BIOL 6810, CSCE 6810, MATH 6710

Advanced Topics in Computational Life Sciences

Topic: Multi-omics data analysis

Fall 2023

Instructor: Rajeev K. Azad

Lectures/Seminars: Thursday, 6:30 – 9:20 PM at ENV 120

Office Hours: Friday, 8-9:30 AM via Zoom: https://unt.zoom.us/j/2298672063, 4:30 - 5:00 PM at LSC B314, or by appointment

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Required Textbook: There will be no required textbook. The course will be based on published journal and conference articles.

Course Objective: This course focuses on recent advances in multi-omics data analysis, with applications in biological and biomedical sciences. The goal of this course is to explore the literature on the topics of developments in multi-omics data modeling and analysis in the context of current and emerging biological/biomedical problems. Advances in high-throughput technologies, including next generation sequencing data, have led accumulation of a vast amount omics data in various databases across the globe, including those of genomics, transcriptomics, proteomics, metabolomics, methylomics, interactomics, and phenomics. These data have been collected from diverse organisms, geographical locations, and environments. The focus of this course is on leveraging computational methods including machine learning for integration and analysis of diverse omics datasets.

Students will present and discuss research papers that describe the latest developments in the field, focusing on the use of computational methodologies and techniques in the integration and analysis of multi-omics. These papers will form the basis for investigative research projects using the methodologies presented in these papers to address important problems in biology or medicine. Students will participate in projects (in team or individually) motivated by problems from this field. Applications of both state-of-the-art as well as emerging multi-omics approaches will be discussed. Students will learn how these techniques are currently being used in addressing a variety of problems in biology or medicine, and will then explore their use in addressing important open problems in these fields. Students will be encouraged to develop ideas or strategies for more robust integration and analysis of multi-omics data and implement in their project works.

Assessment is primarily based on 1) paper and project progress presentations (45%), 2) project work, written report, and final presentation (30%), and 3) class participation─ attendance and discussions (25%).

Attendance: Attendance is essential and thus is expected.