecture

- During: May and June 2019
- 16 lectures
- Each lecture takes 2 hours
- English
- Email
  - wksung1@qq.com
  - My QQ number: 3368465145
  - Algorithms in Bioinformatics QQ number: 336766291

Syllabus (Tentative)

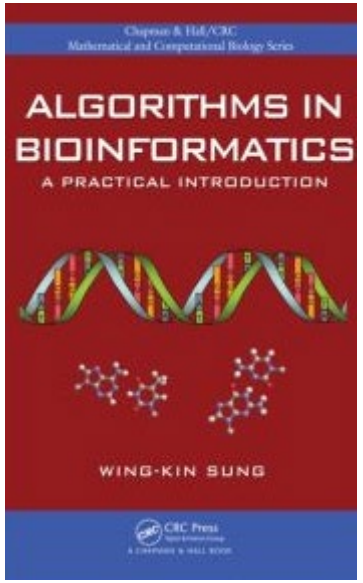
Date	Time	Topic
7/5/2020	10:30-12:10	Introduction
9/5/2020	14:30-16:10	Sequence alignment
12/5/2020	14:30-16:10	Sequence alignment
14/5/2020	10:30-12:10	Sequence alignment
19/5/2020	14:30-16:10	Database search + tutorial
21/5/2020	10:30-12:10	Database search
26/5/2020	14:30-16:10	Database search + tutorial
28/5/2020	10:30-12:10	Whole genome alignment
2/6/2020	14:30-16:10	Phylogenetic tree character based + tutorial
4/6/2020	10:30-12:10	Phylogenetic tree character based
9/6/2020	14:30-16:10	Phylogenetic tree distance based + tutorial
11/6/2020	10:30-12:10	Phylogenetic tree distance based
16/6/2020	14:30-16:10	Genome assembly + tutorial
18/6/2020	10:30-12:10	Genome assembly
23/6/2020	14:30-16:10	RNA 2nd structure + tutorial
25/6/2020	10:30-12:10	Exam

Teaching style

- Bioinformatics is a board area.
- You need to learn by yourself:
  - Reading books/notes
  - Reading papers
  - Practice on the web
- Don’t expect the instructor will tell you everything.

Main Textbook

- Wing-Kin Sung, "Algorithms in Bioinformatics: A Practical Introduction", CRC Press (Taylor & Francis Group), 2009.
- Wing-Kin Sung, “Algorithms for Next-Generation Sequencing”, CRC Press (Taylor & Francis Group), 2017.



Supplementary readings

- Neil C. Jones and Pavel A. Pevzner, "An Introduction to Bioinformatics Algorithms", MIT Press, 2004.
- Pavel A. Pevner, "Computational Molecular Biology: An Algorithmic Approach", MIT Press, 2000.
- Joao Setubal and Joao Meidanis, "Introduction to Computation Molecular Biology", PWS Publishing Company, 1997.
- Dan Gusfield, "Algorithms on Strings, Trees, and Sequences - Computer Science and Computational Biology", Cambridge University Press, 1997.

Assessment

- 1 programming assignment
- 6 tutorial (As long as you attempt and submit, you will get mark!)
- 1 or 2 Written assignments
- 1 exam

Any questions!

- Hope that you enjoy this class