

## CS178A Computational Biology

**Description:** Information and computing technologies are becoming indispensable to modern biological research due to the significant advances of high-throughput experimental technologies in recent years. This course presents an overview of the systematic development and application of computing systems and computational algorithms/techniques to the analysis of biological data, such as sequences, gene expression, protein expression, and biological networks. It is intended for advanced undergraduate students and graduate students. Hand-on training will be provided.

### Syllabus:

- Biological Databases
- Sequence Analysis
  - Genome Sequencing
  - Pair-wise sequence alignment
  - Fast sequence searches
  - Phylogeny
  - Multiple sequence alignment
  - Hidden Markov model and gene prediction
  - Comparative genomics
- Transcription Regulation and Microarray Technology
  - Transcription regulatory motif finding
  - ChIP-chip, genome tiling microarrays
  - Gene Ontology
  - Microarray data analysis
    - Normalization and gene expression index
    - Differentially expressed gene detection and hypothesis testing
    - Clustering
    - Classification
    - Dimension reduction techniques
  - Microarray analysis software
- Proteomics
  - Protein interaction network
  - Mass spectrometry data analysis