

## Math 577a: Computational Biology Laboratory

**Time and Location:** 50435R 2:00-4:00 Tue, Room: MCB-301

### **Instructors:**

Dr. Xianghong Jasmine Zhou	213-740-7055	xjzhou@usc.edu
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### **Description:**

Practical experience in computational biology applications. Mathematical and statistical software packages relevant for genomic analysis. Retrieval and analysis of genomic data from databases.

### **Goals:**

Gaining familiarity and competency in mathematical and statistical software packages applicable to genome analysis and their underlying principles. Development of facility in use and application of molecular biology/genomic databases and ancillary software tools.

**Text:** No required text book. Handouts will be given during the classes.

### **Suggested references:**

Bioinformatics and Computational Biology Solutions Using R and Bioconductor\_(Statistics for Biology and Health) by Robert Gentleman, Vincent Carey, Wolfgang Huber, and Rafael Irizarry

Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by Andreas D. Baxevanis and B. F. Francis Ouellette

**COURSE CONTENTS:** Biological web resources, sequence alignment, BLAST, phylogenetic trees, sequence assembly, gene recognition, RNA and protein structure,

introduction to R, motif identification, microarray analysis, hidden Markov models (HMM).

**Homework:** Homework projects will be assigned by the instructors. You should hand in your projects by the due date specified by the instructors. Points will be subtracted for projects submitted after the due date.

**Grade:** Course grade will be based on the homework projects.

### **Tentative Schedule:**

1. 01/09 Introduction to NCBI web resources (Sun)
2. 01/16 Introduction to Genome Browser (Sun)
3. 01/23 Pairwise and Multiple Sequence Alignment (Sun)
4. 01/30 BLAST (Sun)
5. 02/06 Phylogeny (Sun)
6. 02/13 Protein interactions and Gene ontology (Sun)
7. 02/20 Gene finding (Li)
8. 02/27 DNA sequencing (Li)
9. 03/06 The international hapmap project and software tools (Li)
10. 03/13 Spring break
11. 03/20 Introduction to R (Li)
12. 03/27 Gene Expression Normalization (Li)
13. 04/03 Microarray Analysis (Public Database and Clustering) (Zhou)
14. 04/10 Microarray Analysis (dChip and differential analysis) (Zhou)
15. 04/17 Microarray Analysis (Integrative Analysis) (Zhou)
16. 04/24 Transcription Factor Binding Sites Prediction (Transfac) (Zhou)