Math 578b: Computational Molecular Biology

Lectures: 11:00-12:20 AM TuTh, Room: KAP 164

Instructors

Professor Fengzhu Sun MCB 416H	Phone (213) 740-2413	Email: fsun@usc.edu	OH: TTh 12:30-2:00
Professor Liang Chen MCB 416E	Phone (213) 740-2143	Email: liang.chen@usc.edu	OH: TTh 12:30-2:00
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Course Content

Applications of the mathematical and statistics to data from molecular biology. Statistics for genomic sequence data: DNA sequence assembly, significance of alignment scores, hidden Markov models, models of sequence evolution, population genomics, genetic mapping, and next generation sequencing.

Textbooks

M.S. Waterman (1995) *Introduction to Computational Biology.* Chapman Hall-CRC Press.
Warren J. Ewens and Gregory Grant (2005) *Statistical Methods in Bioinformatics: An Introduction*.

Optional Textbooks

T. Koski (2002) *Hidden Markov Models for Bioinformatics*. Kluwer Academic Publishers.

R. Durbin et al. (1998) *Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids.* Cambridge University Press.

Grading

Homework 40%, Two midterms 20% (each), Final 20%
Final Exam: Tuesday December 16, 8 AM -10 AM

	Math 578b Lecture	**Computational Molecular Biology Topic**	**Lecturer**
Wk. 1	8/25	Introduction; Markov Chains I	PR
	8/27	Markov Chains II	PR
Wk. 2	9/01	MCMC and Phylogenetics	PR
	9/03	Population genomics I	PR
Wk. 3	9/08	Population genomics II	PR

	9/10	Evolution I	PR
Wk. 4	9/15	Evolution II	PR
	9/17	Evolution III	PR
Wk. 5	9/22	EM algorithm	PR
	9/24	Midterm I	PR
Wk. 6	09/29	Next generation sequencing I (Sequencing accuracy)	FS
	10/01	Next generation sequencing II (RNA-Seq)	FS
Wk. 7	10/06	Word Counts I	FS
	10/08	Word Counts II	FS
Wk. 8	10/13	Global Alignment Statistics	FS
	10/15	Local Alignment Statistics I	FS
Wk. 9	10/20	Local Alignment Statistics II	FS
	10/22	Sequencing Progress I (Lander-Waterman Model)	FS
Wk. 10	10/27	Sequence Progress II (Next Generation Sequencing:Chip-Seq)	FS
	10/29	Midterm II	FS
Wk. 11	11/03	HMM Theory I	LC
	11/05	HMM Theory II	LC
Wk. 12	11/10	HMM Application I	LC
	11/12	HMM Application II	LC
Wk. 13	11/17	Statistical Genetics I	LC
	11/19	Statistical Genetics II	LC
Wk. 14	11/24	Statistical Genetics III	LC
	11/26	THANKSGIVING	
Wk. 15	12/02	Multiple Testing and FDR	LC
	12/04	Exam III	LC