CSI 4780: Bioinformatics

Credits Hours: 4 credits, 3.57 contact hours/week.

Instructor: Gautam B. Singh, Ph.D.

Text book: N/A

Specific course information

This is an introductory course on bioinformatics. Bioinformatics is the application of statistics and computer science to the field of molecular biology. In order develop computational tools, we begin by gaining familiarity with molecular biology and genetics, the human genome project and other research efforts for mapping the blueprint of life. Study of genetics and diseases required capturing information and capturing terabytes of data that needs to be stored, curated, indexed, correlated, and searched. The course covers some of these key databanks and the algorithms to search them. Modeling biological data and patterns using stochastic and linguistic modeling techniques is covered. A system biology perspective for clustering biological sequence data and microarray gene expression data is covered to discover patterns and trends in biological data and draw conclusions from the same.

Prerequisites: major standing

Elective course

Course Objectives: Upon successful completion of this course, students should be able to

- Describe basic concepts of molecular biology and genetics [ABET CS: (a)]
- Demonstrate knowledge of biological databases, their inter-relationships and applications [ABET CS: (a)]
- Describe sequence alignment algorithms and their application [ABET CS: (a)]
- Perform computational analysis of DNA and protein sequences [ABET CS: (a, i)]
- Perform mathematical modeling of patterns in DNA and protein sequences [ABET CS: (a, i)]
- Describe microarrays and their applications for biological systems [ABET CS: (a)]

List of Topics:

- Introduction to bioinformatics molecular biology and genetics
- Biological databases
- Information retrieval from biological databases
- Sequence homology DNA and protein alignment multiple sequence alignment
- Proteomics and systems biology microarrays
- Phylogenetic analysis