COSI-178A Computational Biology  
Instructor: Pengyu Hong

**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 (provisional):**
- Biological Databases
- Sequence Analysis
  - Genome Sequencing
  - Pair-wise sequence alignment
  - Fast sequence searches
  - Phylogeny
  - Multiple sequence alignment
- Transcription Regulation and Microarray Technology
  - Transcription regulatory motif finding
  - Gene Ontology
  - Microarray data analysis
    - Normalization and gene expression index
    - Differentially expressed gene detection and hypothesis testing
    - Clustering
    - Classification
    - Dimension reduction techniques
- Proteomics/Glycomics
  - Mass spectrometry data analysis

* This course will not teach programming. Some assignments (include the term project) require programming. Students can choose any of the following programming languages: C++, Java, Matlab, Python, or R.

**Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).**