

CS 843 Artificial Intelligence for Healthcare

Credit Hours:	3+0	Prerequisites :	- A course in AI or ML or Deep Learning or Computer Vision at UG/PG level - Good programming skills
----------------------	-----	---------------------------	--

Course Objectives:

The course is designed to develop student research skills in the broad area of computational pathology, medical image analysis and analyzing healthcare data. It will cover topics on the analysis of massive amounts of data generated in biomedical sciences, in particular DNA/RNA sequences and large multi-gigapixel pathology images. Students will be introduced to the foundations of two fundamental types of biomedical data including genomic sequences and tissue images and how these are acquired and processed. Machine learning plays a central role in processing these data, and to develop computational models that help us better understand the complex phenomena underpinning biological processes. The module will be taught following an “algorithmic approach”, demonstrating that computational biology is a wide-open arena that offers a very diverse range of problems and thus a diverse range of algorithms, making it an exciting and rapidly evolving field for computer scientists.

Course Contents:

- Medical image analysis fundamentals
- Sequence alignments
- Introduction to tissue imaging and computational pathology
- Whole-slide image (WSI) handling and processing
- Recognizing various kinds of cells in cancerous WSIs
- Advanced research topics in computational pathology

Course Learning Outcomes:

At the end of the course the students will be able to:

1. Have a basic grasp of fundamental medical imaging modalities concepts as relevant to this course
2. Understand some basic and commonly used algorithms in medical image analysis
3. Know algorithms to compute sequence alignments and how these are applied in current research
4. Apply image analysis and machine learning to real-world computational pathology problems
5. Have an understanding of how tissue slides are imaged with high throughput
6. Understand basic problems in the processing and analysis of tissue images and some standard solutions to those
7. Analytics of healthcare data, Electronic Medical Records and disease ontology

Teaching Methodology:

Lectures, Problem based learning

Course Assessment:

Sessional Exam, Home Assignments, Quizzes, Project, Presentations, Final Exam

Reference Materials/ Books:

1. L. Pantanowitz and A. Parwani, Digital Pathology, ASCP, 2017
2. The Image Processing Handbook, John C. Russ, CRC Press, 7th ed, 2017