CS3225v: Combinatorial Methods in Computation Biology

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

- Computational Biology is a fast changing area.
- In the post-genome era, many bio-technologies appear and classical algorithms for computational biology 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 computational biology. 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
- 8 lectures
- Each lecture takes 3.5 hours
- English
- Office: Room 306
- Email
  - ksung@comp.nus.edu.sg
  - sungk@gis.a-star.edu.sg
  - My QQ number: 3368465145
  - Algorithms in Bioinformatics QQ number: 336766291

Syllabus

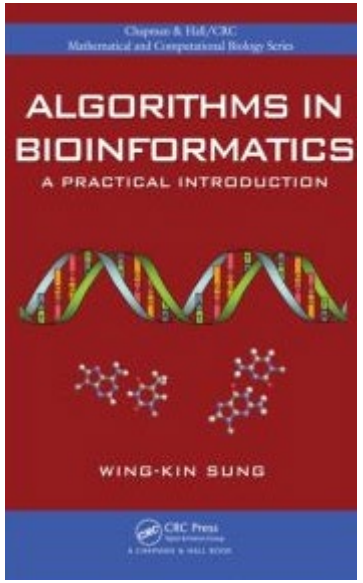
Lecture No.	Topics
1	Basic + Sequence similarity
2	Database search + Multiple sequence alignment
3	Whole genome alignment + genome rearrangement
4	Markov model and Hidden Markov model
5	Phylogenetic tree
6	Genome assembly
7	ChIP-seq + motif finding
8	RNA secondary structure + peptide sequencing

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
- 1 or 2 Written assignments
- 1 quiz

Any questions!

- Hope that you enjoy this class